ADDENDUM NO. 1

TO: PLANS AND SPECIFICATIONS FOR STATE OF MISSOURI

Replace Fire Alarm System & Electrical Renovation
Bellefontaine Habilitation Center
Bellefontaine Neighbors, Missouri 63137
PROJECT NO.: M2006-01

Bid Opening Date: 1:30 PM, May 20, 2025 (UNCHANGED)

Bidders are hereby informed that the construction Plans and/or Specifications are modified as follows:

SPECIFICATION CHANGES:

1. Section 000115 – Drawing Index

   DELETE this Section and REPLACE with attached Section 000115 – Drawing Index (Pages 1 through 3).

2. Section 011000 – Summary of Work

   DELETE this Section and REPLACE with attached Section 011000 – Summary of Work (Pages 1 through 4).

3. Section 012200 – Unit Prices

   DELETE this Section and REPLACE with attached Section 012200 – Unit Prices (Pages 1 through 2).

4. Section 260573 – Protective Device Coordination Study and Arc Flash Risk Assessment

   DELETE this Section and REPLACE with attached Section 260573 – Protective Device Coordination Study and Arc Flash Risk Assessment (Pages 1 through 11).

5. Section 283111 – Addressable Fire Alarm System

   DELETE this Section and REPLACE with attached Section 283111 – Addressable Fire Alarm System (Pages 1 through 30).

DRAWING CHANGES:

1. Drawing G-003:

   DELETE this Drawing and REPLACE with attached Drawing G-003 – Drawing Index.

2. Drawing ES-101:

   DELETE this Drawing and REPLACE with attached Drawing ES-101 – Electrical Site Plan.

3. Drawing FA-001:

   DELETE this Drawing and REPLACE with attached Drawing FA-001 – Fire Alarm Cover Sheet/Notes, Matrix, and Sheet Index.

4. Drawing FA-100:

   DELETE this Drawing and REPLACE with attached Drawing FA-100 – Site Fire Alarm Plan.

5. Drawing FA-103:

   DELETE this Drawing and REPLACE with attached Drawing FA-103 – Buildings 1601-1610, 1908, 1801-1810, 1901-1904 New Work Fire Alarm Plan.

6. Drawing FAD-103:

   DELETE this Drawing and REPLACE with attached Drawing FAD-103 – Buildings 1601-1610, 1908, 1801-1810, 1901-1904 Demolition Work Fire Alarm Plan.

7. Drawing FA-605:

   DELETE this Drawing and REPLACE with attached Drawing FA-605 – Buildings 1901-1904 Matrix, CBE, Calculations and Riser Diagram.

GENERAL COMMENTS:

1. The Pre-Bid Meeting was held at the project site at 10:00am on May 6, 2025, followed by a walk-through of the project site. A copy of the Attendance Record is attached for information only. Changes to, or clarification of, the Bid Documents are only made as issued in the Addenda.

2. Contractor must be accompanied by a MO OA FMDC escort at all times when performing work in an occupied building. MO OA FMDC will provide a single escort person on each working day when the Contractor requires an escort.

3. As of May 13, 2025, the following buildings are vacant, and this is not expected to change for the duration of this project:

   1801 through 1810
   1908
   1903/1904
   Apartment A
   1901/1902 is only occupied on Wednesdays

4. All fire alarm work associated with Building 1905/1906 is being executed under a separate project and is hereby deleted from this project.

5. The size and connection points for temporary generators that will need to be furnished by the Contractor whenever there is an outage on the main campus 12.47kV switchgear that will last longer than three (3) consecutive hours are indicated in Specification Section 260500-3.11. The Ameren Missouri provided meter usage report for the primary meter at the main campus 12.47kV switchgear is attached for Contractor's information. The Contractor will assume all risk if he chooses to furnish generators of lower output ratings than specified when providing temporary power for the facility. Additional requirements related to power outages and advanced notification of power outages are covered in the Construction Phasing & Schedule notes on Drawing G-002.

6. The equipment drawings, schematics and wiring diagrams for the existing main campus 12.47kV Siemens metal-clad switchgear, as modified by EPS Engineering & Design in

2019/2020, are attached for the Contractor's use as indicated in Specification Section 260115-3.1 A.1.

7. The existing campus wide SKM power system study provided by Vincent Kunderman, P.E. on 9/18/2018 is attached for the Contractor's use as indicated in Specification Section 260573-1.10 A. The native SKM files from this study will be provided to the successful Contractor's study engineer to use as the base model for the new study after the notice-to-proceed is issued.

8. Bidders desiring to perform a site inspection should contact Mike Tyler at (314) 566-1798 to schedule a time to enter the facility.

9. Please contact Paul Girouard, Contract Specialist, at (573) 751-4797, Paul.Girouard@oa.mo.gov for questions about bidding procedures, MBE\WBE\SDVE Goals, and other submittal requirements.

10. Following are the responses to the technical questions that were submitted in writing (via email) by the deadline indicated at the pre-bid meeting (noon on May 12, 2025):

    a. Question 1: Per keyed note 1 sheet FA-001 is the intent of this note to provide new conduit and wire to the PIV's or to reuse existing conduit and provide new wiring?

       Response: The intent is to reuse existing underground conduit pathways and pull new wiring to the remote PIV's.

    b. Question 2: Can you provide the load profile for the batteries in the Main Electrical Switchgear?

       Response: Amp-hour rating of new switchgear batteries shall be greater than or equal to the rating of the existing ALCAD FIAMM SGL-7D batteries that are to be replaced.

    c. Question 3: Are the existing concrete pads to be reused in place for the new switchgears and sectionalizing switches to be . . . ?

       Response: The question was not complete, but it is believed to be asking if the existing 12" wide concrete aprons around the existing pad-mount switchgear fiberglass box pads are to remain in place where new pad-mount switchgear are sectionalizing cabinets are to be installed. The intent of the pad mounted switchgear and sectionalizing cabinet details on Drawing E-501 is for the existing fiberglass box pads and concrete aprons around the fiberglass box pads to remain in place for installation of the new switchgear or sectionalizer cabinet. Detail 107/E-501 provides instructions for modifications to close the opening in the top of the fiberglass box pad at locations where a pad-mount switchgear is to be removed and a dimensionally smaller sectionalizer cabinet is to be installed.

ATTACHMENTS:

1. Revised Specification Section 000115 – Drawing Index (3 pages).

2. Revised Specification Section 011000 – Summary of Work (4 pages).

3. Revised Specification Section 012200 – Unit Prices (2 pages).

4. Revised Specification Section 260573 – Protective Device Coordination Study and Arc Flash Risk Assessment (11 pages).

5. Revised Specification Section 283111 – Addressable Fire Alarm System (30 pages).

6. Revised Drawing G-003 – Drawing Index.

7. Revised Drawing ES-101 – Electrical Site Plan.

8. Revised Drawing FA-001 – Fire Alarm Cover Sheet/Notes, Matrix, and Sheet Index.

9. Revised Drawing FA-100 – Site Fire Alarm Plan

10. Revised Drawing FA-103 – Buildings 1601-1610, 1908, 1801-1810, 1901-1904 New Work Fire Alarm Plan.

11. Revised Drawing FAD-103 - Buildings 1601-1610, 1908, 1801-1810, 1901-1904 Demolition Work Fire Alarm Plan.

12. Revised Drawing FA-605 – Buildings 1901-1904 Matrix, CBE, Calculations and Riser Diagram.

13. M2006-01 Pre-Bid Meeting Attendance Sheets (4 pages).

14. Ameren Missouri meter usage report for the Bellefontaine Habilitation Center for the period 1/6/2020 to 5/2/2025.

15. Equipment drawings, schematics and wiring diagrams for the existing main campus 12.47kV switchgear (62 sheets).

16. Existing campus wide SKM Power System Study completed by Vincent Kunderman, P.E. dated 9/18/2018 (117 sheets).

END ADDENDUM NO. 1

SECTION 000115 – LIST OF DRAWINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section provides a comprehensive list of the drawings that comprise the Bid Documents for this project.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 LIST OF DRAWINGS

A. The following list of drawings is a part of the Bid Documents:

	TITLE	SHEET #	DATE
1.	Cover Sheet	Sheet G-001	02-10-25
2.	Site Maps, Asset Numbers, Construction Phasing & Schedule	Sheet G-002	02-10-25
3.	Drawing Index **(ADDENDUM 1, 05/13/25)**	Sheet G-003	~~02-10-25~~ **05-13-25**
4.	Electrical Symbols, Abbreviations & General Notes	Sheet E-001	02-10-25
5.	Electrical Site Plan **(ADDENDUM 1, 05/13/25)**	Sheet ES-101	~~02-10-25~~ **05-13-25**
6.	12.47kV Campus Main Switchgear	Sheet ES-401	02-10-25
7.	Maintenance Building Electrical Demolition Plan	Sheet ED-401	02-10-25
8.	Physical Therapy Building Electrical Demolition Plan	Sheet ED-402	02-10-25
9.	Donnelly Building Electrical Demolition Plan	Sheet ED-403	02-10-25
10.	12.47kV One–Line Diagram – Demolition	Sheet ED-601	02-10-25
11.	Demolition One-Line Diagram – Maintenance Building	Sheet ED-602	02-10-25
12.	Demolition One-Line Diagram – Physical Therapy Building	Sheet ED-603	02-10-25
13.	Maintenance Building Electrical Plan	Sheet E-401	02-10-25
14.	Physical Therapy Building Electrical Plan	Sheet E-402	02-10-25
15.	Donnelly Building Electrical Plan	Sheet E-403	02-10-25
16.	Electrical Details	Sheet E-501	02-10-25

	TITLE	SHEET #	DATE
17.	12.47kV One–Line Diagram	Sheet E-601	02-10-25
18.	One-Line Diagram – Maintenance Building	Sheet E-602	02-10-25
19.	One-Line Diagram – Physical Therapy Building	Sheet E-603	02-10-25
20.	12.47kV Feeder & Equipment Schedules	Sheet E-604	02-10-25
21.	Fire Alarm Cover Sheet/Notes, Matrix, and Sheet Index **(ADDENDUM 1, 05/13/25)**	Sheet FA-001	~~02-10-25~~ **05-13-25**
22.	Site Fire Alarm Plan **(ADDENDUM 1, 05/13/25)**	Sheet FA-100	~~02-10-25~~ **05-13-25**
23.	Apartment A New Work Fire Alarm Plan	Sheet FA-101	02-10-25
24.	Apartment B New Work Fire Alarm Plan	Sheet FA-102	02-10-25
25.	Buildings 1601–1610, 1908, 1801–1810, 1901–~~1906~~ **1904** New Work Fire Alarm Plan **(ADDENDUM 1, 05/13/25)**	Sheet FA-103	~~02-10-25~~ **05-13-25**
26.	Warehouse/Food Distribution Center New Work Fire Alarm Plan	Sheet FA-104	02-10-25
27.	Maintenance Building New Work Fire Alarm Plan	Sheet FA-105	02-10-25
28.	Multipurpose Building New Work Fire Alarm Plan	Sheet FA-106	02-10-25
29.	Physical Therapy Building New Work Fire Alarm Plan	Sheet FA-107	02-10-25
30.	Apartment A Demolition Work Fire Alarm Plan	Sheet FAD-101	02-10-25
31.	Apartment B Demolition Work Fire Alarm Plan	Sheet FAD-102	02-10-25
32.	Buildings 1601–1610, 1908, 1801–1810, 1901–~~1906~~ **1904** Demolition Work Fire Alarm Plan **(ADDENDUM 1, 05/13/25)**	Sheet FAD-103	~~02-10-25~~ **05-13-25**
33.	Warehouse/Food Distribution Center Demolition Work Fire Alarm Plan	Sheet FAD-104	02-10-25
34.	Maintenance Building Demolition Work Fire Alarm Plan	Sheet FAD-105	02-10-25
35.	Multipurpose Building Demolition Work Fire Alarm Plan	Sheet FAD-106	02-10-25
36.	Physical Therapy Building Demolition Work Fire Alarm Plan	Sheet FAD-107	02-10-25
37.	Fire Alarm Details	Sheet FA-500	02-10-25
38.	Apartment A Matrix, CBE, Calculations and Riser Diagram	Sheet FA-601	02-10-25
39.	Apartment B Matrix, CBE, Calculations and Riser Diagram	Sheet FA-602	02-10-25
40.	Buildings 1601–1610, 1908 Matrix, CBE, Calculations and Riser Diagram	Sheet FA-603	02-10-25

	TITLE	SHEET #	DATE
41.	Buildings 1801–1810 Matrix, CBE, Calculations and Riser Diagram	Sheet FA-604	02-10-25
42.	Buildings 1901–~~1906~~ **1904** Matrix, CBE, Calculations and Riser Diagram **(ADDENDUM 1, 05/13/25)**	Sheet FA-605	~~02-10-25~~ **05-13-25**
43.	Warehouse/Food Distribution Center Matrix, CBE, Calculations and Riser Diagram	Sheet FA-606	02-10-25
44.	Maintenance Building Matrix, CBE, Calculations and Riser Diagram	Sheet FA-607	02-10-25
45.	Multipurpose/Physical Therapy Building Matrix, CBE, Calculations and Riser Diagram	Sheet FA-608	02-10-25

END OF SECTION 000115

SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The Project consists of replacement/rearrangement of existing 12.47kV electrical distribution equipment campus wide and replacement of the existing fire alarm system in ~~twenty-nine (29)~~ **twenty-eight (28)** of the thirty-five (35) existing buildings at the Bellefontaine Habilitation Center. **(ADDENDUM 1, 05/13/25)**

1. Project Location: 10695 Bellefontaine Road, St. Louis, Missouri 63137.

2. Owner: State of Missouri, Office of Administration, Division of Facilities Management, Design and Construction, Harry S Truman State Office Building, Post Office Box 809, 301 West High Street, Jefferson City, Missouri 65102.

B. Contract Documents, dated February 10, 2025, were prepared for the Project by Rogers-Schmidt Engineering Co., P.C., 1736 West Park Center Dr., Suite 204, St. Louis, Missouri 63026.

C. The Work consists primarily of 12.47kV electrical equipment replacements /rearrangements and building fire alarm system replacements:

1. The Work includes, but is not limited to:

a. Demolition of ten (10) existing 12.47kV pad-mount distribution switchgear units. Power fuses from demolished equipment are to be turned over to the Owner.

b. Relocation of one (1) existing 12.47kV pad-mount distribution switchgear unit to the location of one of the removed pad-mount switchgear units.

c. Splicing of underground 12.47kV cables in existing handholes and manholes at the location of two (2) of the removed pad-mount switchgear units**.** ~~and at the original location of the relocated pad-mount switchgear units.~~ **(ADDENDUM 1, 05/13/25)**

d. Installation of a 12.47kV pad-mount sectionalizing cabinet at the location of four (4) of the removed pad-mount switchgear units.

e. Installation of a new 12.47 kV pad-mount distribution switchgear unit at the location of three (3) of the removed pad-mount switchgear units.

f. Update the existing protective device coordination and arc flash risk assessment study dated September 18, 2018, including arc flash hazard warning labeling of all new and relabeling of existing electrical equipment, if/as required, throughout the facility.

g. Preventative maintenance service on the existing main campus 12.47kV outdoor, walk-in protected aisle switchgear and replacement of the switchgear 48VDC battery system.

h. Replacement of the existing 300kVA indoor, dry-type distribution transformer that presently serves the Maintenance Building and the associated 208Y/120V-3PH-4W main distribution panelboard with a new 150kVA indoor, dry-type distribution transformer, 600A/3P, 208V enclosed main circuit breaker and 600A main lug, 208Y/120V-3PH-4W main distribution panelboard.

i. Replacement of the 208Y/120V electrical distribution equipment in the Physical Therapy mechanical/electrical room adjacent to the therapeutic pool.

j. Replacement of the existing mineral oil filled, pad-mount distribution transformer that presently serves the Donnelly Building with a less-flammable fluid filled, pad-mount distribution transformer and replacement of the 12.47kV cables serving the primary of this transformer.

k. Replacement of the fire alarm system in ~~twenty-nine (29)~~ **twenty-eight (28)** of the thirty-five (35) existing buildings on campus. **(ADDENDUM 1, 05/13/25)**

D. The Work will be constructed under a single prime contract.

1.3 WORK UNDER OTHER CONTRACTS

A. Separate Contract: The Owner has awarded a separate contract for performance of certain construction operations at the site. Those operations will be conducted simultaneously with work under this contract. That Contract includes the following:

1. Contract: A separate contract has been awarded to Airco Service Company, 3131 Starlight Lane, Edwardsville, IL 62025 under MO OA FMDC Project No. M2307-01 to remove steam boilers, steam water distribution and various HVAC components and provide new heating water boilers, heating water distribution and various HVAC components for the Warehouse Building, Maintenance Building, Multipurpose Building and Physical Therapy Building. The work also includes removing an existing domestic hot water heating system including steam heat exchanger, storage tank, pump and piping in the Multipurpose Building and providing a new domestic water heater, pump and piping.

B. Cooperate fully with separate contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

1.4 WORK SEQUENCE

A. The Work will be conducted under one contract.

B. The Work shall be completed in accordance with the Construction Phasing & Scheduling indicated on Drawing G-002 – Site Maps, Asset Numbers, Construction Phasing & Schedule.

C. The Contractor shall provide a work sequence plan and schedule indicating phasing of work for review and approval by the Construction Representative prior to commencing with any of the Work.

1.5 CONTRACTOR USE OF PREMISES

A. General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor's use of the premises limited only by the Owner's right to perform work or to retain other contractors on portions of the Project.

B. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use.

2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Use of Existing Buildings: Maintain the existing buildings in a weathertight condition throughout the construction period. Repair damage cause by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

1.6 OCCUPANCY REQUIREMENTS

A. Full Owner Occupancy: The Owner will occupy the site and existing buildings during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with the Owner's operations.

B. Partial Owner Occupancy: The Owner reserves the right to occupy and to place and install equipment in completed areas of the buildings prior to Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. The Designer will prepare a Certificate of Partial Occupancy for each specific portion of the Work to be occupied prior to substantial completion.

2. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will operate and maintain mechanical and electrical systems serving occupied portions for the buildings.

3. Upon occupancy, the Owner will assume responsibility for maintenance and custodial service for occupied portions of the buildings.

1.7 MISCELLANEOUS PROVISIONS

A. Submit all shop drawings in a timely fashion and expedite those for especially long lead items such as the pad-mounted, liquid-filled, medium-voltage transformer.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 011000

SECTION 012200 – UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Quantities of Units to be included in the Base Bid are indicated in Section 004322 – Unit Prices Form.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Unit Prices.

B. Related Sections include the following:

1. First Division 1 Section below contains requirements that relate directly to Unit Prices.
2. Division 1 Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Contract Changes.

1.3 DEFINITIONS

A. Unit Price is an amount proposed by bidders, stated on the Bid Form Attachment 004322 as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit Prices include all necessary material plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Single Unit Price Cost: A single unit price cost shall be provided for both increasing and decreasing estimated base bid quantities; separate unit price cost for increased quantity versus decreased quantity will not be accepted

C. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of Unit Prices. Methods of measurement and payment for Unit Prices are specified in those Sections.

D. Owner reserves the right to reject Contractor's measurement of Work in-place that involves use of established Unit Prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

E. List of Unit Prices: A list of Unit Prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each Unit Price.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 **LIST OF UNIT PRICES**

A. Unit Price No. 1:

1. Description: Reinforced concrete encased underground duct bank with (2) 4" ducts per the detail on Drawing E-501 including, but not limited to:

   a. Excavation and backfill
   b. 4" Schedule 40 **or** Type DB-60 PVC conduits and duct bank spacers **(ADDENDUM 1, 05/13/25)**
   c. Reinforcing steel
   d. Red dyed 4,000psi concrete
   e. Underground electric warning tape

2. Unit of Measurement: Linear foot (LF)
3. Base Bid Quantity: 10 LF

END OF SECTION 012200

SECTION 260573 – PROTECTIVE DEVICE COORDINATION STUDY AND ARC FLASH RISK ASSESSMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. This Section includes computer-based fault-current, overcurrent protective device coordination and arc flash risk assessment studies, and the setting of these devices and application of proper arc flash hazard warning labeling to equipment.

1. Coordination Study Report shall include: Short circuit analysis, time current characteristics for all protective devices, graphical demonstration of selectivity, relay and overcurrent protection device instruction books, and pertinent manufacturer data, and Missouri registered Professional Engineer seal and signature.
2. Arc flash risk assessment report, with Missouri registered Professional Engineer seal and signature.
3. Series ratings of protective devices are not acceptable unless specifically authorized by the Designer for existing equipment. These situations will be addressed on a case-by-case basis.

1.3 RELATED SECTIONS

A. Section 260500 – Common Work Results for Electrical

B. Section 260553 – Identification for Electrical Systems

C. Section 261216 – Dry-Type, Medium-Voltage Transformers

D. Section 261219 – Pad-Mounted, Liquid-Filled, Medium-Voltage Transformers

E. Section 262416 – Panelboards

F. Section 262813 – Fuses

G. Section 262816.13 – Enclosed Circuit Breakers

H. Section 262816.16 – Enclosed Switches

I. Section 262913.13 – Across-the-Line Motor Controllers

J. Section 337110 – Medium-Voltage Outdoor Sectionalizing Cabinets

K. Section 337710 – Medium-Voltage Pad-Mounted Switchgear

1.4 SUBMITTALS

A. Study documentation

1. Product Certificates: For coordination study and fault-current study computer software programs, certifying compliance with IEEE 399

2. Qualification Data: For fault-current study and arc flash risk assessment specialist who shall be a professional engineer registered in the State of the Missouri

3. Demonstrate experience with Arc Flash Risk Assessment by submitting names of at least three actual Arc Flash Risk Assessments performed in the past year.

4. Demonstrate capabilities in providing equipment, services, and training to reduce Arc Flash exposure.

5. Demonstrate experience in providing equipment labels in compliance with NFPA 70 (2023 edition), Article 110 and ANSI Z535.4 to identify AFIE and appropriate Personal Protective Equipment classes.

6. Single-line diagram

   a. Include as installed cable/conductor lengths, size, and number of conductors for each circuit segment.

7. Fault-current study report

8. Coordination study report including completed computer program input data sheets

9. Equipment evaluation report

10. Overcurrent protective device settings report

11. Arc flash risk assessment report

B. Submit an electronic copy of the fault-current, overcurrent protective device coordination, and arc flash risk assessment studies for review and comment prior to or along with all submittals related to new overcurrent protective devices to be furnished on this project; medium-voltage vacuum circuit breakers, low-voltage circuit breakers, fuses, etc.

C. Final report

1. Provide two (2) bound copies of the approved fault-current, overcurrent protective device coordination, and arc flash risk assessment studies bound in 8-1/2 inch by 11-inch volumes with drawings and diagrams folded to fit the 8-1/2 inch by 11-inch format, sealed and signed by licensed Missouri Professional Engineer. Report cover shall be extra heavy weight paper (80 lb or heavier). Report data shall be printed on 8-1/2 inch by 11-inch paper. Diagrams, drawings, and coordination curves shall be printed on 11 inch by 17-inch paper unless larger size drawings, 36” x 42” maximum size, are required for legibility. Securely retain larger size drawings by folding and placing in pockets bound into report.

2. Provide one complete copy of all report documentation on USB thumb drive to include all data files, drawings, and diagrams. File types for the report documentation should be .doc, .pdf, .dwg, or .xls. In addition, provide complete study files, in the native SKM software format, on the USB thumb drive to include all models, data, single lines, etc.

D. General report requirements:

1. Include all facility power distribution system equipment located at the Bellefontaine Habilitation Center campus, both indoor and outdoor equipment, including but not limited to the equipment shown on Project Drawings E-601, E-602, E-603 and E-604.

2. Provide identification and description of industry testing standards on which study is based, for each section of study.

3. Provide calculations, impedance diagrams, conclusions, and recommendations as part of study general content.

4. Provide short circuit tabulations which include system impedances, X/R ratio, asymmetry factor, kVA, and symmetrical and asymmetrical fault currents.

5. Provide each study with following:

   a. Coordination plots which graphically indicate coordination proposed for several systems. Provide plots centered on full scale log-log-forms.

   b. Coordination plots with complete titles, representative one-line diagrams and legends, associated power company's system characteristics, significant motor starting characteristics, complete parameters for power, fuses, if applicable, and associated system load protective devices.

   c. Coordination plots which define types of protective devices selected, with proposed coil taps, time dial settings, and pick-up settings required.

   d. Long time region of coordination plots shall indicate complete tap scale for each relay and full load current transformer parameters and designate pick-ups required for low voltage circuit breakers.

   e. Short time region shall indicate low voltage circuit breaker, short time and instantaneous trip devices, fuse manufacturing tolerance bands, when applicable, and significant symmetrical and asymmetrical fault currents.

6. Coordinate each item of equipment as follows:

   a. Separate low voltage power circuit breakers from each other by 16 percent current margin for coordination and protection in event of secondary line-to-line faults.

   b. Terminate protective device characteristics or operating band to reflect actual symmetrical and asymmetrical fault currents sensed by device.

   c. Prepare study with network analyzer, computer, or by written calculations. Include complete fault calculations as specified for each proposed and ultimate source combination.

   d. Source combinations include proposed and future large motors or generators.

E. Drawings and specifications indicate general requirements for motors, motor starter equipment, and low voltage equipment. Determine additional specific characteristics of equipment furnished in accordance with results of short circuit and protective device coordination study.

1. Short circuit protective device coordination and arc flash study shall be coordinated with Contractor provided equipment shop drawings and existing conditions.

2. Submit equipment design discrepancies and proposed corrective modifications, if required, with short circuit and protective device coordination study. Identify variations clearly on shop drawings.

3. Provide equipment, overcurrent devices, field settings, adjustments, and minor modifications for conformance with approved short circuit and protective device coordination study.

4. Identify existing equipment that is overstressed with recommended solution, including series rating of the equipment if that is possible.

1.5 APPLICABLE STANDARDS

A. The latest edition of the following industry standards shall apply to the work specified herein.

1. ANSI/IEEE C37.46 – Power Fuses and Fuse Disconnecting
2. ANSI/IEEE C37.50 – Low-Voltage AC Power Circuit Breakers Used in Enclosures -- Test Procedures
3. ANSI Z535.4 – Product Safety Signs and Labels, Includes Errata
4. ICEA P-32-382 – Short Circuit Characteristics of Insulated Cable
5. ICEA P-45-482 – Short Circuit Performance of Metallic Shields and Sheaths on Insulated Cables
6. IEEE 141 – IEEE Recommended Practice for Electric Power Distribution for Industrial Plants (IEEE Red Book)
7. IEEE 242 – IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (IEEE Buff Book)
8. IEEE 399 – IEEE Recommended Practice for Power Systems Analysis (IEEE Brown Book)
9. IEEE 446 – IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications (IEEE Orange Book)
10. IEEE 1015 – IEEE Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems (IEEE Emerald Book).
11. IEEE 1584 – IEEE Guide for Performing Arc Flash Calculations, Includes Amendments and Errata
12. NFPA 70 – National Electrical Code
13. NFPA 70B – Recommended Practice for Electrical Equipment Maintenance
14. NFPA 70E – Standard for Electrical Safety in the Workplace
15. International Electrical Testing Association, Inc. (NETA) – Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems

1.6 QUALITY ASSURANCE

A. Studies shall use licensed computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

B. Coordination-Study Specialist Qualifications: An organization experienced in the application of computer software used for electrical short circuit analysis and coordination studies having performed successful studies of similar magnitude on electrical distribution systems using similar devices. The coordination study shall be performed by a Missouri State registered professional electrical engineer, in accordance with ANSI/IEEE Standard

242, "Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems."

C. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association to supervise testing specified herein.

D. Comply with IEEE 399 for general study procedures.

E. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

1.7 ACCEPTABLE STUDY PROVIDERS

A. Protective Device Coordination Study and Arc Flash Risk Assessment Report Provider: Subject to compliance with requirements, study shall be commissioned by Division 26 and provided by ~~supplier~~ **State of Missouri registered professional engineer from manufacturer** of the new panelboards per Section 262416 **– Panelboards,** or other qualified **State of** Missouri registered professional engineer**, such as Corey Jasper, P.E., BHMG Engineers, Inc. (314-686-1216),** subject to approval of the **Owner and** Designer. **(ADDENDUM 1, 05/13/25)**

1.8 COMPUTER SOFTWARE PROGRAM

A. Computer Software Program: Subject to compliance with requirements, the protective device coordination study and arc flash risk assessment shall be provided using the latest version of SKM Power Tools Electrical Engineering Software (PTW 32) by SKM Systems Analysis, Inc., ESA, Inc., or CYME International, Inc.

1.9 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Computer software program must comply with IEEE 399.

B. Analytical features of fault-current-study computer software program shall include "mandatory", "very desirable", and "desirable" features as listed in IEEE 399, Table 7-4.

C. Computer software program shall provide plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices.

1. Additional Program Features:
    a. Arcing faults
    b. Simultaneous faults
    c. Explicit negative sequence
    d. Mutual coupling in zero sequence
    e. Arc flash risk assessment

1.10 EXAMINATION

A. The scope of the protective device coordination study and arc flash risk assessment is to include an update to the campus wide SKM Study completed by Vincent Kunderman, P.E. on 9/19/2018 that incorporates all changes to electrical equipment throughout the facility that have occurred since that time, including but not limited to, the changes shown on the

Drawings for this project. The native SKM files from the Vincent Kunderman, P.E. study will be provided to the study engineer for this project to use as the base model for the new study.

B. Examine submittals for new protective devices furnished on this project for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated shall be as indicated on the one-line diagrams on the Drawings.

C. Proceed with coordination study only after relevant equipment submittals have been assembled. Protective devices not submitted for approval with coordination study may not be used in study. Protective devices submitted prior to this coordination study will be reviewed, but final approval will be contingent upon the study results.

D. Field verify all information shown on the electrical one-line diagrams, including but not limited to:

1. Ratings of existing equipment
2. Transformer ratings and impedances
3. Overcurrent protective device sizes/ratings
4. Conductor types and sizes
5. Conduit types (magnetic or non-magnetic)
6. Feeder lengths

E. Update project one-line diagrams with information obtained from field verifications

1.11 FAULT-CURRENT STUDY

A. Fault study shall incorporate the available fault current information obtained from Ameren Missouri by inquiring at:

Ameren Missouri Construction Services
866-992-6619
servicerequest@ameren.com

B. Study electrical distribution system for all Ameren Missouri sources and all Ameren source switching scenarios as well as for the alternate source (existing 1270kW diesel-engine-driven generator next to 12.47kV main campus switchgear) using an approved computer software program to calculate values in order to determine the maximum fault conditions.

C. Calculate momentary and interrupting duties based on the maximum available fault current.

D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with the following:

1. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.50
2. Low-Voltage Fuses: IEEE C37.46
3. Circuit Breakers: IEEE C37.13

E. Fault study must be completed and submitted prior to proceeding with procurement/manufacturing of the following new equipment:

1. Circuit breaker panelboard under Section 262416 - Panelboards

2. Enclosed circuit breaker under Section 262816.13 – Enclosed Circuit Breakers

F. Study Report: Enter calculated X/R ratios and interrupting (5-cycle) fault currents on electrical distribution system diagram of the report. List other output values from computer analysis, including monetary (1/2-cycle), interrupting (5-cycle), and 30-cycle fault-current values for 3-phase, 2-phase, and phase-to-ground faults.

G. Equipment Evaluation Report: Prepare a report on the adequacy of protective devices and conductors by comparing fault-current ratings of these devices with calculated fault-current momentary and interrupting duties. Identify existing equipment that is overstressed with recommended solution, including series rating of the equipment if that is possible. If series ratings for protection of existing electrical equipment are approved by the Designer, provide caution labels for all series rated equipment for compliance with NEC 240.86 and 110.22(B) or (C).

1. Equipment evaluation report shall include all facility power distribution system equipment located at the Bellefontaine Habilitation Center campus, both indoor and outdoor equipment, including but not limited to the equipment shown on Project Drawings E-601, E-602, E-603 and E-604.

1.12 COORDINATION STUDY

A. The final approved settings shall incorporate the results of the Arc Flash Risk Assessment to minimize the hazard associated with the related systems.

B. Gather and tabulate the following input data to support coordination study:

1. Product Data for overcurrent protective devices specified in other Division 26 Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.

2. Electrical distribution system diagram showing the following:

a. Load current that is the basis for sizing continuous ratings of circuits for cables and equipment

b. Circuit-breaker and fuse-current ratings and types

c. Transformer kilovolt amperes, primary and secondary voltages, connection types, impedance, and X/R ratios

d. Cables: Indicate conduit material, sizes of conductors, conductor insulation, and length

e. Motor horsepower and code letter designation according to NEMA MG 1

3. Study specialist must visit the project site to field verify the information shown on the project drawings and to confirm the lengths of existing feeders to a reasonable level of accuracy.

4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram

a. Special load considerations, including starting inrush currents and frequent starting and stopping

b. Magnetic inrush current overload capabilities of transformers

c. Motor inrush current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve

d. Time-current characteristic curves of devices indicated to be coordinated

e. Manufacturer, frame size, interrupting rating in amperes RMS symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers

f. Switchgear, switchboards, panelboards, motor control centers, low-voltage distribution transformers, motor controllers (motor starters), variable-frequency motor controllers (VFDs), enclosed switches (disconnect safety switches), circuit breakers, resistive load bank, main campus switchgear 48VDC battery system and interrupting rating in amperes rms symmetrical

C. Perform coordination study and prepare a written report using the results of fault-current study and approved computer software program. Comply with IEEE 399.

D. Comply with NFPA 70 for overcurrent protection of circuit elements and devices.

E. Comply with IEEE 141 and IEEE 242 time intervals.

F. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Self-cooled, full-load current for the transformer.

b. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device shall protect transformer according to IEEE C57.12.00, for fault currents.

G. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Verify adequacy of phase conductors at maximum three-phase bolted fault currents, equipment grounding conductors, and grounding electrode conductors at maximum ground-fault currents.

H. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:

a. Device tag

b. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings

c. Fuse-current rating and type

d. Ground-fault relay pickup and time-delay settings

e. Medium-voltage protective relay settings

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between series devices, including existing upstream devices. Show the following specific information:

   a. Device tag

   b. Voltage and current ratio for curves

   c. Three-phase and single-phase damage points for each transformer

   d. No damage, melting, and clearing curves for fuses

   e. Cable damage curves

   f. Transformer inrush points

   g. Maximum fault-current cutoff point

3. Study shall include a narrative identifying any potential coordination short falls and recommendations for change.

4. Completed data sheets for setting of overcurrent protective devices

1.13 OVERCURRENT PROTECTIVE DEVICE SETTINGS

A. Manufacturer's Field Service: Engage a factory-authorized service representative, of from the manufacturer of the new panelboards provided on this project, to set overcurrent protective devices within the new equipment.

B. Testing: Perform the following device setting and prepare reports:

1. After installing overcurrent protective devices and during energizing process of electrical distribution system, perform the following:

   a. Verify that overcurrent protective devices meet parameters used in studies.

   b. Adjust devices to values listed in study results if overcurrent protective devices are adjustable.

   c. “Seal” each relay/adjustable circuit breaker setting access cover with an approved sealing device, Square D “TUSEAL” or approved equal, to prevent unauthorized changes to settings.

2. Adjust devices according to recommendations in Chapter 7, "Inspection and Test Procedures", and Tables 10.7 and 10.8 in NETA “Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems”.

1.14 ARC FLASH RISK ASSESSMENT

A. Gather and tabulate the information provided by the Short Circuit Analysis and the Coordination Study, for the preparation of the Arc Flash Risk Assessment.

B. The intent of the Arc Flash Risk Assessment is to achieve the lowest possible hazard ratings for the associated equipment while still maintaining the code required level of electrical coordination for the system. The results of the risk assessment shall be incorporated into the recommended protective device settings to minimize the arc flash hazard.

C. Scope of Work:

1. Provide arc flash risk assessment warning labels in accordance with NEC Article 110-16 for the following equipment:

    a. All equipment located at the Bellefontaine Habilitation Center campus, both indoor and outdoor equipment, including but not limited to the equipment shown on Project Drawings E-601, E-602, E-603 and E-604.

D. Arc Flash Risk Assessment:

1. The Arc Flash Risk Assessment shall be performed with the aid of computer software intended for this purpose in order to calculate Arc Flash Incident Energy (AFIE) levels and flash protection boundary distances.

2. The Arc Flash Risk Assessment shall be performed in conjunction with a short-circuit analysis and time-current coordination analysis.

3. Results of the Risk Assessment shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.

4. The Arc Flash Risk Assessment shall be performed under worst-case arc flash conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

5. The Arc Flash Risk Assessment shall be performed by a professional engineer who is currently registered in the State of Missouri.

6. The Arc Flash Risk Assessment shall be performed in compliance with the latest edition of IEEE Standard 1584, the IEEE Guide for Performing Arc Flash Calculations including any and all addendums and errata.

7. The Arc Flash Risk Assessment shall include recommendations for reducing AFIE levels and enhancing worker safety.

8. Prior to final approval, incorporate actual installed cable/conductor lengths into the Arc Flash Risk Assessment.

E. Comply with NFPA 70, NFPA 70E, and NFPA 70B standards for the Arc Flash Risk Assessment Report.

F. Field Labeling and Signage:

1. Provide complete arc flash hazard warning signage per NFPA 70 Article 110-16 as required by National Electrical Code (NEC) and/or NFPA 70E requirements for all facility power distribution system equipment located at the Bellefontaine Habilitation Center campus, both indoor and outdoor equipment, including but not limited to the equipment shown on Project Drawings E-601, E-602, E-603 and E-604.

2. Arc flash hazard warning labels shall be provided in accordance with Section 260553 – Identification for Electrical Systems.

3. The source protective device name providing the protection (fed from) on each arc flash hazard warning label shall use the designations of equipment shown on the Project Drawings rather than names assigned within the power system study software model.

4. Provide a label for each of the two main breakers in the preferred-reserve 12.47kV main campus switchgear that indicates the maximum available fault current and

the date the fault current calculations were performed for compliance with NEC Article 110.24(A).

1.15 COORDINATION OF WORK

A. Adjustment of protective device equipment to meet the approved protective device coordination submittal shall be the responsibility of Division 26 at no additional cost to the Owner.

1.16 ARC FLASH TRAINING

A. The arc flash study provider shall train the Owner's personnel on the potential arc flash hazards associated with working on energized electrical equipment. The audience will include employees who work on or near energized electrical equipment, who must be made aware of the associated electrical hazards. The training shall be conducted at the Owner's facility and shall be a minimum of 1 hour and a maximum of 2 hours in duration.

B. The intent of this training is not to "certify" or "qualify" the Owner's maintenance personnel to work on energized electrical equipment or provide an adequate level of training for them to meet the NFPA 70E definition of a "qualified person" but rather to give them a broad understanding of the purpose of arc flash hazard warning labeling and an awareness of the dangers of working on or near energized electrical equipment.

C. A key purpose of the training is to help the attendees become aware of potential shock and arc flash hazards associated with energized electrical equipment and ways to mitigate the risk of injury associated with these hazards.

D. It is not the intent of this training to provide electrical equipment preventative maintenance training.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 260573

SECTION 28 31 11 –ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Related Documents: Drawings, General and Supplementary Conditions apply to the work of this section.

1.2 SUMMARY

A. Section includes the following:

1. Intelligent / Addressable Fire Alarm Control Panels
2. Digital Alarm Communicator Transmitter
3. Cellular Communicator
4. Power Supplies
5. Networking
6. Circuits
7. System Smoke Detectors
8. System Heat Detectors
9. Carbon Monoxide (CO) Detectors
10. Manual Pull Stations
11. Addressable Interface Modules
12. Notification Appliances
13. Alarm Verification
14. HVAC Shutdown
15. Remote Annunciators
16. Documentation Cabinet
17. Electromagnetic Door Hold Open
18. Transient Suppression Modules

1.3 DEFINITIONS

A. AHJ: Authority Having Jurisdiction

B. BAS: Building Automation System

C. DACT: Digital Alarm Communicator Transmitter

D. FACP: Fire Alarm Control Panel

E. FAEM: Fire Alarm Equipment Manufacturer

F. FATP: Fire Alarm Transponder Panel

G. FM Global: Factory Mutual Global

H. IDC: Initiating Device Circuit

I. NAC: Notification Appliance Circuit

J. NICET: National Institute for Certification in Engineering Technologies

K. NFPA: National Fire Protection Association

L. NRTL: Nationally Recognized Testing Laboratory

M. SLC: Signaling Line Circuit

N. UL: Underwriters Laboratories, Inc.

1.4 REFERENCES

A. All work shall be installed in accordance with all applicable codes and referenced design standards:

1. ~~2012~~ **2024 International** Building Code with local amendments **(ADDENDUM 1, 05/13/25)**
2. ~~2012~~ **2024 International** Fire Code with local amendments **(ADDENDUM 1, 05/13/25)**
3. ~~2012~~ **2024 International** Mechanical Code with local amendments **(ADDENDUM 1, 05/13/25)**
4. ~~2010~~ **2025** NFPA 72, National Fire Alarm & Signaling Code **(ADDENDUM 1, 05/13/25)**
5. ~~2011~~ **2023** NFPA 70, National Electrical Code **(ADDENDUM 1, 05/13/25)**
6. ~~2012~~ **2024** NFPA 101, Life Safety Code **(ADDENDUM 1, 05/13/25)**
7. ADA - Americans with Disabilities Act
8. FM Global Recommended Practices
9. 19 CSR 30-86 State / Local Standards

1.5 SYSTEM OPERATIONAL DESCRIPTION

A. The fire alarm system shall be a non-coded, documented addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire alarm service only.

B. System Operation shall be as follows:

1. Upon loss of building power, the entire system shall transfer to secondary power within ten (10) seconds, and without loss of signals. The system shall operate under secondary power in normal or trouble conditions for twenty-four (24) hours and have sufficient power to support complete alarm condition operation for a subsequent five (5) minutes of evacuation alarm operation at maximum connected load.
2. Abnormal circuit conditions or devices, as required for the Class of the circuit, shall initiate a "trouble" condition at the control panels for that specific circuit or device. The “trouble” indication shall describe the nature of the condition on the affected circuit or device. The fire alarm system shall transmit a general "trouble" condition to the main FACP located in the Donnelly Building.
3. Activation of any supervisory device as indicated on the engineering drawings shall initiate a "supervisory" condition at the control panels for that specific device. The "supervisory" indication shall describe the nature of the condition and specific address and alphanumeric description of the device affected. The fire alarm system shall transmit a general "supervisory" condition to the main FACP located in the Donnelly Building.

4. Activation of any alarm device as indicated on the engineering drawings shall initiate an "alarm" condition at the control panels and remote annunciators for that specific device. The "alarm" indication shall describe the nature of the condition and specific address and alphanumeric description of the device affected. The fire alarm system shall transmit a general “alarm” condition to the main FACP located in the Donnelly Building.

C. Initiation of an "alarm" condition shall result in the following functions to be performed by the system:

1. Initiate an alarm indication on the control panel by tone and illuminate the corresponding device specific alphanumeric LCD description. Manually activating the "Alarm Silence" shall silence the tone at the panel. The alarm alphanumeric display shall remain "On" at the control panel until the condition causing the alarm has been cleared and reset. An additional alarm reported to the panel subsequent to activating the "Alarm Silence" shall reactivate the control panel tone.
2. Activate the audible and visual notification appliances throughout the affected building.
3. Manually activating the "Alarm Silence" at the panel shall de-energize the audible and visual notification appliances. An additional alarm reported to the panel subsequent to activating the "Alarm Silence" shall re-energize the audible and visual notification appliances throughout the affected building.
4. Each individual building transmits a general “alarm” signal to the Main FACP in the Donnelly Building.
5. The main FACP in the Donnelly Building transmits a general “alarm” signal to the approved remote monitoring station.
6. Cellular communicator shall provide notification via text messages and emails to the predetermined contacts list. A predetermined contacts list shall be coordinated with the facilities supervisor.
7. Release all affected door hold open devices.

D. Actuation of alarm notification appliances, fire safety functions, and annunciation at the protected premises shall occur within ten (10) seconds after the activation of an initiating device.

E. Activation of a Carbon Monoxide (CO) detector shall activate a four-pulse temporal pattern audible alarm signal in accordance with NFPA 720.

F. Additional indications, notifications, enabling functions or control functions shall be as indicated on the engineering drawings.

1.6 DESCRIPTION OF WORK

A. Provide all required labor, warranty labor, materials, equipment, system programming, testing, submittals and services necessary for a complete and operational fire alarm system as hereinafter described, and as shown on the engineering drawings.

B. Provide a minimum of ten (10) hours training, for staff personnel, in the operation and use of the system.

C. It is intended that the engineering drawings and specifications shall describe and provide for a working installation complete in every detail and all items necessary for such complete installation shall be provided whether or not specifically mentioned herein or shown on the engineering drawings.

1.7 PERFORMANCE REQUIREMENTS

A. Seismic Performance

1. The fire alarm control panel and raceways shall withstand the effects of earthquake motions as determined by SEI/ASCE 7.

a. The term "withstand" is defined as "the panel will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will remain fully operational after the seismic event."

1.8 SUBMITTALS

A. The engineering drawings have been prepared using AutoCAD. These documents will be made available either in electronic or hard copy form. Utilization of these documents for the development of shop drawings and submittals does not relieve the Contractor from any responsibilities required herein.

B. In the submittals, the Contractor must clearly identify all areas and sections of this specification to which they take exception or are not capable of providing.

C. Submittals will be disapproved unless required equipment literature, calculations, and complete shop drawings are submitted together as one package for review.

D. The Engineer shall review the Contractor’s submittals to verify conformance to the project specifications and design concepts expressed in the contract documents. The Contractor shall allow sufficient time to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of details and dimensions, or substantiating installation or performance of equipment and systems designed by the Contractor, all of which remain the Contractor’s responsibility to the extent required by the contract documents. The Engineer's review shall not constitute approval of safety precautions of construction, means, methods, techniques, sequences of procedures, or approval of a specific assembly.

E. Prior to release of equipment for shipment or installation, submit to the Engineer the following:

1. Shop Drawings. The specific quantity to be submitted shall be confirmed with the General Contractor and Owner. Electronic submittals are acceptable. Submittal must be comprehensive of the entire project, complete in all detail, and include, but not be limited to, the following:

a. Floor plans showing equipment placement, point to point wiring, wiring types and sizes, conduit types and sizes, wiring and raceway routes, and proposed mounting methods for conduit and backboxes. Floor plans shall be AutoCAD generated.
b. Sequence of Operations in Matrix form to include a detailed description of the operation of each system function for all possible conditions.
c. Audibility and intelligibility testing procedures. Testing procedures shall include a list of testing equipment, certificates of calibration, methods of measurement with minimum score, acceptability criteria and calibration procedure.
d. Design minimum for audibility level for occupant notification.

e. Riser diagram showing typical wiring connections for each type of device and module.
f. Detailed wiring diagrams for major system components (control panels, transponder panels, power supplies, amplifiers, etc.).
g. Supervisory and alarm current calculations for primary power and emergency battery sizing of all control panels and auxiliary power supplies.

1) Battery calculations shall list the type of devices and modules, quantities, amperage draw for standby and alarm conditions for each device, the total amperage draw for each panel, and each panel's battery amp/hour rating.
2) The calculated load shall be the design load, including all required spare capacity.
3) The battery calculations shall include a twenty-five (25) percent correction factor for aging to ensure the battery can meet its current demand at the end of service life.

h. A complete list of all proposed alphanumeric descriptions and their associated point address and circuit number.

i. Voltage drop calculations for all notification appliance circuits.

1) Calculations shall follow the voltage drop calculation criteria as outlined in NFPA 72 and UL 864.
2) Calculations shall use the worst case operating voltage of each control panel or power supply as a starting voltage. The starting voltage shall be 20.4 VDC, unless written documentation is provided confirming that the specific control panel or power supply is capable of maintaining a voltage higher than 20.4 VDC.
3) Calculations shall use the lowest operating voltage of the notification appliances and the associated increased current draw. The lowest operating voltage shall be the UL standard operating voltage of 16 VDC, unless approved otherwise by the Engineer.

2. Manufacturer's literature on all system equipment. The specific quantity to be submitted shall be confirmed with the General Contractor and Owner. Electronic submittals are acceptable.

a. Literature shall include specification and description of recommended supporting methods, enclosures or boxes, and wiring connections.
b. The exact components to be utilized on this specific project shall be indicated, by highlighting or arrows, on each data sheet of the equipment literature.
c. Literature which is not clearly identified will be rejected.
d. UL FHIT System number and associated installation criteria for all Circuit Integrity (CI) or Circuit Integrity in Conduit (CIC) systems.

3. Qualifications and authorization of the representative of the FAEM.

F. The Engineer shall review for accuracy all submittals required to be received by the Engineer prior to equipment release or installation. The Owner, Owner's Representative, or design firms retained by the Owner shall not be responsible for any additional costs resulting from replacement of equipment or materials not reviewed prior to installation.

~~G. After satisfactory review of the submittals by the Engineer, the Contractor shall submit all required drawings, manufacturers' literature, calculations and any other materials required by the AHJ to obtain a permit to the appropriate party for review.~~ **(ADDENDUM 1, 05/13/25)**

~~H. Forward to the Engineer a copy of the transmittal of the permit application.~~ **(ADDENDUM 1, 05/13/25)**

~~I. Forward to the Engineer, in writing, any comments from the AHJ or the Insurance Underwriter within five (5) working days after the receipt of their comments.~~ **(ADDENDUM 1, 05/13/25)**

G. Forward to the Engineer a copy of the UL Central Station Supervisory Center Certificate.

1.9 PROJECT RECORD DOCUMENTS

A. The Contractor shall provide and maintain on site an up-to-date record set of satisfactory shop drawings which shall be marked to show each and every change made to the fire alarm system from the original approved shop drawings. This shall not be construed as authorization to deviate from or make changes to the shop drawings reviewed by the Engineer without written instructions from the Engineer in each case. This set of drawings shall be issued only as a record set. These drawings shall be made available to the Owner, or the Owner's Representative, upon request.

B. The preparation of a record of completion shall be the responsibility or the qualified and experienced installation personnel, as indicated in NFPA 72.

C. The preparation of a record of completion shall be in accordance with NFPA 72. Record of completion shall include, but not be limited to, the following:

1. A final copy of the record of completion shall be provided after completion of the operational acceptance tests.
2. One copy of the record of completion shall be stored at the fire alarm control panel or other approved location.
3. This copy shall be updated to reflect all system additions or modifications and maintained in a current condition at all times.
4. Where not stored at/adjacent to the main fire alarm control panel, the location of these documents shall be identified at the main fire alarm control panel.
5. If the documents are located in a separate enclosure or cabinet, the separate enclosure or cabinet shall be prominently labeled "FIRE ALARM DOCUMENTS".

D. The Contractor shall continually document software and programming changes. This documentation shall include:

1. A complete printout of the system prior to the change.
2. A complete printout of the system program subsequent to the change, with all modifications highlighted.
3. A letter prepared and signed by the individual who made the changes, describing each change made and the reason for the change. This letter shall certify that the programmer has personally reviewed and compared the before and after program printout and verified the correctness of the modification(s).
4. An equivalent means performed automatically in computer software, which verified the results of changes made is acceptable.

E. All fire alarm system modifications made after the initial installation shall be recorded on a revised version of the original record of completion, as indicated in NFPA 72.

F. Once the fire alarm system is put into service, in whole or in part, and the associated building(s) are partially or wholly occupied, no software changes shall be performed without prior written permission of the Owner, or Owner's Representative.

G. Only a certified manufacturer's representative trained in the specific programming software shall make changes to the fire alarm system software once the system is in service.

H. Each revision to the software shall be identified by a unique version number and date.

I. Prior to final payment for the fire alarm system and the beginning of the warranty period, submit a CD ROM and two (2) sets (or as directed by the Owner's Representative) of the following completed project record documents to the Owner's Representative:

1. Copies of all test and inspection reports as required by the AHJ and NFPA 72:

    a. The Record of Completion form shall be in the format as outlined in NFPA 72.
    b. The Inspection and Testing form shall be in the format as outlined in NFPA 72.

~~2. All permits and licenses required to be in the possession of the Owner by the AHJ.~~ **(ADDENDUM 1, 05/13/25)**

2. Accurate record (as-built) drawings of the complete installation to include, but not be limited to, the information required for the shop drawings. Record drawings of the floor plans shall be AutoCAD generated.
3. Original warranty documents including, but not limited to, those of the FAEM. Warranty documents shall reference and be binding to the warranty provisions specified in the warrant portion of this specification.
4. Submit to the Engineer a copy of the transmittal to the Owner's Representative for all final complete project record documents.

J. Upon completion of construction, submit two (2) sets and a CD ROM of equipment warranties and two (2) sets and a CD ROM of installation, operations and maintenance instructions to the Owner's Representative. This manual shall reflect the completed installation and include, but not be limited to the following information:

1. A detailed narrative description of the systems architecture, inputs, evacuation signaling, auxiliary functions, annunciation, sequence of operation, expansion capability, application considerations and limitations.
2. A detailed description of routine maintenance required or recommended, or as would be provided under a maintenance contract, including a testing schedule and detailed maintenance instructions for each type of device installed
3. Detailed troubleshooting instructions for each possible trouble condition.
4. An equipment list/schedule detailing all equipment and quantities installed. The manufacturer's product model/identification number shall be shown next to each piece of equipment on the list.
5. Updated manufacturer's data sheets and installation manuals/instructions for all equipment installed.
6. Updated list of spare parts and accessories recommended by the manufacturer shall be stocked for maintenance of the system.

7. A detailed description of the operation of the systems, including operator responses. Copies of the approved sequence of operation shall be placed in the security office.

K. A copy of all software documentation required by this section shall be maintained on-site by the Contractor, in a binder, arranged in chronological order. This binder shall be provided to the Owner's Representative at the completion of the project.

1.10 QUALITY ASSURANCE

A. All work shall meet the requirements of the Owner, Architect, Engineer and Authority Having Jurisdiction (AHJ).

B. All equipment and components shall be UL listed, for the actual intended use, unless hereinafter specifically excluded from such a listing.

C. Installation and supervision of installation shall be in strict compliance with the requirements of the ~~regulations, licenses, and permits~~ **regulations and licenses** for fire alarm system installers in this jurisdiction. **(ADDENDUM 1, 05/13/25)**

D. Installer must have been actively engaged in the business of selling, installing, and servicing fire alarm systems for at least five (5) years.

E. Installer must be an authorized representative of the FAEM and have technical factory training specifically for the system proposed.

F. The FAEM shall have a representative supervise the final connection of devices, wiring, and programming of the control panels. The FAEM representative shall be NICET certified as Level ~~II~~ **III** or higher Fire Alarm Protection / Fire Alarm Systems Engineering Technician. **(ADDENDUM 1, 05/13/25)**

G. Obtain documentation according to NFPA 72 by a UL listed company.

H. Submittal Documents listed under Paragraph 1.8 E shall be certified by a level IV NICET certified FAEM representative. (ADDENDUM 1, 05/13/25)

1.11 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Beginning with Substantial Completion (as determined by the Owner), provide software support for two (2) years.

C. Update software to latest version at Project completion. Install and program software upgrades that become available within two (2) years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide minimum thirty (30) days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.12 REGULATORY REQUIREMENTS

A. All work shall meet the requirements of all applicable codes and referenced design standards.

B. No approvals or interpretations of the design documents shall be pursued except through the Engineer.

C. Any work performed prior to the satisfactory review of the shop drawings by the Engineer, approval by the AHJ, and determined to be noncompliant with the contract documents or applicable codes by the Owner or AHJ will be replaced at the Contractors' expense.

D. The system will not be acceptable until final testing and receipt of the Inspection and Testing Form has been obtained.

1.13 PROJECT CONDITIONS

A. Interruption of Existing Fire Alarm Service

1. The interruption of fire alarm service to the facilities occupied by Owner or others is unacceptable unless as permitted by the Construction Manager and only after arranging for temporary guard service. The procedures for interruption of fire alarm services are as follows:

    a. Notify Owner a minimum of two (2) days in advance of proposed interruption of fire alarm service.
    b. Do not proceed with interruption of fire alarm service withoutOwner's written permission.

1.14 SEQUENCING AND SCHEDULING

A. Existing Fire Alarm Equipment Replacement

1. Ensure existing equipment remains fully operational until new equipment is operational, tested and accepted.
2. As new equipment is installed, the equipment shall be labeled "NOT IN SERVICE" until the new equipment is accepted.
3. Remove labels from new equipment when the new equipment is put into service and the existing fire alarm equipment is labeled "NOT IN SERVICE" or removed from the building.

B. Existing Equipment Removal

1. Once the acceptance of the new fire alarm system, the existing fire alarm equipment and wiring can be disconnected and removed.

1.15 WARRANTY

A. Repair all defective workmanship or replace all defective materials for a period of one (1) year from the date of acceptance by the Owner's Representative. Workmanship or equipment found to be defective during that period shall be replaced at no additional cost to the Owner.

B. The warranty or any part of the warranty shall not be made void by any required operation or inspection of the system after acceptance during the warranty period. The Owner may select qualified firms other than Warrantor to provide required tests and inspections. System testing and inspections will be conducted only by a duly licensed company under contract with the Owner to perform scheduled testing and inspections as required by the AHJ. The Owner may elect to have a representative present at the scheduled testing during the warranty period.

1.16 POST CONTRACT MAINTENANCE

A. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, required tests, and list pricing for any replacement products included on the bill of materials, along with the list pricing for products not on the bill of materials; if test and inspection rates are different than full service rates the bid/proposal shall include pricing for all levels for a minimum period of five (5) years Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

B. As part of the bid/proposal, include a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Notifier NFW-50X / NFW-100X

B. Or approved equals from:
1. Fire-Lite
2. Gamewell-FCI
3. Potter
(ADDENDUM 1, 05/13/25)

C. All fire alarm equipment provided on this project shall be from a single manufacturer selected from one of the four (4) acceptable manufacturers listed above. (ADDENDUM 1, 05/13/25)

2.2 FIRE ALARM CONTROL PANELS

A. General Requirements for the FACP:

1. Provide control panels that consist of modular components, utilizing solid state programmable microprocessors, to accomplish all system functions. The main control panel and any additional control panels shall be provided in sufficient quantity as to perform all functions in this specification. Transponders will be acceptable in lieu of additional control panels if the main control panel and transponder panels are capable of performing all of the functions in this specification. The components shall include but not be limited to the following items:

   a. Non-volatile RAM memory that provides for no program loss if a primary and secondary power loss occurs.

b. An integral display with a minimum eighty (80) characters liquid crystal display (LCD). Provide light-emitting diodes (LED) for AC power, system alarm, system trouble, display trouble and disable. The display shall be visible through the control panel cabinet's transparent window. The processor shall be capable of displaying historical log data; current system status information; and all individual device addresses, descriptions and conditions on the integral display.

c. The system shall provide a four hundred (400) event historical log on command of all alarms signals, supervisory signals, trouble signals, monitor point changes-in-state, operator commands and system initiated control functions.

d. System core shall have processing capability to support the addressable points including the necessary software, programming, and motherboard/expansion card sockets. Core system shall include a minimum of one (1) signaling line circuits (SLC) as indicated on the engineering drawings. Total system capacity shall support a minimum fifty (50) addressable points. No SLC device or module loop shall be assigned more than eighty (80) percent of its point capacity unless approved in writing by the Engineer.

e. System processing capable of supporting initiation data circuits which can be "T-tapped" at any location on the signaling line circuit (SLC). Any additional modules, programming, or circuits required to achieve the specified system capacity shall be provided and installed at no cost to the Owner.

f. Interface for peer-to-peer operation with automatic default to stand-alone mode if failure occurs in any processor, internal connection, or module.

g. Control panels shall be capable of including an interface for supervised remote annunciators.

h. System processing capable of supporting addressable analog smoke detection, addressable analog heat detection, addressable pull stations, addressable monitoring modules, and remote addressable control modules.

i. Capability of controlling the state of contacts located in remote addressable modules, detector base-mounted programmable relays, and outputs on the panel including all necessary hardware and software.

j. Detection of removal, disconnection, or failure of any control panel module.

k. Capability of adjusting the smoke detector sensitivity from the control panel. The control panel shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings.

    1) The control panel shall be capable to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups.
    2) Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

l. Provide a "maintenance alert" feature whereby the detector initiates a trouble condition should the detectors' sensitivity approach the outside limits of the normal sensitivity window.

m. Provide power supplies, transformers, batteries, battery chargers and modules required for a complete and operational system.

1) Primary power shall be 24 VDC obtained from 120 VAC dedicated service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, and supervisory signals shall be powered by 24-V dc source.
2) Secondary power shall be 24 VDC supply system with batteries, automatic battery charger, and automatic transfer switch.

a) Batteries: Sealed, valve-regulated, recombinant lead acid.

3) Power supply capacity shall not exceed eighty (80) percent of its rated (continuous) capacity.

a) Alarm current draw of entire fire alarm system shall not exceed 80 percent of the power-supply module rating.

4) Provide sufficient output power to the devices to perform the specified functions as shown on the engineering drawings.

n. Provide a UL listed cabinet with sufficient space and circuit board slots for the specified equipment. The cabinet shall have a hinged door keyed in common with all other keyed devices throughout the system. If multiple cabinets are required in one location, the cabinets shall be located adjacent to each other and match in finish and design.

B. Circuits:

1. Initiating Device Circuits (IDC) shall meet the minimum requirements of Class B.
2. Notification Appliance Circuits (NAC) shall meet the minimum requirements of Class B. Addressable notification appliances are not acceptable.
3. Signaling Line Circuits (SLC) shall meet the minimum requirements of Class B.
4. Circuits for relay coil operation shall be 24 volt maximum with a separate or integral field collapsing diode.
5. The control panels and auxiliary power supplies shall receive their power from 120 volt AC dedicated branch circuits. The circuit disconnecting means shall:

a. Have a red marking.
b. Have a listed breaker locking device.
c. Be accessible only to authorized personnel.
d. Be identified as “FIRE ALARM”.

6. The 24 volt DC power for all system initiation, supervisory, notification and control circuits shall be provided by the fire alarm control panel power supplies or listed auxiliary power supplies.

C. Pathway Survivability:

1. Pathway survivability shall be as indicated in the engineering drawings.
2. All pathways shall comply with NFPA 70, National Electrical Code.

2.3 CELLULAR COMMUNICATOR

A. Provide an approved cellular communicator to transmit fire alarm, supervisory and trouble signals to an approved off-site monitoring station. The cellular communicator shall be UL listed for commercial fire reporting to an approved off-site monitoring station, and shall conform to the requirements of NFPA 72.

B. The cellular communicator shall operate from a dedicated 120 volt AC or 24 volt DC source with a listed secondary power source conforming to the same alarm and standby time requirements as the FACP.

C. The cellular communicator shall have the capability of providing single or dual path communications.

D. The cellular communicator shall have the ability to verify of communications path at maximum five (5) minute intervals in accordance with NFPA 72.

E. The communicator shall be able to transmit all signals in the Standard SIA (Security Industry Association) format.

F. The cellular communicator shall have the capability to transmit "general" fire alarm, supervisory, and trouble signal to onsite personnel via two (2) phone numbers and three (3) email addresses. Specific contact numbers and email addresses shall be coordinated with onsite personnel prior to installation and programming.

2.4 AUXILIARY POWER SUPPLIES

A. Provide each auxiliary power supply (APS) in an individual, single, self-contained, lockable cabinet.

B. Input shall be 120 volt AC nominal with an output of regulated 24 volt DC. The APS shall operate from a dedicated 120 volt AC source with a listed secondary power source conforming to the same alarm and standby time requirements as the FACP.

C. Each APS shall be capable of actuation from either the control panel notification circuit, or programmed dry contacts.

D. Each APS shall provide "trouble" indication to the control panel upon loss of AC power, low battery or abnormal conditions on individual output circuits.

E. Each APS shall have a minimum of four (4) Class B and two (2) Class A supervised output notification circuits rated individually at a minimum of two (2.0) amperes available per circuit, with a total output of eight (8.0) amps. The Contractor shall be responsible for all redesign, circuiting, and additional equipment costs to provide the necessary output amperage.

F. Each APS shall have a minimum of twenty (20) percent spare capacity on each circuit,. The twenty (20) percent spare capacity shall be applied assuming the total available current is divided equally between all available circuits.

2.5 SYSTEM SMOKE DETECTORS

A. Intelligent Photoelectric Smoke Detectors

1. Provide analog photoelectric type smoke detectors with the capability to send data, on command, to the control panel representing the analog level of smoke density.
2. Provide a "maintenance alert" feature whereby the detector initiates a trouble condition should the detectors' sensitivity approach the outside limits of the normal sensitivity window.
3. Provide address-setting means and store an internal identification code for each detector which the control panel can use to identify the type and precise location of the detector.
4. Provide dual alarm and power/status LED's. Flash status LED's under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LED's may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected and verified.
5. Provide a low profile design modular detector head with twist-lock base.

B. Intelligent Photoelectric Smoke Detectors for Duct Applications

1. Provide duct mounted analog photoelectric type smoke detectors with the capability to send data, on command, to the control panel representing the analog level of smoke density.
2. Provide detectors operating in air velocities of one hundred (100) fpm to four thousand (4,000) fpm without adverse effects on detector sensitivity.
3. Provide a "maintenance alert" feature whereby the detector initiates a trouble condition should the detectors' sensitivity approach the outside limits of the normal sensitivity window.
4. Provide a molded plastic enclosure with integral conduit knockouts. Provide housing with gasket seals to insure proper seating of the housing to the associated ductwork. Provide sampling tubes that extend across the width of the duct and in compliance with the manufacturer's installation recommendations.
5. Provide address-setting means and store an internal identification code for each detector which the control panel can use to identify the type and precise location of the detector.
6. Provide dual alarm and power/status LED's. Flash status LED's under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LED's may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected and verified.
7. Provide a low profile design modular detector head with twist-lock base.
8. Provide a separate addressable control/relay module for any associated control functions.

2.6 SYSTEM HEAT DETECTORS

A. Intelligent Thermal Detectors

1. Provide analog thermal fixed temperature and rate-of-rise detectors utilizing dual electronic thermostats to measure temperature levels in its chamber. The detector shall be capable of sending data, on command, to the control panel representing the analog temperature level.
2. The fixed temperature rating shall be one hundred thirty-five (135) degrees Fahrenheit. The rate-of-rise temperature detection shall be fifteen (15) degrees Fahrenheit per minute.

3. Provide address-setting means and store an internal identification code for each detector which the control panel can use to identify the type and precise location of the detector.
4. Provide dual alarm and power/status LED's. Flash status LED's under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LED's may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected and verified.
5. Provide a low profile design modular detector head with twist-lock base.
6. Remote test stations, where indicated on the engineering drawings, shall consist of a key operated switch and indicating LED. The remote test station shall be listed for use with the intelligent thermal detector.

2.7 SYSTEM CARBON MONOXIDE (CO) DETECTORS

A. Addressable Carbon Monoxide Detectors

1. CO detector shall meet UL Standards 268 and 2075.
2. Unit shall be equipped with a status LED's that indicate normal operation and regular communications with the control panel, and alarm condition.
3. CO detector shall transmit end-of-life signal to the control panel.
4. Integral alarm horn shall be rated at 85 decibels at 10 feet.
5. Upon activation of the CO detector, the local sounder base shall transmit a temporal 4 pattern.

B. Addressable Combination Smoke / Carbon Monoxide Detectors

1. Detector shall meet UL Standards 268 and 2075.
2. Provide modular detector head with twist-lock base.
3. Unit shall be equipped with a status LEDs that indicate normal operation and regular communications with the control panel, and alarm condition.
4. CO detector shall transmit end-of-life signal to the control panel.
5. Integral alarm horn shall be rated at 85 decibels at 10 feet.
6. Upon activation of the smoke detector, the occupant notification appliance(s) shall transmit a temporal 3 pattern.
7. Upon activation of the CO detector, the local sounder base shall transmit a temporal 4 pattern.

2.8 INTELLIGENT DETECTOR BASES

A. Intelligent Detector Base

1. Provide a UL listed low profile twist-lock detector base with screw terminals. Provide an output connection in the base to connect an external remote alarm LED.
2. Detector base shall be capable of connecting to the control panel.
3. Provide supervision as required by NFPA 72 and the manufacturer's equipment literature.

B. Intelligent Detector Relay Base

1. Provide a UL listed low profile twist-lock detector base with a pre-wired dry contact (Form C) relay.
2. Detector base shall be capable of connecting to the control panel.

3. The relay shall be capable of operating independently from the control panel.
4. Provide all required power to relay bases.
5. Provide supervision as required by NFPA 72 and the manufacturer's equipment literature.

C. Intelligent Detector Sounder Base

1. Provide a UL listed low profile twist-lock detector base with a pre-wired piezoelectric horn that will produce an audible signal at a minimum of eighty-five (85) dBA at ten (10) feet.
2. Detector base shall be capable of connecting to the control panel.
3. Detector base shall be capable of sounding simultaneously, individually or in any combination.
4. Provide all required power to sounder bases.
5. Provide supervision as required by NFPA 72 and the manufacturer's equipment literature.

D. Intelligent Detector Low Frequency Sounder Base

1. Provide a UL listed low profile twist-lock detector base with a pre-wired sounder that will produce an audible signal at a frequency of 520 Hz +/- 10% square wave tone and at a minimum of seventy-five (75) dBA at ten (10) feet.
2. Detector base shall be capable of connecting to the control panel.
3. Detector base shall be capable of sounding simultaneously, individually or in any combination.
4. Provide all required power to sounder bases.
5. Provide supervision as required by NFPA 72 and the manufacturer's equipment literature.

2.9 MANUAL PULL STATIONS

A. Addressable Manual Pull Stations

1. Provide dual action type manual pull stations. Manual pull stations shall be designed that upon activation, shall initiate a change of status at the control panel. The manual pull stations shall not be automatically resettable and shall include a visible indication of the manual pull station being activated.
2. Provide address-setting means and store an internal identification code which the control panel can use to identify the type of device.
3. Construct of hi-impact red molded Lexan with instructions for station operation in raised white letters.
4. Provide flush mounting of pull stations. Where flush mounting is not possible, bring to the immediate attention of the Engineer of Record for resolution.
5. Provide mounting on backboxes UL listed for use with the pull station.
6. Provide a keyed reset on each pull station.

2.10 ADDRESSABLE INTERFACE MODULES

A. Monitor Modules

1. Provide addressable monitor modules where required to interface with contact alarm devices, or to connect a supervised zone of conventional initiating devices (any normally open dry contact device) to an intelligent SLC loop.
2. Provide address-setting means and store an internal identification code which the control panel shall use to identify the type of device.
3. The addressable module must provide a monitor LED that is visible from outside the cover plate unless otherwise noted or approved. Flash status/power LED under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected.
4. Provide an automatic test feature to permit functional testing of the device from the main control panel. Indicate results of the test on the LCD display at the control panel.
5. Monitor modules with multiple input contact connections are acceptable if each input is capable of independent programming and functional operation.
6. The factory provided cover plate shall be used.

B. Relay Modules

1. Provide addressable control/relay modules where required to interface with a dry contact (Form C) relay. Provide power for the relay actuation from the intelligent SLC loop.
2. Minimum rating of Form C contacts shall be two (2.0) amperes at 24 volts and one half (0.5) amperes at 120 volts AC.
3. Provide address-setting means and store an internal identification code which the control panel shall use to identify the type of device.
4. The addressable module must provide a monitor LED that is visible from outside the cover plate unless otherwise noted or approved. Flash status LED under normal conditions, indicating that the control module is operational and in regular communication with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected.
5. Control/relay modules with multiple output contact connections are acceptable if each output is capable of independent programming and functional operation.
6. The factory provided cover plate shall be used.

C. Signal Modules

1. Provide addressable signal modules where required to interface with audible or visual notification appliances, or to connect a supervised zone of conventional indicating appliances (any 24 volt DC polarized notification appliance or) to an intelligent SLC loop. Provide notification appliance power through a separate loop from the main control panel or from supervised remote power supplies.
2. Minimum rating of the output current shall be one and a half (1.5) amperes at 24 volts and one half (0.5) amperes at 120 volts AC.
3. Provide address-setting means and store an internal identification code which the control panel shall use to identify the type of device.
4. The addressable module must provide a monitor LED that is visible from outside the cover plate unless otherwise noted or approved. Flash status LED under normal conditions, indicating that the control module is operational and in regular communication with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected.
5. The factory provided cover plate shall be used.

D. Isolation Modules

1. Provide isolation modules to automatically isolate wire-to-wire shorts on an SLC loop. The isolation module shall limit the number of modules or detectors that may render inoperative by a short circuit fault on the SLC loop. Upon a wire-to-wire short circuit the isolation module shall automatically disconnect the shorted circuit from the SLC loop. Upon a correction of the wire-to-wire short, the isolation module shall automatically re-connect the isolated circuit to the SLC loop.
2. The isolation module shall not require any address-setting means and its operation shall be totally automatic. It shall not be necessary to replace or reset the isolation module after its normal operation.
3. The addressable module must provide a monitor LED that is visible from outside the cover plate unless otherwise noted or approved. Flash status/power LED under normal conditions, indicating that the isolation module is operation and in regular communication with the control panel. The LED may be placed into steady illumination indicating a short circuit has been detected and isolated. Where status LED is provided, manufacturer provided cover plate with viewing hole shall be provided.
4. The factory provided cover plate shall be used.

2.11 NOTIFICATION APPLIANCES

A. Visual Notification Appliances - Wall Mounted

1. Provide visual notification appliances operable at 24 volt DC and polarized supervision. The appliances shall utilize a high intensity solid state xenon strobe tube with associated lens/reflector system. The appliances shall be constructed of high-impact red thermoplastic, shall indicate “FIRE”, and shall be UL listed for wall mounted applications.
2. Where possible, provide flush mounting of appliances. Where flush mounting is not possible, bring to the immediate attention of the Engineer of Record for resolution. Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
3. Provide synchronization of all visual notification appliances. The synchronization modules shall be capable of synchronizing appliances with candela ratings ranging from 15 cd to 185 cd.

B. Visual Notification Appliances - Ceiling Mounted

1. Provide visual notification appliances operable at 24 volt DC and polarized supervision. The appliances shall utilize a high intensity solid state xenon strobe tube with associated lens/reflector system. The appliances shall be constructed of high-impact red thermoplastic, shall indicate “FIRE”, and shall be UL listed for ceiling mounted applications.
2. Where possible, provide flush mounting of appliances. Where flush mounting is not possible, bring to the immediate attention of the Engineer of Record for resolution. Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
3. Provide synchronization of all visual notification appliances. The synchronization modules shall be capable of synchronizing appliances with candela ratings ranging from 15 cd to 185 cd.

C. Audible/Visual Notification Appliances - Wall Mounted

1. Provide solid state electronic audible notification appliances with integral visual notification appliance operable at 24 volt DC and polarized supervision. The appliances shall utilize a high intensity solid state xenon strobe tube with associated lens/reflector system. The appliances shall be constructed of high-impact red thermoplastic, shall indicate "FIRE", and shall be UL listed for wall mounted applications.
2. Where possible, provide flush mounting of appliances. Where flush mounting is not possible, bring to the immediate attention of the Engineer of Record for resolution. Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
3. Provide synchronization of all audible and visual notification appliances. Provide a synchronized temporal pattern audible tone producing a minimum sound pressure level of seventy-five (75) dB reverberant per UL 464 using the A-weighted scale (dBA). The synchronization modules shall be capable of synchronizing appliances with candela ratings ranging from 15 cd to 185 cd.

D. Audible/Visual Notification Appliances - Ceiling Mounted

1. Provide solid state electronic audible notification appliances with integral visual notification appliance operable at 24 volt DC and polarized supervision. The appliances shall utilize a high intensity solid state xenon strobe tube with associated lens/reflector system. The appliances shall be constructed of high-impact red thermoplastic, shall indicate "FIRE", and shall be UL listed for ceiling mounted applications.
2. Where possible, provide flush mounting of appliances. Where flush mounting is not possible, bring to the immediate attention of the Engineer of Record for resolution. Where surface mounting is necessary, provide a decorative backbox skirt covering the appliance backbox.
3. Provide synchronization of all audible and visual notification appliances. Provide a synchronized temporal pattern audible tone producing a minimum sound pressure level of seventy-five (75) dB reverberant per UL 464 using the A-weighted scale (dBA). The synchronization modules shall be capable of synchronizing appliances with candela ratings ranging from 15 cd to 185 cd.

2.12 MISCELLANEOUS

A. Transient Voltage Surge Suppression Modules (TSM)

1. Provide transient voltage surge suppression modules consisting of silicon avalanche suppressor diode (SASD) technology. Modules shall be designed, manufactured and installed in accordance with UL 497B, the National Electrical Code, and the manufacturer's instructions.
2. Performance specifications shall include a Response Time of less than five (5) nanoseconds.

B. Transformer

1. Provide a UL listed step-down transformer with a primary input voltage 120 volt AC and a secondary output voltage 24 volt AC at a minimum of 25 VA. The transformer shall have enclosed pigtail type primary connections and screw type secondary terminal connections.

2. Provide a fusible device to be connected to the secondary/load side of the transformer for protection of the wiring and devices connected to the transformer. The amperage of the fusible device shall be based on the projected load and a twenty-five (25) percent safety factor.

C. Device Guards

1. Provide a welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection. Factory fabricated and furnished by manufacturer of device or an approved equal.

D. End of Line Power Supervision Relay

1. Provide a multi-voltage relay (FORM-C (SPDT)) with terminal strip field wiring connections, mounting track and hardware.
2. The relay shall have an operating voltage of 120VAC.
3. Relay shall have a red LED indicating the Relay Coil is energized.
4. Acceptable manufacturer is System Sensor R-10T.

E. End of Line Power Supervision Relay

1. Provide a single pull single throw (SPST) normally open relay that can be used as an end of line device to supervise the duct smoke detectors.
2. The relay shall have an operating voltage of 24VDC.
3. Acceptable manufacturer is System Sensor EOLR-1.

F. Documentation Cabinet

1. Provide a documentation cabinet of 16 Gauge Steel construction.
2. Where possible, provide flush mounting of documentation cabinet. Where flush mounting is not possible, bring to the immediate attention of the Engineer of Record for resolution.
3. The documentation cabinet shall be red in color with contrasting text indicating FIRE ALARM DOCUMENTS.
4. The documentation cabinet shall be lockable and keyed in common with all other keyed devices throughout the system.
5. The documentation cabinet shall be sized to contain the following: full size record drawing, equipment data sheets, firmware and software control documentation.

2.13 SPARE PARTS

A. Initiating Devices: Provide a quantity equal to ten (10) percent of the number of each type of device installed, but not less than one of each type.

B. Notification Appliances: Provide a quantity equal to ten (10) percent of the number of each type (e.g. candela rating) of appliance installed, but not less than one of each type.

C. Detector Bases: Provide a quantity equal to two (2) percent of the number of each type installed, but not less than one (1) of each type.

D. Keys: Provide a minimum of five (5) keys of each type required. Keys and locks for all equipment shall be identical.

E. Lamps for Remote Indicating Lamp Units: Quantity equal to ten (10) percent of amount installed, but no less than 1 unit.

F. Lamps for Strobe Units: Quantity equal to ten (10) percent of amount installed, but no less than 1 unit.

G. Smoke Detectors, Heat Detectors, Projected Beam Detectors: Quantity equal to ten (10) percent of amount of each type installed, but no less than 1 unit of each type.

H. Detector Bases: Quantity equal to two (2) percent of amount of each type installed, but no less than 1 unit of each type.

I. Audible and Visual Notification Appliances: Quantity equal to ten (10) percent of amount of each type installed, but no less than one (1) unit of each type.

J. Keys and Tools: One (1) extra set for access to locked and tamper proofed components.

K. Fuses: Two (2) of each type installed in the system.

2.14 CONDUCTORS

A. Cable and conductors for any power limited circuits shall be type FPL, FPLP, or FPLR. When circuits are installed above a ceiling, conductors shall be type FPLP.

B. Cable and conductors for any non-power limited circuits shall be type NPLF, NPLFP, NPLFR or THHN installed in conduit. When circuits are installed above a ceiling, conductors shall be type NPLFP.

C. Where the size or type of conductor hereinafter specified conflicts with the FAEM's requirements, the larger size or more specialized conductor type will be used.

D. Cable and conductors for wet locations shall be as follows:

1. Types RHW, TW, THW, THHW, THWN, XHHW or other type listed for use in wet locations.
2. Type listed for direct burial.

E. All electrical characteristics (conductor-to-conductor capacitance, DC resistance, etc.) of the fire alarm Cable and conductors shall meet the requirements of the selected FAEM for the intended application.

F. All fire alarm Cable and conductors shall conform to the requirements of Article 760 of the National Electrical Code, and all local codes and standards.

G. All fire alarm cabling shall be permanently labeled with industry standard labels to clearly indicate the associated circuits. At a minimum, labels shall be provided at each junction box and as necessary to ensure the maximum distance of twenty (20) feet between labels. Handwritten labels are not acceptable.

2.15 RACEWAY

A. The following raceway types shall be permitted:

1. Non-continuous raceway (open air)
2. EMT conduit (3/4 inch minimum).
3. RIGID conduit (3/4 inch minimum).
4. Non-Metallic conduit for wet locations (3/4 inch minimum).
5. Surface mounted metallic raceway with a minimum size equivalent to three quarter (3/4) inch nominal conduit.
6. Other means as approved by Engineer or Owner's Representative.

B. All raceway types shall be new. Installing used raceway is unacceptable.

C. Using existing raceway is unacceptable without prior written permission of the Engineer or Owner's Representative.

D. Boxes, supports, and other accessories for the raceway installation shall be listed for the intended application.

2.16 CABLE MANAGEMENT WRAPS

A. Hook and Loop Cable Ties

1. Re-usable Velcro® strap for routing and securing cables and conductors.
2. Single piece strap with front side (hook material) that mates to its own rear side (loop material).

PART 3 - EXECUTION

3.1 COORDINATION WITH OTHER TRADES

A. Coordinate closely with all other trades to expedite construction, accurately interface with related systems, and avoid interferences.

3.2 INSTALLATION / APPLICATION

A. Furnish and install all control wiring, raceway, and outlet boxes for the fire alarm system.

B. Furnish and install all backboxes, equipment and devices for the fire alarm system.

1. Backboxes shall be of the exact type recommended by the FAEM as shown on the equipment and device submittals.
2. Backboxes shall be installed per the manufacturer's installation recommendations.
3. Devices and equipment must be installed by personnel legally permitted and currently licensed to install the devices and equipment. The cost of installation, warranty of installation and equipment, coordination of the installation, and supervision of the installation are responsibilities of the Contractor.

C. All fire alarm conduit, junction boxes, pull boxes, cable splices and terminal cabinets shall be accessible, painted red or clearly marked “Fire Alarm”. The Contractor shall comply with any local codes or AHJ requirements for circuit identification. Any access panels required for the accessibility to the junction boxes, pull boxes, cable splices and terminal cabinets shall be the responsibility of the Fire Alarm Contractor.

D. All cable and conductors not in conduit shall be installed in a neat and workmanlike manner utilizing a non-continuous pathway compliant with NEC requirements.

E. All conduit, cable and conductors shall be run at right angles (while maintaining manufacturers recommended bend radius specifications) to the building walls, floors, and ceilings. Connecting hardware shall be properly supported from the building structure at intervals compliant with NEC requirements.

F. All cable and conductors within fire alarm equipment enclosures shall be in the vertical or horizontal plane. Make all turns at right angles and tightly bundled and wrapped while maintaining manufacturers recommended bend radius specifications.

G. Cables and conductors shall be installed in a path that will provide proper spacing from electromagnetic interference in accordance with the NEC.

H. Identify all cable and conductors with permanent markings. Cable and conductor markings shall be printed labels, permanently affixed to the conductor via shrink wrap.

I. All power limited cable and conductors for the fire alarm system shall be installed in conduit in the following locations:

1. Seven (7) feet or less above the finished floor.
2. Below the structure.
3. Electrical and mechanical rooms (subject to physical damage).
4. Concealed above ceilings or in partitions (subject to physical damage).
5. Where required by applicable codes.
6. Cabling and conductors in finished areas that cannot be concealed are allowed to be installed in surface-mounted metallic raceway only upon approval of the Owner’s Representative.
7. Where indicated on the engineering drawings.

J. All non-power limited cable and conductors for the fire alarm system shall be installed in conduit.

K. Power limited cable and conductors for the fire alarm system are not required to be installed in conduit in the following locations:

1. Above the structure / More than seven (7) feet above the finished floor.
2. Above lay-in ceilings.
3. Concealed in ceilings or partitions not subject to damage.

L. Exposed cable, conductors and conduits shall be concealed from public view at all locations by routing on the inside of joists, above lay-in ceilings, over girders, within partitions or in any other manner acceptable to the Owner’s Representative.

M. Cable, conductors, and conduits installed above lay-in ceilings shall be supported from the building structure and shall not be permitted less than nine (9) inches above or behind removable panels or ceiling tiles.

N. Cables shall not rest directly on or be supported by ceiling panels, T-bars, ceiling support wires or any components of the suspended ceiling.

O. If support wires are necessary to properly support fire alarm cabling, independent support wires shall be attached to the building structure to carry the load and attached to the suspended ceiling grid to act as "sway control". When independent support wires are used, they must be distinguishable by color, tagging or other effective means.

P. Fire alarm cabling shall not be hung from any piping, ductwork or any hangers supporting piping or ductwork.

Q. Cables shall be installed utilizing a non-continuous pathway that must be attached to the building structure or walls with hardware specifically designed and listed to support the cable and its weight.

1. Hardware used to attach cable to structure shall be installed in a manor to ensure cable manufacturers recommended bend radius is maintained.
2. Non-continuous cable supports shall have flared edges to prevent damage to cable and conductors during installation.
3. Cables shall be installed such that the cable performance is not degraded or compromised.
4. Cable ties and wire straps shall not be used to attach cable to building structure where the cable ties or wire straps is bearing the weight of the cable.
5. Hardware used to attach cable to structure shall be engineered and designed for such purpose. Hardware shall be installed and utilized per manufacturer’s specifications.
6. Cables shall not be installed in a manner such that the cable or conductors rest directly on building structure where damage to the cable may be caused by normal building movement and use.
7. Cable support hardware shall have a wide enough surface area of support to not affect the geometry or performance of the cable.
8. All cable and conductors not in conduit shall be supported from the building structure at intervals of no more than five (5) feet and ensure that midspan sag does not exceed 12 inches.

R. Cable management wraps shall be used to bundle and manage multiple fire alarm cables connected to the same system and sharing a common pathway.

S. Cable ties should be installed with the proper tension to not crimp or effect the geometry of the cable. The use of a Cable Tie tensioning tool is recommended.

1. Cable ties excess must be cut flush to remove any sharp edges that could cause harm to people, hardware, and connectivity.
2. Cable ties shall meet the appropriate listing for the environment in which they are installed.

T. Ground fire alarm control panel and associated circuits shall comply with IEEE 1100. Install a ground wire from main service ground to fire alarm control panel.

U. All cable and conductors shall be tagged at all junction points and shall test free from grounds or crosses between conductors.

V. All cable and conductors shall be pulled splice free. Cable and conductors shall be run continuous from device to device. The use of wire nuts, crimped connectors, or twisting of conductors is prohibited. All terminations shall be at a terminal strip utilizing screw terminals.

W. Cable and conductors that are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting, or junction box shall be connected to screw-type terminal blocks.

X. Power-limited wiring conductors shall not be installed in conduits with electric light, power Class 1, non-power-limited fire alarm and medium power network-powered broadband communications circuits.

Y. Final connections between equipment and the wiring system shall be made under direct supervision of a representative of the FAEM. If other personnel are required by the AHJ to be present during final connections, this shall not relieve the Contractor of the responsibility of providing a representative of the FAEM for direct supervision.

Z. Fire alarm cabling shall not be painted.

AA. Conduits shall enter the control panel enclosures only in the approved locations, as identified in the FAEM installation instructions.

BB. Existing systems being replaced, or their operations abandoned shall be removed immediately after the new fire alarm system is accepted by the Owner. All fire alarm equipment, equipment backboxes, accessible conduit and wiring shall be removed. Conduit and wiring that cannot be removed shall be marked “Abandoned”. All fire alarm equipment (excluding backboxes, conduit, scrap wiring, and other equipment not strictly related to the demolished fire alarm system) shall be turned over to the Owner’s Representative.

CC. When connecting to existing equipment, verify that existing fire alarm equipment is operational before making changes or connections.

1. Connect existing equipment to new control panel in existing part of the building.
2. Connect existing equipment to new monitoring equipment at the supervising station.
3. Expand, modify, and supplement existing equipment as necessary.
4. Existing components shall be capable of merging with new configuration without degrading the performance of either system.

3.3 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire alarm equipment.

B. The control panels and auxiliary power supplies shall be surface mounted with no operational parts which may require maintenance mounted greater than seventy-two (72) inches above the finished floor. The control panel annunciator shall be mounted so that no switch, manually operated device, display or LED is greater than sixty (60) inches above the finished floor.

1. Installing the fire alarm control panels on concrete base the installation shall comply with requirements for concrete base.”

a. Install seismic bracing.
b. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on eighteen (18) inch centers around the full perimeter of concrete base.
c. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
d. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
e. Install anchor bolts to elevations required for proper attachment to supported equipment.

2. Comply with requirements for seismic-restraint devices.

C. The documentation cabinet shall be surface mounted as indicated on the engineering drawings.

D. Mount the cellular communicator within the enclosure at a location with acceptable signal strength from the wireless network connection. The cellular communicator shall not be installed above a suspended ceiling.

E. Duct detectors shall be mounted in the air duct of HVAC units as indicated on the engineering drawings. Duct detectors shall be mounted in such a way as to obtain a representative sample of the airstream. Detectors shall be accessible for cleaning and shall be mounted in accordance with the manufacturer's instructions and NFPA standards. Coordinate placement and connect all circuits. Install sampling tubes so they extend the full width of duct.

F. All HVAC equipment shutdown shall be initiated by relays . Relays shall be mounted within three (3) feet of the motor controller or control circuit of the affected equipment. Provide cabling and wiring connections to HVAC shutdown controls. Final terminations to HVAC shutdown controls are by mechanical or controls contractor. Provide any required intermediate relays for connections to HVAC shutdown controls.

G. Smoke and carbon monoxide detectors shall be mounted on the underside of the ceiling or deck. Locate detectors more than three (3) feet from air supply diffusers or return air openings. The smoke detector and fire alarm cabling shall be installed and supported a minimum 1 ½ inches from the lowest surface of the roof decking in accordance with National Electrical Code. Locate detectors not closer than one (1) foot from any part of a lighting fixture.

H. Where more than one single-/multi-station smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

I. Smoke, carbon monoxide, heat, and duct detectors shall not be installed until after the construction clean-up of all trades is complete and final. Detectors that have been installed prior to final clean-up by all trades shall be cleaned or replaced in accordance with NFPA 72.

J. Manual pull stations shall be securely mounted with the operable part of the manual pull station no greater than forty-eight (48) inches above the finished floor and no less than forty-two (42) inches above the finished floor. Provide surface mounted on standard electrical boxes.

K. Wall mounted audible/visual, and visual appliances shall be surface mounted such that the entire lens is not less than eighty (80) inches and not greater than ninety-six (96) inches above the finished floor or at the mounting height specified using the performance-based alternative. Where low ceiling heights do not permit wall mounting at a minimum of eighty (80) inches, wall mounted appliances shall be mounted within six (6) inches of the ceiling.

L. Wall mounted visual appliances in accessible guest rooms shall be surface mounted on the wall greater than twenty-four (24) inches from the ceiling, within sixteen (16) feet of the pillow (measured horizontally), and in accordance with NFPA 72.

M. Ceiling mounted visual appliances in accessible guest rooms shall be surface mounted on the ceiling, rated at 177 candela, within sixteen (16) feet of the pillow (measured horizontally), and in accordance with NFPA 72.

N. Ceiling mounted audible/visual and visual appliances shall be mounted as shown on the engineering drawings with their visual lenses having an unobstructed line of site in all directions. Exact locations of appliances shall be sufficiently distant from vertical surfaces and hanging items to permit maximum viewing from all directions.

O. Devices and appliances shall be installed in the center or quarter point of the ceiling tiles. Devices and appliances shall not be supported by ceiling tiles. Devices and appliances must be attached to backbox supported by the ceiling grid.

P. All initiating devices and addressable modules shall be mounted in a location accessible for testing and maintenance.

Q. Provide a computer generated label for each initiating device indicating the specific address for that device. The label shall include the node number, loop number and device number where applicable. The label shall be located on the base of all detectors and the cover plates of addressable modules. Hand written labels are not acceptable.

R. Provide a computer generated label for each notification appliance indicating the circuit number, appliance number, and location of the end of line resistor. The label shall be located on the base of all notification appliances. Hand written labels are not acceptable.

3.4 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, connect hardware and devices to fire alarm system.

1. Verify that hardware and devices are NRTL listed for use with the fire alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than three (3) feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Supervisory connections at valve supervisory switches.
2. Interface connections to door hold open devices.
3. Interface connections to kitchen hood suppression systems.

4. Interface connections to door contact monitoring panel.

C. Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to the fire alarm system.

3.5 IDENTIFICATION

A. Comply with requirements for identification for system components, wiring, cabling, and terminals.

B. When required, install framed instructions in a location visible from the fire alarm control panel.

1. Instructions shall be computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

3.6 RESTORATION OF SITE

A. Where sidewalks, curbs, and lawns are excavated by the Fire Alarm Contractor, these areas shall be backfilled and replaced to the original condition and to the satisfaction of the Owner, Architect and AHJ.

3.7 PAINTING AND PATCHING

A. All fire alarm conduit shall be thoroughly cleaned, removing all dirt, oil, etc. and made ready to receive paint.

B. Holes in walls or floors cut during the performance of this work shall be patched or covered with standard escutcheon plates so as to completely conceal the cuts where they would otherwise be exposed to view.

C. Holes in walls and ceilings created by the removal of fire alarm equipment no longer used shall be patched and painted to match the existing walls and ceilings, or covered with standard escutcheon plates so as to completely conceal the “holes” where they would otherwise be exposed to view.

D. All penetrations of fire rated assemblies (wall or floor construction) shall be firestopped to preserve the original fire resistance and smoketight integrity of the assembly. All firestopping methods shall be UL listed Through Penetration Firestop Systems or otherwise approved by the Owner, Architect, Engineer, and AHJ. Specific firestop assembly shall be identified at the penetration location with a sticker or other approved identification means.

3.8 SYSTEM TESTS

A. All test and inspections specified in this section shall be reported in writing and submitted in accordance with this specification section.

B. The system shall meet all the requirements of the listed applicable codes and the requirements of the AHJ. The system tests and test documents, including those required for and by the approved remote monitoring station, shall meet the requirements of the AHJ.

C. Provide one hundred (100) percent initial acceptance testing of the entire fire alarm system prior to the required AHJ acceptance testing. Before requesting the AHJ acceptance testing, furnish a written statement to the Owner's Representative indicating that the system has been installed in accordance with the approved documents and tested in accordance with the manufacturer's specifications and the applicable NFPA requirements. The Record of Completion shall be completed and submitted as part of the written statement.

1. System tests shall be witnessed by Authorities Having Jurisdiction.
2. Manufacturer's factory-authorized service representative shall be engaged to inspect and adjust components, assemblies, and equipment installations, including connections, and to assist in testing.

D. All testing, inspection and retesting required for certification and required for all warranty work or replacements shall meet the requirements of the AHJ. This certification, inspection, or testing shall be completed at no additional cost to the Owner.

E. Provide the testing date in writing to the Owner a minimum of two (2) weeks before the date. The Owner may elect to have a representative present for testing.

F. The fire alarm system will not be acceptable until final testing and receipt of the testing certificates have been obtained.

G. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

H. Testing and Inspections:

1. Visual Inspection shall be conducted prior to testing.

    a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
    b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing shall comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.

I. Reacceptance Testing shall be performed to verify the proper operation of added or replaced devices and appliances.

J. Fire alarm system will be considered defective if it does not pass tests and inspections.

K. Maintenance Test and Inspection:

1. A proposal to perform annual testing and/or inspection services shall be submitted to the Owner a minimum of three (3) weeks before the date of initial acceptance testing. The proposal shall include all testing and/or inspection services required by the AHJ for the two (2) year period beginning at final acceptance of the system. The Owner has the option to accept or reject the proposal.
2. Maintenance Test and Inspection shall be performed as listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
3. Annual Test and Inspection shall be performed one (1) year after date of Substantial Completion. The fire alarm system shall comply with all visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain fire alarm system.

END OF SECTION 28 31 11

DRAWING INDEX

SHEET	DRAWING NUMBER	DRAWING TITLE
1 OF 45	G-001	COVER SHEET
2 OF 45	G-002	SITE MAPS, ASSET NUMBERS, CONSTRUCTION PHASING & SCHEDULE
3 OF 45	G-003	DRAWING INDEX
4 OF 45	E-001	ELECTRICAL SYMBOLS, ABBREVIATIONS & GENERAL NOTES
5 OF 45	ES-101	ELECTRICAL SITE PLAN
6 OF 45	ES-401	12.47kV CAMPUS MAIN SWITCHGEAR
7 OF 45	ED-401	MAINTENANCE BUILDING ELECTRICAL DEMOLITION PLAN
8 OF 45	ED-402	PHYSICAL THERAPY BUILDING ELECTRICAL DEMOLITION PLAN
9 OF 45	ED-403	DONNELLY BUILDING ELECTRICAL DEMOLITION PLAN
10 OF 45	ED-601	12.47kV ONE-LINE DIAGRAM - DEMOLITION
11 OF 45	ED-602	DEMOLTION ONE-LINE DIAGRAM - MAINTENANCE BUILDING
12 OF 45	ED-603	DEMOLITION ONE-LINE DIAGRAM - PHYSICAL THERAPY BUILDING
13 OF 45	E-401	MAINTENANCE BUILDING ELECTRICAL PLAN
14 OF 45	E-402	PHYSICAL THERAPY BUILDING ELECTRICAL PLAN
15 OF 45	E-403	DONNELLY BUILDING ELECTRICAL PLAN
16 OF 45	E-501	ELECTRICAL DETAILS
17 OF 45	E-601	12.47kV ONE-LINE DIAGRAM
18 OF 45	E-602	ONE-LINE DIAGRAM - MAINTENANCE BUILDING
19 OF 45	E-603	ONE-LINE DIAGRAM - PHYSICAL THERAPY BUILDING
20 OF 45	E-604	12.47kV FEEDER & EQUIPMENT SCHEDULES
21 OF 45	FA-001	FIRE ALARM COVER SHEET/NOTES, MATRIX, AND SHEET INDEX
22 OF 45	FA-100	SITE FIRE ALARM PLAN
23 OF 45	FA-101	APARTMENT A NEW WORK FIRE ALARM PLAN
24 OF 45	FA-102	APARTMENT B NEW WORK FIRE ALARM PLAN
25 OF 45	FA-103	BUILDINGS 1601-1610, 1908, 1801-1810, 1901-1904 (A) NEW WORK FIRE ALARM PLAN
26 OF 45	FA-104	WAREHOUSE/FOOD DISTRIBUTION CENTER NEW WORK FIRE ALARM PLAN
27 OF 45	FA-105	MAINTENANCE BUILDING NEW WORK FIRE ALARM PLAN
28 OF 45	FA-106	MULTIPURPOSE BUILDING NEW WORK FIRE ALARM PLAN
29 OF 45	FA-107	PHYSICAL THERAPY BUILDING NEW WORK FIRE ALARM PLAN
30 OF 45	FAD-101	APARTMENT A DEMOLITION WORK FIRE ALARM PLAN
31 OF 45	FAD-102	APARTMENT B DEMOLITION WORK FIRE ALARM PLAN
32 OF 45	FAD-103	BUILDINGS 1601-1610, 1908, 1801-1810, 1901-1904 (A) DEMOLITION WORK FIRE ALARM PLAN
33 OF 45	FAD-104	WAREHOUSE/FOOD DISTRIBUTION CENTER DEMOLITION WORK FIRE ALARM PLAN
34 OF 45	FAD-105	MAINTENANCE BUILDING DEMOLITION WORK FIRE ALARM PLAN
35 OF 45	FAD-106	MULTIPURPOSE BUILDING DEMOLITION WORK FIRE ALARM PLAN
36 OF 45	FAD-107	PHYSICAL THERAPY BUILDING DEMOLITION WORK FIRE ALARM PLAN
37 OF 45	FA-500	FIRE ALARM DETAILS
38 OF 45	FA-601	APARTMENT A MATRIX, CBE, CALCULATIONS AND RISER DIAGRAM
39 OF 45	FA-602	APARTMENT B MATRIX, CBE, CALCULATIONS AND RISER DIAGRAM
40 OF 45	FA-603	BUILDINGS 1601-1610, 1908 MATRIX, CBE, CALCULATIONS AND RISER DIAGRAM
41 OF 45	FA-604	BUILDINGS 1801-1810 MATRIX, CBE, CALCULATIONS AND RISER DIAGRAM
42 OF 45	FA-605	BUILDINGS 1901-1904 (A) MATRIX, CBE, CALCULATIONS AND RISER DIAGRAM
43 OF 45	FA-606	WAREHOUSE/FOOD DISTRIBUTION CENTER MATRIX, CBE, CALCULATIONS AND RISER DIAGRAM
44 OF 45	FA-607	MAINTENANCE BUILDING MATRIX, CBE, CALCULATIONS AND RISER DIAGRAM
45 OF 45	FA-608	MULTIPURPOSE/PHYSICAL THERAPY BUILDING MATRIX, CBE, CALCULATIONS AND RISER DIAGRAM

STATE OF MISSOURI
MIKE KEHOE,
GOVERNOR

STATE OF MISSOURI
BARRY D. FREINER
E-24220
05/13/2025
REGISTERED PROFESSIONAL ENGINEER

BARRY D. FREINER
Registered Professional Engineer
MO # E-24220
Expires 12-31-2026

ROGERS-SCHMIDT
ENGINEERING CO., P.C.
CONSULTING ENGINEERS
1736 WEST PARK CENTER DR.
SUITE 204
ST. LOUIS, MO 63026
PHONE: 636-600-1551
EMAIL: bfreiner@rogers-schmidt.com
MISSOURI STATE CERTIFICATE
OF AUTHORITY #000408

cci
2043 WOODLAND PKWY, SUITE 300
ST. LOUIS, MISSOURI 63146-4235
314-991-2633
www.codeconsultants.com

OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT,
DESIGN AND CONSTRUCTION

DEPARTMENT OF
MENTAL HEALTH

REPLACE FIRE ALARM
SYSTEM & ELECTRICAL
RENOVATION

BELLEFONTAINE
HABILITATION CENTER
10695 BELLEFONTAINE RD.
ST. LOUIS, MISSOURI 63137

PROJECT # M2006-01
SITE # 7356
ASSET # 6517356071

REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION: (A) ADDENDUM 1
DATE: 05/13/2025

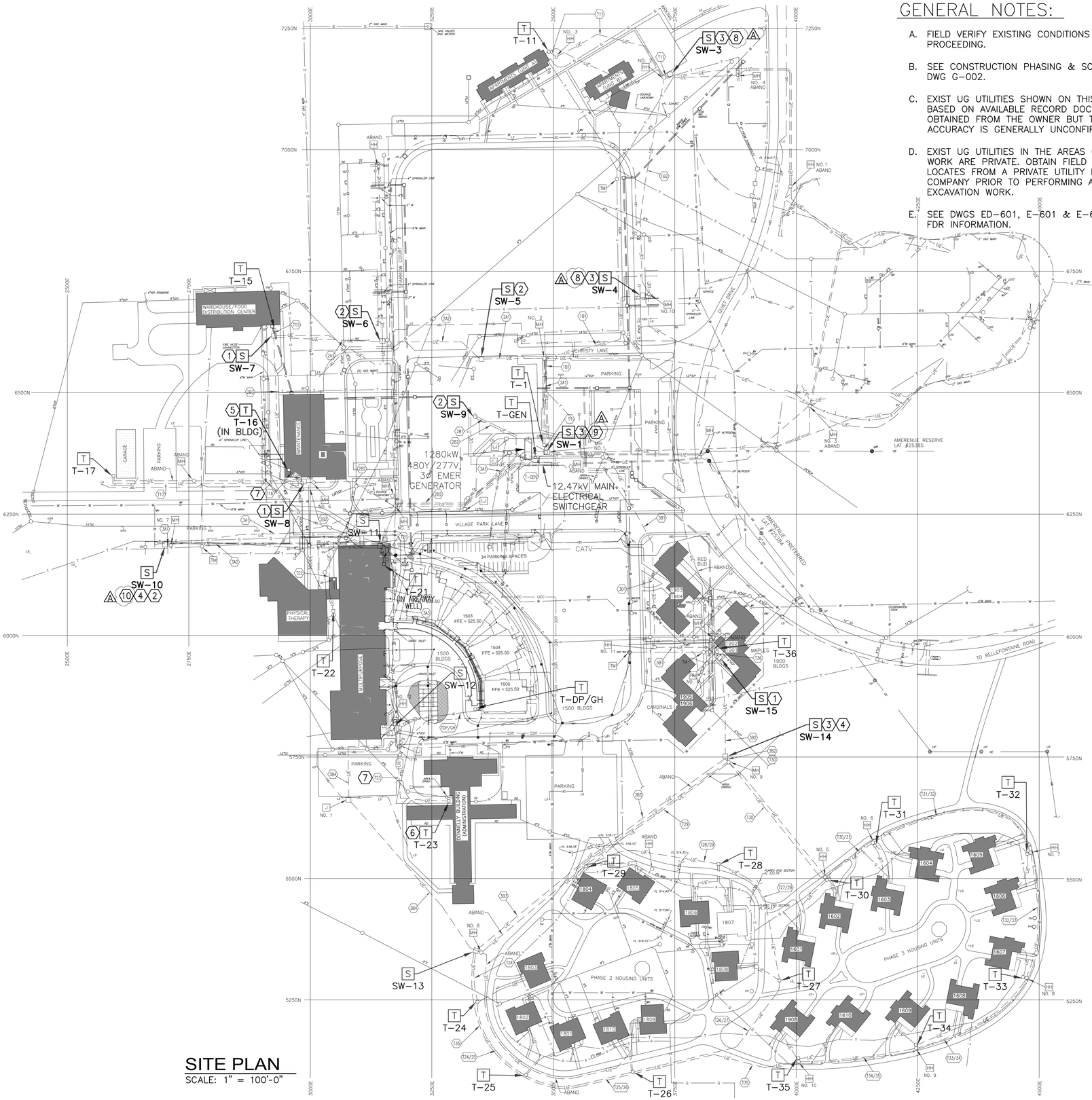
ISSUE DATE: 02/10/2025

CAD DWG FILE: M2006-01-7356-6517356071- G-003.DWG
DRAWN BY: M.N.S
CHECKED BY: B.D.F
DESIGNED BY: B.D.F

SHEET TITLE:
DRAWING INDEX

SHEET NUMBER:
G-003

3 OF 45 SHEETS
FEBRUARY 10, 2025



SITE PLAN
SCALE: 1" = 100'-0"

GENERAL NOTES:

A. FIELD VERIFY EXISTING CONDITIONS PRIOR TO PROCEEDING.

B. SEE CONSTRUCTION PHASING & SCHEDULE ON DWG G–002.

C. EXIST UG UTILITIES SHOWN ON THIS DWG ARE BASED ON AVAILABLE RECORD DOCUMENTS OBTAINED FROM THE OWNER BUT THEIR ACCURACY IS GENERALLY UNCONFIRMED.

D. EXIST UG UTILITIES IN THE AREAS OF SITE WORK ARE PRIVATE. OBTAIN FIELD UTILITY LOCATES FROM A PRIVATE UTILITY LOCATE COMPANY PRIOR TO PERFORMING ANY EXCAVATION WORK.

E. SEE DWGS ED–601, E–601 & E–604 FOR MV FDR INFORMATION.

KEY NOTES:

1. REPLACE EXIST SWGR WITH NEW SWGR PER SPECIFICATION SECTION 337710 AND PER THE PAD–MOUNTED SWGR SCHEDULE ON DWG E–604. SEE DETAILS ON DWG E–501.
2. REPLACE EXIST SWGR WITH NEW SECTIONALIZER CABINET PER SPECIFICATION SECTION 337110. SEE DETAIL ON DWG E–501.
3. EXIST SWGR TO BE REMOVED.
4. EXIST SWGR SW–10 TO BE RELOCATED TO LOCATION OF EXIST SW–14. SEE DETAIL ON DWG E–501.
5. REPLACE EXIST XFMR WITH NEW 150 kVA XFMR PER SPECIFCATION SECTION 261216. SEE DWGS ED–401 & E–401.
6. REPLACE EXIST XFMR WITH NEW 150 kVA XFMR PER SPECIFCATION SECTION 261219. SEE DWGS ED–403 & E–403
7. REPLACE EXIST 12.47kV FDR CABLES IN EXIST 4" DUCT. SEE DWGS ED–601, E–601 & E–604.
8. REMOVE EXIST FIBERGLASS BOX PAD, CONCRETE APRON & PROTECITVE PIPE BOLLARDS. BACKFIILL PER DIVISION 31 AND APPLY SEED & FERTILIZER PER SPECIFICATION SECTION 329200 REQUIREMENTS.
9. PROVIDE CONDUIT/DUCT PLUG PER SPECIFICATION SECTION 337119.13 IN EACH EMPTY CONDUIT IN THE TOP OF MH NO.1.
10. REMOVE EXIST 40"Hx24"Wx14"D CONC PEDESTAL, LOCATED ON THE NORTH SIDE OF SW–10, ALONG WITH (3) ABAND ELEC BOXES & 2"PVC DOWN TO 36" BFG.

LEGEND

LJ	UNDERGROUND LIGHTING JUNCTION BOX
CJ	UNDERGROUND CONTROL JUNCTION BOX
T	ELECTRICAL TRANSFORMER
S	ELECTRICAL PAD–MOUNTED SWITCHGEAR
MH	ELECTRICAL MANHOLE
HH	ELECTRICAL HAND HOLE
TM	TELEPHONE MANHOLE
XXX	12.47kV FEEDER DESIGNATION
UP	UTILITY POLE
LS	LIGHT STANDARD
FH	FIRE HYDRANT
GV	GAS VALVE
WB	WATER BOX
WV	WATER VALVE
CI	CAST IRON
RD	ROOF DRAINS
CO	CLEAN OUT
YD	YARD DRAIN
G	GAS
S	SANITARY SEWER (VITRIFIED CLAY TYP.)
SS	STORM SEWER (CONCRETE PIPE TYP.)
VCP	VITRIFIED CLAY PIPE
W	WATER
T	TELEPHONE
	STEAM AND CONDENSATE
OE	OVERHEAD ELECTRIC
UE	UNDERGROUND ELECTRIC
UEL	UNDERGROUND ELECTRIC LIGHTING
UCC	UNDERGROUND CONTROL CABLES
CATV	UNDERGROUND CABLE TV

TRUE NORTH PLAN NORTH

0 100' 200'
SCALE IN FEET
1" = 100'–0"

STATE OF MISSOURI
MIKE KEHOE,
GOVERNOR

STATE OF MISSOURI
BARRY D. FREINER
E-24220
05/13/2025
REGISTERED PROFESSIONAL ENGINEER

BARRY D. FREINER
Registered Professional Engineer
MO # E-24220
Expires 12-31-2026

ROGERS-SCHMIDT ENGINEERING CO., P.C.
CONSULTING ENGINEERS
1736 WEST PARK CENTER DR.
SUITE 204
ST. LOUIS, MO 63026
PHONE: 636-600-1551
EMAIL: bfreiner@rogers-schmidt.com
MISSOURI STATE CERTIFICATE OF AUTHORITY #000408

cci
2043 WOODLAND PKWY, SUITE 300
ST. LOUIS, MISSOURI 63146-4235
314-991-2633
www.codeconsultants.com

OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT,
DESIGN AND CONSTRUCTION

DEPARTMENT OF MENTAL HEALTH

REPLACE FIRE ALARM SYSTEM & ELECTRICAL RENOVATION

BELLEFONTAINE HABILITATION CENTER
10695 BELLEFONTAINE RD.
ST. LOUIS, MISSOURI 63137

PROJECT # M2006-01
SITE # 7356
ASSET # 6517356071

REVISION:	
DATE:	
REVISION:	
DATE:	
REVISION:	
DATE:	
REVISION:	
DATE:	
REVISION:	
DATE:	
REVISION:	ADDENDUM 1
DATE:	05/13/2025

ISSUE DATE: 02/10/2025

CAD DWG FILE: M2006-01-7356-6517356071-ES-101.DWG
DRAWN BY: K E T / M N S
CHECKED BY: B D F
DESIGNED BY: B D F

SHEET TITLE:
ELECTRICAL SITE PLAN

SHEET NUMBER:
ES-101

5 OF 45 SHEETS
FEBRUARY 10, 2025

INSTALLATION NOTES

1. SEE WIRING LEGEND FOR CABLE TYPES AND SIZES.
2. ALL WORK SHALL BE IN ACCORDANCE WITH NFPA STANDARDS AND ALL LOCAL ADOPTED CODES.
3. CABLE ROUTING SHOWN ON DRAWINGS IS FOR INTENT. EXACT ROUTING TO BE COORDINATED WITH OTHER TRADES IN THE FIELD. SEE SPECIFICATIONS AND DRAWING NOTES FOR ACCEPTABLE INSTALLATION METHODS.
4. PROVIDE ALL REQUIRED CONDUIT, BACKBOXES, AND FITTINGS FOR THE FIRE ALARM SYSTEM CABLING. THE FIRE ALARM CONTRACTOR SHALL COORDINATE WITH THE ELECTRICAL CONTRACTOR TO DETERMINE THE EXTENT OF ALL FIRE ALARM CONDUIT AND BACKBOX REQUIREMENTS.
5. ALL FIRE ALARM CABLING SHALL BE FPL, FPLR OR FPLP AS REQUIRED BY THE ELECTRICAL CODE. SEE WIRING LEGEND FOR CABLE TYPES AND SIZES.
6. NOTE DELETED. (A)
7. FIRE ALARM CABLING SHALL NOT BE PAINTED.
8. FIRE ALARM CABLING SHALL BE RED IN COLOR, SHALL BE LABELED AS FIRE ALARM CABLING, AND SHALL BE LISTED FOR THE INTENDED APPLICATION.
9. ALL CONDUCTORS NOT IN CONDUIT SHALL BE NEATLY BUNDLED, WRAPPED TIGHT AND PROPERLY SECURED. ANY CABLING NOT INSTALLED IN A NEAT AND PROFESSIONAL MANNER SHALL BE PULLED OUT AND RE-RUN BY INSTALLER, AT NO ADDITIONAL COST TO THE OWNER.
10. RUN ALL CONDUIT AND CONDUCTORS NOT IN CONDUIT AT RIGHT ANGLES TO THE BUILDING WALLS, FLOORS AND CEILING, AND SUPPORTED FROM THE BUILDING STRUCTURE AT INTERVALS COMPLIANT WITH NEC REQUIREMENTS.
11. ALL CONDUCTORS IN FIRE ALARM EQUIPMENT ENCLOSURES SHALL BE RUN IN THE VERTICAL OR HORIZONTAL PLANE. MAKE ALL TURNS AT RIGHT ANGLES AND TIGHTLY BUNDLE AND WRAP.
12. NOT USED. (A)
13. IDENTIFY ALL CONDUCTORS WITH PERMANENT MARKINGS. CONDUCTOR MARKINGS SHALL BE PRINTED LABELS, PERMANENTLY AFFIXED TO THE CONDUCTOR VIA SHRINK WRAP.
14. EXPOSED CABLING SHALL BE RUN PARALLEL AND PERPENDICULAR TO BUILDING STRUCTURE. EXPOSED CABLING SHALL NOT BE RUN IN A "SPAN" FASHION BETWEEN BAR JOISTS OR BEAMS (I.E.: CABLING SHALL BE ROUTED ALONG PATH OF JOISTS AND BEAMS). ALL CABLING SHALL BE SECURED TO THE STRUCTURAL CEILING BETWEEN JOISTS OR BEAMS, AND AS INDICATED IN SPECIFICATIONS.
15. ALL CABLING SHALL BE SUPPORTED FROM BUILDING STRUCTURE AND NOT FROM GRID, TILES, OR SUPPORT WIRES. ALL CABLING NOT IN CONDUIT SHALL BE SUPPORTED BY BUILDING STRUCTURE AT NO MORE THAN FIVE (5) FOOT INTERVALS.
16. ALL FIRE ALARM CABLING IN SPRINKLER, ELECTRICAL, MECHANICAL, ELEVATOR EQUIPMENT ROOMS, AND SUBJECT TO PHYSICAL DAMAGE SHALL BE INSTALLED IN METALLIC CONDUIT.
17. ALL EXPOSED VERTICAL CABLING SEVEN (7) FEET ABOVE THE FINISHED FLOOR SHALL BE INSTALLED IN METALLIC CONDUIT.
18. ALL FIRE ALARM CABLING RISERS SHALL BE INSTALLED IN METALLIC CONDUIT.
19. ALL POWER LIMITED FIRE ALARM CABLING ABOVE THE STRUCTURE, ABOVE LAY-IN CEILINGS, OR CONCEALED ABOVE CEILINGS OR IN PARTITIONS (NOT SUBJECT TO PHYSICAL DAMAGE) ARE NOT REQUIRED TO BE INSTALLED IN CONDUIT.
20. ALL NON-POWER LIMITED FIRE ALARM CABLING FOR THE FIRE ALARM SYSTEM SHALL BE INSTALLED IN CONDUIT.
21. ALL CONDUIT LOCATED IN DRYWALL SHALL BE TERMINATED NO LESS THAN SIX (6) INCHES ABOVE THE CEILING TILE.
22. ALL FIRE ALARM CABLING IN FINISHED AREAS SHALL BE CONCEALED.
23. COORDINATE DRILLING OF ANY HOLES (I.E. COLUMN PENETRATIONS) WITH THE GENERAL CONTRACTOR AND ALL OTHER TRADES PRIOR TO INSTALLATION.
24. ALL CABLING, CONDUIT, AND BACKBOXES SHALL BE PROPERLY SUPPORTED AND SEISMICALLY BRACED, AS REQUIRED BY ALL APPLICABLE CODES AND THE LOCAL JURISDICTION.
25. FIRE ALARM CONDUCTORS SHALL BE ACCEPTABLE TO THE FIRE ALARM EQUIPMENT MANUFACTURER FOR THE INTENDED PURPOSE. SHOULD MANUFACTURER OF FIRE ALARM EQUIPMENT REQUIRE DIFFERENT TYPE OR SIZE OF CABLE THAN HEREIN SPECIFIED, THE LARGER OR MORE STRINGENT TYPE OF CABLE SHALL BE USED.
26. CONDUIT AND CABLING SHALL ENTER INTO THE FACP AND EACH APS ONLY AS APPROVED BY THE EQUIPMENT MANUFACTURER.
27. ALL FIRE ALARM JUNCTION BOXES SHALL BE RED IN COLOR.
28. COORDINATE INSTALLATION OF A GROUND ROD OR ACCEPTABLE BUILDING GROUND FOR PROPER GROUNDING OF THE FACP AND EACH APS WITH THE ELECTRICAL CONTRACTOR.
29. NOT USED. (A)
30. ALL SIGNALING LINE CIRCUITS, INITIATING DEVICE CIRCUITS, AND NOTIFICATION APPLIANCE CIRCUITS SHALL BE SUPERVISED IN ACCORDANCE WITH NFPA 72.
31. PROVIDE END OF LINE RESISTORS FOR ALL INITIATING DEVICE CIRCUITS AND NOTIFICATION APPLIANCE CIRCUITS PER MANUFACTURER SPECIFICATIONS.
32. ALL FIRE ALARM DEVICES SHALL BE INSTALLED IN OR ON A PROPER BACKBOX. NO DEVICES SHALL BE INSTALLED WITHOUT A BACKBOX. ALL DEVICES SHALL BE MOUNTED IN AN ACCESSIBLE LOCATION FOR TESTING AND MAINTENANCE.
33. ALL CONDUCTORS SHALL BE PULLED SPLICE FREE. CONDUCTORS SHALL BE CONTINUOUS FROM DEVICE TO DEVICE. THE USE OF WIRE NUTS, CRIMPED CONNECTORS, OR TWISTING OF CONDUCTORS IS PROHIBITED. ALL TERMINATIONS SHALL BE AT A TERMINAL STRIP UTILIZING SCREW TERMINALS.
34. CONDUCTORS THAT ARE TERMINATED, SPLICED, OR OTHERWISE INTERRUPTED IN ANY ENCLOSURE, CABINET, MOUNTING OR JUNCTION BOX SHALL BE CONNECTED TO SCREW-TYPE TERMINAL BLOCKS.
35. PROVIDE A SEPARATE ADDRESSABLE RELAY MODULE (ARM) FOR SHUTDOWN OF ASSOCIATED AHU. LOCATE ARM AT AN ACCESSIBLE LOCATION WITHIN THREE (3) FEET OF THE ASSOCIATED AHU MOTOR CONTROLLER OR CONTROL CIRCUIT. PROVIDE ANY REQUIRED POWER CONNECTIONS AND SUPERVISION FOR DUCT DETECTORS AND ARM. COORDINATE ALL EQUIPMENT INSTALLATION AND INTERFACE CONNECTIONS WITH THE ELECTRICAL, MECHANICAL, AND TEMPERATURE CONTROLS CONTRACTORS. COORDINATE INSTALLATION OF ANY REQUIRED ACCESS PANELS. PROVIDE AHU SHUTDOWN PER EACH INDIVIDUAL AHU.

(A) GENERAL NOTES

1. PROVIDE A NEW FIRE ALARM SYSTEM WITHIN EACH BUILDING AS PART OF THIS SCOPE AS AN EXTENSION OF THE EXISTING CENTRAL STATION SERVICE FIRE ALARM SYSTEM (PRIMARY FACP LOCATED IN THE DONNELLY BUILDING) IN ACCORDANCE WITH ALL NFPA STANDARDS, ALL LOCAL ADOPTED CODES AND AS INDICATED IN THE PLANS AND SPECIFICATIONS.
2. THE FIRE ALARM SYSTEM SHALL OPERATE AS A STANDALONE LOW VOLTAGE SYSTEM AND SHALL BE AN INTELLIGENT ADDRESSABLE SUPERVISED SYSTEM. CIRCUITS SHALL MEET THE FOLLOWING MINIMUM REQUIREMENTS:
   - INITIATING DEVICE CIRCUITS - CLASS B
   - SUPERVISORY CIRCUITS - CLASS B
   - NOTIFICATION APPLIANCE CIRCUITS - CLASS B
   - SIGNALING LINE CIRCUITS - CLASS B
   - AUXILIARY CIRCUITS - CLASS B
   - POWER CIRCUITS - CLASS B
   - CIRCUITS FOR RELAY COIL OPERATION SHALL BE 24 VDC MAXIMUM WITH A SEPARATE OR INTEGRAL FIELD COLLAPSING DIODE.
3. PROVIDE A DOCUMENTATION CABINET ADJACENT TO THE PRIMARY FIRE ALARM CONTROL PANEL LOCATED IN THE DONNELLY BUILDING TO HOUSE ALL SYSTEM DOCUMENTS IN ACCORDANCE WITH NFPA 72. SYSTEM DOCUMENTS SHALL INCLUDE (AT A MINIMUM) RECORD DRAWINGS, EQUIPMENT DATA SHEETS, SOFTWARE AND FIRMWARE CONTROL DOCUMENTATION. THE DOCUMENTATION CABINET SHALL BE PROMINENTLY LABELED "SYSTEM RECORD DOCUMENTS", AND SHALL BE ACCESSIBLE BY AUTHORIZED PERSONNEL ONLY AND PROTECTED FROM PUBLIC ACCESS.
4. THE FIRE ALARM CONTROL PANEL CABINET, AUXILIARY POWER SUPPLY CABINETS, AND DOCUMENTATION CABINET SHALL HAVE A HINGED DOOR KEYED IN COMMON WITH ALL OTHER KEYED DEVICES THROUGHOUT THE SYSTEM.
5. PROVIDE A CELLULAR COMMUNICATOR FOR THE PRIMARY MEANS OF TRANSMISSION TO THE CENTRAL STATION. MOUNT THE CELLULAR COMMUNICATOR AT A LOCATION WITH ACCEPTABLE SIGNAL STRENGTH FROM THE WIRELESS NETWORK CONNECTION. COORDINATE ALL PROGRAMMING, SIGNALS TRANSMISSION AND CONNECTIONS WITH THE OFF-SITE MONITORING STATION.
6. PROGRAM THE CELLULAR COMMUNICATOR TO COMPLY WITH 2025 NFPA 72, SECTION 26.6.3.3, SINGLE COMMUNICATION PATHWAY. PROVIDE VERIFICATION OF COMMUNICATION PATH ON SIXTY (60) MINUTE INTERVALS.
7. UPON LOSS OF BUILDING POWER, THE ENTIRE SYSTEM SHALL TRANSFER TO SECONDARY POWER WITHIN TEN (10) SECONDS, AND WITHOUT LOSS OF SIGNALS. THE SYSTEM SHALL OPERATE UNDER SECONDARY POWER IN NORMAL OR TROUBLE CONDITIONS FOR TWENTY-FOUR (24) HOURS AND HAVE SUFFICIENT POWER TO SUPPORT COMPLETE ALARM CONDITION OPERATION FOR A SUBSEQUENT FIVE (5) MINUTES AT MAXIMUM CONNECTED LOAD.
8. COORDINATE EXACT MOUNTING LOCATIONS OF THE CONTROL PANELS, AUXILIARY POWER SUPPLIES (APS), WITH THE GENERAL CONTRACTOR, OWNER, AND ELECTRICAL CONTRACTOR PRIOR TO INSTALLATION.
9. COORDINATE DEDICATED 120 VAC POWER CIRCUITS (CONNECTED TO THE EMERGENCY GENERATOR) TO THE FACP, AND EACH APS WITH THE ELECTRICAL CONTRACTOR. PROVIDE SURGE SUPPRESSION FOR 120 VAC POWER CIRCUITS. THE DEDICATED CIRCUIT DISCONNECT SHALL BE RED IN COLOR, LABELED "FIRE ALARM CIRCUIT", AND HAVE A LOCKABLE TAB. ALL FIRE ALARM CIRCUIT BREAKERS SHALL BE CLEARLY MARKED AND MECHANICALLY SECURED TO PREVENT ANY UNAUTHORIZED TAMPERING. IDENTIFY THE LOCATION OF THE CIRCUIT DISCONNECT AT THE FACP, AND EACH APS. PROVIDE 24 HOUR BATTERY BACKUP IN THE FACP, AND EACH APS.
10. PROVIDE MONITORING CONNECTIONS TO SPRINKLER WATERFLOW SWITCHES AND CONTROL VALVE TAMPER SWITCHES (SWITCHES AND PROBES ARE BY OTHERS). PROVIDE ALL CABLING TO SWITCHES AND PROBES, FINAL WIRING CONNECTIONS AT SWITCHES AND PROBES, AND SUPERVISION OF ALL WIRING CONNECTIONS. COORDINATE ALL CONNECTIONS WITH THE SPRINKLER CONTRACTOR.
11. NOTIFICATION APPLIANCE CIRCUITS (NAC) HAVE BEEN DESIGNED FOR A MAXIMUM 1.5 AMPS, MAXIMUM 4.4 VDC DROP, AND MINIMUM OPERATING VOLTAGE OF 16 VDC. EACH FACP AND APS SHALL HAVE A MINIMUM OF TWENTY (20) PERCENT SPARE CAPACITY ON EACH CIRCUIT, UNLESS OTHERWISE SHOWN ON THE ENGINEERING DRAWINGS. PROVIDE VOLTAGE DROP CALCULATIONS FOR ALL NOTIFICATION APPLIANCE CIRCUITS.
12. PROVIDE SYNCHRONIZATION OF ALL VISUAL NOTIFICATION APPLIANCE CIRCUITS THROUGHOUT EACH BUILDING. PROVIDE ALL REQUIRED SYNCHRONIZATION MODULES. PROVIDE MULTI-SYNC MODE SLAVE CONNECTIONS, AS REQUIRED, TO ALL AUXILIARY POWER SUPPLIES (APS).
13. THE AUDIBLE/VISUAL NOTIFICATION APPLIANCES SHALL BE RED IN COLOR, HAVE A CLEAR LENS, SHALL BE CLEARLY LABELED AS FIRE, AND SHALL BE LISTED FOR THE INTENDED APPLICATION.
14. WHERE POSSIBLE, PROVIDE FLUSH MOUNTING OF NOTIFICATION APPLIANCES. WHERE SURFACE-MOUNTED NOTIFICATION APPLIANCES ARE NECESSARY, PROVIDE DECORATIVE BACKBOX SKIRT COVERING THE APPLIANCE BACKBOX.
15. PROVIDE DUCT DETECTORS, ASSEMBLY AND SAMPLING TUBES (INSTALLED BY MECHANICAL OR ELECTRICAL CONTRACTORS). PROVIDE A SEPARATE ADDRESSABLE RELAY MODULE (ARM) FOR SHUTDOWN OF ASSOCIATED AIR HANDLING UNIT (AHU). PROVIDE ANY REQUIRED POWER CONNECTIONS AND SUPERVISION FOR DUCT DETECTOR AND ARM. COORDINATE ALL SHUTDOWN CONNECTIONS AND EQUIPMENT INSTALLATION WITH THE ELECTRICAL, MECHANICAL, AND TEMPERATURE CONTROLS CONTRACTORS.
16. DEVICE AND APPLIANCE LOCATIONS AS SHOWN ON THE FIRE ALARM PLANS ARE NOT DIMENSIONED FOR EXACT INSTALLATION.
17. THE CEILING MOUNTED DEVICES AND APPLIANCES SHALL BE INSTALLED ALIGNED AESTHETICALLY WITH THE CEILING LIGHTING, SPRINKLERS, AND OTHER FIXTURES. COORDINATE INSTALLATION OF ALL CEILING MOUNTED FIRE ALARM DEVICES AND NOTIFICATION APPLIANCES WITH THE ARCHITECTURAL DRAWINGS AND ALL OTHER TRADES PRIOR TO INSTALLATION.
18. ARCHITECTURAL, STRUCTURAL, MECHANICAL AND ELECTRICAL BACKGROUND INFORMATION IS SHOWN FOR COORDINATION PURPOSES ONLY. REFER TO THE PROPER DRAWINGS FOR EXACT LOCATIONS, SIZES AND QUANTITIES OF OTHER TRADES' WORK.
19. MOUNT SMOKE AND HEAT DETECTORS AT THE CEILING/DECK, AND NOT ON THE BOTTOM OF BEAMS OR JOISTS. LOCATE ALL SMOKE AND HEAT DETECTORS A MINIMUM OF THREE (3) FEET FROM ANY MECHANICAL DIFFUSERS, AND AS REQUIRED BY NFPA 72.
20. SMOKE AND HEAT DETECTOR HEADS SHALL NOT BE INSTALLED UNTIL AFTER THE CONSTRUCTION CLEAN-UP OF ALL TRADES IS COMPLETE AND FINAL.
21. ALL THROUGH-PENETRATIONS OF FIRE-RATED WALLS AND FLOORS SHALL BE FIRE-STOPPED.
22. ALL JUNCTION BOXES SHALL BE ACCESSIBLE FOR SERVICE. PROVIDE ANY REQUIRED ACCESS PANELS.
23. PROVIDE SEISMIC BRACING AS REQUIRED BY APPLICABLE CODES.
24. PROVIDE A PRINTED LABEL FOR EACH INITIATING DEVICE INDICATING THE SPECIFIC ADDRESS FOR THAT DEVICE. THE LABEL SHALL BE LOCATED ON THE BASE OF ALL DETECTORS AND THE COVER PLATES OF EACH MODULE.
25. PROVIDE A PRINTED LABEL FOR EACH NOTIFICATION APPLIANCE INDICATING THE SPECIFIC CIRCUIT NUMBER FOR THAT APPLIANCE. THE LABEL SHALL INCLUDE END OF LINE RESISTOR LOCATION, CIRCUIT NUMBER AND APPLIANCE NUMBER. THE LABEL SHALL BE LOCATED ON THE BASE OF EACH NOTIFICATION APPLIANCE.
26. ALL AUDIBLE APPLIANCES SHALL BE SET TO THE HIGH DBA SETTING AND SHALL SOUND A THREE-PULSE TEMPORAL PATTERN EVACUATION SIGNAL.

DEMOLITION NOTES

1. THE EXISTING FIRE ALARM SYSTEM SHALL REMAIN IN SERVICE AS PORTIONS OF THE SYSTEM ARE SYSTEMATICALLY DISCONNECTED, DISMANTLED, AND REMOVED FROM SERVICE AND THE NEW FIRE ALARM SYSTEM IS INSTALLED IN ITS PLACE.
2. DEMOLISH AND REMOVE ALL FIRE ALARM SYSTEM COMPONENTS FROM THE EXISTING SPACE, INCLUDING ALL CONTROL PANELS, DEVICES, CABLING, AND CONDUITS.
3. THE EXISTING FIRE ALARM SYSTEM EQUIPMENT AND ASSOCIATED CONDUIT AND CABLING SHALL BE PROPERLY DISCONNECTED FROM THE EXISTING FIRE ALARM CONTROL PANEL AND BE COMPLETELY REMOVED FROM THE BUILDING.
4. VERIFY ACTUAL QUANTITIES AND LOCATIONS OF EXISTING FIRE ALARM EQUIPMENT TO BE DEMOLISHED WITH THE OWNER AND GENERAL CONTRACTOR PRIOR TO COMMENCEMENT OF DEMOLITION WORK.
5. PROPERLY DISPOSE OF ALL DEMOLISHED FIRE ALARM EQUIPMENT.
6. PROVIDE PATCHING, PAINTING OR OTHER REPAIR NECESSARY TO REPAIR DAMAGE TO WALLS, CEILINGS, ETC. CAUSED BY THE DEMOLITION OF THE FIRE ALARM SYSTEM. COORDINATE REPAIR WORK WITH GENERAL CONTRACTOR AND OWNER.
7. PENETRATIONS IN FIRE RATED ASSEMBLIES RESULTING FROM THE REMOVAL OF FIRE ALARM EQUIPMENT, CONDUIT, OR CABLING SHALL BE FIRE STOPPED PER THE LATEST EDITION OF THE UL FIRE RESISTANCE DIRECTORY.

SHOP DRAWING SUBMITTAL NOTES

THE ENGINEERING DRAWINGS WERE PREPARED USING AUTOCAD AND WILL BE MADE AVAILABLE TO THE FIRE ALARM CONTRACTOR IN ELECTRONIC .DWG FORMAT. THE ENGINEERING DRAWINGS WERE PREPARED FOR BIDDING PURPOSES ONLY.

THE AWARDED FIRE ALARM CONTRACTOR SHALL BE RESPONSIBLE FOR PRODUCING SHOP DRAWINGS FOR THE FIRE ALARM SYSTEM IN ACCORDANCE WITH ALL APPLICABLE CODES.

SHOP DRAWINGS FOR THE FIRE ALARM SYSTEM SHALL BE SUBMITTED TO THE AUTHORITY HAVING JURISDICTION (AHJ) FOR REVIEW AND APPROVAL PRIOR TO SYSTEM INSTALLATION. WHERE INSTALLATION DEVIATES FROM THE APPROVED SHOP DRAWINGS, CORRECTED SHOP DRAWINGS SHOWING THE SYSTEM AS ACTUALLY INSTALLED SHALL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO INSPECTION.

KEYED NOTES DENOTED AS (#)

1. PROVIDE ELECTRONIC MONITORING OF ALL EXTERIOR POST INDICATOR VALVES (PIV). COORDINATE INSTALLATION OF A MINIMUM 1-1/2 INCH UNDERGROUND CONDUIT, WITH PULL STRING, FOR FIRE ALARM CABLING CONNECTIONS TO THE EXTERIOR POST INDICATOR VALVE (PIV).
2. PROVIDE SINGLE - OR MULTI-STATION SMOKE DETECTORS AS REQUIRED FOR RESIDENTIAL DWELLING UNITS. PROVIDE ALL REQUIRED SMOKE DETECTOR SOUNDER BASES, INCLUDING ALL NECESSARY POWER AND ADDRESSABLE MODULES.
3. PROVIDE RESIDENTIAL DWELLING UNIT SINGLE - OR MULTI-STATION SMOKE DETECTORS AS REQUIRED. SMOKE DETECTORS SHALL BE INSTALLED OUTSIDE OF EACH SEPARATE SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOM. IN EACH ROOM USED FOR SLEEPING PURPOSE, AND ON EACH STORY WITHIN A DWELLING UNIT / IN SLEEPING AREAS, IN EVERY ROOM IN THE PATH OF EGRESS FROM THE SLEEPING AREA TO THE DOOR LEADING FROM THE SLEEPING UNIT, IN EACH STORY WITHIN THE SLEEPING UNIT.
4. PROVIDE SMOKE DETECTION AS REQUIRED TO UNLOCK ALL EGRESS DOORS, STAIRWELL DOORS, AND FOR RELEASE OF MAGNETIC DOOR HOLDERS.
5. PROVIDE TRANSIENT SUPPRESSION ON ALL FIRE ALARM CIRCUITS THAT ENTER OR LEAVE THE BUILDING. PROVIDE ONE (1) TRANSIENT SUPPRESSION MODULE FOR EACH FIRE ALARM CIRCUIT. FIRE ALARM CABLING IN UNDERGROUND CONDUIT SHALL BE LISTED FOR WET LOCATIONS.
6. DOOR RELEASE SHALL OPERATE ON LOSS OF POWER TO MAGNETIC DOOR HOLDER OR ADDRESSABLE RELAY MODULE (ARM) AND SHALL BE SELF-MONITORING FOR INTEGRITY. LOCATE ARM AT AN ACCESSIBLE LOCATION WITHIN THREE (3) FEET OF THE ASSOCIATED CONTROLS OR CONTROL CIRCUIT. DOOR HOLDERS ARE PROVIDED AND INSTALLED BY OTHERS. PROVIDE/COORDINATE ANY ASSOCIATED POWER CONNECTIONS AS REQUIRED. PROVIDE WIRING CONNECTIONS FROM ARM TO MAGNETIC DOOR HOLDER CONTROLS, AND COORDINATE PROPER DOOR RELEASE OPERATION.
7. PROVIDE ELECTRONIC MONITORING OF ANY KITCHEN HOOD SUPPRESSION SYSTEMS (BY OTHERS).
8. PROVIDE AN ADDRESSABLE MONITOR MODULE (AIM) FOR THE MONITORING OF THE EXISTING ADEMCO VISTA SECURITY PANEL. PROVIDE ANY ADDITIONAL REQUIRED ADDRESSABLE MONITOR MODULES (AIM), INTERMEDIATE RELAYS, AND INTERFACE PANELS. LOCATE AIM WITHIN THREE (3) FEET OF THE ASSOCIATED CONTROLS. COORDINATE INTERFACE CONNECTIONS WITH THE ASSOCIATED CONTRACTOR.
9. DISCONNECT AND REUSE THE EXISTING WALL MOUNTED BEAM DETECTORS. PROVIDE NEW CABLING AND CONDUIT AS NEEDED TO RECONNECT TO THE NEW FIRE ALARM SLC CIRCUIT. ALL CABLE SPLICES SHALL BE ACHIEVED VIA TERMINAL STRIP WITH SCREW TERMINALS. ENSURE APPLIANCE CIRCUIT IS OPERATIONAL AND SUPERVISED IN ACCORDANCE WITH NFPA 72 AS PREVIOUSLY CONFIGURED.
10. DISCONNECT AND REUSE THE EXISTING REMOTE ANNUNCIATOR. PROVIDE NEW CABLING AND CONDUIT AS NEEDED TO RECONNECT TO THE EXISTING BEAM DETECTOR. ALL CABLE SPLICES SHALL BE ACHIEVED VIA TERMINAL STRIP WITH SCREW TERMINALS. ENSURE APPLIANCE CIRCUIT IS OPERATIONAL AS PREVIOUSLY CONFIGURED.
11. MOUNT HEAT DETECTOR ON THE BOTTOM OF THE CEILING/DECK AND NOT ON THE BOTTOM OF BEAMS OR JOISTS. LOCATE ALL DETECTORS A MINIMUM OF THREE (3) FEET FROM ANY MECHANICAL DIFFUSERS, AND AS REQUIRED IN NFPA 72.
12. PROVIDE REMOTE TEST STATIONS/ANNUNCIATORS AS REQUIRED FOR CONCEALED HEAT DETECTORS. PROVIDE ANY REQUIRED POWER CABLING CONNECTIONS TO THE DETECTORS AND REMOTE TEST STATIONS/ ANNUNCIATORS. MOUNT THE REMOTE TEST STATIONS/ANNUNCIATORS ON THE CEILING BELOW THE ASSOCIATED DETECTOR AND AT AN ACCESSIBLE LOCATION. COORDINATE EXACT MOUNTING LOCATION WITH THE GENERAL CONTRACTOR, OWNER, AND THE AHJ PRIOR TO INSTALLATION.
13. FIELD VERIFY THE EXISTING DUCT SMOKE DETECTORS ARE PRESENT. IF EXISTING DUCT SMOKE DETECTORS ARE PRESENT, REPLACE THE EXISTING DUCT DETECTORS WITH NEW ADDRESSABLE DUCT SMOKE DETECTORS. PROVIDE NEW CABLING AND CONDUIT AS NEEDED FOR THE DUCT SMOKE DETECTORS TO BE SUPERVISED BY THE NEW FIRE ALARM SYSTEM.

GENERAL PROGRAMMING NOTES

1. CONTROL-BY-EVENT PROGRAMMING IS PROVIDED FOR GENERAL INFORMATIONAL PURPOSES ONLY. SPECIFIC SYSTEM PROGRAMMING SHALL BE PROVIDED BY THE FIRE ALARM CONTRACTOR IN SHOP DRAWING SUBMITTAL.
2. COORDINATE SPECIFIC ALPHANUMERIC DESCRIPTIONS WITH THE OWNER PRIOR TO SYSTEM PROGRAMMING.
3. THE FIRE ALARM CONTRACTOR SHALL REVISE THE CONTROL-BY-EVENT PROGRAMMING TO INCLUDE ALL SPECIFIC SYSTEM REQUIREMENTS, AND TO INCLUDE A MINIMUM OF TWENTY (20) PERCENT SPARE CAPACITY ON EACH ADDRESSABLE DEVICE AND MODULE LOOP.

DEMO SYMBOL KEY

FACP	EXISTING ADDRESSABLE FIRE ALARM CONTROL PANEL TO BE DISCONNECTED
FCAB	EXISTING FIRE ALARM CABINET TO BE REMOVED
ARM	EXISTING AUXILIARY RELAY MODULE TO BE DISCONNECTED
APS	EXISTING AUXILIARY POWER SUPPLY TO BE DISCONNECTED
F	EXISTING MANUAL PULL STATION TO BE DISCONNECTED
S	EXISTING PHOTOELECTRIC SMOKE DETECTOR TO BE DISCONNECTED
D	EXISTING DUCT-TYPE PHOTOELECTRIC SMOKE DETECTOR TO BE DISCONNECTED
H	EXISTING HEAT DETECTOR TO BE DISCONNECTED
FS	EXISTING FIRE SPRINKLER WATERFLOW SWITCH TO BE DISCONNECTED
TS	EXISTING FIRE SPRINKLER CONTROL VALVE TAMPER SWITCH TO BE DISCONNECTED
CO	EXISTING CARBON MONOXIDE DETECTOR TO BE DISCONNECTED
DH	EXISTING DOOR HOLDER TO BE DISCONNECTED
B	EXISTING BELL APPLIANCE TO BE DISCONNECTED
AV	EXISTING WALL MOUNTED AUDIBLE/VISUAL APPLIANCE TO BE DISCONNECTED
V	EXISTING WALL MOUNTED VISUAL APPLIANCE TO DISCONNECTED
B	EXISTING BEAM SMOKE DETECTOR - RECEIVER TO REMAIN
B	EXISTING BEAM SMOKE DETECTOR - TRANSMITTER TO REMAIN
RA	EXISTING REMOTE ANNUNCIATOR TO REMAIN
CAB	EXISTING SECURITY PANEL TO REMAIN
AIM	EXISTING ADDRESSABLE INPUT MODULE TO REMAIN
KP	EXISTING KEYPAD TO REMAIN
S DC	EXISTING DOOR CONTACT TO REMAIN

SHEET INDEX

APPLICABLE CODES

ALL WORK SHALL BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE CODES AND REFERENCED DESIGN STANDARDS.

2024 LIFE SAFETY CODE (NFPA 101)

2023 NATIONAL ELECTRICAL CODE

2025 EDITION NFPA 72 NATIONAL FIRE ALARM AND SIGNALING CODE

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

19 CSR 30-86

CONFLICTS BETWEEN THE REFERENCE NFPA STANDARDS, FEDERAL OR STATE CODES, SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ENGINEER OF RECORD (CCI) FOR RESOLUTION.

FIRESTOP NOTES

1. ALL THROUGH-PENETRATIONS OF FIRE-RATED WALLS AND FLOORS SHALL BE FIRE-STOPPED.
2. FIRE-RATED GYPSUM BOARD WALLS CONSTRUCTED AS DESCRIBED IN THE INDIVIDUAL U300 OR U400 SERIES DESIGNS IN THE U.L. FIRE RESISTANCE DIRECTORY (GENERALLY DOUBLE THICKNESS WALLBOARD) SHALL BE FIRE-STOPPED WITH U.L. SYSTEMS.
3. ALL REINFORCED LIGHTWEIGHT OR NORMAL WEIGHT CONCRETE FLOORS OR WALLS, AND ALL U.L. CLASSIFIED CONCRETE BLOCK WALLS SHALL BE FIRE-STOPPED WITH U.L. SYSTEMS.

NEW SYMBOL KEY

FACP	ADDRESSABLE FIRE ALARM CONTROL PANEL
APS	AUXILIARY POWER SUPPLY
TSM	TRANSIENT SUPPRESSION MODULE (XX = 24/120 VDC)
DOC	DOCUMENTATION CABINET
F	DUAL ACTION MANUAL PULL STATION (INTELLIGENT)
S	PHOTOELECTRIC SMOKE DETECTOR (CO = CARBON MONOXIDE COMBO, SB = SOUNDER BASE, B = BATTERY POWERED SMOKE ALARM)
H	135°F / 190°F FIXED TEMPERATURE AND ROR HEAT DETECTOR (INTELLIGENT)(AC = ABOVE CEILING MOUNTED)
D S/R	DUCT-TYPE PHOTOELECTRIC SMOKE DETECTOR (R = RETURN SIDE, S = SUPPLY SIDE)
CO	CARBON MONOXIDE DETECTOR
FS	FLOW SWITCH (BY OTHERS)
TS	TAMPER SWITCH (BY OTHERS)
AIM	ADDRESSABLE INPUT MODULE
ARM	ADDRESSABLE RELAY MODULE
DH	DOOR HOLDER (BY OTHERS)
AV XX	WALL MOUNTED AUDIBLE/VISUAL APPLIANCE (XX = CANDELA RATING) (RED COLOR)
V XX	WALL MOUNTED VISUAL APPLIANCE (XX = CANDELA RATING) (RED COLOR)
B	BELL APPLIANCE (24VDC)
R	EXISTING BEAM SMOKE DETECTOR - REFLECTOR TO REMAIN
B	EXISTING BEAM SMOKE DETECTOR - TRANSMITTER TO REMAIN
RA	EXISTING REMOTE ANNUNCIATOR TO REMAIN
CAB	EXISTING SECURITY PANEL TO REMAIN
AIM	EXISTING ADDRESSABLE INPUT MODULE TO REMAIN
KP	EXISTING KEYPAD TO REMAIN
S DC	EXISTING DOOR CONTACT TO REMAIN
——	FIRE ALARM CONDUCTORS [IN CONDUIT] (3/4" MINIMUM)
—·—·—	WET LOCATION FIRE ALARM CONDUCTORS [IN UNDERGROUND CONDUIT] (1-1/2" MINIMUM)
J	JUNCTION BOX
—EOLR	END OF LINE RELAY
—⁄\/\/—	END OF LINE RESISTOR

WIRING LEGEND

CONDUCTOR TYPE:

D = 14/2 TP SHIELDED
E = 18/2 TP SHIELDED
F = 14/2 TP
G = AS REQUIRED BY MANUFACTURER
H = 14/2 WET LOCATION
J = 18/2 WET LOCATION

CIRCUIT DESIGNATION:

AV = AUDIBLE/VISUAL NOTIFICATION CIRCUIT
AN = ANNUNCIATOR CIRCUIT
PW = LOW VOLTAGE POWER CIRCUIT
RC = RELAY CONTROL CIRCUIT
ZN = INITIATION ZONE CIRCUIT
SU = SUPERVISORY ZONE CIRCUIT
RT = REMOTE TEST STATION POWER CIRCUIT
RA = REMOTE ANNUNCIATOR CIRCUIT

E(L ##) — CONDUCTOR TYPE; CIRCUIT DESIGNATION; CIRCUIT NUMBER

SHOULD MANUFACTURER OF FIRE ALARM EQUIPMENT REQUIRE A DIFFERENT TYPE OR SIZE OF CABLE THAN HEREIN SPECIFIED, THE LARGER OR MORE STRINGENT TYPE OF CABLE SHALL BE USED.

ADDRESSING LEGEND

L01M01 — MODULE/DEVICE NUMBER; SIGNALING LINE CIRCUIT (SLC)

L = LOOP
M = MODULE
D = DEVICE

STATE OF MISSOURI
MIKE KEHOE, GOVERNOR

STATE OF MISSOURI COURTNEY R. OGLE NUMBER PE-2015000584 PROFESSIONAL ENGINEER
2025-05-13
COURTNEY R. OGLE
Registered Professional Engineer
MO # 2015000584
Expires 12-31-2026

ROGERS-SCHMIDT ENGINEERING CO., P.C.
CONSULTING ENGINEERS
1736 WEST PARK CENTER DR.
SUITE 204
ST. LOUIS, MO 63026
PHONE: 636-600-1551
EMAIL: bfreiner@rogers-schmidt.com
MISSOURI STATE CERTIFICATE OF AUTHORITY #000408

CCI
2043 WOODLAND PKWY, SUITE 300
ST. LOUIS, MISSOURI 63146-4235
314-991-2633
www.codeconsultants.com

OFFICE OF ADMINISTRATION DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION

DEPARTMENT OF MENTAL HEALTH

REPLACE FIRE ALARM SYSTEM & ELECTRICAL RENOVATION

BELLEFONTAINE HABILITATION CENTER
10695 BELLEFONTAINE RD.
ST. LOUIS, MISSOURI 63137

PROJECT # M2006-01
SITE # 7356
ASSET # SEE SHT G-002

REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION: (A) ADDENDUM 1
DATE: 05/13/2025

ISSUE DATE: 02/10/2025

CAD DWG FILE: M2006-01-7356-6517356071-FA-001.DWG
DRAWN BY: MM
CHECKED BY: MLY
DESIGNED BY: JRC

SHEET TITLE:
FIRE ALARM COVER SHEET/ NOTES, MATRIX, AND SHEET INDEX

SHEET NUMBER:
FA-001

FIRE ALARM SITE PLAN

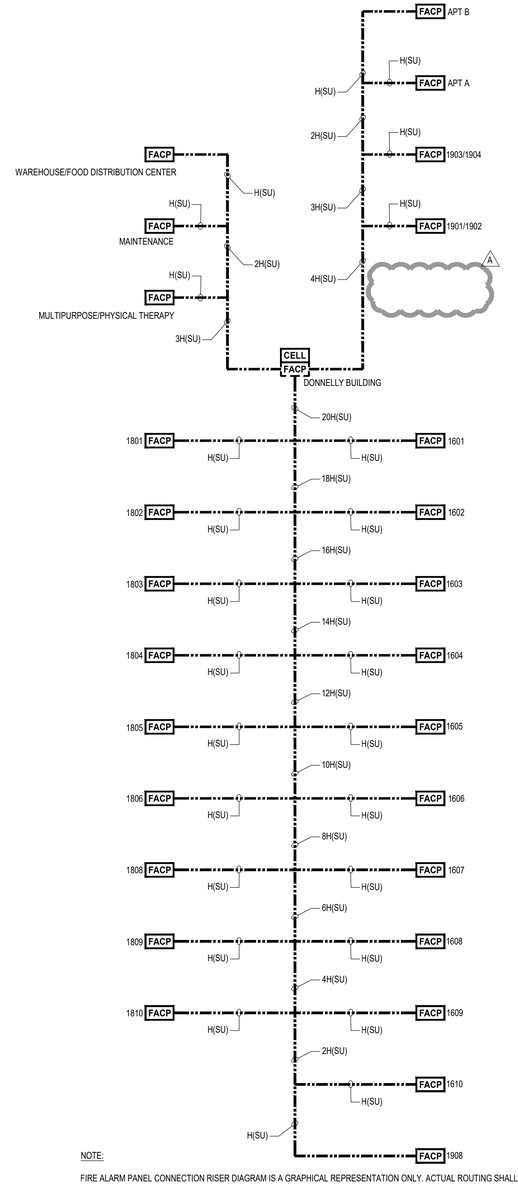
0 100' 200'

SCALE IN FEET
1" = 100'-0"

SITE PLAN KEYED NOTES DENOTED AS (#)
1. PROVIDE AND INSTALL NEW STARLINK CELLULAR COMMUNICATOR IN THE DONNELLY BUILDING ADJACENT TO THE EXISTING MAIN FIRE ALARM CONTROL PANEL. PROGRAM THE CELLULAR COMMUNICATOR TO COMPLY WITH 2025 NFPA 72, SECTION 26.6.3.3, SINGLE COMMUNICATION PATHWAY. PROVIDE VERIFICATION OF COMMUNICATION PATH ON SIXTY (60) MINUTE INTERVALS.

WIRING LEGEND	
CONDUCTOR TYPE:	CIRCUIT DESIGNATION:
H = EXISTING UNDERGROUND	SU = MULTI-CONDUCTOR COPPER

SYMBOL KEY	
FACP	EXISTING FIRE ALARM CONTROL PANEL
FACP	NEW FIRE ALARM CONTROL PANEL
CELL	NEW CELLULAR COMMUNICATOR (STARLINK)
	EXISTING UNDERGROUND FIRE ALARM CONDUCTORS IN UNDERGROUND CONDUIT TO REMAIN
	HATCH AREA IN SCOPE
	HATCH AREA OUT OF SCOPE



NOTE:

FIRE ALARM PANEL CONNECTION RISER DIAGRAM IS A GRAPHICAL REPRESENTATION ONLY. ACTUAL ROUTING SHALL BE FIELD VERIFIED BY THE CONTRACTOR.

1 FA-100 FIRE ALARM PANEL CONNECTION RISER DIAGRAM

NOT TO SCALE

STATE OF MISSOURI
MIKE KEHOE, GOVERNOR

STATE OF MISSOURI
COURTNEY R. OGLE
NUMBER PE-2015000584
PROFESSIONAL ENGINEER
2025-05-13

COURTNEY R. OGLE
Registered Professional Engineer
MO # 2015000584
Expires 12-31-2026

ROGERS-SCHMIDT ENGINEERING CO., P.C.
CONSULTING ENGINEERS
1736 WEST PARK CENTER DR.
SUITE 204
ST. LOUIS, MO 63026
PHONE: 636-600-1551
EMAIL: bfreiner@rogers-schmidt.com
MISSOURI STATE CERTIFICATE OF AUTHORITY #000408

CCI
2043 WOODLAND PKWY, SUITE 300
ST. LOUIS, MISSOURI 63146-4235
314-991-2633
www.codeconsultants.com

OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT,
DESIGN AND CONSTRUCTION

DEPARTMENT OF MENTAL HEALTH

REPLACE FIRE ALARM SYSTEM & ELECTRICAL RENOVATION

BELLEFONTAINE HABILITATION CENTER
10695 BELLEFONTAINE RD.
ST. LOUIS, MISSOURI 63137

PROJECT # M2006-01
SITE # 7356
ASSET # SEE SHT G-002

REVISION: _____
DATE: _____
REVISION: _____
DATE: _____
REVISION: _____
DATE: _____
REVISION: _____
DATE: _____
REVISION: _____
DATE: _____
REVISION: A ADDENDUM 1
DATE: 05/13/2025

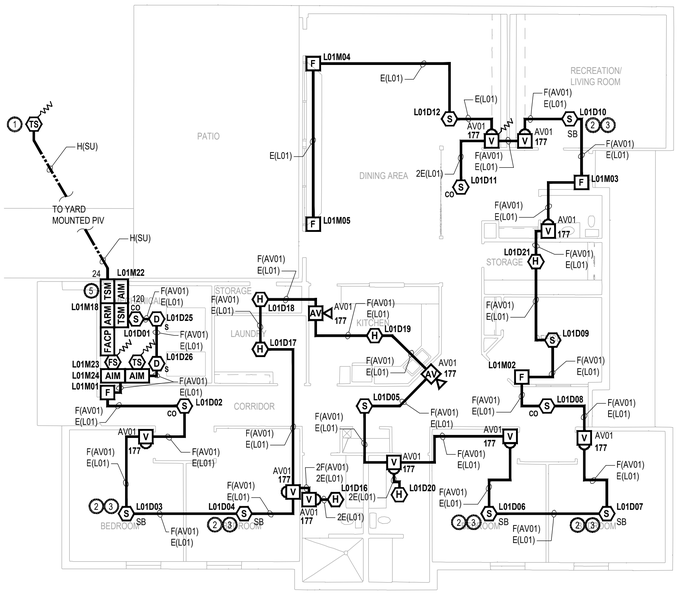
ISSUE DATE: 02/10/2025

CAD DWG FILE: **M2006-01-7356-6517356071-**FA-100.DWG
DRAWN BY: MM
CHECKED BY: MLY
DESIGNED BY: JRC

SHEET TITLE:
SITE FIRE ALARM PLAN

SHEET NUMBER:
FA-100

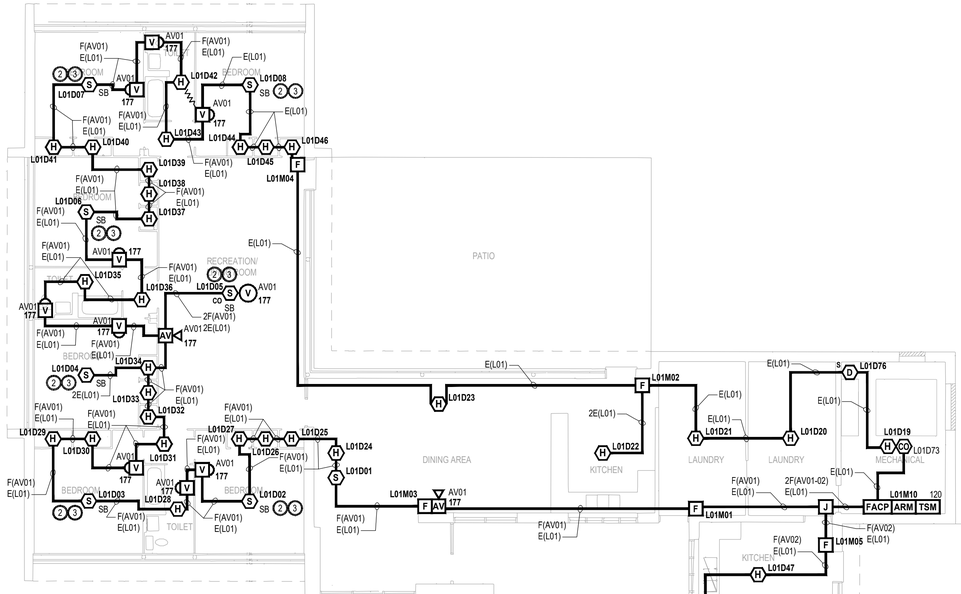
22 OF 45 SHEETS
FEBRUARY 10, 2025

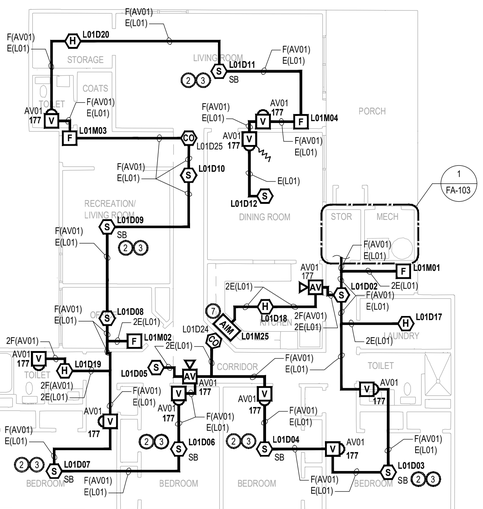


BUILDINGS 1601-1610, 1908 FIRE ALARM PLAN - NEW WORK

SCALE 1/8"=1'-0"

2 1 0 4 8

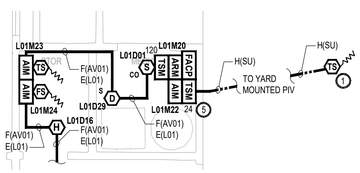




BUILDINGS 1801-1810 FIRE ALARM PLAN - NEW WORK

SCALE 1/8"=1'-0"

2 1 0 4 8



STORAGE & MECHANICAL ROOM FIRE ALARM PLAN - NEW WORK

1 FA-103

SCALE 1/4"=1'-0"

1 0 2 4

BUILDINGS 1901-1904 FIRE ALARM PLAN - NEW WORK

SCALE 1/8"=1'-0"

2 1 0 4 8

NEW SYMBOL KEY	
FACP	ADDRESSABLE FIRE ALARM CONTROL PANEL
APS	AUXILIARY POWER SUPPLY
TSM	TRANSIENT SUPPRESSION MODULE (XX = 24/120 VDC)
DOC	DOCUMENTATION CABINET
F	DUAL ACTION MANUAL PULL STATION (INTELLIGENT)
S	PHOTOELECTRIC SMOKE DETECTOR (CO = CARBON MONOXIDE COMBO, SB = SOUNDER BASE, B = BATTERY POWERED SMOKE ALARM)
H	135°F / 190°F FIXED TEMPERATURE AND ROR HEAT DETECTOR (INTELLIGENT)(AC = ABOVE CEILING MOUNTED)
D S/R	DUCT-TYPE PHOTOELECTRIC SMOKE DETECTOR (R = RETURN SIDE, S = SUPPLY SIDE)
CO	CARBON MONOXIDE DETECTOR
FS	FLOW SWITCH (BY OTHERS)
TS	TAMPER SWITCH (BY OTHERS)
AIM	ADDRESSABLE INPUT MODULE
ARM	ADDRESSABLE RELAY MODULE
DH	DOOR HOLDER (BY OTHERS)
AV XX	WALL MOUNTED AUDIBLE/VISUAL APPLIANCE (XX = CANDELA RATING) (RED COLOR)
VI XX	WALL MOUNTED VISUAL APPLIANCE (XX = CANDELA RATING) (RED COLOR)
B	BELL APPLIANCE (24VDC)
R	EXISTING BEAM SMOKE DETECTOR - REFLECTOR TO REMAIN
B	EXISTING BEAM SMOKE DETECTOR - TRANSMITTER TO REMAIN
RA	EXISTING REMOTE ANNUNCIATOR TO REMAIN
CAB	EXISTING SECURITY PANEL TO REMAIN
AIM	EXISTING ADDRESSABLE INPUT MODULE TO REMAIN
KP	EXISTING KEYPAD TO REMAIN
S DC	EXISTING DOOR CONTACT TO REMAIN
	FIRE ALARM CONDUCTORS [IN CONDUIT] (3/4" MINIMUM)
	WET LOCATION FIRE ALARM CONDUCTORS [IN UNDERGROUND CONDUIT] (1-1/2" MINIMUM)
J	JUNCTION BOX
EOLR	END OF LINE RELAY
	END OF LINE RESISTOR

GENERAL NOTES

1. SEE SHEET FA603 FOR BUILDINGS 1601-1610, 1908 FIRE ALARM MATRIX, CBE, CALCULATIONS AND RISER DIAGRAM.
2. SEE SHEET FA604 FOR BUILDINGS 1801-1810 FIRE ALARM MATRIX, CBE, CALCULATIONS AND RISER DIAGRAM.
3. SEE SHEET FA605 FOR BUILDINGS 1901-1908 FIRE ALARM MATRIX, CBE, CALCULATIONS AND RISER DIAGRAM.

STATE OF MISSOURI
MIKE KEHOE, GOVERNOR

STATE OF MISSOURI
COURTNEY R. OGLE
NUMBER PE-2015000584
PROFESSIONAL ENGINEER
12-05-13

COURTNEY R. OGLE
Registered Professional Engineer
MO # 2015000584
Expires 12-31-2026

ROGERS-SCHMIDT ENGINEERING CO., P.C.
CONSULTING ENGINEERS
1736 WEST PARK CENTER DR.
SUITE 204
ST. LOUIS, MO 63026
PHONE: 636-600-1551
EMAIL: bfreiner@rogers-schmidt.com
MISSOURI STATE CERTIFICATE OF AUTHORITY #000408

CCI
2043 WOODLAND PKWY, SUITE 300
ST. LOUIS, MISSOURI 63146-4235
314-991-2633
www.codeconsultants.com

OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT,
DESIGN AND CONSTRUCTION

DEPARTMENT OF MENTAL HEALTH

REPLACE FIRE ALARM SYSTEM & ELECTRICAL RENOVATION

BELLEFONTAINE HABILITATION CENTER
10695 BELLEFONTAINE RD.
ST. LOUIS, MISSOURI 63137

PROJECT # M2006-01
SITE # 7356
ASSET # SEE SHT G-002

REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION: A ADDENDUM 1
DATE: 05/13/2025

ISSUE DATE: 02/10/2025

CAD DWG FILE: **M2006-01-7356-6517356071-**FA-103.DWG
DRAWN BY: MM
CHECKED BY: MLY
DESIGNED BY: JRC

SHEET TITLE:
BUILDINGS 1601-1610, 1908, 1801-1810, 1901-1904 NEW WORK FIRE ALARM PLAN

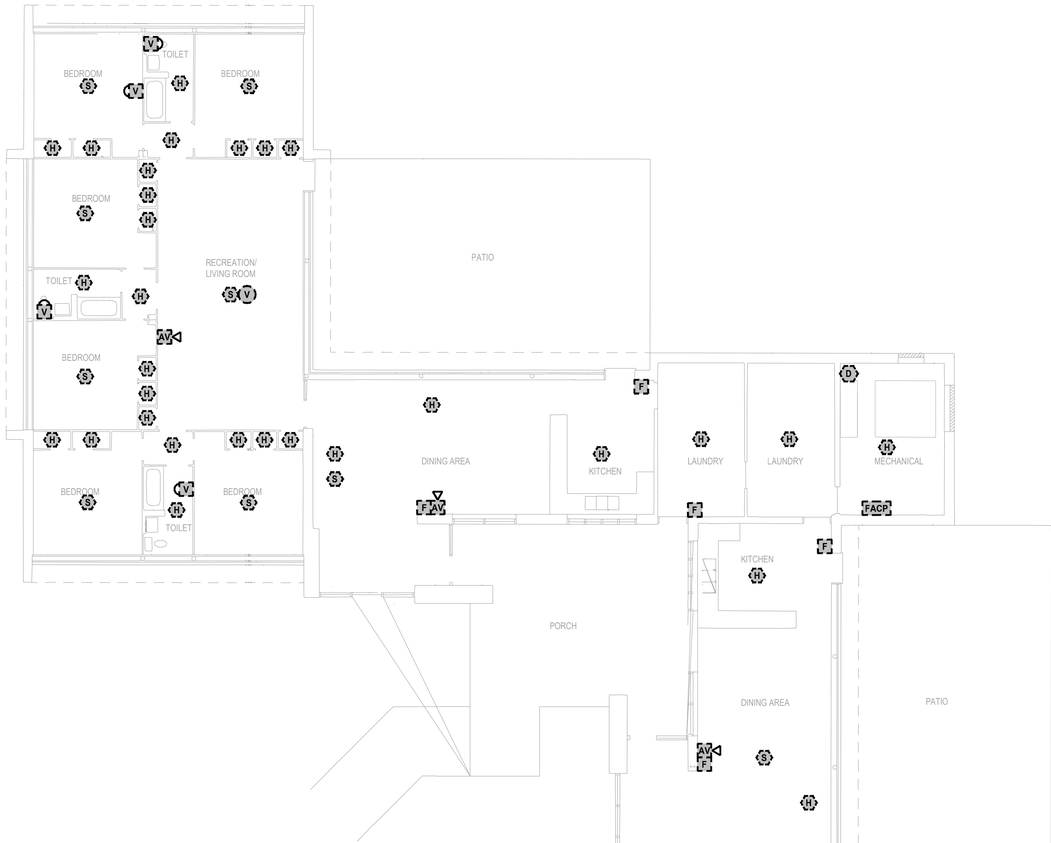
SHEET NUMBER: A
FA-103

25 OF 45 SHEETS
FEBRUARY 10, 2025

BUILDINGS 1601-1610, 1908 FIRE ALARM PLAN - DEMOLITION WORK

SCALE 1/8"=1'-0"

2 1 0 4 8

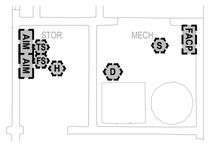


DEMO SYMBOL KEY	
FACP	EXISTING ADDRESSABLE FIRE ALARM CONTROL PANEL TO BE DISCONNECTED
FCAB	EXISTING FIRE ALARM CABINET TO BE REMOVED
ARM	EXISTING AUXILIARY RELAY MODULE TO BE DISCONNECTED
APS	EXISTING AUXILIARY POWER SUPPLY TO BE DISCONNECTED
F	EXISTING MANUAL PULL STATION TO BE DISCONNECTED
S	EXISTING PHOTOELECTRIC SMOKE DETECTOR TO BE DISCONNECTED
D	EXISTING DUCT-TYPE PHOTOELECTRIC SMOKE DETECTOR TO BE DISCONNECTED
H	EXISTING HEAT DETECTOR TO BE DISCONNECTED
PS	EXISTING FIRE SPRINKLER WATERFLOW SWITCH TO BE DISCONNECTED
TS	EXISTING FIRE SPRINKLER CONTROL VALVE TAMPER SWITCH TO BE DISCONNECTED
CO	EXISTING CARBON MONOXIDE DETECTOR TO BE DISCONNECTED
DH	EXISTING DOOR HOLDER TO BE DISCONNECTED
BD	EXISTING BELL APPLIANCE TO BE DISCONNECTED
AV	EXISTING WALL MOUNTED AUDIBLE/VISUAL APPLIANCE TO BE DISCONNECTED
V	EXISTING WALL MOUNTED VISUAL APPLIANCE TO DISCONNECTED
B	EXISTING BEAM SMOKE DETECTOR - RECEIVER TO REMAIN
B	EXISTING BEAM SMOKE DETECTOR - TRANSMITTER TO REMAIN
RA	EXISTING REMOTE ANNUNCIATOR TO REMAIN
CAB	EXISTING SECURITY PANEL TO REMAIN
AIM	EXISTING ADDRESSABLE INPUT MODULE TO REMAIN
KP	EXISTING KEYPAD TO REMAIN
S DC	EXISTING DOOR CONTACT TO REMAIN

BUILDINGS 1801-1810 FIRE ALARM PLAN - DEMOLITION WORK

SCALE 1/8"=1'-0"

2 1 0 4 8



STORAGE & MECHANICAL ROOM FIRE ALARM PLAN - DEMOLITION WORK

1 FAD-103

SCALE 1/4"=1'-0"

1 0 2 4

BUILDINGS 1901-1904 FIRE ALARM PLAN - DEMOLITION WORK

A

SCALE 1/8"=1'-0"

2 1 0 4 8

STATE OF MISSOURI
MIKE KEHOE,
GOVERNOR

STATE OF MISSOURI
COURTNEY R. OGLE
NUMBER PE-2015000584
PROFESSIONAL ENGINEER

05-13

COURTNEY R. OGLE
Registered Professional Engineer
MO # 2015000584
Expires 12-31-2026

ROGERS-SCHMIDT
ENGINEERING CO., P.C.
CONSULTING ENGINEERS
1736 WEST PARK CENTER DR.
SUITE 204
ST. LOUIS, MO 63026
PHONE: 636-600-1551
EMAIL: bfreiner@rogers-schmidt.com
MISSOURI STATE CERTIFICATE
OF AUTHORITY #000408

CCI
2043 WOODLAND PKWY, SUITE 300
ST. LOUIS, MISSOURI 63146-4235
314-991-2633
www.codeconsultants.com

OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT,
DESIGN AND CONSTRUCTION

DEPARTMENT OF
MENTAL HEALTH

REPLACE FIRE ALARM
SYSTEM & ELECTRICAL
RENOVATION

BELLEFONTAINE
HABILITATION CENTER
10695 BELLEFONTAINE RD.
ST. LOUIS, MISSOURI 63137

PROJECT # M2006-01
SITE # 7356
ASSET # SEE SHT G-002

REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION: A ADDENDUM 1
DATE: 05/13/2025

ISSUE DATE: 02/10/2025

CAD DWG FILE: **M2006-01-7356-6517356071-**FAD-103.DWG
DRAWN BY: MM
CHECKED BY: MLY
DESIGNED BY: JRC

SHEET TITLE: A

BUILDINGS 1601-1610, 1908, 1801-1810, 1901-1904 DEMOLITION WORK FIRE ALARM PLAN

SHEET NUMBER:

FAD-103

32 OF 45 SHEETS
FEBRUARY 10, 2025

FIRE ALARM MATRIX

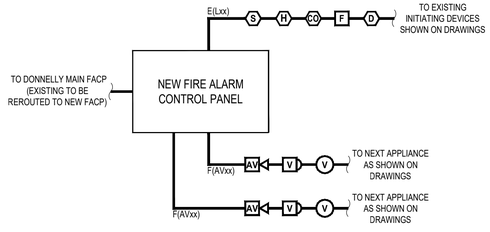
	ACTUATES ALARM CONDITION AT FIRE ALARM CONTROL PANEL	TRANSMITS ALARM SIGNAL TO DONNELLY BLDG FACP AS CURRENTLY CONFIGURED	ACTUATES TROUBLE CONDITION AT FIRE ALARM CONTROL PANEL	TRANSMITS TROUBLE SIGNAL TO DONNELLY BLDG FACP AS CURRENTLY CONFIGURED	ACTIVATES INTERIOR AUDIBLE/VISUAL NOTIFICATION APPLIANCES THROUGHOUT THE BUILDING	ACTIVATES TEMPORAL 4 PATTERN THROUGH SOUNDER BASE	SHUTS DOWN ALL HVAC UNITS	RELEASES AFFECTED DOOR HOLD OPEN DEVICES
MANUAL PULL STATIONS								
- EXITS	●	●			●		●	
SMOKE DETECTION DEVICES								
- SPOT TYPE	●	●			●	●	●	
- ADJACENT TO FACP	●	●			●		●	
- DOOR HOLD OPEN	●	●			●		●	●
- AIR HANDLING UNIT - SUPPLY			●	●	●		●	
HEAT DETECTION DEVICES								
- SPOT TYPE	●	●			●		●	
CARBON MONOXIDE DETECTION DEVICES								
- SPOT TYPE	●	●				●	●	
LOSS OF PRIMARY POWER AT THE FACP			●	●				
ABNORMAL CIRCUIT OR DEVICE			●	●				

NOTIFICATION CIRCUIT VOLTAGE DROP CALCULATIONS

SIGNAL CIRCUIT DESCRIPTION	APS / CIRCUIT LOCATION	MAXIMUM DISTANCE TO LAST APPLIANCE					VOLTAGE DROP CALCULATIONS				
		ALARM CURRENT (AMPS)	12 AWG (FEET)	14 AWG (FEET)	16 AWG (FEET)	18 AWG (FEET)	CIRCUIT LENGTH (FEET)	12 AWG (VOLTS)	V-DROP (12 AWG)	14 AWG (VOLTS)	V-DROP (14 AWG)
FACP	MAIN ELECTRICAL ROOM										
AV01	BUILDINGS 1901-1904	0.920	1,239	779	489	308	380	19.05	1.35	18.25	2.15
AV02	BUILDINGS 1901-1904	0.850	1,341	843	529	333	300	19.42	0.98	18.83	1.57
AV03	SPARE	0.000						20.40	0.00	20.40	0.00
AV04	SPARE	0.000						20.40	0.00	20.40	0.00

NOTES:

1. NOTIFICATION APPLIANCE CIRCUITS (NAC) DESIGNED FOR A MAXIMUM **1.5** AMPS, A MAXIMUM 4.4 VDC DROP, AND MINIMUM OPERATING VOLTAGE OF 16 VDC.
2. FIELD VERIFY ALL VOLTAGE DROP AND POWER REQUIREMENTS.
3. NAC CIRCUITS HAVE BEEN DESIGNED BASED UPON THE ABOVE CIRCUIT CURRENT AND VOLTAGE CRITERIA USING SYSTEM SENSOR LED APPLIANCE CRITERIA. IF ALTERNATE NOTIFICATION APPLIANCES ARE INSTALLED, PROVIDE REVISED POWER AND VOLTAGE DROP CALCULATIONS FOR ALL CIRCUITS.



NOTES:

1. THE EXISTING FIRE ALARM CONTROL PANEL AND AUXILIARY POWER SUPPLY LOCATED IN THE MECHANICAL ROOM SHALL REMAIN AS CURRENTLY CONFIGURED WHILE NEW FIRE ALARM SYSTEM IS BEING INSTALLED.
2.. PROVIDE A SUFFICIENT QUANTITY OF THE NAC CIRCUIT TO SATISFY THE DRAWING AND SPECIFICATION REQUIREMENTS. PROVIDE POWER AND VOLTAGE DROP CALCULATIONS TO THE CIRCUIT.

BUILDINGS 1901-1904 FIRE ALARM SYSTEM RISER DIAGRAM

1 FA-605 NOT TO SCALE

A

CONTROL-BY-EVENT PROGRAMMING MATRIX

ADDRESS	TYPE I.D.	ALPHANUMERIC LABEL OF DEVICE
L01D01	SMOKE	DINING AREA
L01D02	SMOKE	BEDROOM
L01D03	SMOKE	BEDROOM
L01D04	SMOKE	BEDROOM
L01D05	SMOKE / CO	RECREATION/LIVING ROOM
L01D06	SMOKE	BEDROOM
L01D07	SMOKE	BEDROOM
L01D08	SMOKE	BEDROOM
L01D09	SMOKE	DINING AREA
L01D10	SMOKE	BEDROOM
L01D11	SMOKE	BEDROOM
L01D12	SMOKE	BEDROOM
L01D13	SMOKE / CO	RECREATION/LIVING ROOM
L01D14	SMOKE	BEDROOM
L01D15	SMOKE	BEDROOM
L01D16	SMOKE	BEDROOM
L01D17		
L01D18		
L01D19	HEAT	MECHANICAL
L01D20	HEAT	LAUNDRY
L01D21	HEAT	LAUNDRY
L01D22	HEAT	KITCHEN
L01D23	HEAT	DINING AREA
L01D24	HEAT	DINING AREA
L01D25	HEAT	CLOSET
L01D26	HEAT	CLOSET
L01D27	HEAT	CLOSET
L01D28	HEAT	TOILET
L01D29	HEAT	CLOSET
L01D30	HEAT	CLOSET
L01D31	HEAT	BEDROOM
L01D32	HEAT	CLOSET
L01D33	HEAT	CLOSET
L01D34	HEAT	CLOSET
L01D35	HEAT	TOILET
L01D36	HEAT	BEDROOM
L01D37	HEAT	CLOSET
L01D38	HEAT	CLOSET
L01D39	HEAT	CLOSET
L01D40	HEAT	CLOSET
L01D41	HEAT	CLOSET
L01D42	HEAT	TOILET
L01D43	HEAT	BEDROOM
L01D44	HEAT	CLOSET
L01D45	HEAT	CLOSET
L01D46	HEAT	CLOSET
L01D47	HEAT	KITCHEN
L01D48	HEAT	DINING AREA
L01D49	HEAT	DINING AREA
L01D50	HEAT	CLOSET
L01D51	HEAT	CLOSET
L01D52	HEAT	CLOSET
L01D53	HEAT	TOILET
L01D54	HEAT	CLOSET
L01D55	HEAT	CLOSET
L01D56	HEAT	BEDROOM
L01D57	HEAT	CLOSET
L01D58	HEAT	CLOSET
L01D59	HEAT	CLOSET
L01D60	HEAT	BEDROOM
L01D61	HEAT	TOILET
L01D62	HEAT	CLOSET
L01D63	HEAT	CLOSET
L01D64	HEAT	CLOSET
L01D65	HEAT	CLOSET
L01D66	HEAT	CLOSET
L01D67	HEAT	TOILET
L01D68	HEAT	CLOSET
L01D69	HEAT	CLOSET
L01D70	HEAT	CLOSET
L01D71		
L01D72		
L01D73	CARBON MONOXIDE	MECHANICAL ROOM
L01D74		
L01D75		
L01D76	DUCT	MECHANICAL ROOM - SUPPLY SIDE
L01D77		
L01D78		
L01D79		
L01D80		

NOTES:

1. NO SLC DEVICE OR MODULE LOOP SHALL BE ASSIGNED MORE THAN EIGHTY (80) PERCENT OF ITS POINT CAPACITY UNLESS APPROVED IN WRITING BY THE ENGINEER OF RECORD (CCI).
2. CONTROL-BY-EVENT PROGRAMMING IS PROVIDED FOR GENERAL INFORMATION PURPOSES ONLY. SPECIFIC SYSTEM PROGRAMMING SHALL BE PROVIDED BY THE FIRE ALARM CONTRACTOR IN THE SHOP DRAWING SUBMITTAL.

CONTROL-BY-EVENT PROGRAMMING MATRIX

ADDRESS	TYPE I.D.	ALPHANUMERIC LABEL OF DEVICE
L01M01	PULL	LAUNDRY
L01M02	PULL	KITCHEN
L01M03	PULL	DINING AREA
L01M04	PULL	RECREATION/LIVING ROOM
L01M05	PULL	KITCHEN
L01M06	PULL	DINING AREA
L01M07	PULL	RECREATION/LIVING ROOM
L01M08		
L01M09		
L01M10	RELAY	FACP - AHU SHUTDOWN
L01M11	RELAY	DINING AREA - DOOR HOLDER
L01M12		
L01M13		
L01M14		
L01M15		
L01M16		
L01M17		
L01M18		
L01M19		
L01M20		
L01M21		
L01M22		
L01M23		
L01M24		
L01M25		
L01M26		
L01M27		
L01M28		
L01M29		
L01M30		
L01M31		
L01M32		
L01M33		
L01M34		
L01M35		
L01M36		
L01M37		
L01M38		
L01M39		
L01M40		
L01M41		
L01M42		
L01M43		
L01M44		
L01M45		
L01M46		
L01M47		
L01M48		
L01M49		
L01M50		
L01M51		
L01M52		
L01M53		
L01M54		
L01M55		
L01M56		
L01M57		
L01M58		
L01M59		
L01M60		
L01M61		
L01M62		
L01M63		
L01M64		
L01M65		
L01M66		
L01M67		
L01M68		
L01M69		
L01M70		
L01M71		
L01M72		
L01M73		
L01M74		
L01M75		
L01M76		
L01M77		
L01M78		
L01M79		
L01M80		

NOTES:

1. NO SLC DEVICE OR MODULE LOOP SHALL BE ASSIGNED MORE THAN EIGHTY (80) PERCENT OF ITS POINT CAPACITY UNLESS APPROVED IN WRITING BY THE ENGINEER OF RECORD (CCI).
2. CONTROL-BY-EVENT PROGRAMMING IS PROVIDED FOR GENERAL INFORMATION PURPOSES ONLY. SPECIFIC SYSTEM PROGRAMMING SHALL BE PROVIDED BY THE FIRE ALARM CONTRACTOR IN THE SHOP DRAWING SUBMITTAL.

STATE OF MISSOURI
MIKE KEHOE,
GOVERNOR

STATE OF MISSOURI
COURTNEY R. OGLE
NUMBER PE-2015000584
PROFESSIONAL ENGINEER
2-25-25

COURTNEY R. OGLE
Registered Professional Engineer
MO # 2015000584
Expires 12-31-2026

ROGERS-SCHMIDT ENGINEERING CO., P.C.
CONSULTING ENGINEERS
1736 WEST PARK CENTER DR.
SUITE 204
ST. LOUIS, MO 63026
PHONE: 636-600-1551
EMAIL: bfreiner@rogers-schmidt.com
MISSOURI STATE CERTIFICATE OF AUTHORITY #000408

CCI
2043 WOODLAND PKWY, SUITE 300
ST. LOUIS, MISSOURI 63146-4235
314-991-2633
www.codeconsultants.com

OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT,
DESIGN AND CONSTRUCTION

DEPARTMENT OF MENTAL HEALTH

REPLACE FIRE ALARM SYSTEM & ELECTRICAL RENOVATION

BELLEFONTAINE HABILITATION CENTER
10695 BELLEFONTAINE RD.
ST. LOUIS, MISSOURI 63137

PROJECT # M2006-01
SITE # 7356
ASSET # SEE SHT G-002

REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION:
DATE:
REVISION: A ADDENDUM 1
DATE: 05/13/2025

ISSUE DATE: 02/10/2025

CAD DWG FILE: **M2006-01-7356-6517356071-**FA-605.DWG
DRAWN BY: MM
CHECKED BY: MLY
DESIGNED BY: JRC

SHEET TITLE: A
BUILDINGS 1901-1904 MATRIX, CBE, CALCULATIONS AND RISER DIAGRAM

SHEET NUMBER:
FA-605

42 OF 45 SHEETS
FEBRUARY 10, 2025

Pre-Bid Meeting Attendance Sheet
Replace Fire Alarm System & Electrical Renovation
Bellefontaine Habilitation Center
Bellefontaine Neighbors, Missouri

Project No. M2006-01
May 6, 2025 10:00 AM

Name	Company Name & Type of Contracting	MBE/WBE/ SDVE Status	Phone	E-Mail Address of Attendee & E-mail Address of Individual filling out Bid Documents
Michael Schrader	OA/FMDC Engineering Project Manager	—	573-536-7105 Cell	michael.schrader@oa.mo.gov
Mike Howard	OA/FMDC Construction Project Specialist	—	636-875-4160 Office 636-524-8503 Cell	mike.howard@oa.mo.gov
Kevin Dalton	OA/FMDC Specialized Trades Supervisor – DMH East		314-877-5880 Office 314-250-9493 Cell	kevin.dalton@oa.mo.gov
Mike Tyler	OA/FMDC Specialized Trades Supervisor - BHC		314-264-0725 Office 314-566-1798 Cell	michael.tyler@oa.mo.gov
Barry Freiner	Rogers-Schmidt Engineering Co., P.C. Consultant Project Manager	—	636-600-1551 Office 314-484-6270 Cell	bfreiner@rogers-schmidt.com

Pre-Bid Meeting Attendance Sheet
Replace Fire Alarm System & Electrical Renovation
Bellefontaine Habilitation Center
Bellefontaine Neighbors, Missouri

Project No. M2006-01
May 6, 2025 10:00 AM

Name	Company Name & Type of Contracting	MBE/WBE/ SDVE Status	Phone	E-Mail Address of Attendee & E-mail Address of Individual filling out Bid Documents
Matt Yocum	Code Consultants, Inc F/A Consultant Project Manager	—	314-991-2633 Office	matty@codeconsultants.com
Josh Case	Code Consultants, Inc F/A Consultant Project Designer	—	314-991-2633 Office	joshc@codeconsultants.com
Mitch Behnke	Conversint		314-681-4765	mitch.behnke@conversint.com
STEVE TIELKE	TGB, INC PRIME CONTRACTOR	WBE	314-664-4444	steve@tgbinc.com
NATHAN HAAS	ARCHKEY 54CHS ELECTRIC		636 635 8487	NATHAN.HAAS@ARCHKEY.com

Pre-Bid Meeting Attendance Sheet
Replace Fire Alarm System & Electrical Renovation
Bellefontaine Habilitation Center
Bellefontaine Neighbors, Missouri

Project No. M2006-01
May 6, 2025 10:00 AM

Name	Company Name & Type of Contracting	MBE/WBE/ SDVE Status	Phone	E-Mail Address of Attendee & E-mail Address of Individual filling out Bid Documents
Tom McInerney	ARCHKEY SACAS Electril		708-704-3050	thomas.mcinerney@archkey.com
Matt Yocom	CCI		314-991-2633	Matty@codeconsultants.com
Josh CASE	CCI		11	Joshc@codeconsultants.com
Dustin Hulsey	OA/FMDC			Dustin.Hulsey@oa.mo.gov
Mark Palmer	REI		314 562 6104	Mark@reinholdelectric.com

Pre-Bid Meeting Attendance Sheet
Replace Fire Alarm System & Electrical Renovation
Bellefontaine Habilitation Center
Bellefontaine Neighbors, Missouri

Project No. M2006-01
May 6, 2025 10:00 AM

Name	Company Name & Type of Contracting	MBE/WBE/ SDVE Status	Phone	E-Mail Address of Attendee & E-mail Address of Individual filling out Bid Documents
Jason Meyer	REI		314-520-5139	jmeyer@reinhardelectric.com
Nick Cotton	Guarantee Electric		314-913-5100	nick.cotton@geco.com
BRYAN LYNCH	GUARANTEE ELECTRIC		314-393-6536	BRYAN.LYNCH@GECO.COM

Relative Month	Number Of Days	Average Daily Use	Status	Total KWH	Summer Total KWH	Winter Total KWH	Peak KW	On Peak KW	Off Peak KW	Total KVARH	KW TOU With Const	Sec. Energy Block KW	Reactive KVAR	Total Billing Demand	Summer Billing Dmd	Winter Billing Dmd	Oct Ratcheted Summer KW	Oct Ratcheted May KW	Billing Demand
202505	29	4101	Billed	118919	0	118919	289.4	289.4	234.7	16665	289.4	289.4	0	289.4	0	289.4	0	0	289.4
202504	29	4160	Billed	120644	0	120644	250.6	230.4	250.6	15328	230.4	230.4	0	230.4	0	0	0	0	230.4
202503	29	5190	Billed	150502	0	150502	306.7	306.7	297.1	20183	306.7	306.7	0	306.7	0	0	0	0	306.7
202502	31	5320	Billed	164905	0	164905	311.5	311.5	294.7	20406	311.5	311.5	0	311.5	0	0	0	0	311.5
202501	32	4926	Billed	157636	0	157636	279.8	279.8	273.6	16953	279.8	279.8	0	279.8	0	0	0	0	279.8
202412	33	4016	Billed	132524	0	132524	258.2	258.2	251.5	14348	258.2	258.2	0	258.2	0	0	0	0	258.2
202411	29	3905	Billed	113251	0	113251	286.6	282.7	286.6	20818	282.7	282.7	0	282.7	0	0	0	0	282.7
202410	32	4729	Billed	151325	141867	9458	393.1	393.1	321.6	42513	393.1	393.1	0	393.1	0	0	476.6	315.8	393.1
202409	29	5930	Billed	171969	171969	0	470.9	470.9	387.4	63227	470.9	470.9	0	470.9	0	0	0	0	470.9
202408	30	6221	Billed	186639	186639	0	476.6	476.6	383.5	71697	476.6	476.6	0	476.6	0	0	0	0	476.6
202407	32	6123	Billed	195933	195933	0	446.9	446.9	388.8	75124	446.9	446.9	0	446.9	0	0	0	0	446.9
202406	30	4569	Billed	137079	4569	132510	344.6	344.6	314.4	38690	344.6	344.6	0	344.6	0	0	0	0	344.6
202405	29	4124	Billed	119597	0	119597	315.8	315.8	253	21611	315.8	315.8	0	315.8	0	0	0	0	315.8
202404	32	4055	Billed	129763	0	129763	237.1	225.6	237.1	16824	225.6	225.6	0	225.6	0	0	0	0	225.6
202403	29	4600	Billed	133401	0	133401	254.4	249.6	254.4	16380	249.6	249.6	0	249.6	0	0	0	0	249.6
202402	29	5361	Billed	155473	0	155473	301	293.3	301	23060	293.3	293.3	0	293.3	0	0	0	0	293.3
202401	34	4544	Billed	154505	0	154505	254.9	246.2	254.9	20462	246.2	246.2	0	246.2	0	0	0	0	246.2
202312	31	4158	Billed	128896	0	128896	235.7	235.7	235.2	16243	235.7	235.7	0	235.7	0	0	0	0	235.7
202311	31	3835	Billed	118889	0	118889	313	313	298.6	17388	313	313	0	313	0	0	0	0	313
202310	30	4706	Billed	141165	141165	0	359.5	333.6	359.5	35898	333.6	333.6	0	333.6	0	0	481.9	270.7	333.6
202309	29	5962	Billed	172903	172903	0	459.4	459.4	389.8	58706	459.4	459.4	0	459.4	0	0	0	0	459.4
202308	32	6210	Billed	198713	198713	0	481.9	481.9	411.4	79542	481.9	481.9	0	481.9	0	0	0	0	481.9
202307	29	5462	Billed	158406	158406	0	437.3	437.3	363.8	56309	437.3	437.3	0	437.3	0	0	0	0	437.3
202306	30	4652	Billed	139570	9305	130265	388.8	388.8	299.5	39984	388.8	388.8	0	388.8	0	0	0	0	388.8
202305	29	4050	Billed	117463	0	117463	270.7	270.7	235.2	17709	270.7	270.7	0	270.7	0	0	0	0	270.7
202304	31	4464	Billed	138385	0	138385	265	260.2	265	17380	260.2	260.2	0	260.2	0	0	0	0	260.2
202303	29	4615	Billed	133846	0	133846	251	251	246.2	15691	251	251	0	251	0	0	0	0	251
202302	29	4952	Billed	143608	0	143608	273.6	273.6	272.6	20296	273.6	273.6	0	273.6	0	0	0	0	273.6
202301	34	4829	Billed	164195	0	164195	321.1	310.1	321.1	21950	310.1	310.1	0	310.1	0	0	0	0	310.1
202212	31	4245	Billed	131607	0	131607	261.1	261.1	238.6	18630	261.1	261.1	0	261.1	0	0	0	0	261.1
202211	31	3634	Billed	112653	0	112653	245.8	245.8	233.8	17216	245.8	245.8	0	245.8	0	0	0	0	245.8
202210	30	4474	Billed	134206	129732	4474	420.5	420.5	334.6	40245	420.5	420.5	0	420.5	0	0	493	219.8	420.5
202209	29	6114	Billed	177319	177319	0	450.7	450.7	417.6	75646	450.7	450.7	0	450.7	0	0	0	0	450.7
202208	32	6864	Billed	219644	219644	0	493	493	453.1	92013	493	493	0	493	0	0	0	0	493
202207	29	6265	Billed	181676	181676	0	481.9	481.9	400.3	70140	481.9	481.9	0	481.9	0	0	0	0	481.9
202206	30	4657	Billed	139699	13970	125729	400.8	400.8	323.5	39408	400.8	400.8	0	400.8	0	0	0	0	400.8
202205	32	3862	Billed	123587	0	123587	219.8	219.8	216	17712	219.8	219.8	0	219.8	0	0	0	0	219.8
202204	29	4314	Billed	125112	0	125112	258.7	246.2	258.7	20471	246.2	246.2	0	246.2	0	0	0	0	246.2
202203	29	5000	Billed	145011	0	145011	293.3	293.3	272.2	24528	293.3	293.3	0	293.3	0	0	0	0	293.3
202202	29	5249	Billed	152210	0	152210	300.5	291.8	300.5	26725	291.8	291.8	0	291.8	0	0	0	0	291.8
202201	34	4610	Billed	156734	0	156734	265.4	263.5	265.4	25192	263.5	263.5	0	263.5	0	0	0	0	263.5
202112	33	4296	Billed	141763	0	141763	257.3	257.3	240.5	22293	257.3	257.3	0	257.3	0	0	0	0	257.3
202111	29	4297	Billed	124605	0	124605	306.2	301.9	306.2	33511	301.9	301.9	0	301.9	0	0	0	0	301.9
202111	29	4297	Cancelled	124605	0	124605	306.2	301.9	306.2	33511	301.9	301.9	0	301.9	0	0	0	0	301.9
202110	30	5618	Billed	168532	162914	5618	434.9	434.9	382.1	64262	434.9	434.9	0	434.9	0	0	493.4	290.9	434.9
202110	30	5618	Cancelled	168532	162914	5618	434.9	434.9	382.1	64262	434.9	434.9	0	434.9	0	0	493.4	290.9	434.9
202109	29	7194	Billed	208613	208613	0	493.4	493.4	427.7	88537	493.4	493.4	0	493.4	0	0	0	0	493.4
202109	29	7194	Cancelled	208613	208613	0	493.4	493.4	427.7	88537	493.4	493.4	0	493.4	0	0	0	0	493.4
202108	32	6547	Billed	209491	209491	0	475.7	475.7	403.2	88292	475.7	475.7	0	475.7	0	0	0	0	475.7
202108	32	6547	Cancelled	209491	209491	0	475.7	475.7	403.2	88292	475.7	475.7	0	475.7	0	0	0	0	475.7
202107	29	6178	Billed	179160	179160	0	435.8	435.8	385.9	67536	435.8	435.8	0	435.8	0	0	0	0	435.8
202107	29	6178	Cancelled	179160	179160	0	435.8	435.8	385.9	67536	435.8	435.8	0	435.8	0	0	0	0	435.8
202106	30	4515	Billed	135443	13544	121899	347.5	347.5	297.6	36154	347.5	347.5	0	347.5	0	0	0	0	347.5
202106	30	4515	Cancelled	135443	13544	121899	347.5	347.5	297.6	36154	347.5	347.5	0	347.5	0	0	0	0	347.5
202105	31	4319	Billed	133889	0	0	290.9	290.9	260.6	28259	290.9	290.9	0	290.9	0	0	0	0	290.9
202104	29	4351	Billed	126184	0	0	246.7	246.7	241.4	16836	246.7	246.7	0	246.7	0	0	0	0	246.7
202103	29	5180	Billed	150233	0	0	294.7	293.3	294.7	24569	293.3	293.3	0	293.3	0	0	0	0	293.3
202102	29	4912	Billed	142439	0	0	264	254.4	264	24008	254.4	254.4	0	254.4	0	0	0	0	254.4
202102	29	3600	Cancelled	104400	0	0	264	252	264	18000	252	252	0	252	0	0	0	0	252
202101	34	4694	Billed	159600	0	0	254.4	254.4	254.4	24000	254.4	254.4	0	254.4	0	0	0	0	254.4
202012	31	4065	Billed	126000	0	0	240	240	230.4	18000	240	240	0	240	0	0	0	0	240
202011	29	4014	Billed	116400	0	0	326.4	326.4	302.4	21600	326.4	326.4	0	326.4	0	0	0	0	326.4
202010	32	4613	Billed	147600	0	0	408	384	408	40800	384	384	0	384	0	0	504	312	384
202009	29	6248	Billed	181200	0	0	494.4	494.4	393.6	66000	494.4	494.4	0	494.4	0	0	0	0	494.4
202008	29	7076	Billed	205200	0	0	480	480	470.4	80400	480	480	0	480	0	0	0	0	480
202007	32	6563	Billed	210000	0	0	465.6	465.6	422.4	78000	465.6	465.6	0	465.6	0	0	0	0	465.6
202006	30	4600	Billed	138000	0	0	504	504	336	36000	504	504	0	504	0	0	0	0	504
202005	30	4080	Billed	122400	0	0	312	312	254.4	19200	312	312	0	312	0	0	0	0	312
202004	31	4452	Billed	138000	0	0	254.4	254.4	240	21600	254.4	254.4	0	254.4	0	0	0	0	254.4
202003	30	5040	Billed	151200	0	0	312	312	288	27600	312	312	0	312	0	0	0	0	312
202002	29	5007	Billed	145200	0	0	278.4	278.4	264	26400	278.4	278.4	0	278.4	0	0	0	0	278.4
202002	29	5007	Cancelled	145200	0	0	278.4	278.4	264	26400	278.4	278.4	0	278.4	0	0	0	0	278.4

Current Base Demand	Base KW October	October Winter Base Calc	October Winter Base kW	Winter Base Demand	Base KW Winter	Base KWH Ratio	Base KWH (HUD)	Seasonal KWH (HUD)	Recalc Billing KW	Rider Addition Usage	Season	Source	From	Primaries	To	Meters	Bill Class	Rate
0	0	315.8	315.8	289.4	289.4	1	118919	0	0	0	W	Interval	4/3/2025	1	5/2/2025	1		Rate 4M Small Primary Electric Service
0	0	315.8	315.8	230.4	230.4	1	120644	0	0	0	W	Interval	3/5/2025	1	4/3/2025	1		Rate 4M Small Primary Electric Service
0	0	315.8	315.8	306.7	306.7	1	150502	0	0	0	W	Interval	2/4/2025	1	3/5/2025	1		Rate 4M Small Primary Electric Service
0	0	315.8	315.8	311.5	311.5	1	164905	0	0	0	W	Interval	1/4/2025	1	2/4/2025	1		Rate 4M Small Primary Electric Service
0	0	315.8	315.8	279.8	279.8	1	157636	0	0	0	W	Interval	12/3/2024	1	1/4/2025	1		Rate 4M Small Primary Electric Service
0	0	315.8	315.8	258.2	258.2	1	132524	0	0	0	W	Interval	10/31/2024	1	12/3/2024	1		Rate 4M Small Primary Electric Service
0	0	315.8	315.8	282.7	282.7	1	113251	0	0	0	W	Interval	10/2/2024	1	10/31/2024	1		Rate 4M Small Primary Electric Service
315.8	315.8	0	0	0	0	0.8033	7598	1860	0	0	O	Interval	8/31/2024	1	10/2/2024	1		Rate 4M Small Primary Electric Service
0	0	270.7	270.7	270.7	270.7	0.5748	0	0	0	0	S	Interval	8/2/2024	1	8/31/2024	1		Rate 4M Small Primary Electric Service
0	0	270.7	270.7	270.7	270.7	0.5679	0	0	0	0	S	Interval	7/3/2024	1	8/2/2024	1		Rate 4M Small Primary Electric Service
0	0	270.7	270.7	270.7	270.7	0.6057	0	0	0	0	S	Interval	6/1/2024	1	7/3/2024	1		Rate 4M Small Primary Electric Service
0	0	270.7	270.7	270.7	270.7	0.7855	104087	28423	344.6	0	B	Interval	5/2/2024	1	6/1/2024	1		Rate 4M Small Primary Electric Service
0	0	270.7	270.7	270.7	270.7	0.8571	102507	17090	0	0	W	Interval	4/3/2024	1	5/2/2024	1		Rate 4M Small Primary Electric Service
0	0	270.7	270.7	225.6	225.6	1	129763	0	0	0	W	Interval	3/2/2024	1	4/3/2024	1		Rate 4M Small Primary Electric Service
0	0	270.7	270.7	249.6	249.6	1	133401	0	0	0	W	Interval	2/2/2024	1	3/2/2024	1		Rate 4M Small Primary Electric Service
0	0	270.7	270.7	270.7	270.7	0.9229	143486	11987	0	0	W	Interval	1/4/2024	1	2/2/2024	1		Rate 4M Small Primary Electric Service
0	0	270.7	270.7	246.2	246.2	1	154505	0	0	0	W	Interval	12/1/2023	1	1/4/2024	1		Rate 4M Small Primary Electric Service
0	0	270.7	270.7	235.7	235.7	1	128896	0	0	0	W	Interval	10/31/2023	1	12/1/2023	1		Rate 4M Small Primary Electric Service
0	0	270.7	270.7	270.7	270.7	0.8648	102815	16074	0	0	W	Interval	9/30/2023	1	10/31/2023	1		Rate 4M Small Primary Electric Service
270.7	270.7	0	0	0	0	0.8114	0	0	0	0	O	Interval	8/31/2023	1	9/30/2023	1		Rate 4M Small Primary Electric Service
0	0	219.8	219.8	219.8	219.8	0.4784	0	0	0	0	S	Interval	8/2/2023	1	8/31/2023	1		Rate 4M Small Primary Electric Service
0	0	219.8	219.8	219.8	219.8	0.4561	0	0	0	0	S	Interval	7/1/2023	1	8/2/2023	1		Rate 4M Small Primary Electric Service
0	0	219.8	219.8	219.8	219.8	0.5026	0	0	0	0	S	Interval	6/2/2023	1	7/1/2023	1		Rate 4M Small Primary Electric Service
0	0	219.8	219.8	219.8	219.8	0.5653	73639	56626	388.8	0	B	Interval	5/3/2023	1	6/2/2023	1		Rate 4M Small Primary Electric Service
0	0	219.8	219.8	219.8	219.8	0.8119	95368	22095	0	0	W	Interval	4/4/2023	1	5/3/2023	1		Rate 4M Small Primary Electric Service
0	0	219.8	219.8	219.8	219.8	0.8447	116894	21491	0	0	W	Interval	3/4/2023	1	4/4/2023	1		Rate 4M Small Primary Electric Service
0	0	219.8	219.8	219.8	219.8	0.8756	117196	16650	0	0	W	Interval	2/3/2023	1	3/4/2023	1		Rate 4M Small Primary Electric Service
0	0	219.8	219.8	219.8	219.8	0.8033	115360	28248	0	0	W	Interval	1/5/2023	1	2/3/2023	1		Rate 4M Small Primary Electric Service
0	0	219.8	219.8	219.8	219.8	0.7088	116381	47814	0	0	W	Interval	12/2/2022	1	1/5/2023	1		Rate 4M Small Primary Electric Service
0	0	219.8	219.8	219.8	219.8	0.8418	110787	20820	0	0	W	Interval	11/1/2022	1	12/2/2022	1		Rate 4M Small Primary Electric Service
0	0	219.8	219.8	219.8	219.8	0.8942	100734	11919	0	0	W	Interval	10/1/2022	1	11/1/2022	1		Rate 4M Small Primary Electric Service
219.8	219.8	0	0	0	0	0.5227	2339	2135	0	0	O	Interval	9/1/2022	1	10/1/2022	1		Rate 4M Small Primary Electric Service
0	0	290.9	290.9	290.9	290.9	0.6454	0	0	0	0	S	Interval	8/3/2022	1	9/1/2022	1		Rate 4M Small Primary Electric Service
0	0	290.9	290.9	290.9	290.9	0.59	0	0	0	0	S	Interval	7/2/2022	1	8/3/2022	1		Rate 4M Small Primary Electric Service
0	0	290.9	290.9	290.9	290.9	0.6036	0	0	0	0	S	Interval	6/3/2022	1	7/2/2022	1		Rate 4M Small Primary Electric Service
0	0	290.9	290.9	290.9	290.9	0.7257	91242	34487	400.8	0	B	Interval	5/4/2022	1	6/3/2022	1		Rate 4M Small Primary Electric Service
0	0	290.9	290.9	219.8	219.8	1	123587	0	0	0	W	Interval	4/2/2022	1	5/4/2022	1		Rate 4M Small Primary Electric Service
0	0	290.9	290.9	246.2	246.2	1	125112	0	0	0	W	Interval	3/4/2022	1	4/2/2022	1		Rate 4M Small Primary Electric Service
0	0	290.9	290.9	290.9	290.9	0.9918	143822	1189	0	0	W	Interval	2/3/2022	1	3/4/2022	1		Rate 4M Small Primary Electric Service
0	0	290.9	290.9	290.9	290.9	0.9969	151738	472	0	0	W	Interval	1/5/2022	1	2/3/2022	1		Rate 4M Small Primary Electric Service
0	0	290.9	290.9	263.5	263.5	1	156734	0	0	0	W	Interval	12/2/2021	1	1/5/2022	1		Rate 4M Small Primary Electric Service
0	0	290.9	290.9	257.3	257.3	1	141763	0	0	0	W	Interval	10/30/2021	1	12/2/2021	1		Rate 4M Small Primary Electric Service
0	0	290.9	290.9	290.9	290.9	0.9635	120057	4548	0	0	W	Interval	10/1/2021	1	10/30/2021	1		Rate 4M Small Primary Electric Service
0	0	290.9	290.9	290.9	290.9	0.9635	120057	4548	0	0	W	Interval	10/1/2021	1	10/30/2021	1		Rate 4M Small Primary Electric Service
290.9	290.9	0	0	0	0	0.6688	3757	1861	0	0	O	Interval	9/1/2021	1	10/1/2021	1		Rate 4M Small Primary Electric Service
290.9	290.9	0	0	0	0	0.6688	3757	1861	0	0	O	Interval	9/1/2021	1	10/1/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	312	312	0.6323	0	0	0	0	S	Interval	8/3/2021	1	9/1/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	312	312	0.6323	0	0	0	0	S	Interval	8/3/2021	1	9/1/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	312	312	0.6558	0	0	0	0	S	Interval	7/2/2021	1	8/3/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	312	312	0.6558	0	0	0	0	S	Interval	7/2/2021	1	8/3/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	312	312	0.7159	0	0	0	0	S	Interval	6/3/2021	1	7/2/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	312	312	0.7159	0	0	0	0	S	Interval	6/3/2021	1	7/2/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	312	312	0.8978	109441	12458	347.5	0	B	Interval	5/4/2021	1	6/3/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	312	312	0.8978	109441	12458	347.5	0	B	Interval	5/4/2021	1	6/3/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	290.9	290.9	1	133889	0	0	0	W	Interval	4/3/2021	1	5/4/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	246.7	246.7	1	126184	0	0	0	W	Interval	3/5/2021	1	4/3/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	293.3	293.3	1	150233	0	0	0	W	Interval	2/4/2021	1	3/5/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	254.4	254.4	1	142439	0	0	0	W	Interval	1/6/2021	1	2/4/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	252	252	1	104400	0	0	0	W	Actual Special Company Reading	1/6/2021	1	2/4/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	254.4	254.4	1	159600	0	0	0	W	Actual Company	12/3/2020	1	1/6/2021	1		Rate 4M Small Primary Electric Service
0	0	312	312	240	240	1	126000	0	0	0	W	Actual Company	11/2/2020	1	12/3/2020	1		Rate 4M Small Primary Electric Service
0	0	312	312	312	312	0.9558	111255	5145	0	0	W	Actual Company	10/4/2020	1	11/2/2020	1		Rate 4M Small Primary Electric Service
312	312	0	0	0	0	0.8125	119925	27675	0	0	O	Actual Company	9/2/2020	1	10/4/2020	1		Rate 4M Small Primary Electric Service
0	0	0	0	0	0	0	0	0	0	0	S	Actual Company	8/4/2020	1	9/2/2020	1		Rate 4M Small Primary Electric Service
0	0	0	0	0	0	0	0	0	0	0	S	Actual Company	7/6/2020	1	8/4/2020	1		Rate 4M Small Primary Electric Service
0	0	0	0	0	0	0	0	0	0	0	S	Actual Company	6/4/2020	1	7/6/2020	1		Rate 4M Small Primary Electric Service
0	0	264	0	0	0	0	0	0	504	0	6	Actual Company	5/5/2020	1	6/4/2020	1		Rate 4M Small Primary Electric Service
0	0	264	264	264	264	0.8461	103563	18837	0	0	W	Actual Company	4/5/2020	1	5/5/2020	1		Rate 4M Small Primary Electric Service
0	0	264	264	254.4	254.4	1	138000	0	0	0	W	Actual Company	3/5/2020	1	4/5/2020	1		Rate 4M Small Primary Electric Service
0	0	264	264	264	264	0.8461	127930	23270	0	0	W	Actual Company	2/4/2020	1	3/5/2020	1		Rate 4M Small Primary Electric Service
0	0	264	264	264	264	0.9482	137679	7521	0	0	W	Actual Company	1/6/2020	1	2/4/2020	1		Rate 4M Small Primary Electric Service
0	0	264	264	264	264	0.9482	137679	7521	0	0	W	Actual Company	1/6/2020	1	2/4/2020	1		Rate 4M Small Primary Electric Service

EPS ENGINEERING & DESIGN
A Division of Electric Power Systems International, Inc.

Bellefontaine Habilitation Center

General Operating Description

Revision/Approval History

Date	REV #	Description	Prepared by: Initials	1st Approver: Initials & Date		2nd Approver: Initials & Date	
02/20/19	0	Initial Document	DJW				
04/25/20	1	Revised per Customer comments	DJW				
05/05/20	2	Revised per Customer comments	DJW				

ROGERS-SCHMIDT ENGINEERING CO., P.C.

- ☐ NO EXCEPTION TAKEN
- ☐ EXCEPTIONS NOTED
- ☐ REJECTED
- ☐ REVISE AND RESUBMIT AS NOTED
- ☐ SUBMITTAL NOT REQUIRED
- ■ INFORMATION ONLY

REVIEW IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS, AND DOES NOT RELIEVE THE CONTRACTOR OF THE OBLIGATION TO COMPLY WITH THE CONTRACT DOCUMENTS.

BY: Barry D. Freiner
DATE: July 22, 2020
SUBMITTAL NO.: 964-01-261327-051-2

Barry D. Freiner, P.E.

Digitally signed by Barry D. Freiner, P.E.
DN: cn=Barry D. Freiner, P.E., o=Rogers-Schmidt Engineering Co., P.C., ou, email=bfreiner@rogers-schmidt.com, c=US
Date: 2020.07.22 15:36:14 -05'00'

RSE SUBMITTAL NO.: 964-01-261327-051-2

Contents

Definitions and Abbreviations

52TC	Circuit breaker trip coil	Main 1	Preferred Source, Larimore 52, located in switchgear section 8B
52SRC	Circuit breaker close coil	Main 2	Alternate Source, Larimore 56, located in switchgear section 7B
52Y	Aux. closing relay (Anti-pump)	Gen Breaker	Generator tie breaker located in switchgear section 1B
LS	Spring charged switch	1A	Indicates switchgear section 1, upper cabinet
88	Spring charging motor	1B	Indicates switchgear section 1, lower cabinet
52a	Aux. switch-open when bkr is open	7A	Indicates switchgear section 7, upper cabinet
52b	Aux. switch-closed when bkr is open	7B	Indicates switchgear section 7, lower cabinet
CTD	Capacitor trip device	8A	indicates switchgear section 8, upper cabinet
CS/C	Control switch close contact	8B	indicates switchgear section 8, lower cabinet
CS/T	Control switch trip contact	47/27-1	Negative Seq/under voltage relay, section 8A
CS/SC	control switch slip close	47/27-2	Negative Seq/under voltage relay, section 7A
CS/NC	control switch Norm. Closed	47/27-3	Negative Seq/under voltage relay, section 1B
CS/ST	Control switch Slip Trip	62-27	Time delayed undervoltage relay
R	Red indicating lamp	62-59	Time delayed overvoltage relay
G	green indicating lamp	NAC	Normal after close (indicates a contact that closes after the CS has been moved thru the close position)
A	amber indicating lamp	NAT	Normal after Trip (indicates a contact that closes after the CS has been moved thru the open position)
W	white indicating lamp	NAC/C	Normal after close or while in close position (indicates a contact that closes while the switch is in the close position as well as after it has moved thru the closed position)
B	blue indicating lamp	G1	Device associated with the generator
C	clear indicating lamp	3A	Aux relay used to indicate NAC status
11	Multi-functional solid-state relay	2	indicates a starting device
27	Undervoltage relay	94	Aux relay without defined ANSI function
43	Transfer switch	86-1	Lockout relay for Main 1
51	Time overcurrent relay	86-2	Lockout relay for Main 2
50	Instantaneous overcurrent relay	CS CLS	Control switch close contact
59	Overvoltage relay	CS PTL	Control switch pull to latch
62	Timing relay		
86	Lockout relay hand reset (contacts shown in reset position)		
ICS	Indicating Contactor Switch		
SI	Seal - in Contactor switch		

1. Case 1 Loss of power to preferred breaker main 1

a.) Description

Breaker main 1 has been set as the preferred breaker, breaker main 1 is closed, breaker main 2 is open, both sources are hot, Larimore 52, the feed to breaker main 1, goes dead.

b.) Sequence

The Basler relay designated as 8A 47/27-1 Undervoltage function picks up when the voltage level falls below the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 8A 47/27-1 relay energizes time delay relay 8A 62-27 and relay 8A 27E. When time delay relay 8A 62-27 timer expires it will energize relay 8A 27D.

When the normally open contact for 8A 27D goes closed and provided that the Preferred/Reserve selector switch is not in the Manual (middle) position and both breaker pistol switches have been red flagged, and that the voltage on the main 2 is healthy (a closed contact from relay 7A 59D), the trip string will be closed and breaker main 1 will open.

When the contact from relay 8A 27E closes, if the voltage on the main 2 is healthy, as indicated by a closed contact from relay 7A 59D, and breaker main 1 opens, a 52b MOC contact from breaker main 1 will close and complete the close circuit for breaker main 2. Breaker main 2 will then close, provided both bus fault lockout relays are in the reset position.

When the line voltage has returned above the dropout voltage of the Basler relay 8A 47/27-1 the normally closed contacts will return to the closed position and energize time delay relay 8A 62-59. After the 8A 62-59 time delay expires it will close its contact and energize Relay 8A 59D. Relay 8A 59D will close a contact that is located in the close string of breaker main 1, and breaker main 1 will close.

When the 52a MOC contact from breaker main 1 closes it will complete the trip string for breaker main 2 and open breaker main 2

8A 47/27-1 Undervoltage/Neg Sequence pickup 10 %

8A 47/27-1 Undervoltage/Neg Sequence Time delay 0.0 Seconds

8A 62-27 Undervoltage/Neg sequence time delay to initiate transfer to main 2 1 Seconds

8A 62-59 Undervoltage/Neg sequence time delay to initiate transfer to main 1 10 Seconds

2. Case 1A loss of power to preferred breaker main 2

a.) Description

Breaker main 2 has been set as the preferred breaker, breaker main 2 is closed, breaker main 1 is open, both sources are hot, Larimore 56, the feed to breaker main 2, goes dead.

b.) Sequence

The Basler relay designated as 7A 47/27-2 Undervoltage function picks up when the voltage level falls below the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 7A 47/27-2 relay energizes time delay relay 7A 62-27 and relay 7A 27E. When time delay relay 7A 62-27 timer expires it will energize relay 7A 27D.

When the normally open contact for 7A 27D goes closed and provided that the Preferred/Reserve selector switch is not in the Manual (middle) position and both breaker pistol switches have been red flagged, and that the voltage on the main 1 is healthy, a closed contact from relay 8A 59D, the trip string will be closed and breaker main 2 will open.

When the contact from relay 7A 27E closes, if the voltage on the main 1 is healthy, as indicated by a closed contact from relay 8A 59D, and breaker main 2 opens, a 52b MOC contact from breaker main 2 will close and complete the close circuit for breaker main 1. Breaker main 1 will then close, provided both bus fault lockout relays are in the reset position.

When the line voltage has returned above the dropout voltage of the Basler relay 7A 47/27-2 the normally closed contacts will return to the closed position and energize time delay relay 7A 62-59. After the 7A 62-59 time delay expires it will close its contact and energize Relay 7A 59D. Relay 7A 59D will close a contact that is located in the close string of breaker main 2, and breaker main 2 will close.

When the 52a MOC contact from breaker main 2 closes it will complete the trip string for breaker main 1 and open breaker main 1

7A 47/27-2 Undervoltage/Neg Sequence pickup 10 %

7A 47/27-2 Undervoltage/Neg Sequence Time delay 0.0 Seconds

7A 62-27 Undervoltage/Neg sequence time delay to initiate transfer to main 2 1 Seconds

7A 62-59 Normal Voltage time delay to initiate transfer to main 1 10 Seconds

3. Case 2 loss of power to reserve breaker main 2

a.) Description

Breaker main 1 has been set as the preferred breaker. Breaker main 1 is closed, breaker main 2 is open, both sources are hot, Larimore 56, the feed to breaker main 2, goes dead.

b.) Sequence

The Basler relay designated as 7A 47/27-2 Undervoltage function picks up when the voltage level falls below the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 7A 47/27-2 relay energizes time delay relay 7A 62-27 and relay 7A 27E. When time delay relay 7A 62-27 timer expires it will energize relay 7A 27D.

The contacts from 7A 27D are not in the trip string for breaker main 1, so no operation occurs.

The contact from 7A 27E located in the trip string for breaker main 1, is blocked by the contact of relay 8A 27D being open, and blocked by the 1A 94G1A generator running contact being open.

The contact from relay 7A 27E closes in breaker main 1's close string, however this signal is blocked by the 43 selector switch contact 42/46 being open, because breaker main 1 is selected as the primary source.

4. Case 2A loss of power to reserve breaker main 1

a.) Description

Breaker main 2 has been set as the preferred breaker. Breaker main 2 is closed, breaker main 1 is open, both sources are hot, Larimore 52, the feed to breaker main 1, goes dead.

b.) Sequence

The Basler relay designated as 8A 47/27-1 Undervoltage function picks up when the voltage level falls below the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 8A 47/27-1 relay energizes time delay relay 8A 62-27 and relay 8A 27E. When time delay relay 8A 62-27 timer expires it will energize relay 8A 27D.

The contacts from 8A 27D are not in the trip string for breaker main 2, so no operation occurs.

The contact from 8A 27E located in the trip string for breaker main 2, is blocked by the contact of relay 7A 27D being open, and blocked by the 1A 94G1A generator running contact being open.

The contact from relay 8A 27E closes in breaker main 2's close string, however this signal is blocked by the 43 selector switch contact 34/38 being open, because breaker main 2 is selected as the primary source.

5. Case 3 loss of power to main 1 preferred and main 2 reserve

a.) Description

Breaker main 1 has been set as the preferred breaker. Breaker main 1 is closed, breaker main 2 is open, both sources are hot, simultaneously both Larimore 52 and Larimore 56 go dead.

b.) Sequence

The Basler relay designated as 8A 47/27-1 Undervoltage function picks up when the voltage level falls below the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 8A 47/27-1 relay energizes time delay relay 8A 62-27 and relay 8A 27E. Time delay relay 8A 62-27 timer expires it will energize relay 8A 27D.

The Basler relay designated as 7A 47/27-2 Undervoltage function picks up when the voltage level falls below the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 7A 47/27-2 relay energizes time delay relay 7A 62-27 and relay 7A 27E. Time delay relay 7A 62-27 timer expires it will energize

relay 7A 27D.

The contacts for 8A 27E and 7A 27E are in series. When both contacts close, provided the generator breaker has been red flagged, and that the generator is not faulted, time delay relay 1B 2G1 will be energized. When time delay relay 1B 2G1 has expired a closed contact will be sent to the Kohler Generator control board to start the generator. Time delay relay 1B 2G1 will seal itself in once the voltage stable relay 1B 59G1B has been energized.

The Generator control board provides a Generator running contact that energizes relay 1A 94G1A.

With the closed contact from the relay 8A 27D, and provided the generator breaker has been red flagged, and the line connected to breaker main 2 is indicated to have an undervoltage condition, provided by a contact from relay 7A 27E, then the generator running contact provided by a contact from 1A 94G1A will complete the trip string and breaker main 1 will open.

The Basler relay designated as 1B 47/27-3 Normal voltage function picks up when the voltage level rises above the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 1B 47/27-3 relay closes, and provided that both breaker main 1 and main 2 are open, utilizing 52b contacts, energizes time delay relay 1B 59G1A. Time delay relay 1B 59G1A timer expires it will energize relay 1B 59G1B.

A contact from 59G1B located in the generator breaker close string will close, and provided that the Generator breaker has been red flagged, both breakers main 2 and main 1 have been opened, and that both bus lockout relays are in the reset position, the Generator breaker will close.

6. Case 3A loss of power to main 2 preferred and main 1 reserve

a.) Description

Breaker main 2 has been set as the preferred breaker. Breaker main 2 is closed, breaker main 1 is open, both sources are hot, simultaneously both Larimore 56 and Larimore 52 go dead.

b.) Sequence

The Basler relay designated as 8A 47/27-1 Undervoltage function picks up when the voltage level falls below the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 8A 47/27-1 relay energizes time delay relay 8A 62-27 and relay 8A 27E. Time delay relay 8A 62-27 timer expires it will energize relay 8A 27D.

The Basler relay designated as 7A 47/27-2 Undervoltage function picks up when the voltage level falls below the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 7A 47/27-2 relay energizes time delay relay 7A 62-27 and relay 7A 27E. Time delay relay 7A 62-27 timer expires it will energize relay 7A 27D.

The contacts for 8A 27E and 7A 27E are in series. When both contacts close, provided the generator breaker has been red flagged, and that the generator is not faulted, timer delay

relay 1B 2G1 will be energized. When time delay relay 1B 2G1 has expired a closed contact will be sent to the Kohler Generator board to start the generator. Time delay relay 1B 2G1 will seal itself in once the voltage stable relay 1B 59G1B has been energized.

The Generator control board provides a Generator running contact that energizes relay 1A 94G1A.

With the closed contact from the relay 7A 27D, and provided the generator breaker has been red flagged, and the line connected to breaker main 1 is indicated to have an undervoltage condition, provided by a contact from relay 8A 27E, then the generator running contact provided by a contact from 1A 94G1A will complete the trip string and breaker main 2 will open.

The Basler relay designated as 1B 47/27-3 Normal voltage function picks up when the voltage level rises above the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 1B 47/27-3 relay closes, and provided that both breaker main 1 and main 2 are open, utilizing 52b contacts, energizes time delay relay 1B 59G1A. Time delay relay 1B 59G1A timer expires it will energize relay 1B 59G1B.

A contact from 59G1B located in the generator breaker close string will close, and provided that the Generator breaker has been red flagged, both breakers main 1 and main 2 have been opened, and that both bus lockout relays are in the reset position, the Generator breaker will close.

7. Case 4 loss of power to main 1 preferred and main 2 reserve dead

a.) Description

Breaker main 1 has been set as the preferred breaker. Breaker main 1 is closed, Larimore 52 is hot. Breaker main 2 is open, Larimore 56 is already dead. Then Larimore 52, the feed to breaker main 1, goes dead.

b.) Sequence

The Basler relay designated as 8A 47/27-1 Undervoltage function picks up when the voltage level falls below the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 8A 47/27-1 relay energizes time delay relay 8A 62-27 and relay 8A 27E. Time delay relay 8A 62-27 timer expires it will energize relay 8A 27D.

The Basler relay designated as 7A 47/27-2 Undervoltage function has previously picked up. The timer has expired the output of the 7A 47/27-2 relay has energized time delay relay 7A 62-27 and relay 7A 27E. Time delay relay 7A 62-27 timer has expired and has energized relay 7A 27D.

The contacts for 8A 27E and 7A 27E are in series. When both contacts close, provided the generator breaker has been red flagged, and that the generator is not faulted, time delay relay 1B 2G1 will be energized. When time delay relay 1B 2G1 has expired a closed contact will be sent to the Kohler Generator control board to start the generator. Time delay relay 1B 2G1 will seal itself in once the voltage stable relay 1B 59G1B has been energized.

The Generator control board provides a Generator running contact that energizes relay

1A 94G1A.

If breaker main 1 has an undervoltage condition for longer than the time delay relay 8A 62-27, provided by a contact from relay 8A 27D, the generator breaker has been red flagged, and the line connected to breaker main 2 is indicated to have an undervoltage condition, provided by a contact from relay 7A 27E, then the generator running contact provide by a contact from 1A 94G1A will complete the trip string and breaker main 1 will open.

The Basler relay designated as 1B 47/27-3 Normal voltage function picks up when the voltage level rises above the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 1B 47/27-3 relay closes, and provided that both breaker main 1 and main 2 are open, utilizing 52b contacts, energizes time delay relay 1B 59G1A. Time delay relay 1B 59G1A timer expires it will energize relay 1B 59G1B.

A contact from 59G1B located in the generator breaker close string will close will close, and provided that the Generator breaker has been red flagged, both Breakers main 2 and main 1 have been opened, and that both bus lockout relays are in the reset position, the Generator breaker will close.

8. Case 4A loss of power to main 2 preferred and main 1 reserve dead

a.) Description

Breaker main 2 has been set as the preferred breaker. Breaker main 2 is closed, Larimore 56 is hot. Breaker main 1 is open, Larimore 52 is already dead. Then Larimore 56, the feed to breaker main 2, goes dead.

b.) Sequence

The Basler relay designated as 7A 47/27-2 Undervoltage function picks up when the voltage level falls below the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 7A 47/27-2 relay energizes time delay relay 7A 62-27 and relay 7A 27E. Time delay relay 7A 62-27 timer expires it will energize relay 7A 27D.

The Basler relay designated as 8A 47/27-1 Undervoltage function has previously picked up. The timer has expired the output of the 8A 47/27-1 relay has energized time delay relay 8A 62-27 and relay 8A 27E. Time delay relay 8A 62-27 timer has expired and has energized relay 8A 27D.

The contacts for 8A 27E and 7A 27E are in series. When both contacts close, provided the generator breaker has been red flagged, and that the generator is not faulted, time delay relay 1B 2G1 will be energized. When time delay relay 1B 2G1 has expired a closed contact will be sent to the Kohler Generator control board to start the generator. Time delay relay 1B 2G1 will seal itself in once the voltage stable relay 1B 59G1B has been energized.

The Generator control board provides a Generator running contact that energizes relay 1A 94G1A.

If breaker main 2 has an undervoltage condition for longer than the time delay relay 7A 62-27, provided by a contact from relay 7A 27D, the generator breaker has been red flagged, and the line connected to breaker main 1 is indicated to have an undervoltage condition,

provided by a contact from relay 8A 27E, then the generator running contact provide by a contact from 1A 94G1A will complete the trip string and breaker main 2 will open.

The Basler relay designated as 1B 47/27-3 Normal voltage function picks up when the voltage level rises above the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 1B 47/27-3 relay closes, and provided that both breaker main 1 and main 2 are open, utilizing 52b contacts, energizes time delay relay 1B 59G1A. Time delay relay 1B 59G1A timer expires it will energize relay 1B 59G1B.

A contact from 59G1B located in the generator breaker close string will close, and provided that the Generator breaker has been red flagged, both Breakers main 2 and main 1 have been opened, and that both bus lockout relays are in the reset position, the Generator breaker will close.

9. Case 5 main 1 preferred and main 2 reserve goes hot

a.) Description

Breaker main 1 has been set as the preferred breaker. Breaker main 1 is closed, Larimore 52, the feed to main 1, is hot. Breaker main 2 is open, Larimore 56 is dead, then Larimore 56 goes hot.

b.) Sequence

When the line voltage has returned above the dropout voltage of the Basler relay 7A 47/27-2 the normally closed contacts will return to the closed position and energize time delay relay 7A 62-59. After the 7A 62-59 time delay expires it will close its contact and energize Relay 7A 59D.

The contact from 7A 59D located in the trip string for breaker main 1, is blocked by the contact of relay 8A 27D being open, and no operation occurs.

The contact from relay 7A 59D closes in breaker main 1's close string, however this signal is blocked by the 52b contacts internal to breaker main 1 because it is already closed.

10. Case 5A main 2 preferred and main 1 reserve goes hot

a.) Description

Breaker main 2 has been set as the preferred breaker. Breaker main 2 is closed, Larimore 56, the feed to main 2, is hot. Breaker main 1 is open, Larimore 52 is dead, then Larimore 52 goes hot.

b.) Sequence

When the line voltage has returned above the dropout voltage of the Basler relay 8A 47/27-1 the normally closed contacts will return to the closed position and energize time delay relay 8A 62-59. After the 8A 62-59 time delay expires it will close its contact and energize Relay 8A 59D.

The contact from 8A 59D located in the trip string for breaker main 2, is blocked by the contact of relay 7A 27D being open, and no operation occurs.

The contact from relay 8A 59D closes in breaker main 2's close string, however this signal is blocked by the 52b contacts internal to breaker main 2 because it is already closed.

11. Case 6 main 1 preferred and dead, main 1 goes hot

a.) Description

Breaker main 1 has been set as the preferred breaker, breaker main 1 is open because Larimore 52 is dead. Breaker main 2 is closed, Larimore 56, the feed to breaker main 2, is hot. Larimore 52, the feed to breaker main 1, becomes hot.

b.) Sequence

When the line voltage has returned above the dropout voltage of the Basler relay 8A 47/27-1 the normally closed contacts will return to the closed position and energize time delay relay 8A 62-59. After the 8A 62-59 time delay expires it will close its contact and energize Relay 8A 59D. Relay 8A 59D will close a contact that is located in the close string of breaker main 1, and breaker main 1 will close.

When the 52a MOC contact from breaker main 1 closes it will complete the trip string for breaker main 2 and open breaker main 2.

12. Case 6A main 2 preferred and dead, main 2 goes hot

a.) Description

Breaker main 2 has been set as the preferred breaker, breaker main 2 is open because Larimore 56 is dead. Breaker main 1 is closed, Larimore 52, the feed to breaker main 1, is hot. Larimore 56, the feed to breaker main 2, becomes hot.

b.) Sequence

When the line voltage has returned above the dropout voltage of the Basler relay 7A 47/27-2 the normally closed contacts will return to the closed position and energize time delay relay 7A 62-59. After the 7A 62-59 time delay expires it will close its contact and energize Relay 7A 59D. Relay 7A 59D will close a contact that is located in the close string of breaker main 2, and breaker main 2 will close.

When the 52a MOC contact from breaker main 2 closes it will complete the trip string for breaker main 1 and open breaker main 1.

13. Case 7 main 1 is preferred and dead, main 2 is Reserve and closed, main 2 goes dead

a.) Description

Breaker main 2 has been set as the preferred breaker. Breaker main 2 is closed, Larimore 56 is hot. Breaker main 1 is open, Larimore 52 is already dead. Then Larimore 56, the feed to breaker main 2, goes dead.

b.) Sequence

The Basler relay designated as 7A 47/27-2 Undervoltage function picks up when the voltage level falls below the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 7A 47/27-2 relay energizes time delay relay 7A 62-27 and relay 7A 27E. Time delay relay 7A 62-27 timer expires it will energize relay 7A 27D.

The Basler relay designated as 8A 47/27-1 Undervoltage function has previously picked up. The timer has expired the output of the 8A 47/27-1 relay has energized time delay relay 8A 62-27 and relay 8A 27E. Time delay relay 8A 62-27 timer has expired and has energized relay 7A 27D.

The contacts for 8A 27E and 7A 27E are in series. When both contacts close, provided the generator breaker has been red flagged, and that the generator is not faulted, time delay relay 1B 2G1 will be energized. When time delay relay 1B 2G1 has expired a closed contact will be sent to the Kohler Generator control board to start the generator. Time delay relay 1B 2G1 will seal itself in once the voltage stable relay 1B 59G1B has been energized.

The Generator control board provides a Generator running contact that energizes relay 1A 94G1A.

If breaker main 2 has an undervoltage condition for longer than the time delay relay 7A 62-27, provided by a contact from relay 7A 27D, the generator breaker has been red flagged, and the line connected to breaker main 1 is indicated to have an undervoltage condition, provided by a contact from relay 8A 27E, then the generator running contact provide by a contact from 1A 94G1A will complete the trip string and breaker main 2 will open.

The Basler relay designated as 1B 47/27-3 Normal voltage function picks up when the voltage level rises above the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 1B 47/27-3 relay closes, and provided that both breaker main 1 and main 2 are open, utilizing 52b contacts, energizes time delay relay 1B 59G1A. Time delay relay 1B 59G1A timer expires it will energize relay 1B 59G1B.

A contact from 59G1B located the generator breaker close string will close, and provided that the Generator breaker has been red flagged, both Breakers main 2 and main 1 have been opened, and that both bus lockout relays are in the reset position, the Generator breaker will close.

14. Case 7A main 2 is preferred and dead, main 1 is reserve and closed, main 1 goes dead

a.) Description

Breaker main 1 has been set as the preferred breaker. Breaker main 1 is closed, Larimore 52 is hot. Breaker main 2 is open, Larimore 56 is already dead. Then Larimore 52, the feed to breaker main 1, goes dead.

b.) Sequence

The Basler relay designated as 8A 47/27-1 Undervoltage function picks up when the voltage level falls below the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 8A 47/27-1 relay energizes time delay relay 8A 62-27 and relay 8A 27E. Time delay relay 8A 62-27 timer expires it will energize relay 8A 27D.

The Basler relay designated as 7A 47/27-2 Undervoltage function has previously picked up. The timer has expired the output of the 7A 47/27-2 relay has energized time delay relay 7A 62-27 and relay 7A 27E. Time delay relay 7A 62-27 timer has expired and has energized

relay 8A 27D.

The contacts for 8A 27E and 7A 27E are in series. When both contacts close, provided the generator breaker has been red flagged, and that the generator is not faulted, time delay relay 1B 2G1 will be energized. When time delay relay 1B 2G1 has expired a closed contact will be sent to the Kohler Generator control board to start the generator. Time delay relay 1B 2G1 will seal itself in once the voltage stable relay 1B 59G1B has been energized.

The Generator control board provides a Generator running contact that energizes relay 1A 94G1A.

If breaker main 1 has an undervoltage condition for longer than the time delay relay 8A 62-27, provided by a contact from relay 8A 27D, the generator breaker has been red flagged, and the line connected to breaker main 2 is indicated to have an undervoltage condition, provided by a contact from relay 7A 27E, then the generator running contact provide by a contact from 1A 94G1A will complete the trip string and breaker main 1 will open.

The Basler relay designated as 1B 47/27-3 Normal voltage function picks up when the voltage level rises above the percentage as set. The pickup initiates a time delay internal to the relay. When the timer has expired the output of the 1B 47/27-3 relay closes, and provided that both breaker main 1 and main 2 are open, utilizing 52b contacts, energizes time delay relay 1B 59G1A. Time delay relay 1B 59G1A timer expires it will energize relay 1B 59G1B.

A contact from 59G1B located in the generator breaker close string will close, and provided that the Generator breaker has been red flagged, both Breakers main 2 and main 1 have been opened, and that both bus lockout relays are in the reset position, the Generator breaker will close.

15. Case 8 On Generator, main 1 is preferred, main 1 line goes hot

a.) Description

Breaker main 1 has been set as the preferred breaker. Breaker main 1 is open, Larimore 52 is dead. Breaker main 2 is open, Larimore 56 is dead. The facility is running on the generator, then Larimore 52, the feed to breaker main 1, goes hot.

b.) Sequence

When the line voltage has returned above the dropout voltage of the Basler relay 8A 47/27-1 the normally closed contacts will return to the closed position and energize time delay relay 8A 62-59. The normally open contacts will return to their open state and de-energize 8A 62-27, 8A 27D, and 8A 27E. After the 8A 62-59-time delay expires it will close its contact and energize Relay 8A 59D. Relay 8A 59D will close a contact that is in the close string of breaker main 1. The close command will be blocked by a 52b contact from the generator breaker and routed through a generator breaker 52a contact to relay 8B 5A, the Generator breaker open command relay.

The normally open contact for 8A 27E located in the generator start string will open and interrupt the normal path to energize 1B 2G1. 1B 2G1 will however stay latched in thru its seal in circuit until it is interrupted by the 1B 5G1A, Generator trip/shutdown relay.

A contact from relay 8B 5A goes closed and initiates the time 1B 62G1, Generator stop

delay. When the 1B 62G1 preset time has elapsed a normally open contact will go closed and energize relay 1B 5G1A the generator trip/shutdown relay. The normally closed contact of 5G1A located in the string of the 1B 2G1 generator start time delay relay, will then open and interrupt the seal in latch. The closed contact that provides the run command signal to the generator control board will go open, and the generator will go into cooldown mode.

A second normally open contact of 5G1A, located in the trip string of the generator breaker, will close causing the generator breaker to open. When the Generator breaker opens the 52b contact located in the main 1 close string will close completing the close circuit and breaker main 1 will close.

If, at any time during the countdown of timer 1B 62G1, the line Larimore 52 goes dead, the healthy voltage contact from the 8A 47/27-1 will open and the 8A 62-59 voltage healthy time delay and the 8A 59D voltage healthy relay will de-energize. This will cause the contacts of 8A 59D located in the close string of breaker main 1 to go open, and remove the signal, that keeps 1B 62G1 energized. This will halt and reset the countdown of timer 1B 62G1 allowing the generator to continue to supply the facility.

16. Case 8A On Generator, main 2 is preferred, main 2 line goes hot

a.) Description

Breaker main 2 has been set as the preferred breaker. Breaker main 2 is open, Larimore 56 is dead. Breaker main 1 is open, Larimore 52 is dead. The facility is running on the generator, then Larimore 56, the feed to breaker main 2, goes hot.

b.) Sequence

When the line voltage has returned above the dropout voltage of the Basler relay 7A 47/27-2 the normally closed contacts will return to the closed position and energize time delay relay 7A 62-59. The normally open contacts will return to their open state and de-energize 7A 62-27, 7A 27D, and 7A 27E. After the 7A 62-59-time delay expires it will close its contact and energize Relay 7A 59D. Relay 7A 59D will close a contact that is located in the close string of breaker main 2. The close command will be blocked by a 52b contact from the generator breaker and routed through a generator breaker 52a contact to relay 8B 5A, the Generator breaker open command relay.

The normally open contact for 7A 27E located in the generator start string will open and interrupt the normal path to energize 1B 2G1. 1B 2G1 will however stay latched in thru its seal in circuit until it is interrupted by the 1B 5G1A, Generator trip/shutdown relay.

A contact from relay 7B 5A goes closed and initiates the time 1B 62G1, Generator stop delay. When the 1B 62G1 preset time has elapsed a normally open contact will go closed and energize relay 1B 5G1A the generator trip/shutdown relay. The normally closed contact of 5G1A located in the string of the 1B 2G1 generator start time delay relay, will then open and interrupt the seal in latch. The closed contact that provides the run command signal to the generator control board will go open, and the generator will go into cooldown mode.

A second normally open contact of 5G1A, located in the trip string of the generator breaker, will close causing the generator breaker to open. When the Generator breaker opens the 52b contact located in the main 2 close string will close completing the close circuit and breaker

main 2 will close.

If, at any time during the countdown of timer 1B 62G1, the line Larimore 56 goes dead, the healthy voltage contact from the 7A 47/27-2 will open and the 7A 62-59 voltage healthy time delay and the 7A 59D voltage healthy relay will de-energize. This will cause the contacts of 7A 59D located in the close string of breaker main 2 to go open, and remove the signal, that keeps 1B 62G1 energized. This will halt and reset the countdown of timer 1B 62G1 allowing the generator to continue to supply the facility.

17. Case 9 On Generator, main 1 is preferred, main 2 reserve line goes hot

a.) Description

Breaker main 1 has been set as the preferred breaker. Breaker main 1 is open, Larimore 52 is dead. Breaker main 2 is open, Larimore 56 is dead. The facility is running on the generator, then Larimore 56, the feed to breaker main 2, goes hot.

b.) Sequence

When the line voltage has returned above the dropout voltage of the Basler relay 7A 47/27-2 the normally closed contacts will return to the closed position and energize time delay relay 7A 62-59. The normally open contacts will return to their open state and de-energize 7A 62-27, 7A 27D, and 7A 27E. After the 7A 62-59-time delay expires it will close its contact and energize Relay 7A 59D. Relay 7A 59D will close a contact that is located in the close string of breaker main 2. The close command will be blocked by a 52b contact from the generator breaker and routed through a generator breaker 52a contact to relay 7B 5A, the Generator breaker open command relay.

The normally open contact for 7A 27E located in the generator start string will open and interrupt the normal path to energize 1B 2G1. 1B 2G1 will however stay latched in thru its seal in circuit until it is interrupted by the 1B 5G1A, Generator trip/shutdown relay.

A contact from relay 7B 5A goes closed and initiates the time 1B 62G1, Generator stop delay. When the 1B 62G1 preset time has elapsed a normally open contact will go closed and energize relay 1B 5G1A the generator trip/shutdown relay. The normally closed contact of 5G1A located in the string of the 1B 2G1 generator start time delay relay, will then open and interrupt the seal in latch. The closed contact that provides the run command signal to the generator control board will go open, and the generator will go into cooldown mode.

A second normally open contact of 5G1A, located in the trip string of the generator breaker, will close causing the generator breaker to open. When the Generator breaker opens the 52b contact located in the main 2 close string will close completing the close circuit and breaker main 2 will close.

If, at any time during the countdown of timer 1B 62G1, the line Larimore 52 goes dead, the healthy voltage contact from the 7A 47/27-2 will open, the 7A 62-59 voltage healthy time delay and the 7A 59D voltage healthy relay will de-energize. This will cause the contacts of 7A 59D located in the close string of breaker main 2 to go open, and remove the signal, that keeps 1B 62G1 energized. This will halt and reset the countdown of timer 1B 62G1 allowing the

generator to continue to supply the facility.

18. Case 9A On Generator, main 2 is preferred, main 1 reserve line goes hot

a.) Description

Breaker main 2 has been set as the preferred breaker. Breaker main 2 is open, Larimore 56 is dead. Breaker main 1 is open, Larimore 52 is dead. The facility is running on the generator, then Larimore 52, the feed to breaker main 1, goes hot.

b.) Sequence

When the line voltage has returned above the dropout voltage of the Basler relay 8A 47/27-1 the normally closed contacts will return to the closed position and energize time delay relay 8A 62-59. The normally open contacts will return to their open state and de-energize 8A 62-27, 8A 27D, and 8A 27E. After the 8A 62-59-time delay expires it will close its contact and energize Relay 8A 59D. Relay 8A 59D will close a contact that is located in the close string of breaker main 1. The close command will be blocked by a 52b contact from the generator breaker and routed through a generator breaker 52a contact to relay 8B 5A, the Generator breaker open command relay.

The normally open contact for 8A 27E located in the generator start string will open and interrupt the normal path to energize 1B 2G1. 1B 2G1 will however stay latched in thru its seal in circuit until it is interrupted by the 1B 5G1A, Generator trip/shutdown relay.

A contact from relay 8B 5A goes closed and initiates the time 1B 62G1, Generator stop delay. When the 1B 62G1 preset time has elapsed a normally open contact will go closed and energize relay 1B 5G1A the generator trip/shutdown relay. The normally closed contact of 5G1A located in the string of the 1B 2G1 generator start time delay relay, will then open and interrupt the seal in latch. The closed contact that provides the run command signal to the generator control board will go open, and the generator will go into cooldown mode.

A second normally open contact of 5G1A, located in the trip string of the generator breaker, will close causing the generator breaker to open. When the Generator breaker opens the 52b contact located in the main 1 close string will close completing the close circuit and breaker main 1 will close.

If, at any time during the countdown of timer 1B 62G1, the line Larimore 56 goes dead, the healthy voltage contact from the 7A 47/27-2 will open and the 7A 62-59 voltage healthy time delay and the 7A 59D voltage healthy relay will de-energize. This will cause the contacts of 7A 59D located in the close string of breaker main 2 to go open, and remove the signal, that keeps 1B 62G1 energized. This will halt and reset the countdown of timer 1B 62G1 allowing the generator to continue to supply the facility.

19. Case 10 On Generator, main 1 is preferred, both lines hot

a.) Description

Breaker main 1 has been set as the preferred breaker. Breaker main 1 is open, Larimore 52 is dead. Breaker main 2 is open, Larimore 56 is dead. The facility is running on the generator, then Larimore 56 and Larimore 52 go hot simultaneously.

b.) Sequence

When the line voltage has returned above the dropout voltage of the Basler relay 8A 47/27-1 the normally closed contacts will return to the closed position and energize time delay relay 8A 62-59. The normally open contacts will return to their open state and de-energize 8A 62-27, 8A 27D, and 8A 27E. After the 8A 62-59-time delay expires it will close its contact and energize Relay 8A 59D. Relay 8A 59D will close a contact that is in the second close string of breaker main 1. The close command will be blocked by a 52b contact from the generator breaker and routed through a generator breaker 52a contact to relay 8B 5A, the Generator breaker open command relay.

Simultaneously Basler relay 7A 47/27-2 the normally closed contacts will return to the closed position and energize time delay relay 7A 62-59. The normally open contacts will return to their open state and de-energize 7A 62-27, 7A 27D, and 7A 27E. After the 7A 62-59 time delay expires it will close its contact and energize Relay 7A 59D. Relay 7A 59D will close a contact that is in the second close string of breaker main 2 and a contact in the third close string of breaker main 2. The close command from the second string will be blocked by an open contact from the preferred/reserve selector switch located ahead of the 7A 59D relay. The close command from the third close string will be blocked by the 8A 27E contact being open.

The normally open contacts for 8A 27E and 7A 27E located in the generator start string will open and interrupt the normal path to energize 1B 2G1. 1B 2G1 will however stay latched in thru its seal in circuit until it is interrupted by the 1B 5G1A, Generator trip/shutdown relay.

A contact from relay 8B 5A goes closed and initiates the time 1B 62G1, Generator stop delay. When the 1B 62G1 preset time has elapsed a normally open contact will go closed and energize relay 1B 5G1A the generator trip/shutdown relay. The normally closed contact of 5G1A located in the string of the 1B 2G1 generator start time delay relay, will then open and interrupt the seal in latch. The closed contact that provides the run command signal to the generator control board will go open, and the generator will go into cooldown mode.

A second normally open contact of 5G1A, located in the trip string of the generator breaker, will close causing the generator breaker to open. When the Generator breaker opens the 52b contact located in the main 1 close string will close completing the close circuit and breaker main 1 will close.

If, at any time during the countdown of timer 1B 62G1, the line Larimore 52 goes dead, the healthy voltage contact from the 8A 47/27-1 will open, the 8A 62-59 voltage healthy time delay and the 8A 59D voltage healthy relay will de-energize. This will cause the contacts of 8A 59D located in the close string of breaker main 1 to go open, and remove the signal, that keeps 1B 62G1 energized. At the same time, the contact from 8A 27E located in the breaker main 2 third close string will close issuing a close command to breaker main 2. The close command will be blocked by a 52b contact from the generator breaker and routed through a generator breaker 52a contact to relay main 2 5A, the Generator breaker open command relay.

A contact from relay main 2 5A goes closed and initiates the time 1B 62G1, Generator stop delay. When the 1B 62G1 preset time has elapsed a normally open contact will go closed and energize relay 1B 5G1A the generator trip/shutdown relay. The normally closed contact of 5G1A located in the string of the 1B 2G1 generator start time delay relay, will then open and

interrupt the seal in latch. The closed contact that provides the run command signal to the generator control board will go open, and the generator will go into cooldown mode.

A second normally open contact of 5G1A, located in the trip string of the generator breaker, will close causing the generator breaker to open. When the Generator breaker opens the 52b contact located in the main 2 close string will close completing the close circuit and breaker main 2 will close.

20. Case 10A On Generator, main 2 is preferred, both lines hot

a.) Description

Breaker main 2 has been set as the preferred breaker. Breaker main 2 is open, Larimore 56 is dead. Breaker main 1 is open, Larimore 52 is dead. The facility is running on the generator, then Larimore 52 and Larimore 56 go hot simultaneously.

b.) Sequence

When the line voltage has returned above the dropout voltage of the Basler relay 7A 47/27-2 the normally closed contacts will return to the closed position and energize time delay relay 7A 62-59. The normally open contacts will return to their open state and de-energize 7A 62-27, 7A 27D, and 7A 27E. After the 7A 62-59-time delay expires it will close its contact and energize Relay 7A 59D. Relay 7A 59D will close a contact that is in the second close string of breaker main 2. The close command will be blocked by a 52b contact from the generator breaker and routed through a generator breaker 52a contact to relay 7B 5A, the Generator breaker open command relay.

Simultaneously Basler relay 8A 47/27-1 the normally closed contacts will return to the closed position and energize time delay relay 8A 62-59. The normally open contacts will return to their open state and de-energize 8A 62-27, 8A 27D, and 8A 27E. After the 8A 62-59 time delay expires it will close its contact and energize Relay 8A 59D. Relay 8A 59D will close a contact that is in the second close string of breaker main 1 and a contact in the third close string of breaker main 1. The close command from the second string will be blocked by an open contact from the preferred/reserve selector switch located ahead of the 8A 59D relay. The close command from the third close string will be blocked by the 7A 27E contact being open.

The normally open contacts for 8A 27E and 7A 27E located in the generator start string will open and interrupt the normal path to energize 1B 2G1. 1B 2G1 will however stay latched in thru its seal in circuit until it is interrupted by the 1B 5G1A, Generator trip/shutdown relay.

A contact from relay 7B 5A goes closed and initiates the time 1B 62G1, Generator stop delay. When the 1B 62G1 preset time has elapsed a normally open contact will go closed and energize relay 1B 5G1A the generator trip/shutdown relay. The normally closed contact of 5G1A located in the string of the 1B 2G1 generator start time delay relay, will then open and interrupt the seal in latch. The closed contact that provides the run command signal to the generator control board will go open, and the generator will go into cooldown mode.

A second normally open contact of 5G1A, located in the trip string of the generator breaker, will close causing the generator breaker to open. When the Generator breaker opens the 52b contact located in the main 2 close string will close completing the close circuit and breaker main 2 will close.

If, at any time during the countdown of timer 1B 62G1, the line Larimore 56 goes dead, the healthy voltage contact from the 7A 47/27-2 will open, the 7A 62-59 voltage healthy time delay and the 7A 59D voltage healthy relay will de-energize. This will cause the contacts of 7A 59D located in the close string of breaker main 2 to go open, and remove the signal, that keeps 1B 62G1 energized. At the same time, the contact from 7A 27E located in the breaker main 1 third close string will close issuing a close command to breaker main 1. The close command will be blocked by a 52b contact from the generator breaker and routed through a generator breaker 52a contact to relay 8B 5A, the Generator breaker open command relay.

A contact from relay 8B 5A goes closed and initiates the time 1B 62G1, Generator stop delay. When the 1B 62G1 preset time has elapsed a normally open contact will go closed and energize relay 1B 5G1A the generator trip/shutdown relay. The normally closed contact of 5G1A located in the string of the 1B 2G1 generator start time delay relay, will then open and interrupt the seal in latch. The closed contact that provides the run command signal to the generator control board will go open, and the generator will go into cooldown mode.

A second normally open contact of 5G1A, located in the trip string of the generator breaker, will close causing the generator breaker to open. When the Generator breaker opens the 52b contact located in the main 1 close string will close completing the close circuit and breaker main 1 will close.

21. Case 11 Preferred breaker selection changed from main 1 to main 2

a.) Description

Breaker main 1 has been set as the preferred breaker and is closed. Breaker main 2 is the reserve and open. The operator changes the 43 selector switch to make breaker main 2 the preferred breaker. (Note: The key that allows operation of the 43 selector switch is inside an Ameren Missouri lock box. Only Ameren can perform this operation.)

b.) Sequence

When the operator moves the 43 selector switch to the main 2 position the closed contact in the second close string of breaker main 1 opens and interrupts the main 1 close circuit. As the selector switch is moved thru the center position a contact will close. This contact will energize relay 8A 94M. A normally closed contact from relay 8A 94M in the voltage healthy string will open and de-energize time delay relay 8A 62-59, relay 8A 59D and 7A 62-59, relay 7A 59D. When the selector switch moves out of the center position and into the position of main 2, the relay 8A 94M will de-energize, and the normally closed contact in the voltage healthy strings of 8A 62-59 and 7A 62-59 will close and both timers will begin to time. A separate contact from the selector switch located in the second trip string of breaker main 1 will close, but the trip to breaker main 1 will be blocked until breaker main 2 closes.

After the 7A 62-59-time delay expires it will close its contact and energize Relay 7A 59D. Relay 7A 59D will close a contact that is in the second close string of breaker main 2. The breaker main 2 will then close.

In the second trip string of breaker main 1, the 52a contact of main 2 will close. This will complete the trip string and breaker main 1 will open.

22. Case 11A Preferred breaker selection changed from main 2 to main 1

a.) Description

Breaker main 2 has been set as the preferred breaker and is closed. Breaker main 1 is the reserve and open. The operator changes the 43 selector switch to make breaker main 1 the preferred breaker. (Note: The key that allows operation of the 43 selector switch is inside an Ameren Missouri lock box. Only Ameren can perform this operation.)

b.) Sequence

When the operator moves the 43 selector switch to the main 1 position the closed contact in the second close string of breaker main 2 opens and interrupts the main 2 close circuit. As the selector switch is moved thru the center position a contact will close. This contact will energize relay 8A 94M. A normally closed contact from relay 8A 94M in the voltage healthy string will open and de-energize time delay relay 8A 62-59, relay 8A 59D and 7A 62-59, relay 7A 59D. When the selector switch moves out of the center position and into the position of Main 1, the relay 8A 94M will de-energize, and the normally closed contact in the voltage healthy stings of 8A 62-59 and 7A 62-59 will close and both timers will begin to time. A separate contact from the selector switch located in the second trip string of breaker Main 1 will close, but the trip to breaker Main 2 will be blocked until breaker Main 1 closes.

After the 7A 62-59-time delay expires it will close its contact and energize Relay 7A 59D. Relay 7A 59D will close a contact that is in the second close string of breaker main 1. The breaker main 1 will then close.

In the second trip string of breaker 2, the 52a contact of breaker 1 will close. This will complete the trip string and breaker 2 will open.

23. Case 12 Preferred breaker selection changed from manual to main 1

a.) Description

The system has been placed into manual using the 43 selector switch. Both main 1 and main 2 breakers are closed. The operator changes the 43 selector switch from manual to main 1 as the preferred breaker. (Note: The key that allows operation of the 43 selector switch is inside an Ameren Missouri lock box. Only Ameren can perform this operation.)

b.) Sequence

Within the second trip string of breaker main 2 are a 52a contact from main 1 and main 2. These contacts are both closed. When the operator moves the 43 selector switch to the main 1 as the preferred source position, the contact from the switch in series in the second trip coil of main 2 will close and complete the trip string, opening main 2. Main 1's trip string is blocked by an open contact from the 43 selector switch that is only closed when main 2 is selected as the preferred source.

24. Case 12A Preferred breaker selection changed from manual to main 2

a.) Description

The system has been placed into manual using the 43 selector switch. Both main 1 and

main 2 breakers are closed. The operator changes the 43 selector switch from manual to main 2 as the preferred breaker. (Note: The key that allows operation of the 43 selector switch is inside an Ameren Missouri lock box. Only Ameren can perform this operation.)

b.) Sequence

Within the second trip string of breaker main 1 are a 52a contact from main 1 and main 2. These contacts are both closed. When the operator moves the 43 selector switch to the main 2 as the preferred source position, the contact from the switch in series in the second trip coil of main 1 will close and complete the trip string, opening main 1. Main 2's trip string is blocked by an open contact from the 43 selector switch that is only closed when main 1 is selected as the preferred source.

25. Manual operation

a.) Instructions

1.) Place the 43 preferred source selector switch into the center manual position. (Note: The key that allows operation of the 43 selector switch is inside an Ameren Missouri lock box. Only Ameren can perform this operation.)
2.) The 52 CS breaker control switches for main 1 and main 2 can now be used to operate the breakers.
3.) Neither of the main breakers can be closed in manual if the generator breaker is closed, because of the 52b contacts from the generator breaker located in the close string of the main breakers.
4.) The 52 CS breaker control switch for the generator breaker can be closed only if both main breakers are open. This is prevented by a 52b contact from main 1 and main 2 located in series in the close string of the generator breaker.

b.) Sequence

When the operator moves the 43 selector switch to the manual position, a contact from the switch will close in close string 1 of main breaker 1 and main breaker 2. This close signal will then be blocked by a normally open contact from the respective 52 CS. When the operator moves the control switch to the closed position the contact will close. Provided that both lockout relays are in the reset position and that the generator breaker is open, the main will then close.

26. Transfer Testing 1

a.) Description

Breaker main 1 has been set as the preferred breaker and is closed. Breaker main 2 is the reserve and open. The operator desires to test the transfer to main 2. (Note: This is a supervised testing and not to be used as permanent transfer to the alternate source.)

b.) Instructions

1.) Place the 43T generator/normal selector switch into the normal position.
2.) Press the transfer test push button.
3.) When testing is complete place the 43T selector switch back into the off position.

c.) Sequence

When the operator moves the 43T selector switch to the normal position, a contact from the switch will close in the test circuit and allow control power to the terminals of the transfer test push button.

The 43 selector switch preferred breaker is in the position of main 1, it provides a closed contact and energizes the relay 94M1. Relay 94M1's normally open contact located in the control string for coil 94M1A will close.

When the transfer test push button is pressed it will be routed thru the 94M1 contact and energize relay 94M1A. The relay 94M1A has a normally open contact in its own circuit to seal itself in. This seal in circuit will keep 94M1A energized until either the 43T selector switch is moved back into the off position, or the normally closed contact from the undervoltage relay 7A 27E opens indicating a failure in the source supplying breaker main 2.

The normally open contact, of relay 94M1A located in parallel with the 8A 47/27-1 undervoltage contacts will go closed and energize 8A 62-27, 8A 27D, and 8A 27E. A normally closed contact located in the control string of the voltage healthy timer and relay will open and de-energize 8A 62-59 and 8A 59D. The equipment will then proceed to operate as described in Case 1.

While operating in this mode if Larimore 56 goes dead, the Basler relay designated as 7A 47/27-2 Undervoltage will pickup. The output of the 7A 47/27-2 relay has energized time delay relay 7A 62-27 and relay 7A 27E. The normally closed contact of relay 7A 27E located in the control circuit of the 94M1A will open and interrupt the latch sealing in 94M1A. The switchgear will then revert to normal operation and transfer back to main 1.

If Larimore 52 goes dead, the status of the switchgear will not change since Larimore 56 is still hot.

If both feeds to the switchgear go dead, the Basler relay designated as 7A 47/27-2 Undervoltage will pickup. The output of the 7A 47/27-2 relay has energized time delay relay 7A 62-27 and relay 7A 27E. The normally closed contact of relay 7A 27E located in the control circuit of the 94M1A will open and interrupt the latch sealing in 94M1A. The switchgear will then revert to normal operation as described in Case 3.

27. Transfer Testing 2

a.) Description

Breaker main 2 has been set as the preferred breaker and is closed. Breaker main 1 is the reserve and open. The operator desires to test the transfer to main 1. (Note: This is a supervised testing and not to be used as permanent transfer to the alternate source.)

b.) Instructions

1.) Place the 43T generator/normal selector switch into the normal position.
2.) Press the transfer test push button.
3.) When testing is complete place the 43T selector switch back into the off position.

c.) Sequence

When the operator moves the 43T selector switch to the normal position, a contact from the switch will close in the test circuit and allow control power to the terminals of the transfer test push button.

The 43 selector switch preferred breaker is in the position of main 2, it provides a closed contact and energize the relay 94M2. Relay 94M2s normally open contact located in the control string for coil 94M2A will close.

When the transfer test push button is pressed it will be routed thru the 94M2 contact and energize relay 94M2A. The relay 94M2A has a normally open contact in its own circuit to seal itself in. This seal in circuit will keep 94M2A energized until either the 43T selector switch is moved back into the off position, or the normally closed contact from the undervoltage relay 8A 27E opens indicating a failure in the source supplying breaker main 1.

The normally open contact, of relay 94M2A located in parallel with the 7A 47/27-2 undervoltage contacts will go closed and energize 7A 62-27, 7A 27D, and 7A 27E. A normally closed contact located in the control string of the voltage healthy timer and relay will open and de-energize 7A 62-59 and 7A 59D. The equipment will then proceed to operate as described in Case 1A.

While operating in this mode if Larimore 52 goes dead, the Basler relay designated as 8A 47/27-1 Undervoltage will pickup. The output of the 8A 47/27-1 relay has energized time delay relay 8A 62-27 and relay 8A 27E. The normally closed contact of relay 8A 27E located in the control circuit of the 94M2A will open, and interrupt the latch sealing in 94M2A

If Larimore 56 goes dead, the status of the switchgear will not change since Larimore 52 is still hot.

If both feeds to the switchgear go dead, the Basler relay designated as 8A 47/27-1 Undervoltage will pickup. The output of the 8A 47/27-1 relay has energized time delay relay 8A 62-27 and relay 8A 27E. The normally closed contact of relay 8A 27E located in the control circuit of the 94M2A will open and interrupt the latch sealing in 94M2A. The switchgear will then revert to normal operation as described in Case 3.

28. Transfer Testing 3

a.) Description

Either main breaker has been set as the preferred breaker and is closed. The operator desires to test the transfer to the generator. (Note: This is a supervised testing and not to be used as permanent transfer to the generator source.)

b.) Instructions

1.) Place the 43T generator/normal selector switch into the generator position.
2.) Press the transfer test push button.
3.) When testing is complete place the 43T selector switch back into the off position.

c.) Sequence

When the operator moves the 43T selector switch to the generator position, a contact

from the switch will close in the test circuit and allow control power to the terminals of the transfer test push button.

When the transfer test push button is pressed it will energize relay 94GA. The relay 94GA has a normally open contact in its own circuit to seal itself in. This seal in circuit will keep 94M2A energized until the 43T selector switch is moved back into the off position. A normally open contact of 94GA located in the control string of relay 94M1A and 94M2A will close and energize both relays.

The normally open contact, of relay 94M1A located in parallel with the 8A 47/27-1 undervoltage contacts will go closed and energize 8A 62-27, 8A 27D, and 8A 27E. A normally closed contact located in the control string of the voltage healthy timer and relay will open and de-energize 8A 62-59 and 8A 59D.

The normally open contact, of relay 94M2A located in parallel with the 7A 47/27-2 undervoltage contacts will go closed and energize 7A 62-27, 7A 27D, and 7A 27E. A normally closed contact located in the control string of the voltage healthy timer and relay will open and de-energize 7A 62-59 and 7A 59D.

The equipment will then proceed to operate in the manner described in case 3.

d.) Loss of power to preferred feed

If the utility feed to the preferred main goes dead while in this operating mode, no change will occur, as both the 8A & 7A 62-27 and 27D relays will already be energized, and the voltage healthy relays 8A & &A 62-59 and 59D relays will already be de-energized. The system will continue to run on the generator until the operator places the 43T generator/normal switch back to the off position.

e.) Loss of power to reserve feed

If the utility feed to the reserve main goes dead while in this operating mode, no change will occur, as both the 8A & 7A 62-27 and 27D relays will already be energized, and the voltage healthy relays 8A & &A 62-59 and 59D relays will already be de-energized. The system will continue to run on the generator until the operator places the 43T generator/normal switch back to the off position.

f.) Generator fails to start

In the event the Generator fails to start, the normally open contact 94G1A, indicating the generator is running, located in the third trip strings of both main 1 and main 2 will remain open and prevent the trip string from completing and opening the preferred breaker.

g.) Generator faults

If the generator fails the normally open contact from the Generator fault relay F1, located inside of the generator control panel, will close and energize relay 5G1A. Then normally closed contact from 5G1A located in the generator start circuit will open and interrupt the generator start circuit. A normally open contact from relay 5G1A located in the trip string of the generator breaker will close and the generator breaker will open.

If breaker main 1 is selected as the preferred breaker, when the generator breaker opens, the 52a contacts located in the main 1 breaker close string will open and prevent the

energization of the 8A 5A Gen breaker open command relay. The 62G1 time delay relay will not be energized, as the generator has already been shut down and the generator breaker has already been opened by the 5G1A relay. The 52b normally closed contact located in the same close string will return to the closed state, completing the circuit.

The operator will be required to move the 43T generator/normal selector switch to the off position. The normally open contacts will return to their open state and de-energize 8A 62-27, 8A 27D, and 8A 27E. After the 8A 62-59-time delay expires it will close its contact and energize Relay 8A 59D. Relay 8A 59D will close a contact that is in the second close string of breaker main 1. The close command will no longer be blocked by a 52b contact from the generator breaker and breaker main 1 will close.

If breaker main 2 is selected as the preferred breaker, when the generator breaker opens, the 52a contacts located in the main 2 breaker close string will open and prevent the energization of the 7A 5A Gen breaker open command relay. The 62G1 time delay relay will not be energized, as the generator has already been shut down and the generator breaker has already been opened by the 5G1A relay. The 52b normally closed contact located in the same close string will return to the closed state, completing the circuit.

The operator will be required to move the 43T generator/normal selector switch to the off position. The normally open contacts will return to their open state and de-energize 7A 62-27, 7A 27D, and 7A 27E. After the 7A 62-59-time delay expires it will close its contact and energize Relay 7A 59D. Relay 7A 59D will close a contact that is in the second close string of breaker main 1. The close command will no longer be blocked by a 52b contact from the generator breaker and breaker main 1 will close.

h.) Generator 480V breaker opens

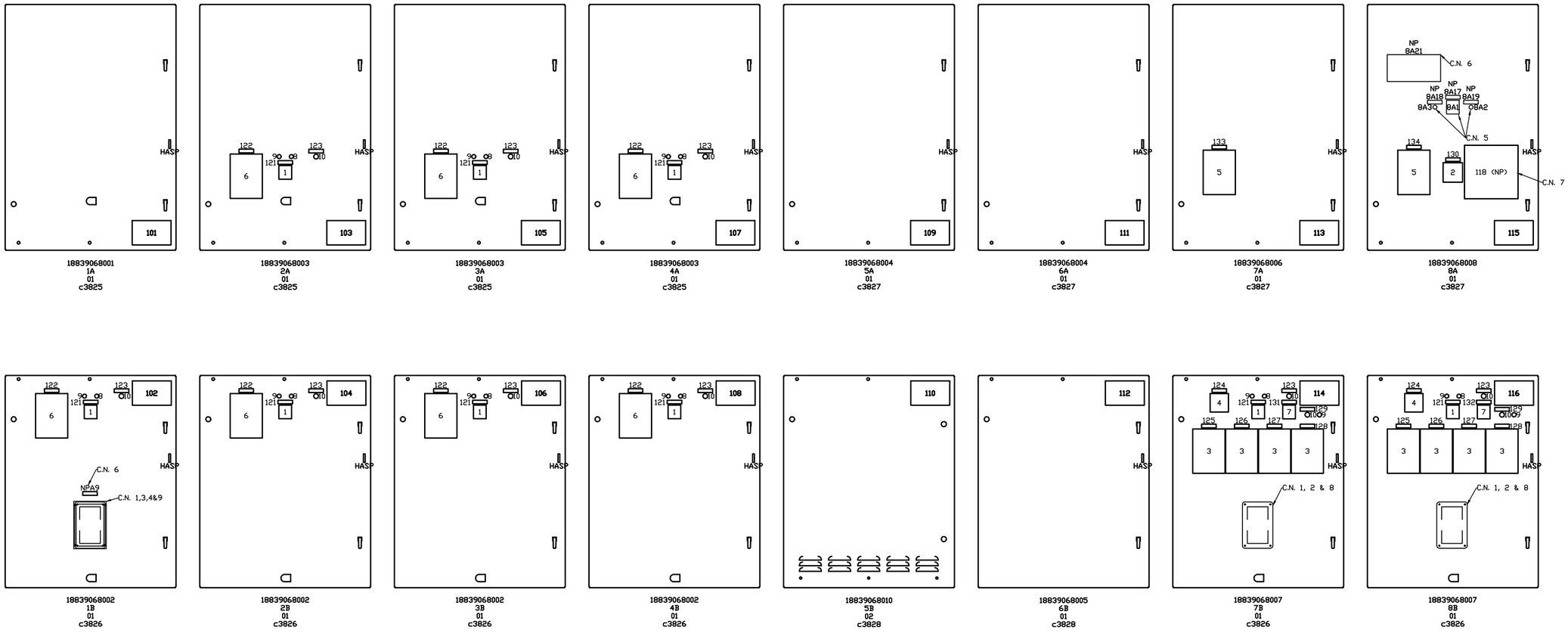
If the generator 480V generator output circuit breaker trips or is manually opened, no transfer occurs, as this status is not monitored by the ATS scheme. The operator will be required to move the 43T generator/normal selector switch to the off position. If the Operator does not wish to wait for the generator shutdown timer 62G1 to expire the generator breaker can be manually opened using the 52CS.

EPS Engineering & Design
A Division of Electric Power Systems International, Inc.

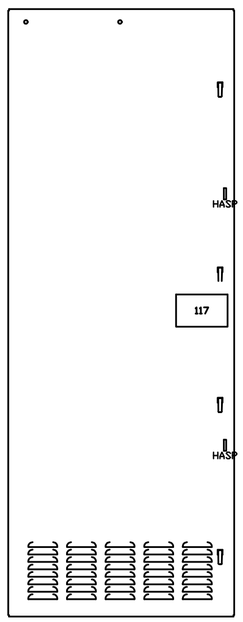
DSG18081 - ASCHINGER ELECTRIC BHC DRAWING INDEX

Record Drawings

DWG NO.	REMOVAL/INSTALL	REVISION	DRAWING TITLE
18839068460	INSTALL	07	PANEL ARRANGEMENT DRAWING
MVS04-110204NP02A	INSTALL	06	NAMEPLATE DRAWING
MVS04-110204SC01C	INSTALL	08	SCHEMATIC DIAGRAM SECTION 1 TIE TO GENERATOR
MVS04-110204SC02C	INSTALL	07	SCHEMATIC DIAGRAM SECTION 2 FEEDER 3A SWITCH-10 FEEDER 3B SWITCH-15
MVS04-110204SC03C	INSTALL	07	SCHEMATIC DIAGRAM SECTION 3 FEEDER 2A SWITCH-5 FEEDER 2B SWITCH-9
MVS04-110204SC04C	INSTALL	07	SCHEMATIC DIAGRAM SECTION 4 FEEDER 1A SWITCH-4 FEEDER 1B SWITCH-1
MVS04-110204SC05C	INSTALL	08	SCHEMATIC DIAGRAM SECTION 7 MAIN BREAKER AMEREN RESERVE LAT. 25384
MVS04-110204SC06C	INSTALL	08	SCHEMATIC DIAGRAM SECTION 8 MAIN BREAKER AMEREN PREFERRED LAT. 25385
MVS04-110204TL01C	INSTALL	08	THREE LINE SECTION 1 SPARE TIE TO GENERATOR
MVS04-110204TL07C	INSTALL	07	THREE LINE SECTION 7 RESERVE INCOMING LINE VT'S MAIN BREAKER RESERVE LAT 25384
MVS04-110204TL08C	INSTALL	08	THREE LINE SECTION 8 & 9 MAIN BKR PREFERRED LAT. 25385 & VT'S 48 VDC BATTERY CHARGER AND BATTERIES
MVS04-110204WD01C	INSTALL	04	WIRING DIAGRAM SECTION 1A SPARE
MVS04-110204WD02C	INSTALL	06	WIRING DIAGRAM SECTION 1B TIE TO GENERATOR
MVS04-110204WD03C	INSTALL	05	WIRING DIAGRAM SECTION 2A FEEDER 3A SWITCH - 10
MVS04-110204WD04C	INSTALL	05	WIRING DIAGRAM SECTION 2B FEEDER 3B SWITCH - 15
MVS04-110204WD05C	INSTALL	05	WIRING DIAGRAM SECTION 3A FEEDER 2A SWITCH - 5
MVS04-110204WD06C	INSTALL	05	WIRING DIAGRAM SECTION 3B FEEDER 2B SWITCH - 9
MVS04-110204WD07C	INSTALL	05	WIRING DIAGRAM SECTION 4A FEEDER 1A SWITCH - 4
MVS04-110204WD08C	INSTALL	05	WIRING DIAGRAM SECTION 4B FEEDER 1B SWITCH - 1
MVS04-110204WD13C	INSTALL	05	WIRING DIAGRAM SECTION 7A RESERVE INCOMING LINE VT'S
MVS04-110204WD14C	INSTALL	05	WIRING DIAGRAM SECTION 7B MAIN BREAKER AMEREN RESERVE LAT. 25384
MVS04-110204WD15C	INSTALL	05	WIRING DIAGRAM SECTION 8A PREFERRED INCOMING LINE VT'S
MVS04-110204WD16C	INSTALL	05	WIRING DIAGRAM SECTION 8B MAIN BREAKER AMEREN PREFFERRED LAT. 25385
MVS04-110204WD17C	INSTALL	05	WIRING DIAGRAM SECTION 9 48 VDC BATTERY CHARGER AND BATTERIES
D-2200	INSTALL	1	NAMEPLATE DETAILS
D-2201	INSTALL	1	REMOTE ANNUNCIATOR BACK PANEL LAYOUT
D-2202	INSTALL	1	SWITCHGEAR REMOTE I/O RACK
D-4000	INSTALL	1	ATS SCHEME FOR TESTING AND ALARM
D-4001	INSTALL	1	I0M1 SCHEMATIC DIAGRAM
D-4901	INSTALL	1	ATS SCHEME TESTING LOGIC DIAGRAM
D-5000	INSTALL	1	CONSTRUCTION NOTES
D-5001	INSTALL	1	REMOTE ANNUNCIATOR PANEL WIRING DIAGRAM
D-5002	INSTALL	1	REMOTE ANNUNCIATOR PANEL FRONT LAYOUT
D-5003	INSTALL	1	REMOTE ANNUNCIATOR PANEL SIDE LAYOUT



* DO NOT USE LEGEND PLATE HOLDER EBOM ITEM #12 IN THE MOUNTING OF THE PUSHBUTTON EBOM ITEM #10.



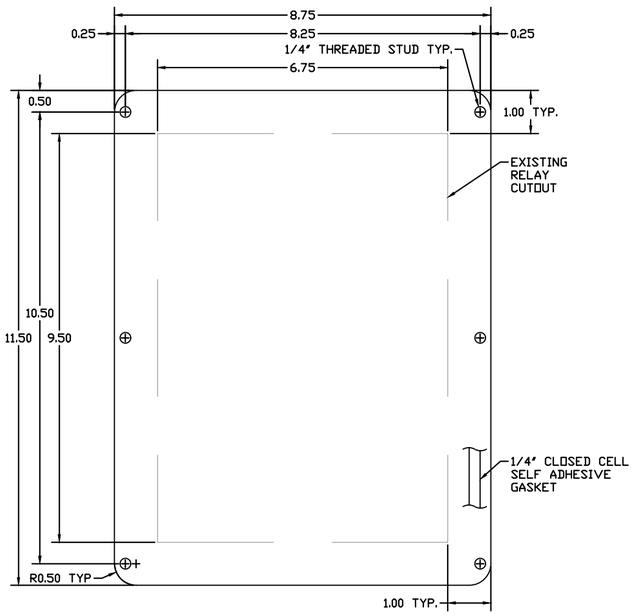


PLATE 1
SCALE: 8"=1'-0"

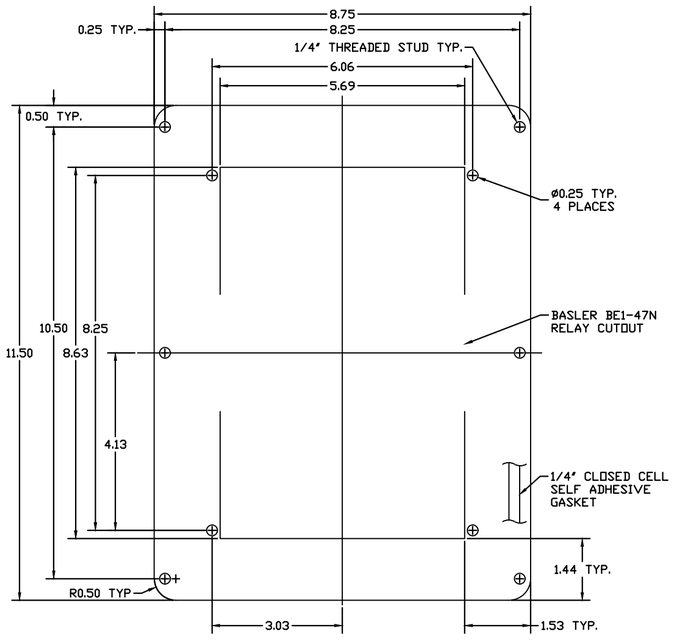


PLATE 2
SCALE: 8"=1'-0"

CONSTRUCTION NOTES:

1. REMOVE SIEMENS SIPROTEC 7SJ641
2. INSTALL BLANK COVER PLATE. 12 GAUGE MIN.
3. INSTALL COVER PLATE WITH NEW BASLER CUTOUT DRAWING 9170400990 PG. 14 (BE1-47N MANUAL).
4. INSTALL BASLER BE1-47N RELAY.
5. INSTALL NEW SELECTOR SWITCH, LIGHT, AND PUSH BUTTON.
6. INSTALL NEW NAME PLATES.
7. INSTALL REVISED NAMEPLATES.
8. SEE PLATE 1 DETAIL.
9. SEE PLATE 2 DETAIL.

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

REFERENCE DRAWINGS

MVS04-110204NP02A	NAMEPLATE DRAWING
D-2200	NAMEPLATE DETAILS
BM-001	BILL OF MATERIALS SIEMENS SWGR

* SEE MISC. AUX. (MVS04-110204MA01C) FOR DEVICES BY ITEM NUMBER.
SEE E.B.O.M. (MVS04-110204EB01A) FOR DEVICES BY ITEM NUMBER.
SEE NAMEPLATE ENGRAVING (MVS04-110204NP01C) FOR NAMEPLATES BY ITEM NUMBER.

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DOC NAME: PANEL ARRANGEMENT DRAWING

SHEET: 1
NEXT: F

REV'D 11/01/2001

PROD. TYPE: GM-15KV
SCALE: NTS
DR: DES
AP: YSK
DOC. NO. : 18839068460

PRE:
APP:
CER: X

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALES ITEM:
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 0206044345\9

00	02-25-2004	DES
JOB WAS FOR APPROVAL. NOW CERTIFIED.		
01	11-17-2004	JJM
JOB WAS FOR APPROVAL. NOW CERTIFIED.		
02	12-07-2004	JJM
REVISED PANEL 5B.		
03	12-14-2004	JJM
INTER CHANGED ITEM 8&9 PER AS BUILT DWG		
04	02-23-2005	JJM
AS BUILT		
05	05-15-2015	WC
CONTROLS UPGRADES		
06	05-10-2019	JRR
FOR RECORD		
07	04-29-2020	DCT

AUTO-TRANSFER OPERATION LINE #1 PREFERRED - LINE #2 RESERVE						
	BREAKER POSITION		VOLTAGE			
CASE	LINE #1	LINE #2	LINE #1	LINE #2	CHANGE	REQUIREMENT
1	C	O	HOT	HOT	LINE #1 DEAD	LINE #1 OPENS AFTER TIME DELAY AND LINE #2 CLOSES (OPEN TRANSITION)
2	C	O	HOT	HOT	LINE #2 DEAD	NO CHANGE
3	C	O	HOT	HOT	BOTH DEAD SIMULTANEOUSLY	BACKUP GENERATOR STARTS, LINE #1 OPENS, GENERATOR BREAKER CLOSES. (OPEN TRANSITION)
4	C	O	HOT	DEAD	LINE #1 DEAD	BACKUP GENERATOR STARTS, LINE #1 OPENS, GENERATOR BREAKER CLOSES. (OPEN TRANSITION)
5	C	O	HOT	DEAD	LINE #2 HOT	NO CHANGE
6	O	C	DEAD	HOT	LINE #1 HOT	LINE #1 CLOSES AFTER TIME DELAY AND LINE #2 OPENS (CLOSED TRANSITION)
7	O	C	DEAD	HOT	LINE #2 DEAD	BACKUP GENERATOR STARTS, LINE #2 OPENS GENERATOR BREAKER CLOSES. (OPEN TRANSITION)
8	O	O	DEAD	DEAD	LINE #1 HOT	GENERATOR BREAKER OPENS AFTER TIME DELAY, LINE #1 IS CLOSED (OPEN TRANSITION)
9	O	O	DEAD	DEAD	LINE #2 HOT	GENERATOR BREAKER OPENS AFTER TIME DELAY, LINE #2 IS CLOSED (OPEN TRANSITION)
10	O	O	DEAD	DEAD	BOTH HOT SIMULTANEOUSLY	GENERATOR BREAKER OPENS AFTER TIME DELAY, LINE #1 IS CLOSED (OPEN TRANSITION)
11	C	O	HOT	HOT	SWITCH FROM LINE #1 PREFERRED TO LINE #2 PREFERRED	LINE #2 CLOSES AFTER TIME DELAY AND LINE #1 OPENS (CLOSED TRANSITION)
12	C	C	HOT	HOT	SWITCH FROM MANUAL TO LINE #1 PREFERRED	LINE #2 OPENS IMMEDIATELY LINE #1 REMAINS CLOSED

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

06	04-29-2020	DCT	FOR RECORD
05	05-10-2019	JRR	CONTROLS UPGRADES
04	05-15-2015	MS	AS BUILT.
03	08/10/2011	AR	BACKUP GENERATION ADDED
02	11-17-2004	JJM	JOB WAS FOR APPROVAL. NOW CERTIFIED.
01	02-26-2004	DES	

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALES ITEM:

PRE:
APP:
CER: X
A.B.:

CUSTOMER:
FRENCH GERLEMAN ELECTRIC
LOCATION:
BELLEFONTAINE NEIGHBORS, MO
GROUP:
BELLEFONTAINE HABILITATION
CUSTOMER ORDER:
020604434699

PROD. TYPE

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

SCALE
NTS

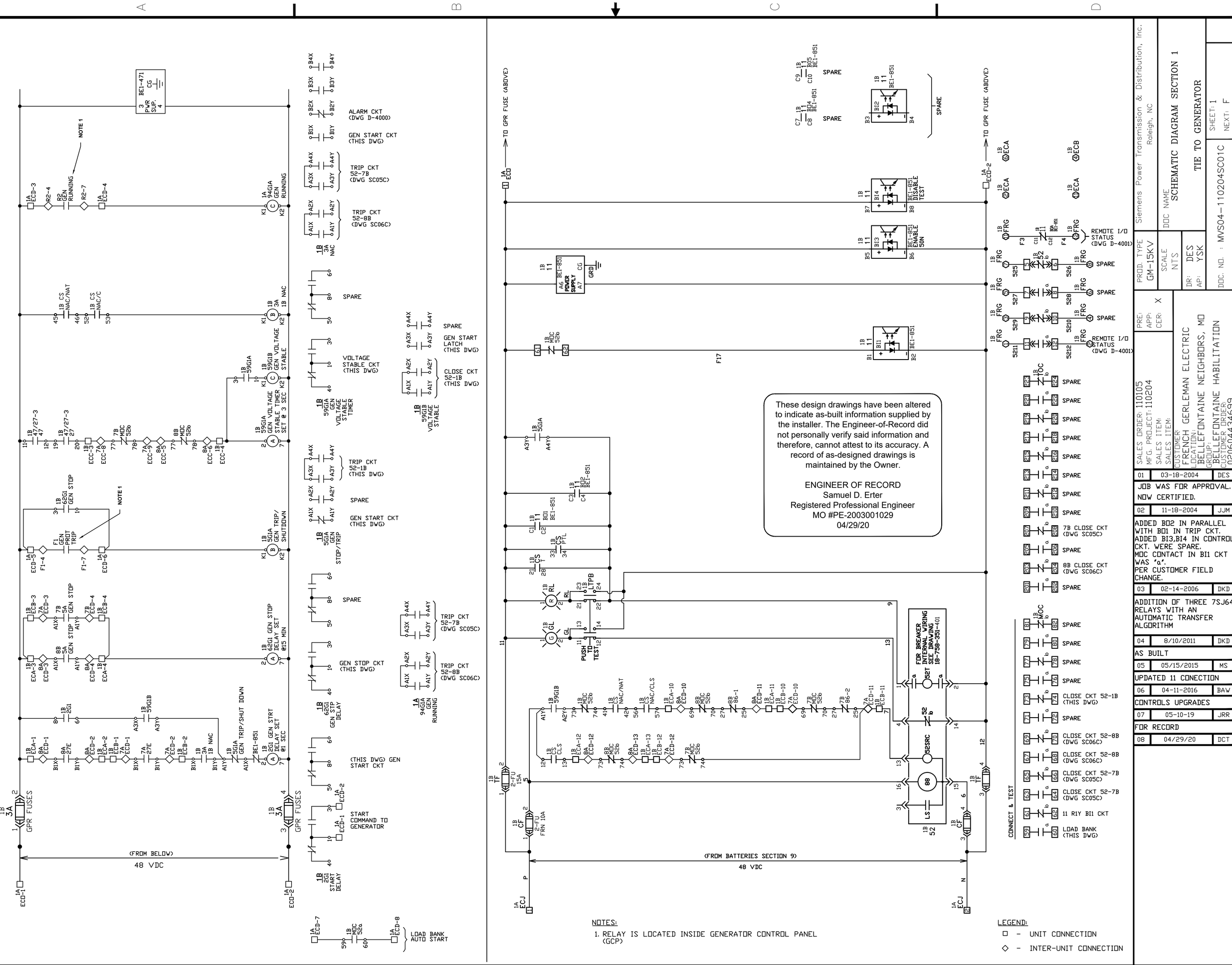
DR: DES
AP: YSK

DOC NAME
NAMEPLATE DRAWING

DOC. NO. : MVS04-110204NP02A

SHEET: 1
NEXT: F

REV'D 06/01/2001



These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

SALES ORDER:	110105
MFG. PROJECT:	110204
SALES ITEM:	
SALES ITEM:	
CUSTOMER:	FRENCH GERLEMAN ELECTRIC
LOCATION:	BELLEFONTAINE NEIGHBORS, MO
GROUP:	BELLEFONTAINE HABILITATION
CUSTOMER ORDER:	0206044699

PRE: APP: CER: X

PROD. TYPE GM-15KV | SCALE NTS | DR: DES AP: YSK

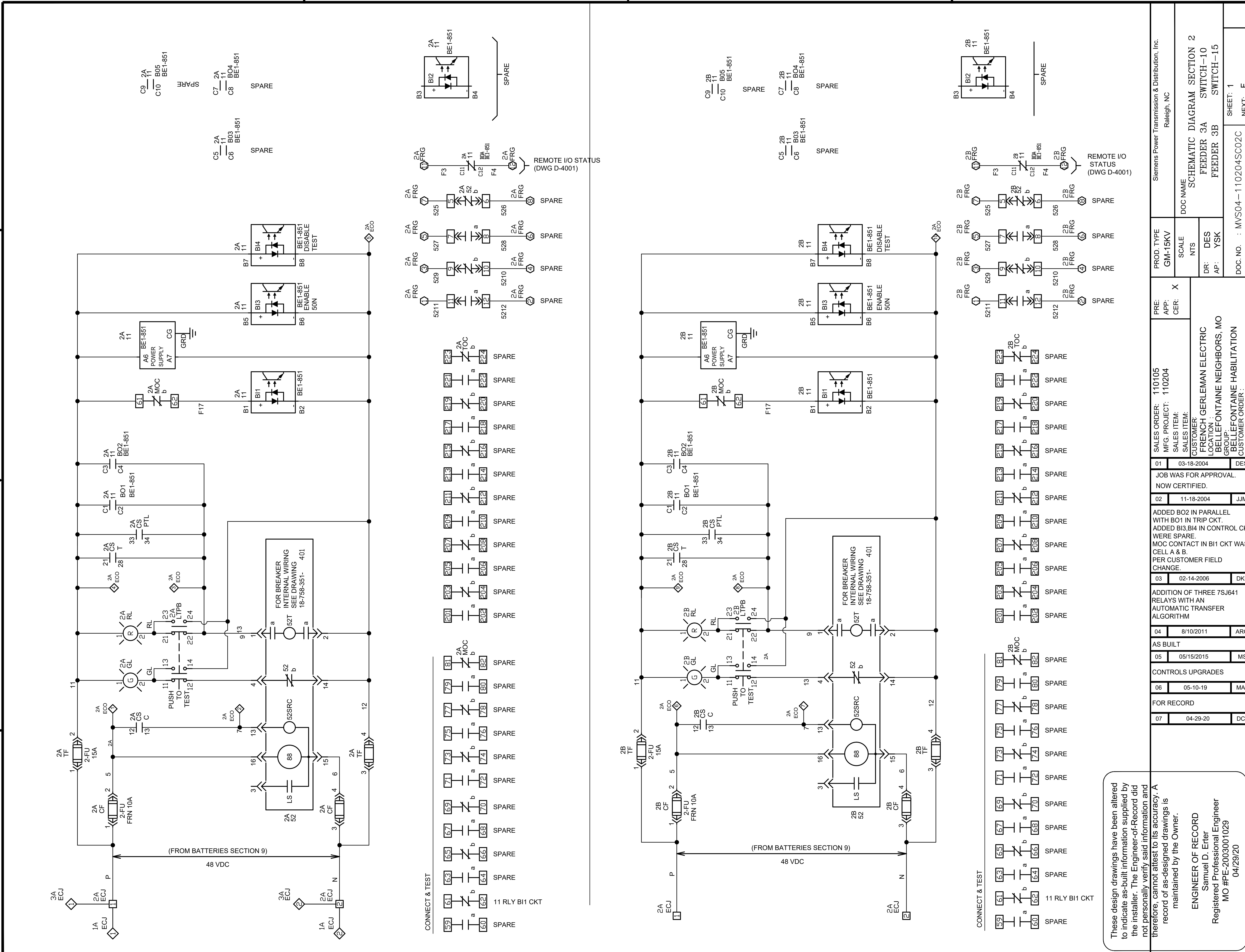
Siemens Power Transmission & Distribution, Inc. Raleigh, NC

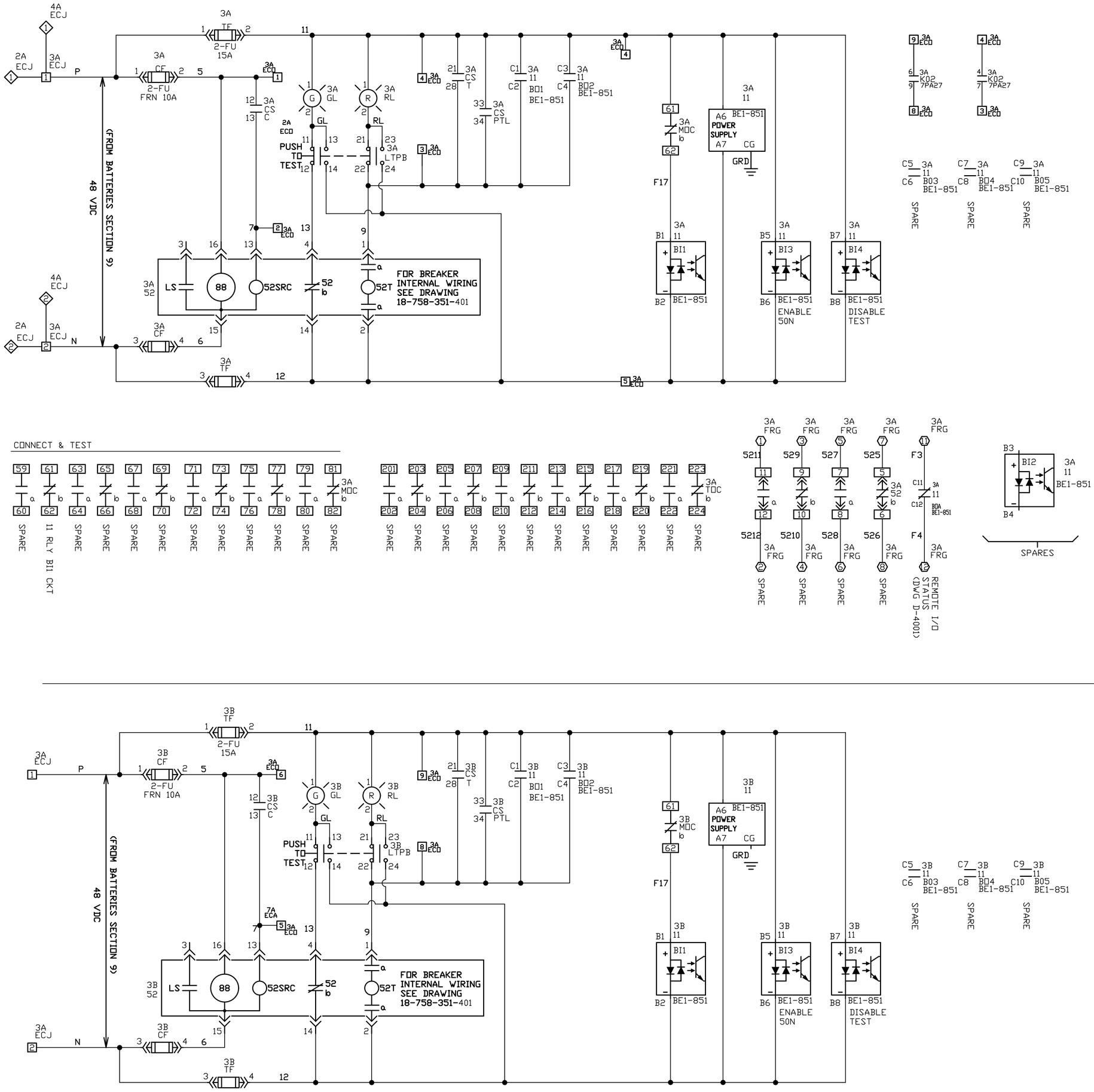
DOC NAME: SCHEMATIC DIAGRAM SECTION 1 TIE TO GENERATOR

DOC. NO. : MVS04-110204SC01C | SHEET: 1 NEXT: F

4 REV'D 11/01/2001

01	03-18-2004	DES
JOB WAS FOR APPROVAL. NOW CERTIFIED.		
02	11-18-2004	JJM
ADDED BO2 IN PARALLEL WITH BO1 IN TRIP CKT. ADDED BI3,BI4 IN CONTROL CKT. WERE SPARE. MOC CONTACT IN BI1 CKT WAS 'o'. PER CUSTOMER FIELD CHANGE.		
03	02-14-2006	DKD
ADDITION OF THREE 7SJ64 RELAYS WITH AN AUTOMATIC TRANSFER ALGORITHM		
04	8/10/2011	DKD
AS BUILT		
05	05/15/2015	MS
UPDATED 11 CONECTION		
06	04-11-2016	BAW
CONTROLS UPGRADES		
07	05-10-19	JRR
FOR RECORD		
08	04/29/20	DCT


Siemens Power Transmission & Distribution, Inc.
Raleigh, NC
DOC NAME
SCHEMATIC DIAGRAM SECTION 2
FEEDER 3A SWITCH-10
FEEDER 3B SWITCH-15
SHEET: 1
NEXT: F
REVD 11/01/2001
PROD. TYPE GM-15KV
SCALE NTS
DR: DES
AP: YSK
DOC. NO. : MVS04-110204SC02C
PRE:
APP:
CER: X
SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALES ITEM:
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 02060434699
01 03-18-2004 DES
JOB WAS FOR APPROVAL. NOW CERTIFIED.
02 11-18-2004 JJM
ADDED BO2 IN PARALLEL WITH BO1 IN TRIP CKT. ADDED BI3,BI4 IN CONTROL CKT WERE SPARE. MOC CONTACT IN BI1 CKT WAS "a". CELL A & B. PER CUSTOMER FIELD CHANGE.
03 02-14-2006 DKD
ADDITION OF THREE 7SJ641 RELAYS WITH AN AUTOMATIC TRANSFER ALGORITHM
04 8/10/2011 ARG
AS BUILT
05 05/15/2015 MS
CONTROLS UPGRADES
06 05-10-19 MAB
FOR RECORD
07 04-29-20 DCT
These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.
ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20
REMOTE I/O STATUS (DWG D-4001)
FOR BREAKER INTERNAL WIRING SEE DRAWING 18-758-351-401
(FROM BATTERIES SECTION 9)
48 VDC
CONNECT & TEST
11 RLY BI1 CKT
PUSH TO TEST
BE1-851 POWER SUPPLY
BE1-851 DISABLE TEST
BE1-851 ENABLE 50N



These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

07	04-29-20	FOR RECORD	DCT
06	05-10-19	CONTROLS UPGRADES	MAB
05	05/15/2015	AS BUILT	MS
04	8/10/2011	ADDITION OF THREE 7SJ641 RELAYS WITH AN AUTOMATIC TRANSFER ALGORITHM	ARG
03	02-14-2006	MDC CONTACT IN BI1 CKT WAS 'a'. CELL A & B. PER CUSTOMER FIELD CHANGE.	DKD
02	11-18-2004	ADDED B02 IN PARALLEL WITH B01 IN TRIP CKT. ADDED B13,B14 IN CONTROL CKT. WERE SPARE.	JJM
01	03-18-2004	JOB WAS FOR APPROVAL. NOW CERTIFIED.	DES

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALES ITEM:
PRE:
APP:
CER: X

CUSTOMER:
FRENCH GERLEMAN ELECTRIC
LOCATION:
BELLEFONTAINE NEIGHBORS, MO
GROUP:
BELLEFONTAINE HABILITATION
CUSTOMER ORDER:
020604434699

PROD. TYPE: GM-15KV

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

SCALE: NTS

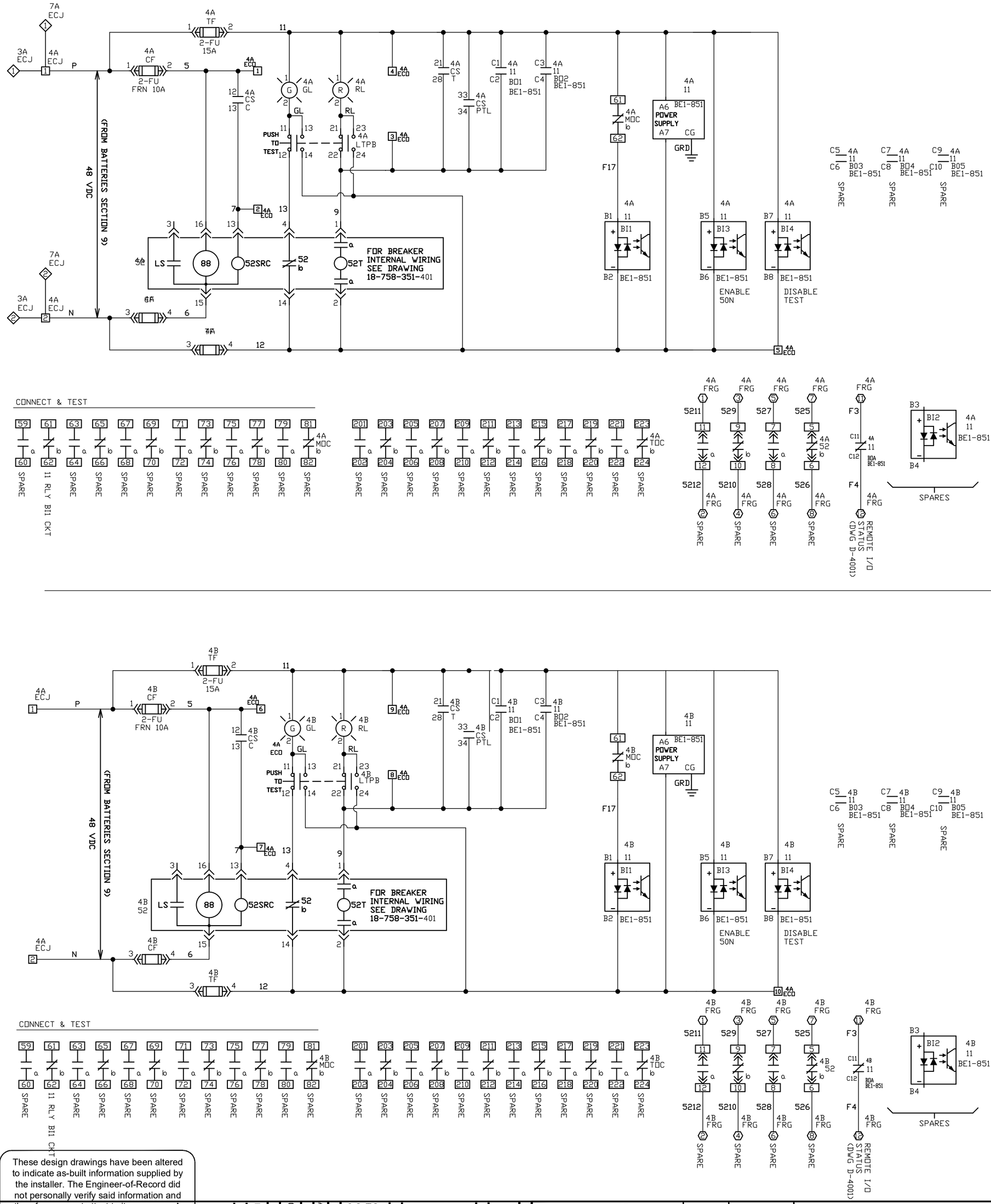
DR: DES
AP: YSK

DOC NAME
SCHEMATIC DIAGRAM SECTION 3
FEEDER 2A SWITCH-5
FEEDER 2B SWITCH-9

DOC. NO. : MVS04-110204SC03C

SHEET: 1
NEXT: F

REV'D 11/01/2001



These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

07	04/29/20	DCT	FOR RECORD
06	05/10/19	MAB	CONTROLS UPGRADES
05	05/15/2015	MS	AS BUILT
04	8/10/2011	DKD	ADDITION OF THREE 7SJ64 RELAYS WITH AN AUTOMATIC TRANSFER ALGORITHM
03	02-14-2006	DKD	ADDED BO2 IN PARALLEL WITH BO1 IN TRIP CKT. ADDED BI3,BI4 IN CONTROL CKT. WERE SPARE. MOC CONTACT IN BI1 CKT WAS "a". CELL A & B PER CUSTOMER FIELD CHANGE.
02	11-18-2004	JJM	NOW CERTIFIED.
01	03-18-2004	DES	JOB WAS FOR APPROVAL.

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALES ITEM:
PRE:
APP:
CER: X
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 020604434699

PROD. TYPE: GM-15KV
SCALE: NTS
DR: DES
AP: YSK
DOC. NO. : MVS04-110204SC04C

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DOC NAME
SCHEMATIC DIAGRAM SECTION 4
FEEDER 1A SWITCH-4
FEEDER 1B SWITCH-1

SHEET: 1
NEXT: F

REV'D 11/01/2001

LEGEND:
□ - UNIT CONNECTION
◇ - INTER-UNIT CONNECTION

48 VDC (FROM BATTERIES SECTION 9)

FOR BREAKER INTERNAL WIRING SEE DRAWING 18-758-351-401

CONNECT & TEST

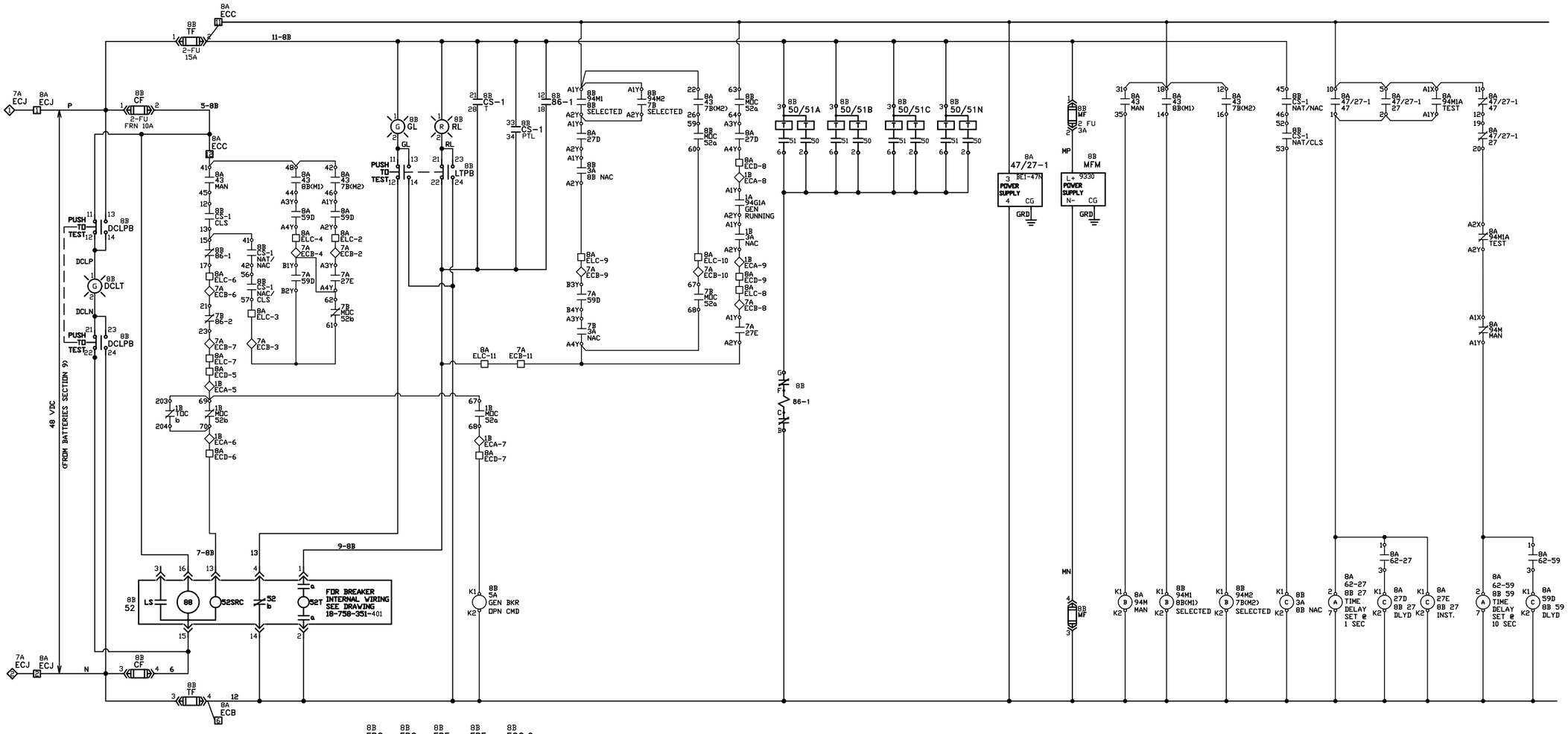
Siemens Power Transmission & Distribution, Inc. Raleigh, NC	DOC NAME: SCHEMATIC DIAGRAM SECTION 7 MAIN BREAKER AMEREN RESERVE LAT. 25384
PROD. TYPE: GM-15KV	SCALE: NTS
DR: DES AP: YSK	DOC. NO. : MVS04-110204SC05C
SHEET: 1 NEXT: F	REV'D 11/01/2001
PRE: APP: CER: X	
SALES ORDER: 110105 MFG. PROJECT: 110204 SALES ITEM: SALES ITEM:	CUSTOMER: FRENCH GERLEMAN ELECTRIC LOCATION: BELLEFONTAINE NEIGHBORS, MO GROUP: BELLEFONTAINE HABILITATION CUSTOMER ORDER: 02606434699

01	03-18-2004	DES
ADDED 86-2 CONTACT IN CLOSE CKT & CS-1 & CS-2 CONTACT IN AUTO-TRANSFER CKT		
02	09-17-2004	DES
JOB WAS FOR APPROVAL, NOW CERTIFIED.		
03	11-18-2004	JJM
CHANGED PIN NO.,WIRE NO & TAG NO PER AS BUILT DWG		
04	02-23-2005	DES
ADDITION OF THREE 7SJ64 RELAYS WITH AN AUTOMATIC TRANSFER ALGORITHM		
05	8/10/2011	ARG
AS BUILT		
06	05/15/2015	MS
CONTROLS UPGRADES		
07	05/10/2019	JRR
FOR RECORD		
08	04/29/2020	DCT

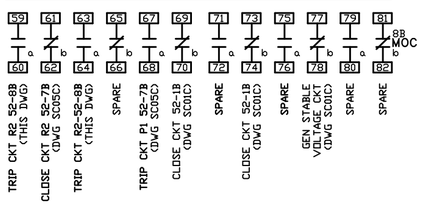
These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

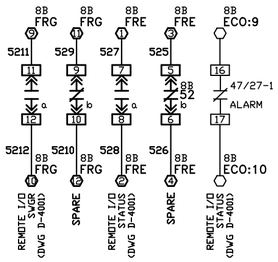
ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

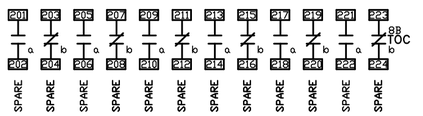
LEGEND:
□ – UNIT CONNECTION
◇ – INTER-UNIT CONNECTION

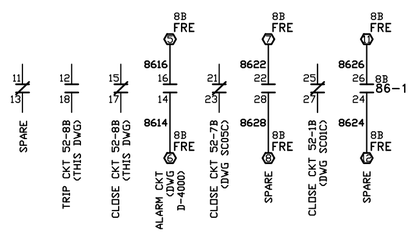


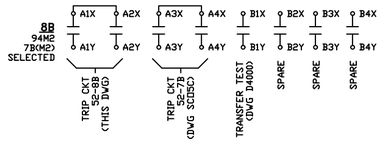
CONNECT & TEST

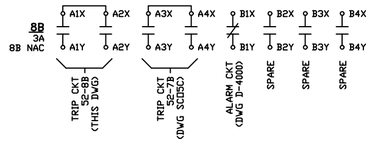


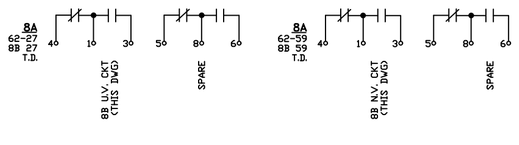


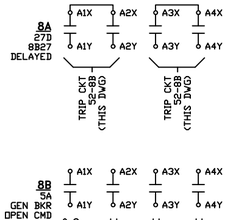


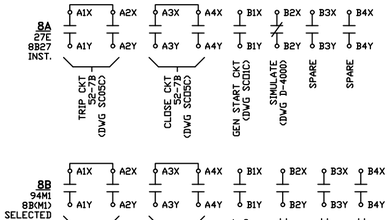


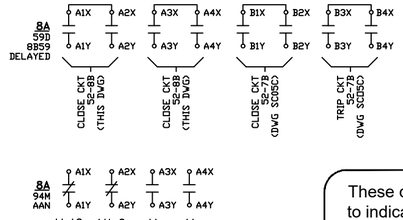












Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DOC NAME: SCHEMATIC DIAGRAM SECTION 8
MAIN BREAKER AMEREN PREFERRED
LAT. 25385

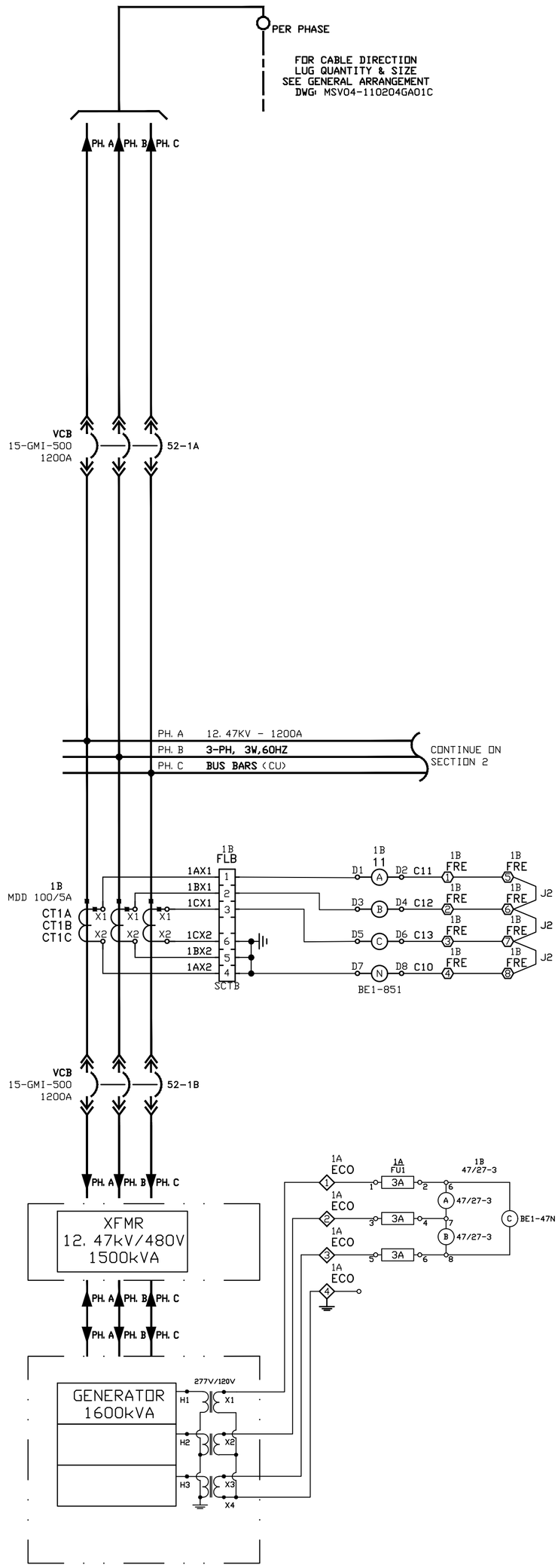
SHEET: 1
NEXT: F

PROD. TYPE: GM-15KV
SCALE: NTS
DR: DES
AP: YSK
DOC. NO. : MVS04-110204SC06C
REV'D 11/01/2001

PRE:
APP:
CER: X

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALES ITEM:
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 02606434699

01	03-24-2004	DES
ADDED 86-2 CONTACT IN CLOSE CKT & CS-1 & CS-2 CONTACT IN AUTO-TRANSFER CKT.		
02	09-17-2004	DES
JOB WAS FOR APPROVAL. NOW CERTIFIED.		
03	11-18-2004	JJM
CHANGED PIN NO, WIRE NO & TAG NO PER AS BUILT DWG		
04	02-23-2005	DES
ADDITION OF THREE 7SJ641 RELAYS WITH AN AUTOMATIC TRANSFER ALGORITHM		
05	8/10/2011	DKD
AS BUILT		
06	05/15/2015	MS
CONTROLS UPGRADES		
07	05/10/2019	JRR
FOR RECORD		
08	04/29/2020	DCT



These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

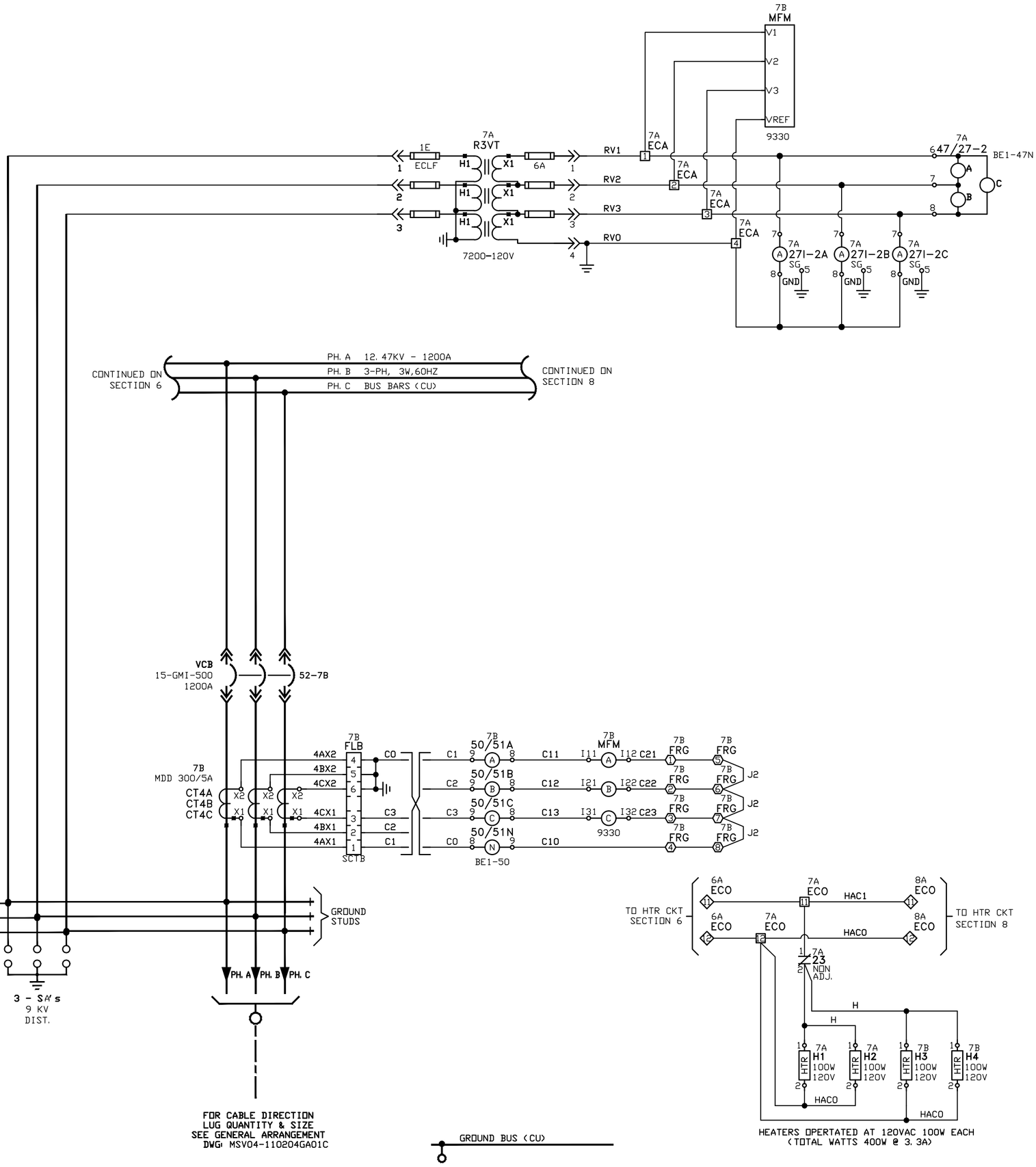
ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

08	04-29-2020	DCT	FOR RECORD
07	05-10-2019	DCT	CONTROLS UPGRADES
06	04-11-2016	BAW	UPDATED RATINGS
05	05-15-2015	WC	AS BUILT
04	08-10-2011	DKD	ADDITION OF THREE 7SJ641 RELAYS WITH AN AUTOMATIC TRANSFER ALGORITHM
03	11-18-2004	JJM	WAS FOR APPROVAL. NOW CERTIFIED.
02	08-03-2004	DES	REMOVED BKR AND CT'S FROM 1A AND REVISED AMP. DF CT'S IN 1B
01	03-01-2004	DES	

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALES ITEM:
PRE:
APP:
CER: X
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 020604434699

PROD. TYPE: GM-15KV
Siemens Power Transmission & Distribution, Inc.
Raleigh, NC
SCALE: NTS
DR: DES
AP: YSK
DOC NAME: THREE LINE SECTION 1 SPARE TIE TO GENERATOR
DOC. NO.: MVS04-110204TL01C
SHEET: 1
NEXT: F

REV' D 11/01/2001



These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

07	04-29-2020	DCT	FOR RECORD
06	05-10-2019	JRR	CONTROLS UPGRADES
05	05-15-2015	MS	AS BUILT.
04	08-10-2011	DKD	ADDITION OF THREE 7SJ641 RELAYS WITH AN AUTOMATIC TRANSFER ALGORITHM
03	02-23-2005	DES	TAG NO 0.5E CHANGED TO 1E PER AS BUILT DWG
02	11-18-2004	JJM	JOB WAS FOR APPROVAL. NOW CERTIFIED.
01	03-17-2004	DES	

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALES ITEM:
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 020604434699

PRE:
APP:
CER: X

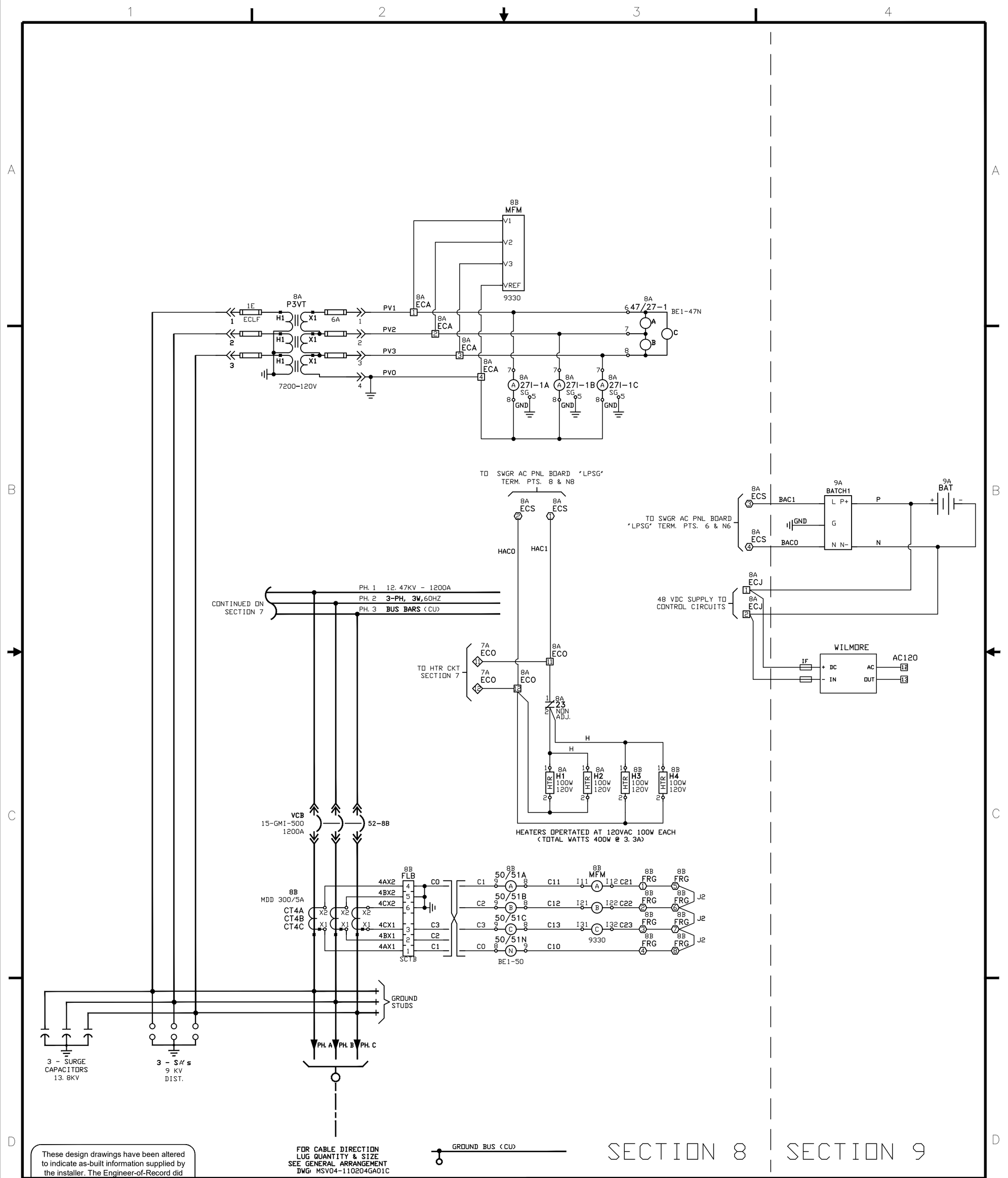
PROD. TYPE: GM-15KV
SCALE: NTS
DR: DES
AP: YSK

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DOC NAME
THREE LINE SECTION 7
RESERVE INCOMING LINE VT'S
MAIN BREAKER RESERVE LAT 25384

DOC. NO.: MVS04-110204TL07C
SHEET: 1
NEXT: F

REV'D 11/01/2001



These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

08	04-29-2020	FOR RECORD	DCT
07	05-10-2019	CONTROLS UPGRADES	JRR
06	05-15-2015	AS BUILT.	MS
05	08-10-2011	ADDITION OF THREE 7SJ641 RELAYS WITH AN AUTOMATIC TRANSFER ALGORITHM	DKD
04	02-23-2005	TAG NO 0.5E CHANGED TO 1E PER AS BUILT DWG	DES
03	11-18-2004	JOB WAS FOR APPROVAL. NOW CERTIFIED.	JJM
02	08-03-2004	ADDED CONNECTION FOR BATTERY CHARGER TO AC PANEL BOARD	DES
01	03-17-2004		DES

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALES ITEM:
PRE:
APP:
CER: X
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 020604434699

PROD. TYPE: GM-15KV
Siemens Power Transmission & Distribution, Inc.
Raleigh, NC
SCALE: NTS
DR: DES
AP: YSK
DOC NAME: THREE LINE SECTION 8 & 9
MAIN BKR PREFERRED LAT. 25385 & VT'S
48 VDC BATTERY CHARGER AND BATTERIES
DOC. NO.: MVS04-110204TL08C
SHEET: 1
NEXT: F

REV'D 11/01/2001

REGION A – SWINGING PANEL (REAR VIEW)

CONSTRUCTION NOTES:

1. GEN STAND, PROT TRIP, GEN RUN SIGNALS TO BE FIELD LOCATED.

GRD
(BRASS JUMPER)

REGION E (LEFT HAND SIDE SHEET)

REGION E (FIXED PORTION FRONT VIEW)

H (1A23:2) e1
H (1AH2:1) e1
HAC0 (1AECD:12) e1
HAC0 (1AH2:2) e1

1A
H1
HEATER
100W
120V

REGION E (RIGHT HAND SIDE SHEET)

(BRASS JUMPER)
GND
GND=GND (1BFLB: 6) f0

1A
23
1 2
NON-ADJ.
THERMOSTAT
1=HAC1 (1AECD: 11) e1
2=H (1AH1: 1) e1
2=H (1BH3: 1) e1

REGION E (DEVICE MOUNTING PLATE FRONT VIEW)

NP1A1
1A
94G1A

K1=1A ECD: 4
K2=1B 3A: K2
A1X=1A 94G1A: A2X
A1Y=1B ECA-8
A2X=1A 94G1A: A1X
A2Y=1B 3A: A1Y
A3X=1A 94G1A-A4X
A3Y=1B ECB-8
A4X=1A 94G1A-A3X
A4Y=1B 3A-A3Y

FU1

1=1A ECD-1
2=1B 47/27-3: 6
3=1A ECD-2
4=1B 47/27-3: 7
5=1A ECD-3
6=1B 47/27-3: 8

FUSED DISC.
FOR C.B. TEST
CABINET
ADDITION BY
ASCHINGER

REGION E (CENTER BARRIER TOP VIEW)

1A
ECD

START COMMAND TO GENERATOR	1	2G1-1
	2	2G1-3
TO GEN RUN CONTACT IN GEN CNTRL PNL	3	1B ECD: 3
	4	1A ECD: 5 1A 94G1A: K1
TO GEN PROT TRIP CONTACT IN GEN CNTRL PNL	5	1A ECD: 3
	6	1B 62G1: 3
	7	1B 62G1: 1
LOAD BANK AUTO START	7	1B MDC: 59
	8	1B MDC: 60
	9	
	10	
	11	
	12	

1A
ECD
1 2 3 4 5 6 7 8 9 10 11 12 13
FU1-1 FU1-3 FU1-5
X1 X2 X3 X4
BK W R G
HAC1 (1AE3:1) e1
HAC0 (1BH3:2) e1
HAC0 (1AH1:2) e1
HAC1 (2AECD:11) h1
HAC0 (2AECD:12) h1
TO GENERATOR PT (2A-01)

1A
ECJ
1 2
P (2AECJ:1) h1
N (2AECJ:2) h1
P (1BCF:1) e1
N (1BCF:3) e1

SHOP NOTE

FOR SPECIAL CHARACTERS AND WIRE SIZES SEE GENERAL INFORMATION DRAWING GIDWGN

E– REFERENCE ITEMS ON EBOM EBOMDWGN

M– REFERENCE ITEMS ON MISC. AUX. EQUIP. DRAWING MISCAUXDWGN

NP NAMEPLATE ENGRAVING ITEM NUMBER NPDWGN

REFERENCE DRAWINGS

D-5000 CONSTRUCTION NOTES

REGION W (CABLE AREA REAR VIEW)

H (1AH1:1) e1
HAC0 (1AH1:2) e1
1A
H2
HEATER
100V
120V

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DOC NAME: WIRING DIAGRAM SECTION 1A SPARB

SHEET: 1
NEXT: F

PROD. TYPE: GM-15KV
SCALE: NTS
DR: DES
AP: YSK
DOC. NO.: MVS04-110204WD01C

PRE:
APP:
CER: X

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALES ITEM:
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
POSITION: 1
02006434699

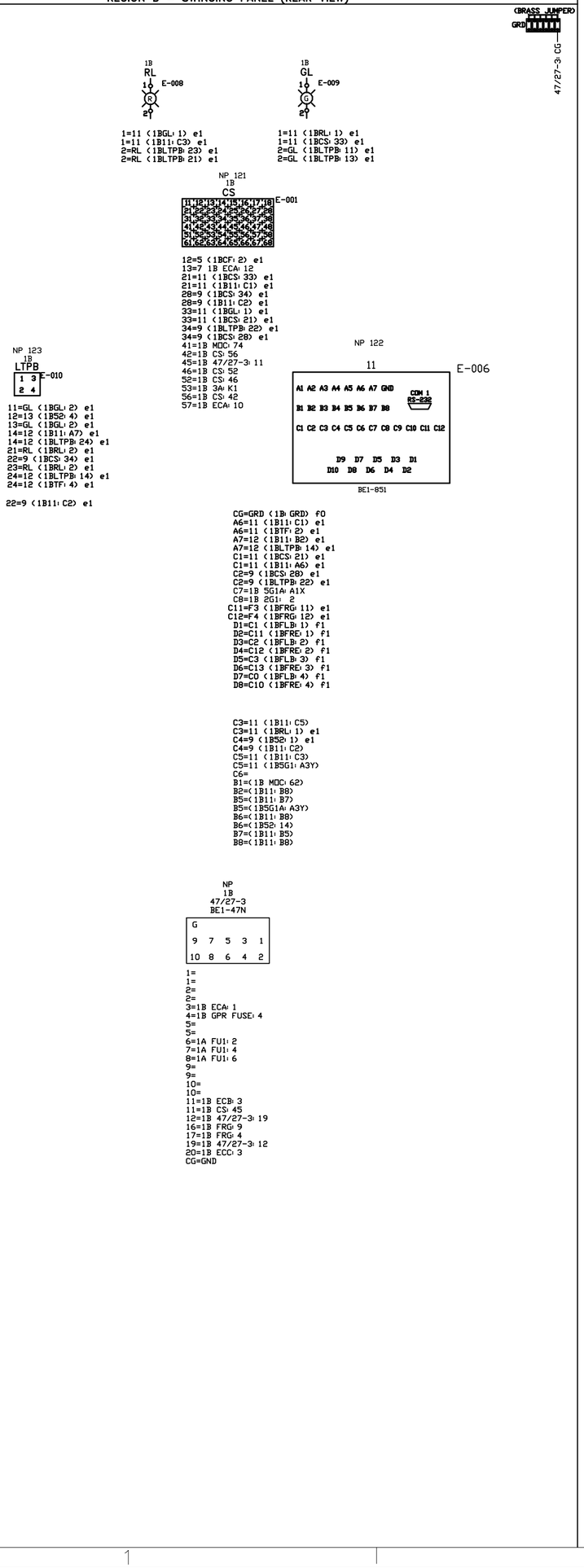
01	11-18-2004	JJM
AS BUILT.		
02	05-15-2015	MS
CONTROLS UPGRADES		
03	05-10-2019	DPP
FOR RECORD		
04	04-29-2020	DCT

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

REV'D 11/01/2001

REGION B — SWINGING PANEL (REAR VIEW)

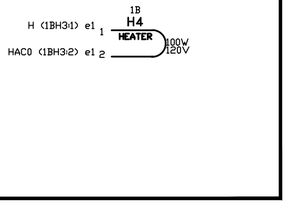


REGION F (CENTER BARRIER TOP VIEW)

REFERENCE DRAWINGS

D-5000 CONSTRUCTION NOTES

REGION W (CABLE AREA REAR VIEW)



SHOP NOTE

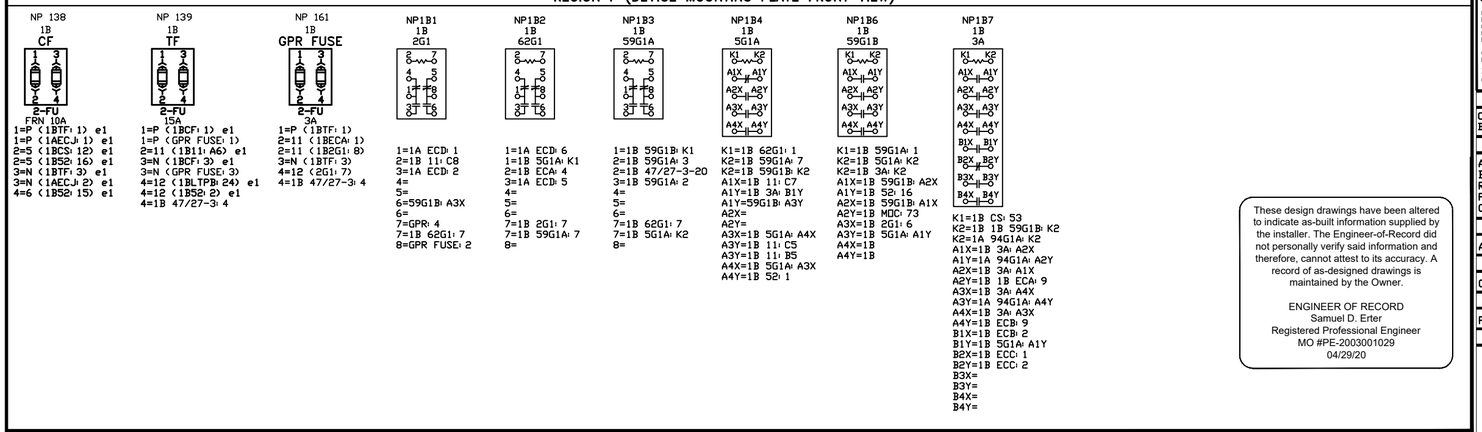
FOR SPECIAL CHARACTERS AND WIRE SIZES SEE GENERAL INFORMATION DRAWING MVS04-110204GI01C

E- REFERENCE ITEMS ON EBOM MVSD4-110204EB01A

M- REFERENCE ITEMS ON MISC. AUX. EQUIP. DRAWING MVSD4-110204MA01C

NP NAMEPLATE ENGRAVING ITEM NUMBER MVS04-110204NP01C

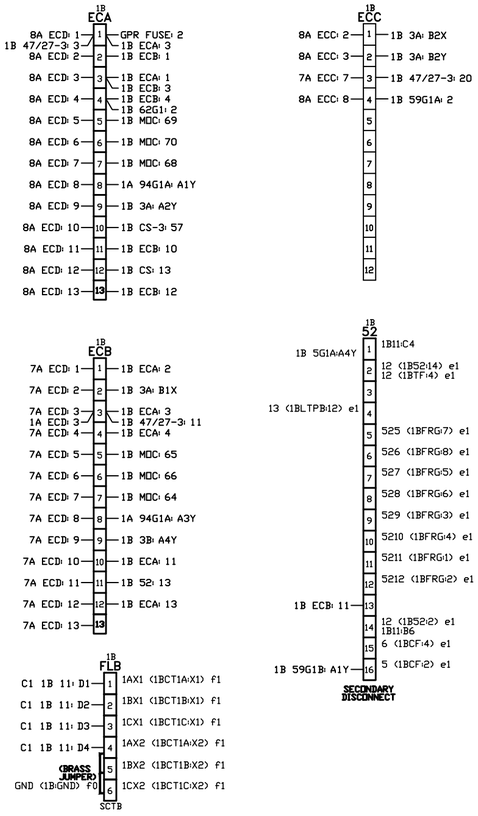
REGION F (DEVICE MOUNTING PLATE FRONT VIEW)



These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

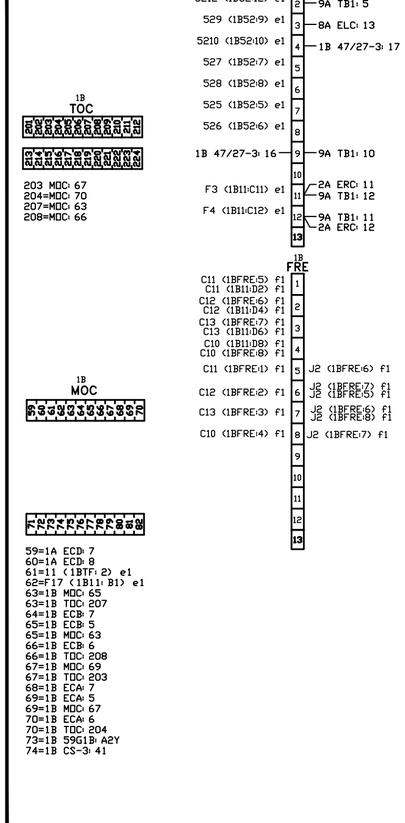
ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

REGION F (LEFT HAND SIDE SHEET)



REGION F (FIXED PORTION FRONT VIEW)

REGION F (RIGHT HAND SIDE SHEET)



PROD. TYPE: GM-15KV	SCALE: NTS	DR: DES APP: YSK
PREL: X APP: CER:	Siemens Power Transmission & Distribution, Inc. Raleigh, NC	
DDC NAME: WIRING DIAGRAM SECTION 1B TIE TO GENERATOR	SHEET: 1 NEXT: F	
DDC. NO.: MVS04-110204WD02C	REV'D 11/01/2001	

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALES ITEM:
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
BUILDING: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 0206044346699

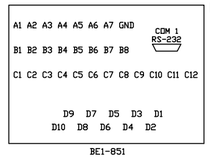
01	11-18-2004	JJM
CHANGED SPACE IN TITLE BLK TO SPARE.		
02	01-06-2005	DES
ADDED WIRING TO 11:B2,B5, B6,B7,B8,C3,C4; LTPB:22; RL:1. PER CUSTOMER FIELD CHANGE.		
03	02-14-2006	DKD
AS BUILT.		
04	05-15-2015	MS
CONTROLS UPGRADES		
05	05-10-2019	DPP
FOR RECORD		
06	04-29-2020	DCT

REGION A – SWINGING PANEL (REAR VIEW)

NP 123
2A
LTPB
1 3
2 4
E-010

11=GL (2ALTPB: 13) e1
11=GL (2AGL: 2) e1
12=13 (2A52: 4) e1
13=GL (2ALTPB: 11) e1
14=12 (2ALTPB: 24) e1
14=12 (2ATF: 4) e1
21=RL (2ALTPB: 23) e1
21=RL (2ARL: 2) e1
22=9 (2ACS: 34) e1
23=RL (2ALTPB: 21) e1
24=12 (2A11: A7) e1
24=12 (2ALTPB: 14) e1
22=9 (2A11: C4) e1

NP 122
11
E-006



BE1-851

CG=GRD (2A: GRD) f0
A6=11 (2A11: C1) e1
A6=11 (2ATF: 2) e1
A7=12 (2A11: B2) e1
A7=12 (2ALTPB: 24) e1
B1=F17 (2AMOC: 60) e1
B2=12 (2A11: A7) e1
C1=11 (2ACS: 21) e1
C1=11 (2A11: A6) e1
C2=9 (2ACS: 28) e1
C2=9 (2A52: 1) e1
C11=F3 (2AERC: 11) e1
C12=F4 (2AERC: 12) e1
D1=C1 (2AELB: 1) f1
D2=C11 (2AERE: 1) f1
D3=C2 (2AELB: 2) f1
D4=C12 (2AERE: 2) f1
D5=C3 (2AELB: 3) f1
D6=C13 (2AERE: 3) f1
D7=C0 (2AELB: 4) f1
D8=C10 (2AERE: 4) f1

B2=12 (2A11: B6) e1
B5=11 (2A11: B7) e1
B5=11 (2A11: C3) e1
B6=12 (2A11: B8) e1
B6=12 (2A11: B2) e1
B7=11 (2A11: B5) e1
B8=12 (2A11: B6) e1
C3=11 (2A11: B5) e1
C3=11 (2ARL: 1) e1
C4=9 (2ALTPB: 22) e1

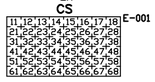
2A
RL
E-008

1=11 (2AGL: 1) e1
1=11 (2A11: C3) e1
2=RL (2ALTPB: 21) e1

2A
GL
E-009

1=11 (2ARL: 1) e1
1=11 (2ACS: 33) e1
2=GL (2ALTPB: 11) e1

NP 121
2A
CS
E-001



12=5 (2ACF: 2) e1
13=7 (2A52: 13) e1
21=11 (2ACS: 33) e1
21=11 (2A11: C1) e1
28=9 (2ACS: 34) e1
28=9 (2A11: C2) e1
33=11 (2AGL: 1) e1
33=11 (2ACS: 21) e1
34=9 (2ALTPB: 22) e1
34=9 (2ACS: 28) e1

GRD
(BRASS JUMPER)GRD=GRD (2A11: CG) f0

REGION E (LEFT HAND SIDE SHEET)

2A
52

9 (2A ECD:3) e1
9 (2A11:C2) e1
12 (2A52:14) e1
12 (2ATF:4) e1
13 (2ALTPB:12) e1
525 (2AERC:7) e1
526 (2AERC:8) e1
527 (2AERC:5) e1
528 (2AERC:6) e1
529 (2AERC:3) e1
5210 (2AERC:4) e1
5211 (2AERC:1) e1
5212 (2AERC:2) e1
7 (2A ECD:2) e1
7 (2ACS:13) e1
12 (2A52:2) e1
6 (2ACF:4) e1
5 (2ACF:2) e1
5 (2A ECD:1) e1

SECONDARY DISCONNECT

2A
ELB

C1 (2A11:D1) f1
C2 (2A11:D3) f1
C3 (2A11:D5) f1
C0 (2A11:D7) f1
(BRASS JUMPER)
GND (2A:GND) f0
1AX1 (2ACT1A:X1) f1
1BX1 (2ACT1B:X1) f1
1CX1 (2ACT1C:X1) f1
1AX2 (2ACT1A:X2) f1
1BX2 (2ACT1B:X2) f1
1CX2 (2ACT1C:X2) f1

SCTB

REGION E (FIXED PORTION FRONT VIEW)

REFERENCE DRAWINGS

D-5000 CONSTRUCTION NOTES

2A
CT1A
X1 X2
MDD 100/5A

X1 1AX1 (2AELB:1) f1
X2 1AX2 (2AELB:4) f1

2A
CT1B
X1 X2
MDD 100/5A

X1 1BX1 (2AELB:2) f1
X2 1BX2 (2AELB:5) f1

2A
CT1C
X1 X2
MDD 100/5A

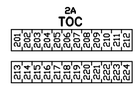
X1 1CX1 (2AELB:3) f1
X2 1CX2 (2AELB:6) f1

2A
H1
HEATER
100W
120V

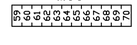
H (2A23:2) e1
H (2AH2:1) e1
HAC0 (2AECD:12) e1
HAC0 (2AH2:2) e1

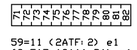
REGION E (RIGHT HAND SIDE SHEET)

2A
TOC



2A
MOC





59=11 (2ATF: 2) e1
60=F17 (2A11: B1) e1

2A
ERE

C11 (2AERE:5) f1
C11 (2A11:D2) f1
C12 (2AERE:6) f1
C12 (2A11:D4) f1
C13 (2AERE:7) f1
C13 (2A11:D6) f1
C10 (2AERE:8) f1
C10 (2A11:D8) f1
C11 (2AERE:1) f1
J1 (2AERE:6) f1
C12 (2AERE:2) f1
J1 (2AERE:5) f1
J1 (2AERE:7) f1
C13 (2AERE:3) f1
J1 (2AERE:6) f1
J1 (2AERE:8) f1
C10 (2AERE:4) f1
J1 (2AERE:7) f1

2A
ERC

5211 (2A52:11) e1
5212 (2A52:12) e1
529 (2A52:9) e1
5210 (2A52:10) e1
527 (2A52:7) e1
528 (2A52:8) e1
525 (2A52:5) e1
526 (2A52:6) e1
F3 (2A11:C11) e1
F4 (2A11:C12) e1
1B FRG:11
2B FRG:11
2B FRG:12
1B FRG:12

(BRASS JUMPER)
GND

2A
23
NON-ADJ.
THERMOSTAT
1=HAC1 (2AECD: 11) e1
2=H (2AH1: 1) e1
2=H (2BH3: 1) e1

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

REGION E (DEVICE MOUNTING PLATE FRONT VIEW)

NP 138
2A
CF
2-FU
FRN 10A

1=P (2ATF: 1) e1
1=P (2AECJ: 1) e1
2=5 (2ACS: 12) e1
2=5 (2A52: 16) e1
3=N (2ATF: 3) e1
3=N (2AECJ: 2) e1
4=6 (2A52: 15) e1

NP 139
2A
TF
2-FU
15A

1=P (2ACF: 1) e1
2=11 (2A11: A6) e1
2=11 (2AMOC: 59) e1
2=11 (2A ECD: 4) e1
3=N (2ACF: 3) e1
4=12 (2ALTPB: 14) e1
4=12 (2A52: 2) e1
4=12 (2A ECD: 5) e1

REGION E (CENTER BARRIER TOP VIEW)

2A
ECD

5 (2A52:16) e1
7 (2A52:30 e1
9 (2A52:1) e1
11 2ATF:2 e1
12 2ATF:4 e1
5 (2B52:16) e1
7 (2B52:13) e1
9 (2B52:1) e1
11 (2BTF:2) e1
12 2BTF:4 e1
HAC1 (2AE31) e1
HAC0 (2BH32) e1
HAC0 (2AH12) e1
HAC1 (3AECD:11) H1
HAC0 (3AECD:12) H1
HAC0 (3AECD:12) H1
HAC0 (3AECD:12) H1

2A
ECJ

P (3AECJ:1) H1
P (3AECJ:2) H1
N (3AECJ:3) H1
N (3AECJ:12) H1
P (2BCF:1) e1
P (2ACF:1) e1
N (2BCF:3) e1
N (2ACF:3) e1

SHOP NOTE

FOR SPECIAL CHARACTERS AND WIRE SIZES SEE GENERAL INFORMATION DRAWING GIDWGN

E – REFERENCE ITEMS ON EBOM EBOMDWGN

M – REFERENCE ITEMS ON MISC. AUX. EQUIP. DRAWING MISCAUXDWGN

NP NAMEPLATE ENGRAVING ITEM NUMBER NPDWGN

REGION W (CABLE AREA REAR VIEW)

2A
H2
HEATER
100W
120V

H (2AH1:1) e1
HAC0 (2AH1:2) e1

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DDC NAME: WIRING DIAGRAM SECTION 2A FEEDER 3A SWITCH - 10

SHEET: 1
NEXT: F

REV'D 11/01/2001

PROD. TYPE: GM-15KV
SCALE: NTS
DR: DES
AP: YSK
DDC. NO.: MVS04-110204WD03C

PRE: X
APP:
CER:

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALESMAN:
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 02060443699

01	11-18-2004	JJM
ADDED WIRING TO 11:B2,B5, B6,B7,B8,C3,C4; LTPB:22) RL:1. PER CUSTOMER FIELD CHANGE.		
02	02-14-2006	DKD
AS BUILT DWG		
03	05-15-2015	MS
CONTROLS UPGRADES		
04	05-10-2019	MAB
FOR RECORD		
05	04-29-2020	DCT

REGION B – SWINGING PANEL (REAR VIEW)

(BRASS JUMPER)
GRD

2B
RL
E-008

1=11 (2BGL: 1) e1
1=11 (2B11: C3) e1
2=RL (2BLTPB: 21) e1
2=RL (2BLTPB: 23) e1

2B
GL
E-009

1=11 (2BRL: 1) e1
1=11 (2BCS: 33) e1
2=GL (2BLTPB: 11) e1
2=GL (2BLTPB: 13) e1

NP 121
2B
CS
E-001

11	12	13	14	15	16	17	18
21	22	23	24	25	26	27	28
31	32	33	34	35	36	37	38
41	42	43	44	45	46	47	48
51	52	53	54	55	56	57	58
61	62	63	64	65	66	67	68

12=5 (2BCF: 2) e1
13=7 (2B52: 13) e1
21=11 (2BCS: 33) e1
21=11 (2B11: C1) e1
28=9 (2BCS: 34) e1
28=9 (2B11: C2) e1
33=11 (2BGL: 1) e1
33=11 (2BCS: 21) e1
34=9 (2BLTPB: 22) e1
34=9 (2BCS: 28) e1

NP 123
2B
LTPB
E-010

11=GL (2BGL: 2) e1
12=13 (2B52: 4) e1
13=GL (2BGL: 2) e1
14=12 (2B11: A7) e1
14=12 (2BLTPB: 24) e1
21=RL (2BRL: 2) e1
22=9 (2BCS: 34) e1
23=RL (2BRL: 2) e1
24=12 (2BLTPB: 14) e1
24=12 (2BTF: 4) e1
22=9 (2B11: C4) e1

NP 122
11
E-006

A1 A2 A3 A4 A5 A6 A7 GND
B1 B2 B3 B4 B5 B6 B7 B8
COM 1 RS-232
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12
D9 D7 D5 D3 D1
D10 D8 D6 D4 D2
BE1-851

CG=GRD (2B: GRD) f0
A6=11 (2B11: C1) e1
A6=11 (2BTF: 2) e1
A7=12 (2B11: B2) e1
A7=12 (2BLTPB: 14) e1
B1=F17 (2BMDC: 60) e1
B2=12 (2B11: A7) e1
C1=11 (2BCS: 21) e1
C1=11 (2B11: A6) e1
C2=9 (2BCS: 28) e1
C2=9 (2B52: 1) e1
C11=F3 (2BFRG: 11) e1
C12=F4 (2BFRG: 12) e1
D1=C1 (2BFLB: 1) f1
D2=C11 (2BFRE: 1) f1
D3=C2 (2BFLB: 2) f1
D4=C12 (2BFRE: 2) f1
D5=C3 (2BFLB: 3) f1
D6=C13 (2BFRE: 3) f1
D7=C0 (2BFLB: 4) f1
D8=C10 (2BFRE: 4) f1
B2=12 (2B11: B6) e1
B5=11 (2B11: B7) e1
B5=11 (2B11: C3) e1
B6=12 (2B11: B8) e1
B6=12 (2B11: B2) e1
B7=11 (2B11: B5) e1
B8=12 (2B11: B6) e1
C3=11 (2B11: B5) e1
C3=11 (2BRL: 1) e1
C4=9 (2BLTPB: 22) e1

REGION F (CENTER BARRIER TOP VIEW)

REFERENCE DRAWINGS

D-5000 CONSTRUCTION NOTES

REGION W (CABLE AREA REAR VIEW)

2B
H4
HEATER
100W
120V
H (2BH3:1) e1 1
HACO (2BH3:2) e1 2

SHOP NOTE

FOR SPECIAL CHARACTERS AND WIRE SIZES
SEE GENERAL INFORMATION DRAWING
GIDWGN

E– REFERENCE ITEMS ON EBOM
EBOMDWGN

M– REFERENCE ITEMS ON MISC.
AUX. EQUIP. DRAWING
MISCAUXDWGN

NP NAMEPLATE ENGRAVING
ITEM NUMBER
NPDWGN

REGION F (DEVICE MOUNTING PLATE FRONT VIEW)

NP 138
2B
CF
2-FU
FRN 10A

1=P (2BTF: 1) e1
1=P (2AECJ: 1) e1
2=5 (2BCS: 12) e1
2=5 (2B52: 16) e1
3=N (2BTF: 3) e1
3=N (2AECJ: 2) e1
4=6 (2B52: 15) e1

NP 139
2B
TF
2-FU
15A

1=P (2BCF: 1) e1
2=11 (2B11: A6) e1
2=11 (2BMDC: 59) e1
2=11 (2A ECD: 9) e1
3=N (2BCF: 3) e1
4=12 (2BLTPB: 24) e1
4=12 (2B52: 2) e1
4=12 (2A ECD: 10) e1

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

REGION F (LEFT HAND SIDE SHEET)

2B
52

9 (2A ECD:8) e1
9 (2B11:C2) e1
12 (2B52:14) e1
12 (2BTF:4) e1
13 (2BLTPB:12) e1
525 (2BFRG:7) e1
526 (2BFRG:8) e1
527 (2BFRG:5) e1
528 (2BFRG:6) e1
529 (2BFRG:3) e1
5210 (2BFRG:4) e1
5211 (2BFRG:1) e1
5212 (2BFRG:2) e1
7 (2A ECD:7) e1
7 (2BCS:13) e1
12 (2B52:2) e1
6 (2BCF:4) e1
5 (2BCF:2) e1
5 (2A ECD:6) e1

SECONDARY DISCONNECT

2B
FLB

C1 (2B11:D1) f1 1AX1 (2BCT1A:X1) f1
C2 (2B11:D3) f1 1BX1 (2BCT1B:X1) f1
C3 (2B11:D5) f1 1CX1 (2BCT1C:X1) f1
C0 (2B11:D7) f1 1AX2 (2BCT1A:X2) f1
(BRASS JUMPER) 1BX2 (2BCT1B:X2) f1
GND (2B:GND) f0 1CX2 (2BCT1C:X2) f1

SCTB

REGION F (FIXED PORTION FRONT VIEW)

2B
CT1A
X1 X2
MDD 100/5A
X1 1AX1 (2BFLB:1) f1
X2 1AX2 (2BFLB:4) f1

2B
CT1B
X1 X2
MDD 100/5A
X1 1BX1 (2BFLB:2) f1
X2 1BX2 (2BFLB:5) f1

2B
CT1C
X1 X2
MDD 100/5A
X1 1CX1 (2BFLB:3) f1
X2 1CX2 (2BFLB:6) f1

2B
H3
HEATER
100W
120V
H (2A23:2) e1
H (2BH4:1) e1 1
HACO (2AECD:12) e1
HACO (2BH4:2) e1 2

REGION F (RIGHT HAND SIDE SHEET)

2B
FRG

5211 (2B52:11) e1 1
5212 (2B52:12) e1 2
529 (2B52:9) e1 3
5210 (2B52:10) e1 4
527 (2B52:7) e1 5
528 (2B52:8) e1 6
525 (2B52:5) e1 7
526 (2B52:6) e1 8
9
10
F3 (2B11:C11) e1 11 2A ERC:11 3A ERC:11
F4 (2B11:C12) e1 12 3A ERC:12 2A ERC:12
13

2B
TOC

201	202	203	204	205	206	207	208	209	210	211	212
213	214	215	216	217	218	219	220	221	222	223	224

2B
FRE

C11 (2BFRE:5) f1
C11 (2B11:D2) f1
C12 (2BFRE:6) f1
C12 (2B11:D4) f1
C13 (2BFRE:7) f1
C13 (2B11:D6) f1
C10 (2B11:D8) f1
C10 (2BFRE:8) f1
C11 (2BFRE:1) f1
C12 (2BFRE:2) f1
C13 (2BFRE:3) f1
C10 (2BFRE:4) f1
J2 (2BFRE:6) f1
J6 (2BFRE:5) f1
J6 (2BFRE:7) f1
J6 (2BFRE:6) f1
J6 (2BFRE:8) f1
J2 (2BFRE:7) f1

2B
MOC

59	61	62	63	64	65	66	67	68	69	70	
71	72	73	74	75	76	77	78	79	80	81	82

59=11 (2BTF: 2) e1
60=F17 (2B11: B1) e1

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DOC NAME
WIRING DIAGRAM SECTION 2B
FEEDER 3B SWITCH – 15

SHEET: 1
NEXT: F

PROD. TYPE
GM-15KV

SCALE
NTS

DR: DES
AP: YSK

DOC. NO.: MVS04-110204WD04C

REV'D 11/01/2001

PRE: X
APP:
CER:

SALES ORDER 110105
MFG. PROJECT 110204
SALES ITEM:
SALES AAA
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 020604434699

01	11-18-2004	JJM
ADDED WIRING TO 11:B2,B5, B6,B7,B8,C3,C4; LTPB:22; RL:1. PER CUSTOMER FIELD CHANGE.		
02	02-14-2006	DKD
AS BUILT DWG		
03	05-15-2015	MS
CONTROLS UPGRADES		
04	05-10-2019	MAB
FOR RECORD		
05	04-29-2020	DCT

REGION A – SWINGING PANEL (REAR VIEW)

NP 123
3A
LTPB
E-010

11=GL (3ALTPB:13) e1
11=GL (3AGL:2) e1
12=13 (3A52:4) e1
13=GL (3ALTPB:11) e1
14=12 (3ALTPB:24) e1
14=12 (3ATF:4) e1
21=RL (3ALTPB:23) e1
21=RL (3ARL:2) e1
22=9 (3ACS:34) e1
23=RL (3ALTPB:21) e1
24=12 (3A11:A7) e1
24=12 (3ALTPB:14) e1
22=9 (3A11:C4) e1

NP 122
11
E-006

A1 A2 A3 A4 A5 A6 A7 GND
COM 1 RS-232
B1 B2 B3 B4 B5 B6 B7 B8
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12
D9 D7 D5 D3 D1
D10 D8 D6 D4 D2
BE1-851

CG=GRD (3A:GRD) f0
A6=11 (3A11:C1) e1
A6=11 (3ATF:2) e1
A7=12 (3A11:B2) e1
A7=12 (3ALTPB:24) e1
B1=F17 (3AMDC:60) e1
B2=12 (3A11:A7) e1
C1=11 (3ACS:21) e1
C1=11 (3A11:A6) e1
C2=9 (3ACS:28) e1
C2=9 (3A52:1) e1
C11=F3 (3AERC:11) e1
C12=F4 (3AERC:12) e1
D1=C1 (3AELB:1) f1
D2=C11 (3AERE:1) f1
D3=C2 (3AELB:2) f1
D4=C12 (3AERE:2) f1
D5=C3 (3AELB:3) f1
D6=C13 (3AERE:3) f1
D7=C0 (3AELB:4) f1
D8=C10 (3AERE:4) f1

B2=12 (3A11:B6) e1
B5=11 (3A11:B7) e1
B5=11 (3A11:C3) e1
B6=12 (3A11:B8) e1
B6=12 (3A11:B2) e1
B7=11 (3A11:B5) e1
B8=12 (3A11:B6) e1
C3=11 (3A11:B5) e1
C3=11 (3ARL:1) e1
C4=9 (3ALTPB:22) e1

3A
RL
E-008
1=11 (3AGL:1) e1
1=11 (3A11:C3) e1
2=RL (3ALTPB:21) e1

3A
GL
E-009
1=11 (3ARL:1) e1
1=11 (3ACS:33) e1
2=GL (3ALTPB:11) e1

NP 121
3A
CS
E-001

11,12,13,14,15,16,17,18
21,22,23,24,25,26,27,28
31,32,33,34,35,36,37,38
41,42,43,44,45,46,47,48
51,52,53,54,55,56,57,58
61,62,63,64,65,66,67,68

12=5 (3ACF:2) e1
13=7 (3A52:13) e1
21=11 (3ACS:33) e1
21=11 (3A11:C1) e1
28=9 (3ACS:34) e1
28=9 (3A11:C2) e1
33=11 (3AGL:1) e1
33=11 (3ACS:21) e1
34=9 (3ALTPB:22) e1
34=9 (3ACS:28) e1

GRD
<BRASS JUMPER>GRD=GRD (3A11:CG) f0

REGION E (LEFT HAND SIDE SHEET)

3A
52
SECONDARY DISCONNECT

9 (3A ECD:3) e1
9 (3A11:C2) e1
12 (3A52:14) e1
12 (3ATF:4) e1
13 (3ALTPB:12) e1
525 (3AERC:7) e1
526 (3AERC:8) e1
527 (3AERC:5) e1
528 (3AERC:6) e1
529 (3AERC:3) e1
5210 (3AERC:4) e1
5211 (3AERC:1) e1
5212 (3AERC:2) e1
7 (3A ECD:2) e1
7 (3ACS:13) e1
12 (3A52:2) e1
6 (3ACF:4) e1
5 (3ACF:2) e1
5 (3A ECD:1) e1

3A
ELB
SCTB

C1 (3A11:D1) f1 — 1AX1 (3ACT1A:X1) f1
C2 (3A11:D3) f1 — 1BX1 (3ACT1B:X1) f1
C3 (3A11:D5) f1 — 1CX1 (3ACT1C:X1) f1
C0 (3A11:D7) f1 — 1AX2 (3ACT1A:X2) f1
<BRASS JUMPER> — 1BX2 (3ACT1B:X2) f1
GND (3A:GND) f0 — 1CX2 (3ACT1C:X2) f1

REGION E (FIXED PORTION FRONT VIEW)

REFERENCE DRAWINGS

D-5000 CONSTRUCTION NOTES

3A
CT1A
MDD 100/5A
X1 1AX1 (3AELB:1) f1
X2 1AX2 (3AELB:4) f1

3A
CT1B
MDD 100/5A
X1 1BX1 (3AELB:2) f1
X2 1BX2 (3AELB:5) f1

3A
CT1C
MDD 100/5A
X1 1CX1 (3AELB:3) f1
X2 1CX2 (3AELB:6) f1

<BRASS JUMPER>
GND

3A
H1
HEATER
100W 120V
H (3A23:2) e1
H (3AH2:1) e1
HAC0 (3AECD:12) e1
HAC0 (3AH2:2) e1

REGION E (RIGHT HAND SIDE SHEET)

3A
TOC
201 202 203 204 205 206 207 208 209 210 211 212
213 214 215 216 217 218 219 220 221 222 223 224

3A
MOC
59 60 61 62 63 64 65 66 67 68 69 70
71 72 73 74 75 76 77 78 79 80 81 82
59=11 (3ATF:2) e1
60=F17 (3A11:B1) e1

3A
ERE
C11 (3AERE:5) f1
C11 (3A11:D2) f1
C12 (3AERE:6) f1
C12 (3A11:D4) f1
C13 (3AERE:7) f1
C13 (3A11:D6) f1
C10 (3AERE:8) f1
C10 (3A11:D8) f1
C11 (3AERE:1) f1 — J1 (3AERE:6) f1
C12 (3AERE:2) f1 — J1 (3AERE:5) f1, J1 (3AERE:7) f1
C13 (3AERE:3) f1 — J1 (3AERE:8) f1
C10 (3AERE:4) f1 — J1 (3AERE:7) f1

3A
ERC
5211 (3A52:11) e1
5212 (3A52:12) e1
529 (3A52:9) e1
5210 (3A52:10) e1
527 (3A52:7) e1
528 (3A52:8) e1
525 (3A52:5) e1
526 (3A52:6) e1
F3 (3A11:C11) e1 — 2B FRG:11, 3B FRG:11
F4 (3A11:C12) e1 — 3B FRG:12, 2B FRG:12

3A
23
NON-ADJ. THERMOSTAT
1=HAC1 (3AECD:11) e1
2=H (3AH1:1) e1
2=H (3BH3:1) e1

REGION E (DEVICE MOUNTING PLATE FRONT VIEW)

NP 138
3A
CF
2-FU
FRN 10A
1=P (3ATF:1) e1
1=P (3AECJ:1) e1
2=5 (3ACS:12) e1
2=5 (3A52:16) e1
3=N (3ATF:3) e1
3=N (3AECJ:2) e1
4=6 (3A52:15) e1

NP 139
3A
TF
2-FU
15A
1=P (3ACF:1) e1
2=11 (3A11:A6) e1
2=11 (3AMDC:59) e1
2=11 (3A ECD:4) e1
3=N (3ACF:3) e1
4=12 (3ALTPB:14) e1
4=12 (3A52:2) e1
4=12 (3A ECD:5) e1

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

REGION E (CENTER BARRIER TOP VIEW)

3A
ECO
5 (3A52:16) e1
7 (3A52:13) e1
9 (3A52:1) e1
11 (3ATF:2) e1
12 (3ATF:4) e1
5 (3B52:16) e1
7 (3B52:13) e1
9 (3B52:1) e1
11 (3BTF:2) e1
12 (3BTF:4) e1
HAC1 (3AE31) e1
HAC0 (3BH3:2) e1
HAC0 (3AH1:2) e1
HAC1 (4AECD:11) h1
HAC0 (4AECD:1) h1
HAC0 (4AECD:12) h1
HAC0 (4AECD:12) h1

3A
ECJ
P (3BCF:1) e1
P (3ACF:1) e1
N (3ACF:3) e1
N (3ACF:3) e1
P (4AECJ:1) h1
P (4AECJ:1) h1
N (4AECJ:2) h1
N (4AECJ:2) h1

SHOP NOTE

FOR SPECIAL CHARACTERS AND WIRE SIZES SEE GENERAL INFORMATION DRAWING GIDWGN

E – REFERENCE ITEMS ON EBOM EBOMDWGN

M – REFERENCE ITEMS ON MISC. AUX. EQUIP. DRAWING MISCAUXDWGN

NP NAMEPLATE ENGRAVING ITEM NUMBER NPDWGN

REGION W (CABLE AREA REAR VIEW)

3A
H2
HEATER
100W 120V
H (3AH1:1) e1
HAC0 (3AH1:2) e1

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DDC NAME: WIRING DIAGRAM SECTION 3A FEEDER 2A SWITCH – 5

SHEET: 1
NEXT: F

REV'D 11/01/2001

PROD. TYPE: GM-15KV
SCALE: NTS
DR: DES
APP: YSK
DDC. NO.: MVS04-110204WD05C

PRE:
APP: X
CER:

SALES ORDER: 110105
MFG. PROJECT: 110E04
SALES ITEM:
SALESMAN:
CUSTOMER: FRENCH GERLEMAN ELECTRIC
GROUP: BELLEFONTAINE NEIGHBORS, MO
LOCATION: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 02060443469

01	11-18-2004	JJM
ADDED WIRING TO 11:B2,B5, B6,B7,B8,C3,C4; LTPB:22, RL:1, PER CUSTOMER FIELD CHANGE.		
02	02-14-2006	DKD
AS BUILT DWG		
03	05-15-2015	MS
CONTROLS UPGRADES		
04	05-10-2019	MAB
FOR RECORD		
05	04-29-2020	DCT

REGION B – SWINGING PANEL (REAR VIEW)

(BRASS JUMPER)
GRD

3B
RL
E-008

1=11 (3BGL: 1) e1
1=11 (3B11: C3) e1
2=RL (3BLTPB: 21) e1
2=RL (3BLTPB: 23) e1

3B
GL
E-009

1=11 (3BRL: 1) e1
1=11 (3BCS: 33) e1
2=GL (3BLTPB: 11) e1
2=GL (3BLTPB: 13) e1

NP 121
3B
CS
E-001

11	12	13	14	15	16	17	18
21	22	23	24	25	26	27	28
31	32	33	34	35	36	37	38
41	42	43	44	45	46	47	48
51	52	53	54	55	56	57	58
61	62	63	64	65	66	67	68

12=5 (3BCF: 2) e1
13=7 (3B52: 13) e1
21=11 (3BCS: 33) e1
21=11 (3B11: C1) e1
28=9 (3BCS: 34) e1
28=9 (3B11: C2) e1
33=11 (3BGL: 1) e1
33=11 (3BCS: 21) e1
34=9 (3BLTPB: 22) e1
34=9 (3BCS: 28) e1

NP 123
3B
LTPB
E-010

1	3
2	4

11=GL (3BGL: 2) e1
12=13 (3B52: 4) e1
13=GL (3BGL: 2) e1
14=12 (3B11: A7) e1
14=12 (3BLTPB: 24) e1
21=RL (3BRL: 2) e1
22=9 (3BCS: 34) e1
23=RL (3BRL: 2) e1
24=12 (3BLTPB: 14) e1
24=12 (3BTF: 4) e1
22=9 (3B11: C4) e1

NP 122
11
E-006

A1 A2 A3 A4 A5 A6 A7 GND
COM 1 RS-232
B1 B2 B3 B4 B5 B6 B7 B8
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12
D9 D7 D5 D3 D1
D10 D8 D6 D4 D2
BE1-851

CG=GRD (3B: GRD) f0
A6=11 (3B11: C1) e1
A6=11 (3BTF: 2) e1
A7=12 (3B11: B2) e1
A7=12 (3BLTPB: 14) e1
B1=F17 (3BMDC: 60) e1
B2=12 (3B11: A7) e1
C1=11 (3BCS: 21) e1
C1=11 (3B11: A6) e1
C2=9 (3BCS: 28) e1
C2=9 (3B52: 1) e1
C11=F3 (3BFRG: 11) e1
C12=F4 (3BFRG: 12) e1
D1=C1 (3BFLB: 1) f1
D2=C11 (3BFRE: 1) f1
D3=C2 (3BFLB: 2) f1
D4=C12 (3BFRE: 2) f1
D5=C3 (3BFLB: 3) f1
D6=C13 (3BFRE: 3) f1
D7=C0 (3BFLB: 4) f1
D8=C10 (3BFRE: 4) f1

B2=12 (3B11: B6) e1
B5=11 (3B11: B7) e1
B5=11 (3B11: C3) e1
B6=12 (3B11: B8) e1
B6=12 (3B11: B2) e1
B7=11 (3B11: B5) e1
B8=12 (3B11: B6) e1
C3=11 (3B11: B5) e1
C3=11 (3BRL: 1) e1
C4=9 (3BLTPB: 22) e1

REGION F (CENTER BARRIER TOP VIEW)

REFERENCE DRAWINGS

D-5000 CONSTRUCTION NOTES

REGION W (CABLE AREA REAR VIEW)

3B
H4
HEATER
100W
120V
H (3BH3:1) e1 1
HACO (3BH3:2) e1 2

SHOP NOTE

FOR SPECIAL CHARACTERS AND WIRE SIZES
SEE GENERAL INFORMATION DRAWING
GIDWGN

E– REFERENCE ITEMS ON EBOM
EBOMDWGN

M– REFERENCE ITEMS ON MISC.
AUX. EQUIP. DRAWING
MISCAUXDWGN

NP NAMEPLATE ENGRAVING
ITEM NUMBER
NPDWGN

REGION F (DEVICE MOUNTING PLATE FRONT VIEW)

NP 138
3B
CF

1	3
2	4

2-FU
FRN 10A
1=P (3BTF: 1) e1
1=P (3AECJ: 1) e1
2=5 (3BCS: 12) e1
2=5 (3B52: 16) e1
3=N (3BTF: 3) e1
3=N (3AECJ: 2) e1
4=6 (3B52: 15) e1

NP 139
3B
TF

1	3
2	4

2-FU
15A
1=P (3BCF: 1) e1
2=11 (3B11: A6) e1
2=11 (3BMDC: 59) e1
2=11 (3A ECD: 9) e1
3=N (3BCF: 3) e1
4=12 (3BLTPB: 24) e1
4=12 (3B52: 2) e1
4=12 (3A ECD: 10) e1

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

REGION F (LEFT HAND SIDE SHEET)

3B
52
SECONDARY DISCONNECT

9 (3A ECD:8) e1 9 (3B11:C2) e1	1	
	2	12 (3B52:14) e1 12 (3BTF:4) e1
	3	
13 (3BLTPB:12) e1	4	
	5	525 (3BFRG:7) e1
	6	526 (3BFRG:8) e1
	7	527 (3BFRG:5) e1
	8	528 (3BFRG:6) e1
	9	529 (3BFRG:3) e1
	10	5210 (3BFRG:4) e1
	11	5211 (3BFRG:1) e1
7 (3A ECD:7) e1	12	5212 (3BFRG:2) e1
7 (3BCS:13) e1	13	
	14	12 (3B52:2) e1
	15	6 (3BCF:4) e1
	16	S (3BCF:2) e1 S (3A ECD:6) e1

3B
FLB
SCTB

C1 (3B11:D1) f1	1	1AX1 (3BCT1A:X1) f1
C2 (3B11:D3) f1	2	1BX1 (3BCT1B:X1) f1
C3 (3B11:D5) f1	3	1CX1 (3BCT1C:X1) f1
C0 (3B11:D7) f1	4	1AX2 (3BCT1A:X2) f1
(BRASS JUMPER)	5	1BX2 (3BCT1B:X2) f1
GND (3A:GND) f0	6	1CX2 (3BCT1C:X2) f1

REGION F (FIXED PORTION FRONT VIEW)

3B
CT1A
MDD 100/5A
X1 1AX1 (3BFLB:1) f1
X2 1AX2 (3BFLB:4) f1

3B
CT1B
MDD 100/5A
X1 1BX1 (3BFLB:2) f1
X2 1BX2 (3BFLB:5) f1

3B
CT1C
MDD 100/5A
X1 1CX1 (3BFLB:3) f1
X2 1CX2 (3BFLB:6) f1

3B
H3
HEATER
100W
120V
H (3A23:2) e1
H (3BH4:1) e1 1
HAC0 (3AECD:12) e1
HAC0 (3BH4:2) e1 2

REGION F (RIGHT HAND SIDE SHEET)

3B
FRG

5211 (3B52:11) e1	1	
5212 (3B52:12) e1	2	
529 (3B52:9) e1	3	
5210 (3B52:10) e1	4	
527 (3B52:7) e1	5	
528 (3B52:8) e1	6	
525 (3B52:5) e1	7	
526 (3B52:6) e1	8	
	9	
	10	
F3 (3B11:C11) e1	11	3A ERC:11 4A ERC:11
F4 (3B11:C12) e1	12	4A ERC:12 3A ERC:12
	13	

3B
TOC

200	201	203	204	205	206	207	208	209	210	211	212	
213	214	215	216	217	218	219	220	221	222	223	224	

3B
FRE

C11 (3BFRE:5) f1 C11 (3B11:D2) f1	1	
C12 (3BFRE:6) f1 C12 (3B11:D4) f1	2	
C13 (3BFRE:7) f1 C13 (3B11:D6) f1	3	
C10 (3B11:D8) f1 C10 (3BFRE:8) f1	4	
C11 (3BFRE:1) f1	5	J2 (3BFRE:6) f1
C12 (3BFRE:2) f1	6	J6 (3BFRE:5) f1 J6 (3BFRE:7) f1
C13 (3BFRE:3) f1	7	J2 (3BFRE:6) f1 J2 (3BFRE:8) f1
C10 (3BFRE:4) f1	8	J2 (3BFRE:7) f1
	9	
	10	
	11	
	12	
	13	

3B
MOC

59	61	62	63	64	65	66	67	68	69	70		
71	72	73	74	75	76	77	78	79	80	81	82	

59=11 (3BTF: 2) e1
60=F17 (3B11: B1) e1

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DOC NAME
WIRING DIAGRAM SECTION 3B
FEEDER 2B SWITCH - 9

SHEET: 1
NEXT: F

REV'D 11/01/2001

PROD. TYPE
GM-15KV

SCALE
NTS

DR: DES
AP: YSK

DOC. NO.: MVS04-110204WD06C

PRE: X
APP:
CER:

SALES ORDER 110105
MFG. PROJECT 110204
SALES ITEM:
CUSTOMER:
LOCATION:
GROUP:
CUSTOMER ORDER:

FRENCH GERLEMAN ELECTRIC
BELLEFONTAINE NEIGHBORS, MO
BELLEFONTAINE HABILITATION
020604434699

01	11-18-2004	JJM

ADDED WIRING TO 11:B2,B5, B6,B7,B8,C3,C4; LTPB:22) RL:1.
PER CUSTOMER FIELD CHANGE.

02	02-14-2006	DKD

AS BUILT DWG

03	05-15-2015	MS

CONTROLS UPGRADES

04	05-10-2019	MAB

FOR RECORD

05	04-29-2020	DCT

REGION A – SWINGING PANEL (REAR VIEW)

NP 123
4A
LTPB
E-010

11=GL (4ALTPB:13) e1
11=GL (4AGL:2) e1
12=13 (4A52:4) e1
13=GL (4ALTPB:11) e1
14=12 (4ALTPB:24) e1
14=12 (4ATF:4) e1
21=RL (4ALTPB:23) e1
21=RL (4ARL:2) e1
22=9 (4ACS:34) e1
23=RL (4ALTPB:21) e1
24=12 (4A11:A7) e1
24=12 (4ALTPB:14) e1
22=9 (4A11:C4) e1

NP 122
11
E-006

A1 A2 A3 A4 A5 A6 A7 GND
COM 1
RS-232
B1 B2 B3 B4 B5 B6 B7 B8
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12
D9 D7 D5 D3 D1
D10 D8 D6 D4 D2
BE1-851

CG=GRD (4A:GRD) f0
A6=11 (4A11:C1) e1
A6=11 (4ATF:2) e1
A7=12 (4A11:B2) e1
A7=12 (4ALTPB:24) e1
B1=F17 (4AMOC:60) e1
B2=12 (4A11:A7) e1
C1=11 (4ACS:21) e1
C1=11 (4A11:A6) e1
C2=9 (4ACS:28) e1
C2=9 (4A52:1) e1
C11=F3 (4AERC:11) e1
C12=F4 (4AERC:12) e1
D1=C1 (4AELB:1) f1
D2=C11 (4AERE:1) f1
D3=C2 (4AELB:2) f1
D4=C12 (4AERE:2) f1
D5=C3 (4AELB:3) f1
D6=C13 (4AERE:3) f1
D7=C0 (4AELB:4) f1
D8=C10 (4AERE:4) f1

B2=12 (4A11:B6) e1
B5=11 (4A11:B7) e1
B6=12 (4A11:B8) e1
B6=12 (4A11:B2) e1
B7=11 (4A11:B5) e1
B8=12 (4A11:B6) e1
C3=11 (4A11:B5) e1
C3=11 (4ARL:1) e1
C4=9 (4ALTPB:22) e1

4A
RL
E-008
1=11 (4AGL:1) e1
1=11 (4A11:C3) e1
2=RL (4ALTPB:21) e1

4A
GL
E-009
1=11 (4ARL:1) e1
1=11 (4ACS:33) e1
2=GL (4ALTPB:11) e1

NP 121
4A
CS
E-001

11	12	13	14	15	16	17	18
21	22	23	24	25	26	27	28
31	32	33	34	35	36	37	38
41	42	43	44	45	46	47	48
51	52	53	54	55	56	57	58
61	62	63	64	65	66	67	68

12=5 (4ACF:2) e1
13=7 (4A52:13) e1
21=11 (4ACS:33) e1
21=11 (4A11:C1) e1
28=9 (4ACS:34) e1
28=9 (4A11:C2) e1
33=11 (4AGL:1) e1
33=11 (4ACS:21) e1
34=9 (4ALTPB:22) e1
34=9 (4ACS:28) e1

GRD
(BRASS JUMPER)XGRD=GRD (4A11:CG) f0

REGION E (LEFT HAND SIDE SHEET)

4A
52
9 (4A ECD:3) e1
9 (4A11:C2) e1
13 (4ALTPB:12) e1
7 (4A ECD:2) e1
7 (4ACS:13) e1
SECONDARY DISCONNECT

4A
ELB
C1 (4A11:D1) f1
C2 (4A11:D3) f1
C3 (4A11:D5) f1
C0 (4A11:D7) f1
(BRASS JUMPER)
GND (4A:GND) f0
1AX1 (4ACT1A:X1) f1
1BX1 (4ACT1B:X1) f1
1CX1 (4ACT1C:X1) f1
1AX2 (4ACT1A:X2) f1
1BX2 (4ACT1B:X2) f1
1CX2 (4ACT1C:X2) f1
SCTB

REGION E (FIXED PORTION FRONT VIEW)

REFERENCE DRAWINGS

D-5000 CONSTRUCTION NOTES

4A
CT1A
X1 X2
MDD 100/5A
X1 1AX1 (4AELB:1) f1
X2 1AX2 (4AELB:4) f1

4A
CT1B
X1 X2
MDD 100/5A
X1 1BX1 (4AELB:2) f1
X2 1BX2 (4AELB:5) f1

4A
CT1C
X1 X2
MDD 100/5A
X1 1CX1 (4AELB:3) f1
X2 1CX2 (4AELB:6) f1

4A
H1
HEATER
100W
120V
H (4A23:2) e1
H (4AH2:1) e1
HAC0 (4AECD:12) e1
HAC0 (4AH2:2) e1

REGION E (RIGHT HAND SIDE SHEET)

4A
TOC
201 202 203 204 205 206 207 208 209 210 211 212
213 214 215 216 217 218 219 220 221 222 223 224

4A
MOC
59 60 61 62 63 64 65 66 67 68 69 70
71 72 73 74 75 76 77 78 79 80 81 82
59=11 (4ATF:2) e1
60=F17 (4A11:B1) e1

4A
ERE
C11 (4AERE:5) f1
C11 (4A11:D2) f1
C12 (4AERE:6) f1
C12 (4A11:D4) f1
C13 (4AERE:7) f1
C13 (4A11:D6) f1
C10 (4AERE:8) f1
C10 (4A11:D8) f1
C11 (4AERE:1) f1 J1 (4AERE:6) f1
C12 (4AERE:2) f1 J1 (4AERE:5) f1 J1 (4AERE:7) f1
C13 (4AERE:3) f1 J1 (4AERE:8) f1
C10 (4AERE:4) f1 J1 (4AERE:7) f1

4A
ERC
5211 (4A52:11) e1
5212 (4A52:12) e1
529 (4A52:9) e1
5210 (4A52:10) e1
527 (4A52:7) e1
528 (4A52:8) e1
525 (4A52:5) e1
526 (4A52:6) e1
F3 (4A11:C11) e1 3B FRG:11 4B FRG:11
F4 (4A11:C12) e1 4B FRG:12 3B FRG:12

(BRASS JUMPER)
GND

4A
23
NON-ADJ.
THERMOSTAT
1=HAC1 (4AECD:11) e1
2=H (4AH1:1) e1
2=H (4BH3:1) e1

REGION E (DEVICE MOUNTING PLATE FRONT VIEW)

NP 138
4A
CF
2-FU
FRN 10A
1=P (4ATF:1) e1
1=P (4AECJ:1) e1
2=5 (4ACS:12) e1
2=5 (4A52:16) e1
3=N (4ATF:3) e1
3=N (4AECJ:2) e1
4=6 (4A52:15) e1

NP 139
4A
TF
2-FU
15A
1=P (4ACF:1) e1
2=11 (4A11:A6) e1
2=11 (4AMOC:59) e1
2=11 (4A ECD:4) e1
3=N (4ACF:3) e1
4=12 (4ALTPB:14) e1
4=12 (4A52:2) e1
4=12 (4A ECD:5) e1

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

REGION E (CENTER BARRIER TOP VIEW)

4A
ECO
1 5 (4A52:16) e1
2 7 (4A52:13) e1
3 9 (4A52:1) e1
4 11 (4ATF:2) e1
5 12 (4ATF:4) e1
6 5 (4B52:16) e1
7 7 (4B52:13) e1
8 9 (4B52:1) e1
9 11 (4BTF:2) e1
10 12 (4BTF:4) e1
11 HAC1 (4A23:1) e1
12 HAC0 (4BH3:2) e1 HAC0 (4AH1:2) e1
13 HAC1 (3AECD:11) h1
HAC0 (3AECD:12) h1
HAC0 (3AECD:12) h1

4A
ECJ
1 P (7AECJ:1) h1
P (3AECJ:1) h1
2 N (7AECJ:2) h1
N (7AECJ:2) h1
P (4ACF:1) e1
P (4BCF:1) e1
N (4ACF:3) e1
N (4BCF:3) e1

SHOP NOTE

FOR SPECIAL CHARACTERS AND WIRE SIZES SEE GENERAL INFORMATION DRAWING GIDWGN

E – REFERENCE ITEMS ON EBOM EBOMDWGN

M – REFERENCE ITEMS ON MISC. AUX. EQUIP. DRAWING MISCAUXDWGN

NP NAMEPLATE ENGRAVING ITEM NUMBER NPDWGN

REGION W (CABLE AREA REAR VIEW)

4A
H2
HEATER
100W
120V
H (4AH1:1) e1
HAC0 (4AH1:2) e1

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DDC NAME: WIRING DIAGRAM SECTION 4A FEEDER 1A SWITCH – 4

SHEET: 1
NEXT: F

REV'D 11/01/2001

PROD. TYPE: GM-15KV
SCALE: NTS
DR: DES
AP: YSK
DDC. NO.: MVS04-110204WD07C

PRE: X
APP:
CER:

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALESMAN:
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 02060443469

01	11-18-2004	JJM
ADDED WIRING TO 11:B2,B5, B6,B7,B8,C3,C4; LTPB:22) RL1. PER CUSTOMER FIELD CHANGE.		
02	02-14-2006	DKD
AS BUILT DWG		
03	05-15-2015	MS
CONTROLS UPGRADES		
04	05-10-2019	MAB
FOR RECORD		
05	04-29-2020	DCT

REGION B – SWINGING PANEL (REAR VIEW)

(BRASS JUMPER)
GRD

4B
RL
E-008

1=11 (4BGL: 1) e1
1=11 (4B11: C3) e1
2=RL (4BLTPB: 21) e1
2=RL (4BLTPB: 23) e1

4B
GL
E-009

1=11 (4BRL: 1) e1
1=11 (4BCS: 33) e1
2=GL (4BLTPB: 11) e1
2=GL (4BLTPB: 13) e1

NP 121
4B
CS
E-001

11	12	13	14	15	16	17	18
21	22	23	24	25	26	27	28
31	32	33	34	35	36	37	38
41	42	43	44	45	46	47	48
51	52	53	54	55	56	57	58
61	62	63	64	65	66	67	68

12=5 (4BCF: 2) e1
13=7 (4B52: 13) e1
21=11 (4BCS: 33) e1
21=11 (4B11: C1) e1
28=9 (4BCS: 34) e1
28=9 (4B11: C2) e1
33=11 (4BGL: 1) e1
33=11 (4BCS: 21) e1
34=9 (4BLTPB: 22) e1
34=9 (4BCS: 28) e1

NP 123
4B
LTPB
E-010

1	3
2	4

11=GL (4BGL: 2) e1
12=13 (4B52: 4) e1
13=GL (4BGL: 2) e1
14=12 (4B11: A7) e1
14=12 (4BLTPB: 24) e1
21=RL (4BRL: 2) e1
22=9 (4BCS: 34) e1
23=RL (4BRL: 2) e1
24=12 (4BLTPB: 14) e1
24=12 (4BTF: 4) e1
22=9 (4B11: C4) e1

NP 122
11
E-006

A1 A2 A3 A4 A5 A6 A7 GND
COM 1 RS-232
B1 B2 B3 B4 B5 B6 B7 B8
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12
D9 D7 D5 D3 D1
D10 D8 D6 D4 D2
BE1-851

CG=GRD (4B: GRD) FO
A6=11 (4B11: C1) e1
A6=11 (4BTF: 2) e1
A7=12 (4B11: B2) e1
A7=12 (4BLTPB: 14) e1
B1=F17 (4BMDC: 60) e1
B2=12 (4B11: A7) e1
C1=11 (4BCS: 21) e1
C1=11 (4B11: A6) e1
C2=9 (4BCS: 28) e1
C2=9 (4B52: 1) e1
C11=F3 (4BFRG: 11) e1
C12=F4 (4BFRG: 12) e1
D1=C1 (4BFLB: 1) f1
D2=C11 (4BFRE: 1) f1
D3=C2 (4BFLB: 2) f1
D4=C12 (4BFRE: 2) f1
D5=C3 (4BFLB: 3) f1
D6=C13 (4BFRE: 3) f1
D7=CO (4BFLB: 4) f1
D8=C10 (4BFRE: 4) f1
B2=12 (4B11: B6) e1
B5=11 (4B11: B7) e1
B5=11 (4B11: C3) e1
B6=12 (4B11: B8) e1
B6=12 (4B11: B2) e1
B7=11 (4B11: B5) e1
B8=12 (4B11: B6) e1
C3=11 (4B11: B5) e1
C3=11 (4BRL: 1) e1
C4=9 (4BLTPB: 22) e1

REGION F (CENTER BARRIER TOP VIEW)

REFERENCE DRAWINGS

D-5000 CONSTRUCTION NOTES

REGION W (CABLE AREA REAR VIEW)

4B
H4
HEATER
100W
120V

H (4BH3:1) e1 1
HACO (4BH3:2) e1 2

SHOP NOTE

FOR SPECIAL CHARACTERS AND WIRE SIZES
SEE GENERAL INFORMATION DRAWING
GIDWGN

E– REFERENCE ITEMS ON EBOM
EBOMDWGN

M– REFERENCE ITEMS ON MISC.
AUX. EQUIP. DRAWING
MISCAUXDWGN

NP NAMEPLATE ENGRAVING
ITEM NUMBER
NPDWGN

REGION F (DEVICE MOUNTING PLATE FRONT VIEW)

NP 138
4B
CF

1	3
2	4

2-FU
FRN 10A

1=P (4BTF: 1) e1
1=P (4AECJ: 1) e1
2=5 (4BCS: 12) e1
2=5 (4B52: 16) e1
3=N (4BTF: 3) e1
3=N (4AECJ: 2) e1
4=6 (4B52: 15) e1

NP 139
4B
TF

1	3
2	4

2-FU
15A

1=P (4BCF: 1) e1
2=11 (4B11: A6) e1
2=11 (4BMDC: 59) e1
2=11 (4A ECD: 9)
3=N (4BCF: 3) e1
4=12 (4BLTPB: 24) e1
4=12 (4B52: 2) e1
4=12 (4A ECD)

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

REGION F (LEFT HAND SIDE SHEET)

4B
52

9 (4A ECD:8) e1 9 (4B11:C2) e1	1	
	2	10 (4B52:14) e1 12 (4BTF:4) e1
	3	
13 (4BLTPB:12) e1	4	
	5	525 (4BFRG:7) e1
	6	526 (4BFRG:8) e1
	7	527 (4BFRG:5) e1
	8	528 (4BFRG:6) e1
	9	529 (4BFRG:3) e1
	10	5210 (4BFRG:4) e1
	11	5211 (4BFRG:1) e1
7 (4A ECD:7) e1	12	5212 (4BFRG:2) e1
7 (4BCS:13) e1	13	
	14	12 (4B52:2) e1
	15	6 (4BCF:4) e1
	16	5 (4BCF:2) e1 5 (4A ECD:6) e1

SECONDARY DISCONNECT

4B
FLB

C1 (4B11:D1) f1	1	1AX1 (4BCT1A:X1) f1
C2 (4B11:D3) f1	2	1BX1 (4BCT1B:X1) f1
C3 (4B11:D5) f1	3	1CX1 (4BCT1C:X1) f1
CO (4B11:D7) f1	4	1AX2 (4BCT1A:X2) f1
<BRASS JUMPER>	5	1BX2 (4BCT1B:X2) f1
GND (4A:GND) f0	6	1CX2 (4BCT1C:X2) f1

SCTB

REGION F (FIXED PORTION FRONT VIEW)

4B
CT1A
X1 X2
MDD 100/5A

X1 1AX1 (4BFLB:1) f1
X2 1AX2 (4BFLB:4) f1

4B
CT1B
X1 X2
MDD 100/5A

X1 1BX1 (4BFLB:2) f1
X2 1BX2 (4BFLB:5) f1

4B
CT1C
X1 X2
MDD 100/5A

X1 1CX1 (4BFLB:3) f1
X2 1CX2 (4BFLB:6) f1

4B
H3
HEATER
100W
120V

H (4A23:2) e1
H (4BH4:1) e1 1
HACO (4AECD:12) e1 2
HACO (4BH4:2) e1

REGION F (RIGHT HAND SIDE SHEET)

4B
FRG

5211 (4B52:11) e1	1	
5212 (4B52:12) e1	2	
529 (4B52:9) e1	3	
5210 (4B52:10) e1	4	
527 (4B52:7) e1	5	
528 (4B52:8) e1	6	
525 (4B52:5) e1	7	
526 (4B52:6) e1	8	
	9	
	10	
F3 (4B11:C11) e1	11	4A ERC:11
F4 (4B11:C12) e1	12	4A ERC:12
	13	

4B
TOC

201	202	203	204	205	206	207	208	209	210	211	212	
213	214	215	216	217	218	219	220	221	222	223	224	

4B
MOC

59	60	61	62	63	64	65	66	68	69	70
71	72	73	74	75	76	77	78	79	80	81	82

59=11 (4BTF: 2) e1
60=F17 (4B11: B1) e1

4B
FRE

C11 (4BFRE:5) f1 C11 (4B11:D2) f1	1	
C12 (4BFRE:6) f1 C12 (4B11:D4) f1	2	
C13 (4BFRE:7) f1 C13 (4B11:D6) f1	3	
C10 (4B11:D8) f1 C10 (4BFRE:8) f1	4	
C11 (4BFRE:1) f1	5	J2 (4BFRE:6) f1
C12 (4BFRE:2) f1	6	J6 (4BFRE:5) f1 J2 (4BFRE:7) f1
C13 (4BFRE:3) f1 C10 (4BFRE:4) f1	7	J6 (4BFRE:6) f1 J2 (4BFRE:8) f1
	8	J2 (4BFRE:7) f1
	9	
	10	
	11	
	12	
	13	

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DOC NAME: WIRING DIAGRAM SECTION 4B
FEEDER 1B SWITCH – 1

SHEET: 1
NEXT: F

REV'D 11/01/2001

PROD. TYPE: GM-15KV
SCALE: NTS
DR: DES
AP: YSK
DOC. NO.: MVS04-110204WD08C

PRE: X
APP:
CER:

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
CUSTOMER ORDER:
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 020604434699

01	11-18-2004	JJM
ADDED WIRING TO 11:B2,B5, B6,B7,B8,C3,C4; LTPB:22) RL:1. PER CUSTOMER FIELD CHANGE.		
02	02-14-2006	DKD
AS BUILT DWG		
03	05-15-2015	MS
CONTROLS UPGRADES		
04	05-10-2019	MAB
FOR RECORD		
05	04-29-2020	DCT

REGION A – SWINGING PANEL (REAR VIEW)

NP 133
7A
47/27-2
BE1-47N
E-005

1=7A 62-27: 2
1=2AT14 (7A47/27-2: 2) e1
2=2AT14 (7A47/27-2: 1) e1
2=7A ECD: 2
3=11-7B 7A ECC: 5
3=7A 47/27-2: 10
4=7A 59D: K2
5=2AT13 7A47/27-2: 10
5=7A 47/27-2: 11
6=1
6=RV1 (7AR3VT: 1) f1
7=
7=RV2 (7AR3VT: 2) f1
8=
8=RV3 (7AR3VT: 3) f1
10=7A 47/27-2: 3
10=2AT13 (7A47/27-2: 5)
11=7A ECD: 1
11=7A 47/27-2: 5
12=7A 47/27-2: 19
16=7A ECD: 9
17=7A ECD: 10
19=7A 47/27-2: 12
20=7A ECD: 4
CG=GRD (7A: GRD) f0

REGION E (LEFT HAND SIDE SHEET)

REGION E (FIXED PORTION FRONT VIEW)

H (7A23:2) e1
H (7AH2:1) e1
1
7A
H1
HEATER
100W
120V
HAC0 (7AECD:12) e1
HAC0 (7AH2:2) e1
2

REGION E (RIGHT HAND SIDE SHEET)

NP 140
7A
R3VT
1 RV1 (7AECA:1) f1
RV1 (7A47/27-2:6) f1
2 RV2 (7AECA:2) f1
RV2 (7A47/27-2:7) f1
3 RV3 (7AECA:3) f1
RV3 (7A47/27-2:8) f1
4 RV0 (7AECA:4) f1
RV0 (7A:GND) f0

(BRASS JUMPER)
GND

7A
23
1 2
NON-ADJ.
THERMOSTAT
1=HAC1 (7AECD: 11) e1
2=H (7AH1: 1) e1
2=H (7BH3: 1) e1

REGION E (DEVICE MOUNTING PLATE FRONT VIEW)

NP7A1
7A
62-27
M2 66

1=7A 62-27: 2
1=7A 27E: K1
2=7B 5A: K2
2=7A 27D: K2
3=7A 27D: K1
4=
5=
6=
7=7A 47/27-2: 1
7=7A 62-27-2: 1
8=

NP7A2
7A
27D

K1=7A 62-27: 3
K2=7A 62-27: 7
K2=7A 27E: K2
A1X=7A 27D: A2X
A1Y=7A ECC: 5
A2X=7A 27D: A1X
A2Y=7B 3A: A1Y
A3X=7A 27D: A4X
A3Y=7B MDC: 64
A4X=7A 27D: A3X
A4Y=7A ECD: 8

NP7A3
7A
27E

K1=7A 62-27: 1
K2=7A 27D: K2
K2=7A 62-59: 7
A1X=7A 27E: A2X
A1Y=7A ECB: 8
A2X=7A 27E: A1X
A2Y=7A ECB-11
A3X=7A 27E: A4X
A3Y=7A ECB: 2
A4X=7A 27E: A3X
A4Y=7B MDC: 62
B1X=7A ECD: 1
B1Y=7A ECD: 2
B2X=7A ECA: 11
B2Y=7A ECA: 12
B3X=
B3Y=
B4X=
B4Y=

NP7A5
7A
62-59

1=7A 62-59: 2
2=7A 27C: K2
2=7A 59D: K2
3=7A 59D: K1
4=
5=
6=
7=7A ECD: K3
7A 62-59: 1

NP7A6
7A
59D

K1=7A 62-59: 3
K2=7A 62-59: 7
K2=7A 47/27-2: 4
A1X=7A 59D: A2X
A1Y=7A ELC: 2
A2X=7A 59D: A1X
A2Y=7A ELC: 12
A3X=7A 59D: A4X
A3Y=7A ELC: 4
A4X=7A 59D: A3X
A4Y=7A ECC: 7
B1X=7A 59D: B2X
B1Y=7A ECB: 4
B2X=7A 59D: B1X
B2Y=7A ECB: 3
B3X=7A 59D: B4X
B3Y=7A ECB: 9
B4X=7A 59D: B3X
B4Y=7B 3A: A3Y

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

REGION E (CENTER BARRIER TOP VIEW)

7A ECA
1 RV1 (7AR3VT:1) f1
RV1 (7BMFMV:1) f1
2 RV2 (7AR3VT:2) f1
RV2 (7BMFMV:2) f1
3 RV3 (7AR3VT:3) f1
RV3 (7BMFMV:3) f1
4 RV0 (7AR3VT:4) f1
RV0 (7BMFMV:REF) f1
5 RV0 (7A27T-2A:8) f1
6
7
8
9
10 8A ECA: 10
11 8A ECA: 11
12 7A 27E: B2X
13 7A 27E: B2Y

7A ECB
1 8A ECB: 1
2 8A ECB: 2
3 8A ECB: 3
4 8A ECB: 4
5 8A ECB: 5
6 8A ECB: 6
7 8A ECB: 7
8 8A ECB: 8
9 8A ECB: 9
10 8A ECB: 10
11 8A ECB: 11
12 8A ECB: 12
7A ECC: 1
7A 59D: A1Y
7B CS-2: 57
7A 59D: A3Y
7B CS-2: 12
7B 86-2: 17
7A ECD: 5
7A ECD: 9
7B 3A: A2Y
7B MDC: 60
7B S2: 1
7A 59D: A2Y

7A ECC
1 (7A ELC: 1) e1
2 7B S2: 16
3
4 11-7B (7A 27D: A1Y 7B MF: 1)
5 7B MDC: 59 7A 47/27-2: 3
6
7 8A ECC: 7
8 1A ECC: 3
9 8A ECC: 5
10
11
12 8A ECC: 2
13 8A ECC: 3
7A ELC: 1
7A 27E: A3Y
7A 59D: B2Y
7B MDC: 61
7A 59D: B1Y
7B 86-2: 21
7B 86-2: 23
7A 27E: A1Y
7A 59D: B3Y
7B MDC: 67
7A 27E: A2Y
7B 3A: A4Y

7A ECD
1 8A ECD: 1
2 8A ECD: 2
3 8A ECD: 3
4 8A ECD: 4
5
6
7
8
9 8A ECD: 09
10 8A ECD: 10
11 HAC1 (8AECD:11) H1
12 HAC0 (8AECD:12) H1
13 HAC0 (8AECD:12) H1
7A 47/27-2: 11
7A 47/27-2: 2
7A 62-59: 2
7A 47/27-2: 20
7A 47/27-2: 16
7A 47/27-2: 17
HAC1 (7A23:1) e1
HAC0 (7BH32) e1
HAC0 (7AH1:2) e1

7A ECE
1 1B ECB: 1
2 1B ECB: 2
3 1B ECB: 3
4 1B ECB: 4
5 1B ECB: 5
6 1B ECB: 6
7 1B ECB: 7
8 1B ECB: 8
9 1B ECB: 9
10 1B ECB: 10
11 1B ECB: 11
12 1B ECB: 12
13 1B ECB: 13
7A 27E: B1X
7A 27E: B1Y
7B 5A: A1X
7B 5A: A1Y
7A ELC: 7
7B S2: 13
7B 5A: K1
7A 27D: A4Y
7A ELC: 8
7B MDC: 69
7B 86-2: 25
7B MDC: 74
7B MDC: 73

7A ECJ
1 P (7BCF:1) e1
2 N (7BCF:3) e1
P (4AEC:1) M1
P (4AEC:3) M1
N (4AEC:2) M1
N (8AEC:2) M1

SHOP NOTE

FOR SPECIAL CHARACTERS AND WIRE SIZES SEE GENERAL INFORMATION DRAWING MVS04-110204GI01C

E – REFERENCE ITEMS ON EBOM MVSD4-110204EB01A

M – REFERENCE ITEMS ON MISC. AUX. EQUIP. DRAWING MVSD4-110204MA01C

NP – NAMEPLATE ENGRAVING ITEM NUMBER MVS04-110204NP01C

REFERENCE DRAWINGS

D-5000 CONSTRUCTION NOTES

REGION W (CABLE AREA REAR VIEW)

H (7AH1:1) e1
1
7A
H2
HEATER
100W
120V
HAC0 (7AH1:2) e1
2

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DDC NAME: WIRING DIAGRAM SECTION 7A RESERVE INCOMING LINE VT's

SHEET: 1
NEXT: F

PROD. TYPE: GM-15KV
SCALE: NTS
DR: DES
AP: YSK
DDC. NO.: MVS04-110204WD13C
REV'D 11/01/2001

PRE:
APP: X
CER:

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SUBMITTAL DATE:
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 02060434699

01	11-22-2004	JJM
DESCRIPTION ADD IN NP133 DISCRIPTION CHANGED IN NP148,NP150 &7AECC PER AS BUILT DWG		
02	02-23-2005	DES
AS BUILT		
03	05-15-2015	MS
CONTROLS UPGRADES		
04	05-10-2019	DPP
FOR RECORD		
05	04-29-2020	DCT

REGION B – SWINGING PANEL (REAR VIEW)

(BRASS JUMPER)
GRD

NP 123 7B LTPB E-010

1 3
2 4

11=GL (7BGL: 2) e1
12=13 (7B52: 4) e1
13=GL (7BGL: 2) e1
14=12 (7BLTPB: 24) e1
14=12 (7B86-2: B) e1
21=RL (7BRL: 2) e1
22=9-7B (7BCS-2: 34) e1
22=
23=RL (7BRL: 2) e1
24=12 (7BLTPB: 14) e1

7B RL E-008

1=11-7B (7BGL: 1) e1
2=RL ((???) e1
2=RL (7BLTPB: 21) e1
2=RL (7BLTPB: 23) e1

7B GL E-009

1=11-7B (7BRL: 1) e1
1=11-7B (7BCS-2: 33) e1
2=GL (7BLTPB: 11) e1
2=GL (7BLTPB: 13) e1

7B DCLT E-009

1=DCLP (7BDCLPB: 14) e1
2=DCLN (7BDCLPB: 23) e1

NP 131 7B 86-2 E-007

A B C D E F G H
11 12 13 14 15 16 17 18
21 22 23 24 25 26 27 28

B=12 (7BLTPB: 14) e1
B=12 (7B52: 14) e1
G=86 (7B50/51A: 2) e1
11=
11=
12=7B CS-2: 45
12=11-7B (7B50/51A: 3) e1
13=
14=8614 (7BFRE: 6) e1
15=7B CS-2: 41
16=8616 (7BFRE: 5) e1
17=7A ELC: 6
18=9-7B (7BCS-2: 28) e1
18=9-7B (7B52: 1) e1
21=7A ECB: 6
22=8622 (7BFRE: 7) e1
23=7A ECB: 7
24=
25=7A ECD: 11
26=
27=7B MDC: 70
28=8628 (7BFRE: 8) e1

NP 121 7B CS-2 E-001

11 12 13 14 15 16 17 18
21 22 23 24 25 26 27 28
31 32 33 34 35 36 37 38
41 42 43 44 45 46 47 48
51 52 53 54 55 56 57 58
61 62 63 64 65 66 67 68

12=7A ELC: 5
13=7B CS-2: 41
21=11-7B (7BCS-2: 33) e1
21=7B CS-2: 45
28=9-7B (7BCS-2: 34) e1
28=9-7B (7B86-2: 18) e1
33=11-7B (7BGL: 1) e1
33=11-7B (7BCS-2: 21) e1
34=9-7B (7BLTPB: 22) e1
34=9-7B (7BCS-2: 28) e1
41=7B CS-2: 13
41=7B 86-2: 15
42=2AT2 (7BCS-2: 56) e1
45=7B 86-2: 16
45=7B CS-2: 21
46=1AT6 (7BCS-2: 52) e1
52=1AT6 (7BCS-2: 46) e1
53=7B 3A: K1
56=2AT2 (7BCS-2: 42) e1
57=7A ELC: 3

NP 124 7B MFM E-004

I32 I31 I22 I21 I12 I11
ANALOG OUTPUTS A1 A2 A3 A4 AC
SWITCHES S1 S2 S3 S4 SC
DIGITAL PORTS D4 D3 D2 D1 DC
COM1 SH + − | COM2 SH + −
CG VREF V1 V2 V3 N/− L/+ G
9330

CG=GRD (7BGRD: GRD) f0
L+=MP (7BMF: 2) e1
N-=MN (7BMF: 4) e1
VREF=RVO (7AECA: 4) f1
I11=C11 (7B50/51A: 8) f1
I12=C21 (7BFRG: 1) f1
I21=C12 (7B50/51B: 8) f1
I22=C22 (7BFRG: 2) f1
I31=C13 (7B50/51C: 8) f1
I32=C23 (7BFRG: 3) f1
V1=RV1 (7AECA: 1) f1
V2=RV2 (7AECA: 2) f1
V3=RV3 (7AECA: 3) f1

NP 129 7B DCLPB E-010

1 3
2 4

11=5-7B (7B52: 16) e1
12=DCLP (7BDCLPB: 14) e1
13=P (7BTF: 1) e1
14=DCLP (7BDCLT: 1) e1
14=DCLP (7BDCLPB: 12) e1
21=DCLN (7BDCLPB: 23) e1
22=6 (7BCF: 4) e1
22=7B KO1: 8 e1
23=
23=DCLN (7BDCLPB: 21) e1
24=N (7BTF: 3) e1

NP 128 7B 50/51N BE1-50B E-003

G
9 7 5 3 1
10 8 6 4 2

GRD GRD (GRD) f0
2=86 (7B50/51N: 6) e1
2=86 (7B50/51C: 6) e1
3=11-7B (7B50/51C: 3) e1
3=11-7B (7BTF: 2) e1
6=86 (7B50/51N: 2) e1
8=C0 (7BFLB: 4) f1
9=C10 (7BFRG: 4) f1

NP 127 7B 50/51C BE1-50B E-003

G
9 7 5 3 1
10 8 6 4 2

GRD GRD (GRD) f0
2=86 (7B50/51C: 6) e1
2=86 (7B50/51B: 6) e1
3=11-7B (7B50/51B: 3) e1
3=11-7B (7B50/51N: 3) e1
6=86 (7B50/51N: 2) e1
6=86 (7B50/51C: 2) e1
8=C13 (7BMFM: I31) f1
9=C3 (7BFLB: 3) f1

NP 126 7B 50/51B BE1-50B E-003

G
9 7 5 3 1
10 8 6 4 2

GRD GRD (GRD) f0
2=86 (7B50/51B: 6) e1
2=86 (7B50/51A: 6) e1
3=11-7B (7B50/51A: 3) e1
3=11-7B (7B50/51C: 3) e1
6=86 (7B50/51C: 2) e1
6=86 (7B50/51B: 2) e1
8=C12 (7BMFM: I21) f1
9=C2 (7BFLB: 2) f1

NP 125 7B 50/51A BE1-50B E-003

G
9 7 5 3 1
10 8 6 4 2

GRD GRD (GRD) f0
2=86 (7B50/51A: 6) e1
2=86 (7B86-2: G) e1
3=11-7B (7B86-2: 12) e1
3=11-7B (7B50/51B: 3) e1
6=86 (7B50/51B: 2) e1
6=86 (7B50/51A: 2) e1
8=C11 (7BMFM: I11) f1
9=C1 (7BFLB: 1) f1

REGION F (CENTER BARRIER TOP VIEW)

REFERENCE DRAWINGS

D-5000 CONSTRUCTION NOTES

REGION W (CABLE AREA REAR VIEW)

7B H4 HEATER 100W 120V

H (7BH3: 1) e1 — 1
HACO (7BH3: 2) e1 — 2

SHOP NOTE

FOR SPECIAL CHARACTERS AND WIRE SIZES SEE GENERAL INFORMATION DRAWING GIDWGN

E – REFERENCE ITEMS ON EBOM EBOMDWGN

M – REFERENCE ITEMS ON MISC. AUX. EQUIP. DRAWING MISCAUXDWGN

NP NAMEPLATE ENGRAVING ITEM NUMBER NPDWGN

REGION F (DEVICE MOUNTING PLATE FRONT VIEW)

NP 138 7B CF 2-FU FRN 10A

1=P (7BTF: 1) e1
1=P (7AECJ: 1) e1
2=
2=5-7B (7B52: 16) e1
3=N (7BTF: 3) e1
3=N (7AECJ: 2) e1
4=6 (7BDCLPB: 22) e1
4=6 (7B52: 15) e1

NP 139 7B TF 2-FU 15A

1=P (7BDCLPB: 13) e1
1=P (7BCF: 1) e1
2=11-7B (7B50/51N: 3) e1
2=11-7B (7BMF: 1) e1
3=N (7BDCLPB: 24) e1
3=N (7BCF: 3) e1
4=12 (7BMF: 3) e1
4=7B 3A: K2

NP 141 7B MF 2-FU 3A

1=11-7B (7BTF: 2) e1
1=11-7B (7AECC: 5) e1
2=MP (7BMFM: L+) e1
3=12 (7B52: 2) e1
3=12 (7BTF: 4) e1
4=MN (7BMFM: N-) e1

NP7B1 7B 3A

K1=7B CS-2: 53
K2=7B TF: 4
K2=7B 5A: K2
A1X=7B 3A: A2X
A1Y=7A 27D: A2Y
A2X=7B 3A: A1X
A2Y=7A ELC: 9
A3X=7B 3A: A4X
A3Y=7A 59D: B4Y
A4X=7B 3A: A3X
A4Y=7A ECB: 11, 7B MDC: 68
B1X=7B FRE: 5
B1Y=7B FRE: 6
B2X=
B2Y=
B3X=
B3Y=
B4X=
B4Y=

NP7B3 7B 5A

K1=7A ECD: 7
K2=7B 3A: K2
K2=7A 62-27: 2
A1X=7A ECD: 3
A1Y=7A ECD: 4
A2X=
A2Y=
A3X=
A3Y=
A4X=
A4Y=

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

REGION F (LEFT HAND SIDE SHEET)

7B 52

9-7B (7B86-2: 18) e1	1	7A ELC: 11
	2	12 (7BMF: 3) e1 12 (7B52: 14) e1
	3	
13 (7BLTPB: 12) e1	4	
	5	525 (7BFRE: 3) e1
	6	526 (7BFRE: 4) e1
	7	527 (7BFRE: 1) e1
	8	528 (7BFRE: 2) e1
	9	529 (7BFRG: 11) e1
	10	5210 (7BFRG: 12) e1
	11	5211 (7BFRG: 9) e1
	12	5212 (7BFRG: 10) e1
7A ECD: 6	13	
12 (7B86-2: B) e1	14	12 (7B52: 2) e1
	15	6 (7BCF: 4) e1
5-7B (7BDCLPB: 11) e1 7A ECC: 1	16	5-7B (7BCF: 2) e1

SECONDARY DISCONNECT

7B FLB

C1 (7B50/51A: 9) f1	1	4AX1 (7BCT4A: X1) f1
C2 (7B50/51B: 9) f1	2	4BX1 (7BCT4B: X1) f1
C3 (7B50/51C: 9) f1	3	4CX1 (7BCT4C: X1) f1
C0 (7B50/51N: 8) f1	4	4AX2 (7BCT4A: X2) f1
(BRASS JUMPER)	5	4BX2 (7BCT4B: X2) f1
GND (7A: GND) f0	6	4CX2 (7BCT4C: X2) f1

SCTB

REGION F (FIXED PORTION FRONT VIEW)

7B CT4A X1 X2 MDD 300/5A

X1 4AX1 (7BFLB: 1) f1
X2 4AX2 (7BFLB: 4) f1

7B CT4B X1 X2 MDD 300/5A

X1 4BX1 (7BFLB: 2) f1
X2 4BX2 (7BFLB: 5) f1

7B CT4C X1 X2 MDD 300/5A

X1 4CX1 (7BFLB: 3) f1
X2 4CX2 (7BFLB: 6) f1

7B H3 HEATER 100W 120V

H (7A23: 2) e1
H (7BH4: 1) e1 — 1
HACO (7AECD: 12) e1
HACO (7BH4: 2) e1 — 2

REGION F (RIGHT HAND SIDE SHEET)

7B FRG

C21 (7BFRG: 5) f1 C21 (7BMFM: I12) f1	1	
C22 (7BFRG: 6) f1 C22 (7BMFM: I22) f1	2	
C23 (7BFRG: 7) f1 C23 (7BMFM: I32) f1	3	
C10 (7BFRG: 8) f1 C10 (7B50/51N: 9) f1	4	
C21 (7BFRG: 1) f1	5	J2 (7BFRG: 6) f1
C22 (7BFRG: 2) f1	6	J2 (7BFRG: 5) f1 J2 (7BFRG: 7) f1
C23 (7BFRG: 3) f1	7	J2 (7BFRG: 6) f1 J2 (7BFRG: 8) f1
C10 (7BFRG: 4) f1	8	J2 (7BFRG: 7) f1
5211 (7B52: 11) e1	9	8B FRG: 9
5212 (7B52: 12) e1	10	8B FRE: 2
529 (7B52: 9) e1	11	
5210 (7B52: 10) e1	12	
	13	

7B TOC-2

201 202 203 204 205 206 207 208 209 210 211 212
213 214 215 216 217 218 219 220 221 222 223 224

201=
202=
205=
206=
221=
222=

7B FRE

527 (7B52: 7) e1	1	8B FRE: 1
528 (7B52: 8) e1	2	8B FRG: 10
525 (7B52: 5) e1	3	
526 (7B52: 6) e1	4	
8616 (7B86-2: 16) e1	5	7A ECC: 12 7B 3A: B1X
8614 (7B86-2: 14) e1	6	7A ECC: 13 7B 3A: B1Y
8622 (7B86-2: 22) e1	7	
8628 (7B86-2: 28) e1	8	
	9	
	10	
	11	
	12	
	13	

7B MOC-2

59 61 62 63 64 65 66 67 68 69 70
71 72 73 74 75 76 77 78 79 80 81 82

59=7A ECC: 5
59=7B MDC: 63
60=7A ELC: 10
61=7A ECB: 3
62=7A 27E: A4Y
63=7B MDC: 59
64=7A 27D: A3Y
65=
66=
67=7A ECB: 10
68=7B 3A: A4Y
69=7A ECD: 10
70=7B 86-2: 27
71=
72=
73=7A ECD: 12
74=7A ECD: 11
75=
76=
77=7A ECC: 7
78=7A ECC: 8
79=
80=
81=
82=

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DDC NAME: WIRING DIAGRAM SECTION 7B MAIN BREAKER AMEREN RESERVE LAT. 25384

SHEET: 1
NEXT: F

PROD. TYPE: GM-15KV
SCALE: NTS
DR: DES
APP: YSK
DDC. NO.: MVS04-110204WD14C
REV'D 11/01/2001

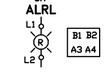
PREP: X
APP:
CER:

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALES AMT:
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: BELLEFONTAINE HABILITATION
CUSTOMER ORDER: 020604434699

01	11-22-2004	JJM
DESCRIPTION CHANGED IN NP131 & 52 7B PER AS BUILT DWG		
02	02-23-2005	DES
AS BUILT DWG		
03	05-15-2015	MS
CONTROLS UPGRADES		
04	05-10-2019	DPP
FOR RECORD		
05	04-29-2020	DCT

REGION A – SWINGING PANEL (REAR VIEW)

NP8A19
8A
ALRL



L1=ALRL: B2
L2=8A 94GA: K2
B1=43: 25
B1=94AL: K1
B2=ALRL: L1
B2=ALRL: A4
A3=43T: 11
A3=43: 21
A4=ALRL: B2

NP8A17
8A
43T

11	12	13	14	15	16	17	18

11=8A 43T: 12
11=8A ALRL: A3
12=8A 94GA: A1X
12=8A 43T: 11
13=8A T. T. PB: 1
14=
14=
15=
15=
16=
18=8A T. T. PB: 3

NPA18
8A
T.T.PB

1	3
2	4

1=8A 43T: 13
1=8A 27E: B2X
2=94M1: B1X
3=8A 43T: 18
3=8A 94GA: A3X
4=8A 94GA: A3Y

NP 118

MOUNTS ON FRONT
OF PANEL

NP 130
8A
43

11	12	13	14	15	16	17	18
21	22	23	24	25	26	27	28
31	32	33	34	35	36	37	38
41	42	43	44	45	46	47	48

E-002

11=8A ECB: 1
11=8A 43: 32
12=8A 43: 18
12=8A 43: 22
14=8B 94M1: K1
15=8A ECB: 5
16=8B 94M2: K1
18=8A ECC: 11
18=8A 43: 12
21=8A ECC: 2
21=8A ALRL: A3
22=8A 43: 12
22=8A 43: 31
24=8B MDC: 67
25=8A ALRL: 1
25=8A ECC: 3
26=8B MDC: 59
28=8A ECB: 10
31=8A 43: 22
31=8A 47/21-1: 3
32=8A 43: 11
32=8A 43: 38
34=8A 27E: A3Y
35=8A 94M: K1
36=8A 8A ECB: 4
38=8A 43: 32
41=8A 43: 42
41=8A ECC: 12
42=8A 43: 48
42=8A 43: 41
44=8A 59D: A3Y
45=8B CS-1: 12
46=8A 59D: A1Y
48=8A 43: 42

NP 133
8A
47/27-1
BE1-47N

G
9 7 5 3 1
10 8 6 4 2

E-005

1=8A 62-27A: 2
1=1AT14 (8A47/27-1: 2) e1
2=1AT14 (8A47/27-1: 1) e1
2=8A 94M1A: A1Y
3=8A 43: 31
3=47-27-1: 10
4=12 8B 52: 14
4=8A 94M: K2
5=1AT13 (8A47/27-1: 10)
5=8A 47/27-1: 11
6=PV1 (8AP3VT: 1) f1
6=
7=
7=PV2 (8AP3VT: 2) f1
8=
8=PV3 (8AP3VT: 3) f1
10=47/27-1: 3
10=1A713 (8A47/27-1: 5)
11=8A 47/27-1: 5
11=8A 94M1A: A1X
12=8A 47/27-1: 19
16=8A ECC: 9
17=8A ECC: 10
19=8A 47/27-1: 12
20=8A 94M1A: A2X
CG=GRD (8A: GRD) f0

REGION E (LEFT HAND SIDE SHEET)

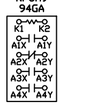
INTERLOCKS FROM 7B TO 8B
8A
ELC

7A ECB: 1	1	
7A ECB: 2	2	8A 59D: A2Y
7A ECB: 3	3	8B CS-1: 57
7A ECB: 4	4	8A 59D: A4Y
7A ECB: 5	5	
7A ECB: 6	6	8B 86-1: 17
7A ECB: 7	7	8A ECD: 5
7A ECB: 8	8	8B ECD: 9
7A ECB: 9	9	8B 3A: A2Y
7A ECB: 10	10	8B MDC: 60
7A ECB: 11	11	8B 52: 1
	12	
1B FRG: 3	13	9A BT: 9

INTERLOCKS FROM 8B TO 7B
8A
ECB

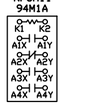
7A ELC: 1	1	8A 43: 11
7A ELC: 2	2	8A 27E: A4Y
7A ELC: 3	3	8B MDC: 61
7A ELC: 4	4	8A 43: 36
7A ELC: 5	5	8A 43: 15
7A ELC: 6	6	8B 86-1: 21
7A ELC: 7	7	8B 86-1: 23
7A ELC: 8	8	8A 27E: A1Y
7A ELC: 9	9	8B 94M1: A3Y
7A ELC: 10	10	8A 43: 28
7A ELC: 11	11	8B 3A: A4Y 8A 27E: A2Y
7A ELC: 12	12	8B MDC: 62
7A ELC: 13	13	

NP8A9
94GA



K1=8A 94GA: A3Y
K2=8A 94M1A: K2/ALRL: 2
A1X=8A 43T: 12
A1X=8A 94GA: A2X
A1Y=8A 94M1A: A3Y
A2X=8A 94GA: A1X
A2Y=8A 94M2A: A3Y
A3X=8A TTPB: 3
A3Y=8A TTPB: 4
A3Y=8A 94GA: K1
A4X=
A4Y=

NP8A11
94M1A



K1=8B 94M1: B1Y
K1=8A 94M1A: A3Y
K2=8A 94GA: K2
K2=8A 94M2A: K2
A1X=8A 47-27-1: 11
A1Y=8A 47-27-1: 2
A2X=8A 47-27-1: 20
A2Y=8A 94M: A1X
A3X=8A ECA: 11
A3Y=8A 94M1A: K1
A3Y=8A 94GA: A1Y
A4X=
A4Y=

NP8A13
94M2A

K1=8B 94M2: B1Y
K1=8A 94M2A: A3Y
K2=8A 94M1A: K2
K2=8A 94AL: K2
A1X=8A ECD: 1
A1Y=8A ECD: 2
A2X=8A ECD: 4
A2Y=8A 94M: A2X
A3X=8A 27E: B2Y
A3Y=8A 94M2A: K1
A3Y=94GA: A2Y
A4X=
A4Y=

NP8A15
94AL

K1=8A ALRL: 1
K1=
K2=8A 94M2A: K2
K2=8B NF: 4
A1X=
A1Y=
A2X=
A2Y=
A3X=
A3Y=
A4X=
A4Y=

REGION E (FIXED PORTION FRONT VIEW)

H (8A23:2) e1
H (8AH2:1) e1 1
HAC0 (8AECD:12) e1 2
HAC0 (8AH2:2) e1

8A
H1
HEATER
100W
120V

REGION E (RIGHT HAND SIDE SHEET)

NP 140
8A
P3VT

1	PV1 (8AECA:1) f1 PV1 (8A47/27-1:6) f1
2	PV2 (8AECA:2) f1 PV2 (8A47/27-1:7) f1
3	PV3 (8AECA:3) f1 PV3 (8A47/27-1:8) f1
4	PV0 (8AECA:4) f1 GND (8A:GND) f0

<BRASS JUMPER>
GND

8A
23
1 2
NON-ADJ.
THERMOSTAT
1=HAC1 (8AECD: 11) e1
2=H (8AH1: 1) e1
2=H (8BH3: 1) e1

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

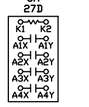
ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

REGION E (DEVICE MOUNTING PLATE FRONT VIEW)

NP8A1
8A
62-27
M1 U. V.

1=8A 62-27: 2
1=8A 27E: K1
2=8A 47/27-1: 1
2=8A 62-27: 1
3=8A 27D: K1
4=
5=
6=
7=8B 94M2: K2
7=8A 27D: K2
8=

NP8A2
8A
27D



K1=8A 62-27: 3
K2=8A 62-27: 7
K2=8A 27E: K2
A1X=8A 27D: A2X
A1Y=94M1: A2Y
A2X=8A 27D: A1X
A2Y=8B 3A: A1Y
A3X=8A 27D: A4X
A3Y=8B MDC: 64
A4X=8A 27D: A3X
A4Y=8A ECD: 8

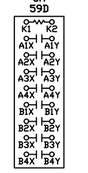
NP8A3
8A
27E

K1=8A 62-27: 1
K2=8A 27D: K2
K2=8A 62-59: 7
A1X=8A 27E: A2X
A1Y=8A ECB: 8
A2X=8A 27E: A1X
A2Y=8A ECB: 11
A3X=8A 27E: A4X
A3Y=8A 43: 34
A4X=8A 27E: A3X
A4Y=8A ECB: 2
B1X=8A ECD: 1
B1Y=8A ECD: 2
B2X=8A TTPB: 1
B2X=8A ECA: 10
B2Y=8A 94M2A: A3X
B3X=8A ECC: 9
B3Y=8A ECC: 10
B4X=
B4Y=

NP8A5
8A
62-59
M1 N. V.

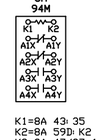
1=8A 62-59: 2
2=8A 94M: A1Y
2=8A 62-59: 1
3=8A 59D: K1
4=
5=
6=
7=8A 27E: K2
7=8A 59D: K2

NP8A6
8A
59D



K1=8A 62-59: 3
K2=8A 62-59: 7
K2=8A 94M: K2
A1X=8A 59D: A2X
A1Y=8A 43: 46
A2X=8A 59D: A1X
A2Y=8A ELC: 2
A3X=8A 59D: A4X
A3Y=8A 43: 44
A4X=8A 59D: A3X
A4Y=8A ELC: 4
B1X=8A 59D: B2X
B1Y=8A 8A ECC: 7
B2X=8A 59D: B1X
B2Y=8A ECB: 4
B3X=8A 59D: B4X
B3Y=8B 94M1: A4Y
B4X=8A 59D: B3X
B4Y=8B 3A: A3Y

NP8A8
8A
94M



K1=8A 43: 35
K2=8A 59D: K2
K2=8A 47/27-1: 4
A1X=8A 94M1A: A2Y
A1Y=8A 62-59: 2
A2X=8A 94M2: A2Y
A2Y=8A ECD: 3
A3X=
A3Y=
A4X=
A4Y=

REGION E (CENTER BARRIER TOP VIEW)

8A ECA

1	2	3	4	5	6	7	8	9	10	11	12	13
PV1 (8AP3VT1) f1 PV1 (8BMFMV1) f1	PV2 (8AP3VT2) f1 PV2 (8BMFMV2) f1	PV3 (8AP3VT3) f1 PV3 (8BMFMV3) f1	PV0 (8AP3VT4) f1 PV0 (8BMFMVREF) f1		5A-8B (8BCS-1:2) e1		PV0 (8A27I-1A:B) f1		7A ECA:11	7A ECA:12	8A 27E:B2X 8A 94M1A:A3X 7A-8B (7AECC:8) e1	

8A ECB

1	2	3	4	5	6	7	8	9	10	11	12	13
7A ECC: 12 1B ECC: 1 7A ECC: 13 1B ECC: 2	8B FRE: 5 8A 43: 21 8A 43: 25 8B FRE: 6			7A ECC: 9	8B MDC: 77 8B MDCO1: 78	1B ECC: 4 7A ECC: 7	8A ECB: 12 8B 59D: B1Y		8A 27E: B3X	8A 27E: B3Y 8B 94M1: A1Y 8B MDC: 63	8A 43:18 8B NF:1 5-8B (8BCF:2) e1	8B 43: 41

8A ECC

1	2	3	4	5	6	7	8	9	10	11	12	13
8A 94M2A: A1X	8A 94M2A: A1Y	8A 94M: A2Y	8A 94M2A: A2X		47-27-1: 16	9A TBI: 8 7A ECD: 9 7A ECD: 10	47-27-1: 17 TBI: 10	HAC1 (8A23:1) e1 HAC1 (7AECCD:11) h1 HAC1 (8AECS:1) h1	HAC0 (8BH3:2) e1 HAC0 (8AH1:2) e1 HAC0 (7AECCD:12) h1 HAC0 (8AECS:2) h1			

8A ECS

1	2	3	4
HAC1 (8AECD:11) h1	HAC0 (8AECD:12) h1	BAC1 (9ABATCH:L) h1	BAC0 (9ABATCH:N) h1

8A ECJ

1	2
P (8BCF:1) e1	P (9ABAT:+) h1 P (7AECJ:1) h1
N (8BCF:3) e1	N (7AECJ:2) h1 N (9ABAT:-) h1

SHOP NOTE

FOR SPECIAL CHARACTERS AND WIRE SIZES SEE GENERAL INFORMATION DRAWING GIDWGN

E– REFERENCE ITEMS ON EBOM EBOMDWGN

M– REFERENCE ITEMS ON MISC. AUX. EQUIP. DRAWING MISCAUXDWGN

NP NAMEPLATE ENGRAVING ITEM NUMBER NPDWGN

REFERENCE DRAWINGS

D-5000 CONSTRUCTION NOTES

REGION W (CABLE AREA REAR VIEW)

H (8AH1:1) e1 1
HAC0 (8AH1:2) e1 2

8A
H2
HEATER
100W
120V

02	02-23-2005	DES

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DDC NAME: WIRING DIAGRAM SECTION 8A PREFERRED INCOMING LINE VT'S

SHEET: 1
NEXT: F

PRJD. TYPE: GM-15KV
SCALE: NTS
DR: DES
AP: YSK
DDC. NO.: MVS04-110204WD15C

PRE:
APP:
CER: X

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
SALES ITEM:

GROUP: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
CUSTOMER: BELLEFONTAINE HABILITATION
CUSTOMER ITEM: 020604434699

01	11-19-2004	JJM

DESCRIPTION ADD IN NP133 DISCRIPTION CHANGED IN NP152, NP154 &ELC9A PER AS BUILT DWG

02	02-23-2005	DES

AS BUILT DWG

03	05-15-2015	MS

CONTROLS UPGRADES

04	05-10-2019	JRR

FOR RECORD

05	04-29-2020	DCT

REV'D 11/01/2001

REGION B – SWINGING PANEL (REAR VIEW)

(BRASS JUMPER)
GRD

NP 123
8B
LTPB
E-010

1 3
2 4

11=GL (8BGL: 2) e1
12=13 (8B52: 4) e1
13=GL (8BGL: 2) e1
14=12 (8BLTPB: 24) e1
14=12 (8B52: 2) e1
21=RL (8BRL: 2) e1
22=9-8B (8BCS-1: 28) e1
22=9-8B (8B86-1: 18) e1
23=RL (8BRL: 2) e1
24=12 (8BLTPB: 14) e1
24=12 (8B86-1: 8) e1

8B
RL
E-008

1=11-8B (8BGL: 1) e1

2=RL (8BLTPB: 21) e1
2=RL (8BLTPB: 23) e1

8B
GL
E-009

1=11-8B (8BRL: 1) e1
1=11-8B (8BCS-1: 33) e1
2=GL (8BLTPB: 11) e1
2=GL (8BLTPB: 13) e1

8B
DCLT
E-009

1=DCLP (8BDCLPB: 14) e1
2=DCLN (8BDCLPB: 23) e1

NP 131
8B
86-1
E-007

A B C D E F G H
11 12 13 14 15 16 17 18
21 22 23 24 25 26 27 28

B=12 (8BLTPB: 24) e1
B=12 (8B52: 2) e1
G=86 (8B50/51A: 2) e1
11=
11=
12=11-8B (8B CS-1: 45)
12=11-8B (8B50/51A: 3) e1
13=
14=8614 (8BFRE: 6) e1
15=8B CS-1: 41
16=8616 (8BFRE: 5) e1
17=8A ELC: 6
18=9-8B (8BLTPB: 22) e1
18=9-8B (8B52: 1) e1
21=8A ECB: 6
22=8622 (8BFRE: 7) e1
23=8A ECB: 7
24=
25=8A ECB: 11
26=
27=8B MDC: 70
28=8628 (8BFRE: 8) e1

NP 121
8B
CS-1
E-001

11 12 13 14 15 16 17 18
21 22 23 24 25 26 27 28
31 32 33 34 35 36 37 38
41 42 43 44 45 46 47 48
51 52 53 54 55 56 57 58
61 62 63 64 65 66 67 68

12=8A 43: 45
13=8B CS-1: 41
21=11-8B (8BCS-1: 33) e1
21=11-8B (8B CS-1: 45)
28=9-8B (8BCS-1: 34) e1
28=9-8B (8BLTPB: 22) e1
33=11-8B (8BGL: 1) e1
33=11-8B (8BCS-1: 21) e1
34=9-8B (8BCS-1: 28) e1
34=8B KO1: 7 e1
41=8B CS-1: 13
41=8B 86-1: 15
42=2AT6 (8BCS-1: 56) e1
45=8B 86-1: 12
45=8B CS-1: 21
46=1AT2 (8BCS-1: 52) e1
52=1AT2 (8BCS-1: 46) e1
53=8B 3A: K1
56=2AT6 (8BCS-1: 42) e1
57=8A ELC: 3

NP 124
8B
MFM
E-004

I32 I31 I22 I21 I12 I11

ANALOG OUTPUTS
A1 A2 A3 A4 AC

SWITCHES
S1 S2 S3 S4 SC

DIGITAL PORTS COM1 COM2
D4 C3 D3 D2 D1 DC SH + - SH + -
CG N/- L/+ G
VREF V1 V2 V3

9330

CG=GRD (8BGRD: GRD) f0
L+=MP (8BMF: 2) e1
N-=MN (8BMF: 4) e1
VREF=PVO (8AECA: 4) f1
I11=C11 (8B50/51A: 8) f1
I12=C21 (8BFRG: 1) f1
I21=C12 (8B50/51B: 8) f1
I22=C22 (8BFRG: 2) f1
I31=C13 (8B50/51C: 8) f1
I32=C23 (8BFRG: 3) f1
V1=PV1 (8AECA: 1) f1
V2=PV2 (8AECA: 2) f1
V3=PV3 (8AECA: 3) f1

NP 129
8B
DCLPB
E-010

1 3
2 4

11=5-8B (8B52: 16) e1
12=DCLP (8BDCLPB: 14) e1
13=P (8BTF: 1) e1
14=DCLP (8BDCLT: 1) e1
14=DCLP (8BDCLPB: 12) e1
21=DCLN (8BDCLPB: 23) e1
22=6 (8BCF: 4) e1
22=8B KO1: B e1
23=DCLN (8BDCLT: 2) e1
23=DCLN (8BDCLPB: 21) e1
24=N (8BTF: 3) e1

NP 128
8B
50/51N
BE1-50B
E-003

G
9 7 5 3 1
10 8 6 4 2

GRD GRD (GRD) f0

2=86 (8B50/51N: 6) e1
2=86 (8B50/51C: 6) e1
3=11-8B (8B50/51C: 3) e1
3=11-8B (8BTF: 2) e1
6=86 (8B50/51N: 2) e1
8=C0 (8BFLB: 4) f1
9=C10 (8BFRG: 4) f1

NP 127
8B
50/51C
BE1-50B
E-003

G
9 7 5 3 1
10 8 6 4 2

GRD GRD (GRD) f0

2=86 (8B50/51C: 6) e1
2=86 (8B50/51B: 6) e1
3=11-8B (8B50/51B: 3) e1
3=11-8B (8B50/51N: 3) e1
6=86 (8B50/51N: 2) e1
6=86 (8B50/51C: 2) e1
8=C13 (8BMFM: I31) f1
9=C3 (8BFLB: 3) f1

NP 126
8B
50/51B
BE1-50B
E-003

G
9 7 5 3 1
10 8 6 4 2

GRD GRD (GRD) f0

2=86 (8B50/51B: 6) e1
2=86 (8B50/51A: 6) e1
3=11-8B (8B50/51A: 3) e1
3=11-8B (8B50/51C: 3) e1
6=86 (8B50/51C: 2) e1
6=86 (8B50/51B: 2) e1
8=C12 (8BMFM: I21) f1
9=C2 (8BFLB: 2) f1

NP 125
8B
50/51A
BE1-50B
E-003

G
9 7 5 3 1
10 8 6 4 2

GRD GRD (GRD) f0

2=86 (8B50/51A: 6) e1
2=86 (8B86-1: G) e1
3=11-8B (8B86-1: 12) e1
3=11-8B (8B50/51B: 3) e1
6=86 (8B50/51B: 2) e1
6=86 (8B50/51A: 2) e1
8=C11 (8BMFM: I11) f1
9=C1 (8BFLB: 1) f1

REGION F (CENTER BARRIER TOP VIEW)

REFERENCE DRAWINGS

D-5000 CONSTRUCTION NOTES

REGION W (CABLE AREA REAR VIEW)

H (8BH31) e1 1
HACO (8BH32) e1 2

8B
H4
HEATER
100W
120V

SHOP NOTE

FOR SPECIAL CHARACTERS AND WIRE SIZES SEE GENERAL INFORMATION DRAWING GIDWGN

E– REFERENCE ITEMS ON EBOM EBOMDWGN

M– REFERENCE ITEMS ON MISC. AUX. EQUIP. DRAWING MISCAUXDWGN

NP NAMEPLATE ENGRAVING ITEM NUMBER NPDWGN

REGION F (DEVICE MOUNTING PLATE FRONT VIEW)

NP 138
8B
CF

1 3
2 4
2-FU
FRN 10A

1=P (8BTF: 1) e1
1=P (8AECJ: 1) e1
2=5-8B (8B52: 16) e1
2=5-8B (8AECC: 12) e1
3=N (8BTF: 3) e1
3=N (8AECJ: 2) e1
4=6 (8BDCLPB: 22) e1
4=6 (8B52: 15) e1

NP 139
8B
TF

1 3
2 4
2-FU
15A

1=P (8BDCLPB: 13) e1
1=P (8BCF: 1) e1
2=11-8B (8B50/51N: 3) e1
2=11-8B (8BMF: 1) e1
3=N (8BDCLPB: 24) e1
3=N (8BCF: 3) e1
4=12 (8BMF: 3) e1
4=8B 3A: K2

NP 141
8B
MF

1 3
2 4
2-FU
3A

1=11-8B (8BTF: 2) e1
1=11-8B (8BNF: 1) e1
2=MP (8BMFM: L+) e1
3=8B NF: 3
3=12 (8BTF: 4) e1
4=MN (8BMFM: N-) e1

NP 142
8B
NF

1 3
2 4
2-FU

1=11-8B (8BMF: 1) e1
1=11-8B (8AECC-11)
2=8B 3A: B1X
3=8B MF: 3
3=8B 52: 14
4=8A 94AL: K2

NP8B1
8B
3A

K1 K2
A1X A1Y
A2X A2Y
A3X A3Y
A4X A4Y
B1X B1Y
B2X B2Y
B3X B3Y
B4X B4Y

K1=8B CS-1: 53
K2=8B TF: 4
K2=8B 5A: K2
A1X=8B 3A: A2X
A1Y=8B 27D: A2Y
A2X=8B 3A: A1X
A2Y=8A ELC: 9
A3X=8B 3A: A4X
A3Y=8A 59D: B4Y
A4X=8B 3A: A3X
A4Y=8B MDC: 68
A4Y=8A ECB: 11
B1X=8B FRE: 5
B1X=8B NF: 2
B1Y=8B FRE: 6
B2Y=7A ECA: 12

NP8B2
8B
5A

K1 K2
A1X A1Y
A2X A2Y
A3X A3Y
A4X A4Y
B1X B1Y
B2X B2Y
B3X B3Y
B4X B4Y

K1=8A ECD: 7
K2=8B 3A: K2
K2=8B 94M1: K2
A1X=8A ECD: 3
A1Y=8A ECD: 4
A2X=
A2Y=
A3X=
A3Y=
A4X=
A4Y=

NP8B4
8D
94M1

K1 K2
A1X A1Y
A2X A2Y
A3X A3Y
A4X A4Y
B1X B1Y
B2X B2Y
B3X B3Y
B4X B4Y

K1=8A 43: 14
K2=8B 5A: K2
K2=8B 94M2: K2
A1X=8B 94M1: A2X
A1Y=8A ECC: 11
A1Y=8B 94M2: A1Y
A2X=8B 94M1: A1X
A2Y=8A 27D: A1Y
A2Y=8B 94M2: A2Y
A3X=8B 94M1: A4X
A3Y=8A ECB: 9
A3Y=8B 94M2: A3Y
A4X=8B 94M1: A3X
A4Y=8B 94M2: A4Y
A4Y=8A 59D: B3Y
B1X=TTPB: 2
B1X=8B 94M2: B1X
B1Y=8A 94M1A: K1
B2X=8B FRE: 9
B2X=8B 94M2: B2X
B2Y=8B FRE: 1

NP8B5
8B
94M2

K1 K2
A1X A1Y
A2X A2Y
A3X A3Y
A4X A4Y
B1X B1Y
B2X B2Y
B3X B3Y
B4X B4Y

K1=8A 43: 16
K2=8B 94M1: K2
K2=8A 62-27: 7
A1X=8B 94M2: A2X
A1Y=8B 94M1: A1X
A2Y=8B 94M1: A1Y
A2X=8B 94M2: A1X
A2Y=8B 94M1: A2Y
A3X=8B 94M2: A4X
A3Y=8B 94M1: A3Y
A4X=8B 94M2: A3X
A4Y=8B 94M1: A4Y
B1X=8B 94M1: B1X
B1Y=8A 94M2A: K1
B2X=8B 9M1: B2X
B2Y=8B FRG: 9

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

REGION F (LEFT HAND SIDE SHEET)

8B
S2

8A ECB: 10 e1
9-8B (8B86-1: 18) e1
12 (8BLTPB: 14) e1
12 (8B86-1: 8) e1
13 (8BLTPB: 12) e1

1 9-8B (8BMDC-1: 68) e1
2 12 (8B52: 14) e1
3
4
5 525 (8BFRE: 3) e1
6 526 (8BFRE: 4) e1
7 527 (8BFRE: 1) e1
8 528 (8BFRE: 2) e1
9 529 (8BFRG: 11) e1
10 5210 (8BFRG: 12) e1
11 5211 (8BFRG: 9) e1
12 5212 (8BFRG: 10) e1
13
14 12 (8BNF: 3) e1
12 (8B52: 2) e1
15 6 (8BCF: 4) e1
16 5-8B (8BCF: 2) e1

8A ECD: 6
8A 47/27-1: 4
5-8B (8BDCLPB: 11) e1

SECONDARY DISCONNECT

8B
FLB

C1 (8B50/51A: 9) f1 1 4AX1 (8BCT4A: X1) f1
C2 (8B50/51B: 9) f1 2 4BX1 (8BCT4B: X1) f1
C3 (8B50/51C: 9) f1 3 4CX1 (8BCT4C: X1) f1
C0 (8B50/51N: 8) f1 4 4AX2 (8BCT4A: X2) f1
(BRASS JUMPER) 5 4BX2 (8BCT4B: X2) f1
GND (8B: GND) f0 6 4CX2 (8BCT4C: X2) f1

SCTB

REGION F (FIXED PORTION FRONT VIEW)

8B
CT4A
X1 X2
MDD 300/5A

X1 4AX1 (8BFLB: 1) f1
X2 4AX2 (8BFLB: 4) f1

8B
CT4B
X1 X2
MDD 300/5A

X1 4BX1 (8BFLB: 2) f1
X2 4BX2 (8BFLB: 5) f1

8B
CT4C
X1 X2
MDD 300/5A

X1 4CX1 (8BFLB: 3) f1
X2 4CX2 (8BFLB: 6) f1

H (8A23: 2) e1 1
H (8BH41) e1
HACO (8AECD: 12) e1 2
HACO (8BH42) e1

8B
H3
HEATER
100W
120V

REGION F (RIGHT HAND SIDE SHEET)

8B
FRG

C21 (8BFRG: 5) f1 1
C21 (8BMFM: I12) f1
C22 (8BFRG: 6) f1 2
C22 (8BMFM: I22) f1
C23 (8BFRG: 7) f1 3
C23 (8BMFM: I32) f1
C10 (8BFRG: 8) f1 4
C10 (8B50/51N: 9) f1
C21 (8BFRG: 1) f1 5 J2 (8BFRG: 6) f1
C22 (8BFRG: 2) f1 6 J3 (8BFRG: 5) f1
J2 (8BFRG: 7) f1
C23 (8BFRG: 3) f1 7 J3 (8BFRG: 6) f1
C10 (8BFRG: 4) f1 8 J3 (8BFRG: 7) f1
5211 (8B52: 11) e1 9 8B 94M2: B2Y
7B FRG: 9
5212 (8B52: 12) e1 10 7B FRE: 2
9A TB1: 4
529 (8B52: 9) e1 11
5210 (8B52: 10) e1 12
13

8B
TOC-1

201 202 203 204 205 206 207 208 209 210 211 212
213 214 215 216 217 218 219 220 221 222 223 224

8B
FRE

527 (8B52: 7) e1 1 8B 94M1: B2Y
7B FRE: 1
528 (8B52: 8) e1 2 7B FRG: 10
9A TB1: 2
525 (8B52: 5) e1 3
526 (8B52: 6) e1 4
8616 (8B86-1: 16) e1 5 8A ECC: 2
3A 3A: B1X
8614 (8B86-1: 14) e1 6 3A 3A: B1Y
9A ECC: 3
8622 (8B86-1: 22) e1 7
8628 (8B86-1: 28) e1 8
8B 94M1: B2X 9 9A TB1: 1
10
8626 (8B86-1: 26) e1 11
8624 (8B86-1: 24) e1 12
13

8B
MOC-1

59 60 61 62 63 64 65 66 67 68 69 70
71 72 73 74 75 76 77 78 79 80 81 82

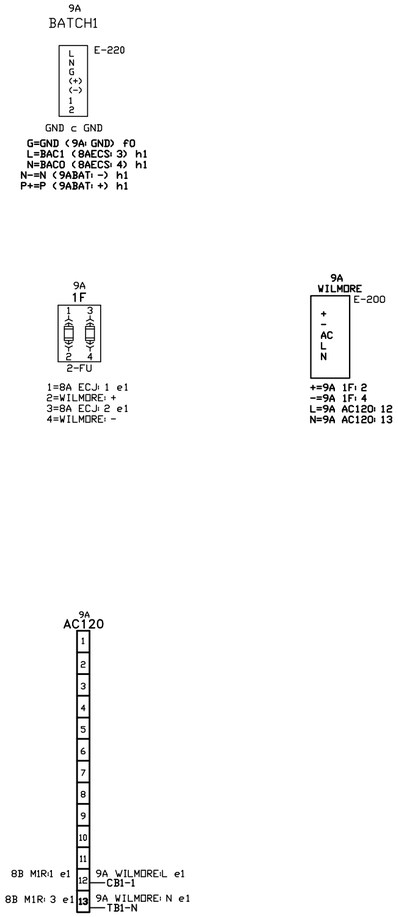
59=8A 43: 26
60=8A ELC: 10
61=8A ECB: 3
62=8A ECB: 12
63=8A ECC: 11
64=8A 27D: A3Y
67=8A 43: 24
68=8B 3A: A4Y
69=8A ECD: 10
70=8A 86-1: 27
73=8A ECD: 12
74=8A ECD: 13
77=8A ECC: 7
78=8A ECC: 8

Siemens Power Transmission & Distribution, Inc. Raleigh, NC		
DDC NAME: WIRING DIAGRAM SECTION 8B MAIN BREAKER AMEREN PREFERRED LAT. 25385	SHEET: 1 NEXT: F	REV'D 11/01/2001
PROD. TYPE: GM-15KV	SCALE: NTS	DES: YSK
DDC. NO.: MVS04-110204WD16C	DR: AP:	
PRE: APP: CER: X		
SALES ORDER: 110105 MFG. PROJECT: 110204 SALES ITEM: CUSTOMER: FRENCH GERLEMAN ELECTRIC CUSTOMER ORDER: 020604434699	LOCATION: BELLEFONTAINE NEIGHBORS, MO GROUP: BELLEFONTAINE HABILITATION	

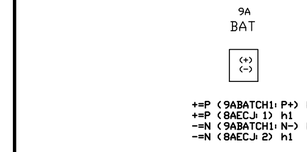
01	11-19-2004	JJM
DESCRIPTION CHANGED IN NP131 & 52&B PER AS BUILT DWG		
02	02-23-2005	DES
AS BUILT DWG		
03	05-15-2015	MS
CONTROLS UPGRADES		
04	05-10-2019	JRR
FOR RECORD		
05	04-29-2020	DCT

SWINGING PANEL (REAR VIEW)

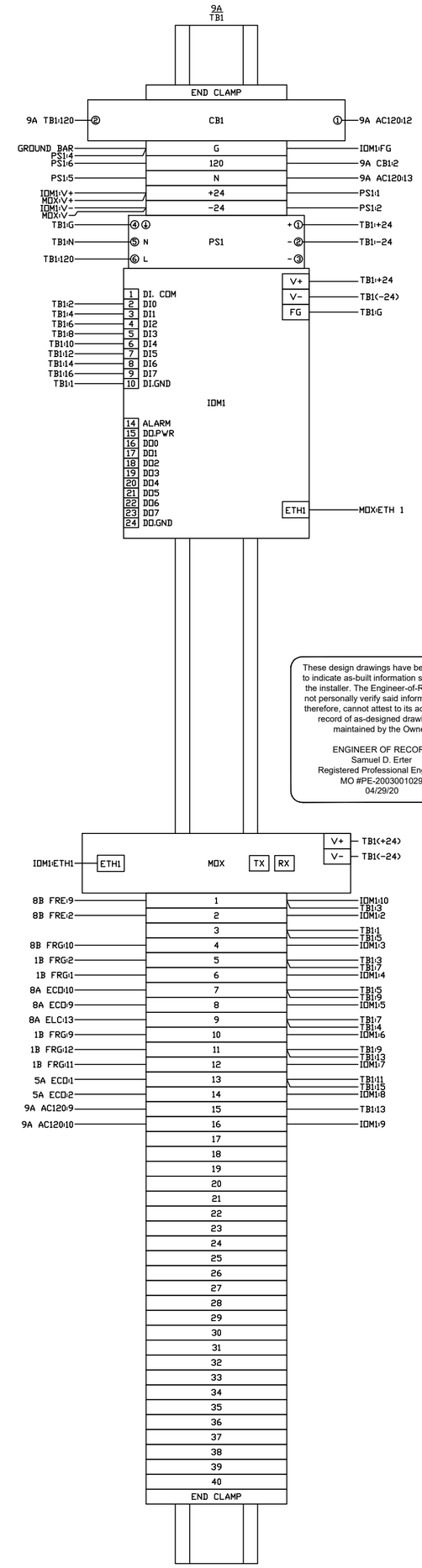
LEFT HAND SIDE SHEET



FIXED PORTION FRONT VIEW



RIGHT HAND SIDE SHEET



CONSTRUCTION NOTES:

1. SWITCHGEAR TEMPERATURE & BATTERY ALARM CONTACTS TO BE LOCATED IN FIELD.

REFERENCE DRAWINGS

D-2202 SWITCHGEAR REMOTE I/O PACK
D-5000 CONSTRUCTION NOTES

SHOP NOTE

FOR SPECIAL CHARACTERS AND WIRE SIZES SEE GENERAL INFORMATION DRAWING MVS04-110204GI01C

E- REFERENCE ITEMS ON EBOM MVS04-110204EB01A

M- REFERENCE ITEMS ON MISC. AUX. EQUIP. DRAWING MVS04-110204MA01C

NP NAMEPLATE ENGRAVING ITEM NUMBER MVS04-110204NP01C

Siemens Power Transmission & Distribution, Inc.
Raleigh, NC

DDC NAME: WIRING DIAGRAM SECTION 9
48 VDC BATTERY CHARGER AND BATTERIES

SHEET: 1
NEXT: F

REV'D 11/01/2001

PROD. TYPE: GM-15KV
SCALE: NTS
DR: DES
AP: YSK
DDC. NO.: MVS04-110204WD17C

PRE:
APP: X
CER:

SALES ORDER: 110105
MFG. PROJECT: 110204
SALES ITEM:
CUSTOMER: FRENCH GERLEMAN ELECTRIC
LOCATION: BELLEFONTAINE NEIGHBORS, MO
GROUP: LEFONTAINE HABILITATION
CUSTOMER ORDER: 020604434699

01	11-23-2004	JJM
CORRECT SPELLING OF AND IN TITLE BLK		
02	01-06-2006	DES
AS BUILT DWG		
03	05-15-2015	MS
CONTROLS UPGRADES		
04	05-10-2019	EPS
FOR RECORD		
05	04-29-2020	DCT

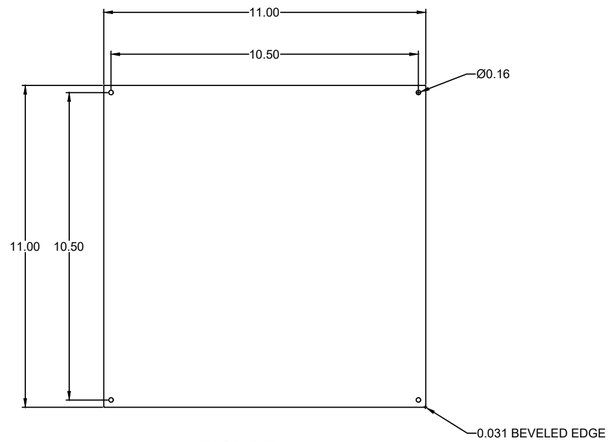


FIGURE 1

SCALE: 3" = 1'-0"
WHITE LAMICOID W/ BLACK CORE
3/4" HIGH LETTERS
(SEE DWG MVS04-110204NP02A)

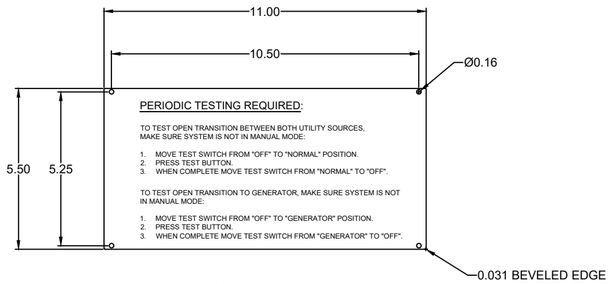


FIGURE 2

SCALE: 3" = 1'-0"
WHITE LAMICOID W/ BLACK CORE
3/4" HIGH LETTERS

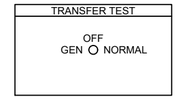


FIGURE 5

SCALE: 3" = 1'-0"

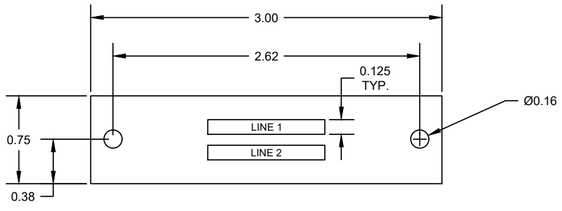


FIGURE 3

SCALE: 1" = 1"
WHITE LAMICOID W/ BLACK CORE
1/8" HIGH LETTERS
2 LINES OF TEXT

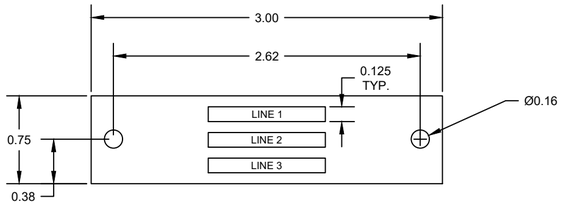


FIGURE 4

SCALE: 1" = 1"
WHITE LAMICOID W/ BLACK CORE
1/8" HIGH LETTERS
3 LINES OF TEXT

REFERENCE DRAWINGS

18839068460	PANEL ARRANGEMENT DRAWING
NP-001	NAMEPLATE SCHEDULE FOR SIEMENS SWGR
NP-002	NAMEPLATE SCHEDULE SWITCHGEAR REMOTE I/O
NP-003	NAMEPLATE SCHEDULE REMOTE ANNUNCIATOR PANEL
NP-004	NAMEPLATE SCHEDULE SHIP LOOSE

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

FOR RECORD

ASCHINGER ELECTRIC
BHC
BELLEFONTAINE NEIGHBORS, MO

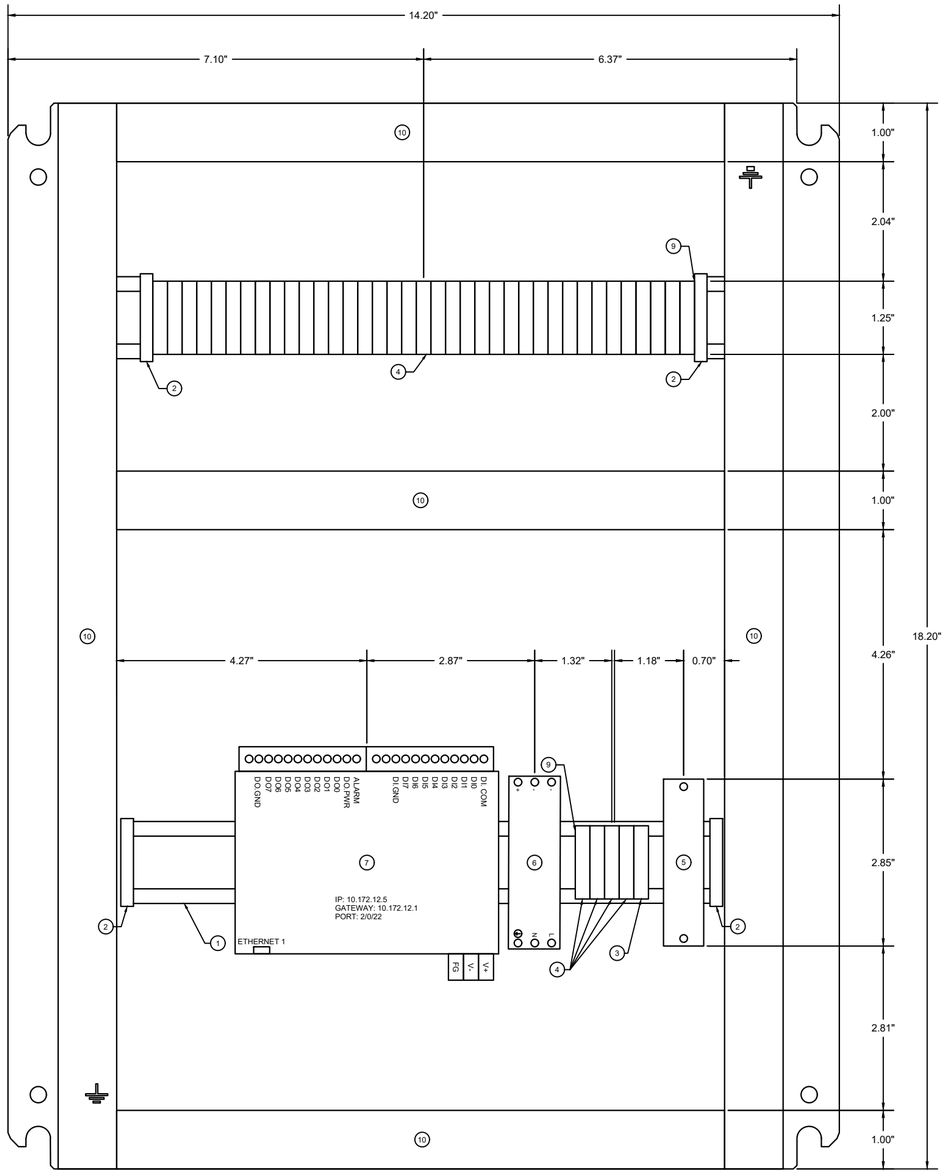
DRAFTER: TWM		ENGR: DJW	DATE: 01/02/2019
CHECKER: MAB		APPD: DJW	SCALE: AS SHOWN

REV	DATE	DESCRIPTION
0	10 MAY 19	CONTROLS UPGRADES
1	29 APR 20	FOR RECORD

NAMEPLATE DETAILS

DRAWING NO. D-2200

REV. 1



BACK PANEL

SCALE: 6" = 1'-0"

REFERENCE DRAWINGS

BM-003 BILL OF MATERIAL- REMOTE ANNUNCIATOR PANEL

NOTES:

1. THE REMOTE ANNUNCIATOR PANEL MUST BE FABRICATED BY A UL 508A CERTIFIED INDUSTRIAL CONTROL PANEL SHOP, MUST BE UL 508A LISTED AND LABELED, AND MUST BE LABELED WITH THE SCCR THAT MUST BE A MINIMUM OF 10kA PER SPECIFICATION 261327-2.12 O.1.

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

FOR RECORD

ASCHINGER ELECTRIC
BHC
BELLEFONTAINE NEIGHBORS, MO

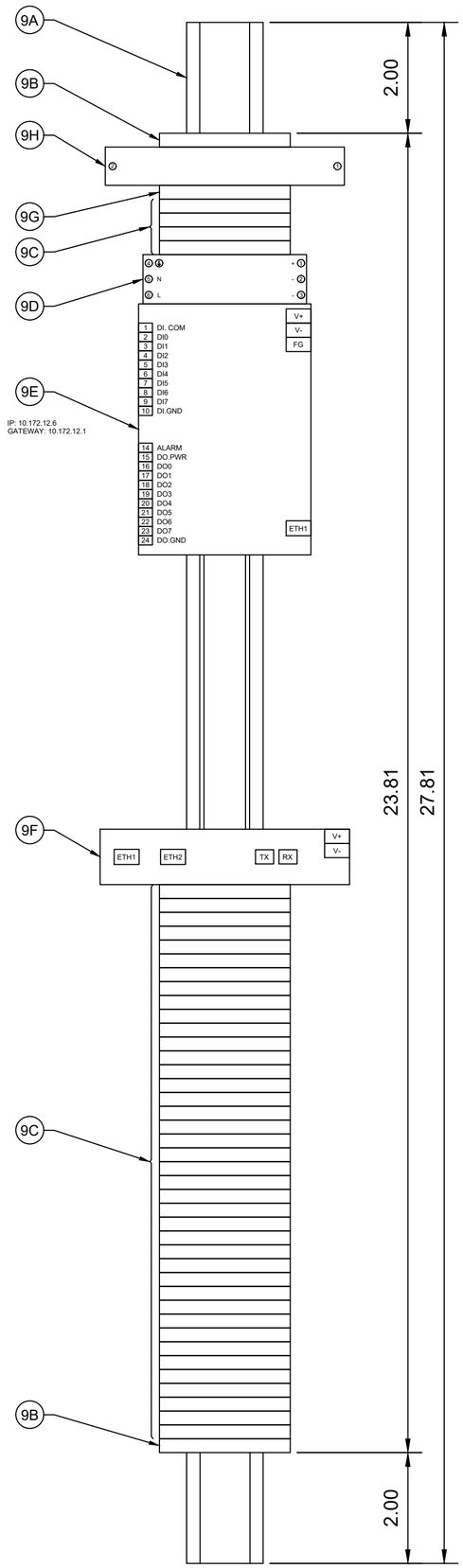
DRAFTER: TWM	ENGR: DJW	DATE: 01/02/2019
CHECKER: MAB	APPD: DJW	SCALE: AS SHOWN

REV	DATE	DESCRIPTION
0	10 MAY 19	CONTROLS UPGRADES
1	29 APR 20	FOR RECORD

REMOTE ANNUNCIATOR
BACK PANEL LAYOUT

DRAWING NO. D-2201

REV. 1



9A - TB1

SCALE: 6" = 1'-0"

REFERENCE DRAWINGS

BM-002 BILL OF MATERIAL- SWGR REMOTE I/O

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

FOR RECORD

ASCHINGER ELECTRIC
BHC
BELLEFONTAINE NEIGHBORS, MO

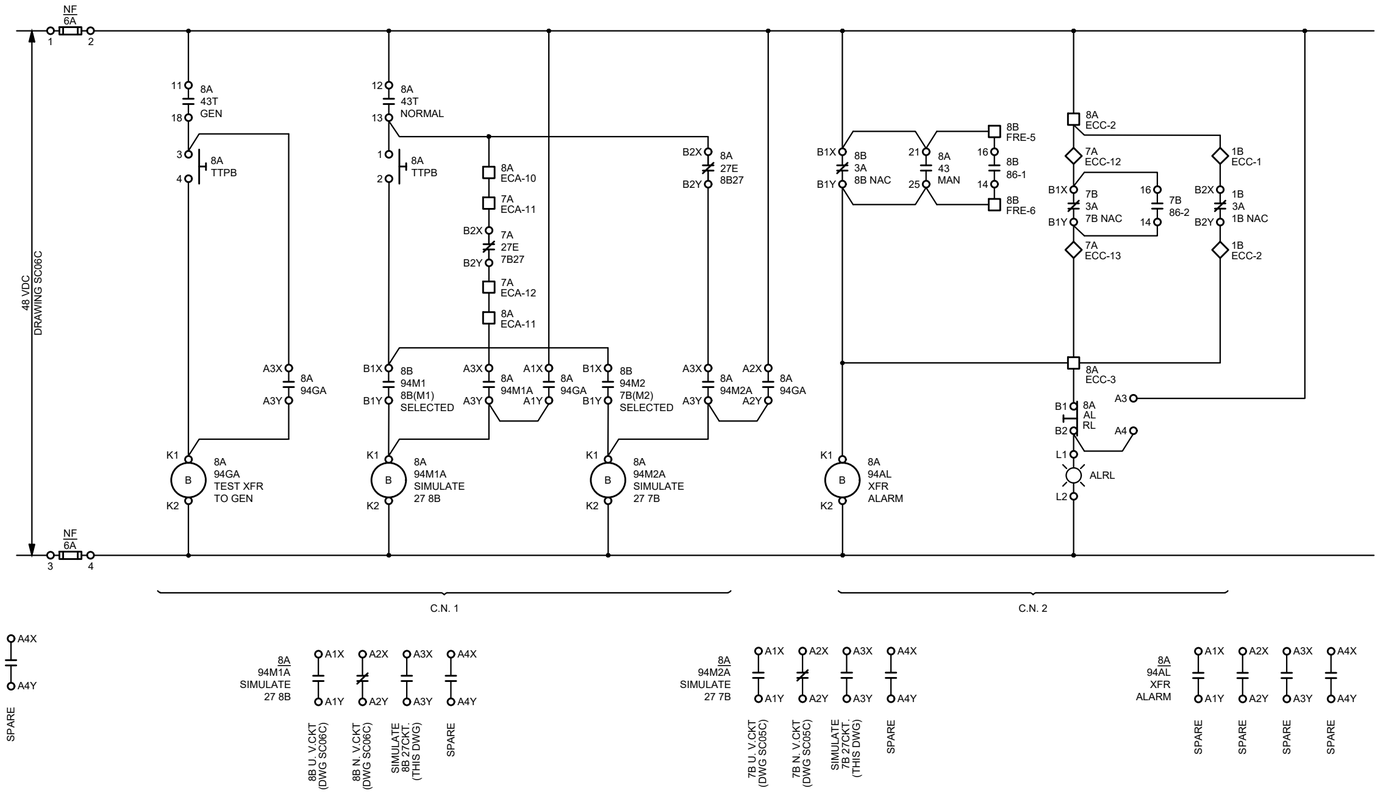
DRAFTER: TWM	ENGR: DJW	DATE: 01/02/2019
CHECKER: MAB	APPD: DJW	SCALE: AS SHOWN

REV	DATE	DESCRIPTION
0	10 MAY 19	CONTROLS UPGRADES
1	29 APR 20	FOR RECORD

SWITCHGEAR REMOTE I/O RACK

DRAWING NO. D-2202

REV. 1



CONSTRUCTION NOTES:

1. ADDITIONAL SCHEMATIC FOR COMPLIANCE WITH U.L. 1008 16.4.5.
2. ADDITIONAL SCHEMATIC FOR COMPLIANCE WITH U.L. 1008 16.4.7 & 16.1.10.

LEGEND:

- □ - UNIT CONNECTION
- ◇ - INTER-UNIT CONNECTION

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

FOR RECORD

ASCHINGER ELECTRIC
BHC
BELLEFONTAINE NEIGHBORS, MO

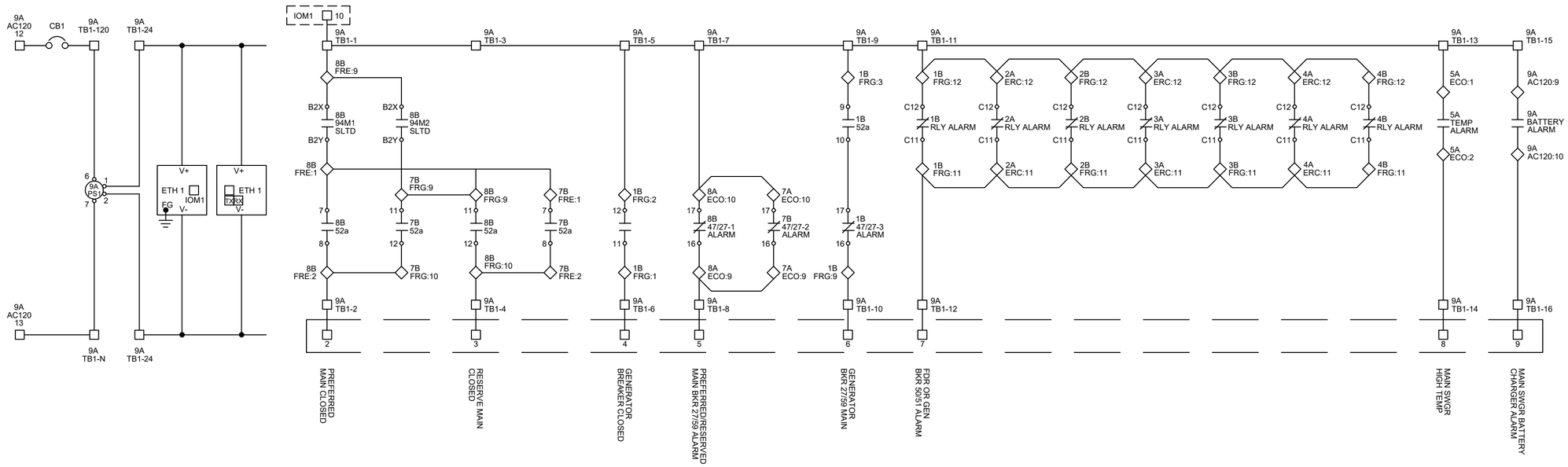
DRAFTER: TWM		ENGR: DJW	DATE: 01/02/2019
CHECKER: MAB		APPD: DJW	SCALE: NTS

REV	DATE	DESCRIPTION
0	10 MAY 19	CONTROLS UPGRADES
1	29 APR 20	FOR RECORD

ATS SCHEME FOR
TESTING AND ALARM

DRAWING NO. D-4000

REV. 1



CONSTRUCTION NOTES:

1. SWITCHGEAR TEMPERATURE & BATTERY ALARMS TO BE LOCATED IN FIELD.

LEGEND:

- □ - UNIT CONNECTION
- ◇ - INTER-UNIT CONNECTION

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

FOR RECORD

ASCHINGER ELECTRIC
BHC
BELLEFONTAINE NEIGHBORS, MO

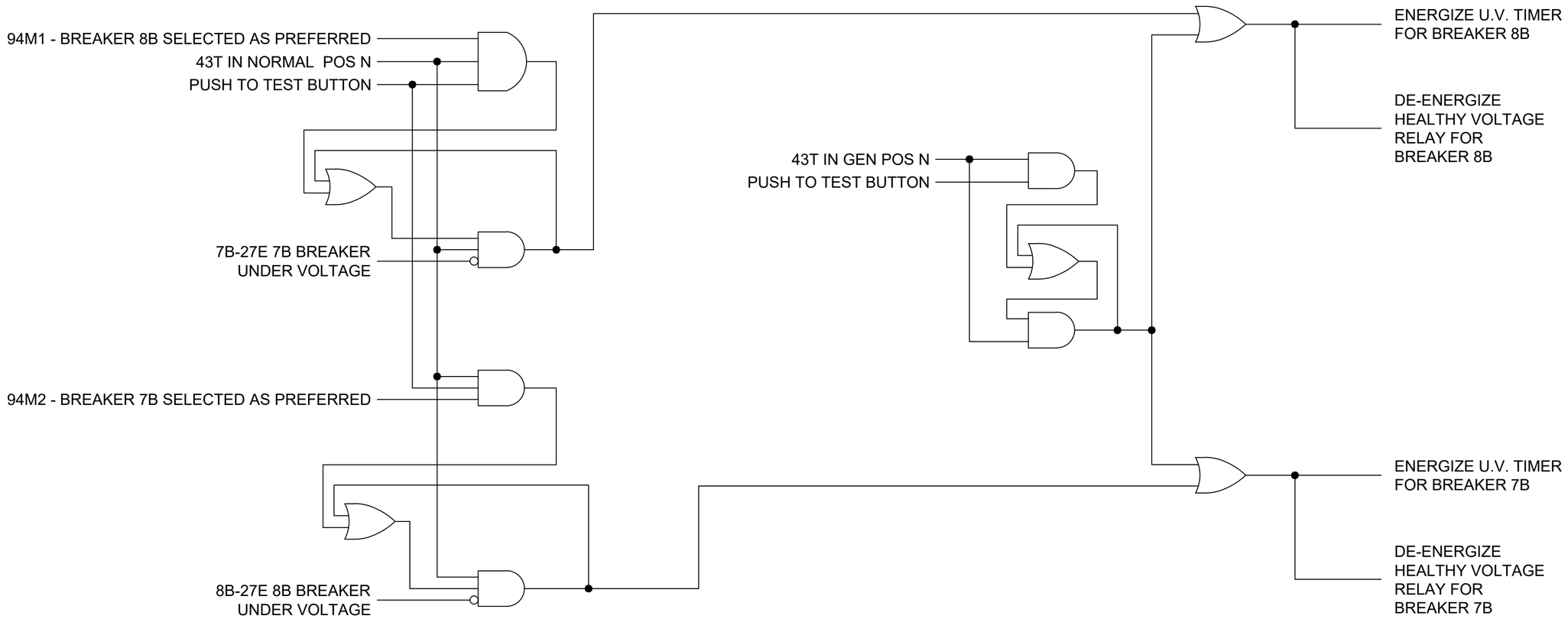
DRAFTER: TWM		ENGR: DJW	DATE: 01/02/2019
CHECKER: MAB		APPD: DJW	SCALE: NTS

REV.	DATE	DESCRIPTION
0	10 MAY 19	CONTROLS UPGRADES
1	29 APR 20	FOR RECORD

I0M1 SCHEMATIC DIAGRAM

DRAWING NO. D-4001

REV. 1



These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

FOR RECORD

ASCHINGER ELECTRIC
BHC
BELLEFONTAINE NEIGHBORS, MO

DRAFTER: TWM	ENGR: DJW	DATE: 01/02/2019
CHECKER: MAB	APPD: DJW	SCALE: NTS

REV	DATE	DESCRIPTION
0	10 MAY 19	CONTROLS UPGRADES
1	29 APR 20	FOR RECORD

ATS SCHEME
TESTING LOGIC DIAGRAM

DRAWING NO. D-4901

REV. 1

CONSTRUCTION NOTES:

1. ALL POWER AND CONTROL WIRING TO BE 90°C RATED.
2. MINIMUM SIZE OF POWER WIRING TO BE 12AWG.
3. MINIMUM SIZE OF CONTROL WIRING TO BE 14AWG.
4. WIRING TO CONTACTS POWERED FROM EXTERNAL SOURCE SHALL BE YELLOW.
5. POSITIVE DC WIRING TO BE RED.
6. NEGATIVE DC WIRING TO BE BLACK.
7. WIRE LABELS TO BE SELF LAMINATED VINYL, COMPUTER PRINTED.
8. WIRE LABELS WILL BE MARKED WITH SOURCE AND DESTINATION ON BOTH ENDS.
9. WIRING THAT RUNS ACROSS HINGES TO BE CLASS C STRANDING.
10. WIRES WILL BE CONTINUOUS RUNS, SPLICES ARE NOT PERMITTED.
11. NO MORE THAN TWO (2) WIRES CONNECTED PER TERMINATION POINT.
12. TERMINAL BLOCKS WILL BE INSTALLED A MINIMUM OF SIX (6) INCHES ABOVE THE PANEL BOTTOM.
13. NOT LESS THAN TWO (2) INCHES SHALL BE PROVIDED BETWEEN TERMINAL BLOCKS AND WIRING DUCT OR OTHER EQUIPMENT.
14. WIRING DUCT SHALL NOT EXCEED 50% FILL.
15. WIRES EXCEPT FOR THOSE COVERED IN WIREWAY SHALL BE PERMANENTLY MARKED WITH THE TERMINAL NUMBER.
16. TERMINAL NUMBERS SHALL BE A PERMANENT NON-CONDUCTIVE STRIP ON EACH BLOCK. WIRE NUMBERS SHALL BE USED TO IDENTIFY TERMINALS.
17. ALL WIRES TO BE TERMINATED WITH VINYL OR NYLON SPADE TYPE TERMINALS.

REFERENCE DRAWINGS

MVS04-110204WD01C	WIRING DIAGRAM SECTION 1A SPARE
MVS04-110204WD02C	WIRING DIAGRAM SECTION 1B TIE TO GENERATOR
MVS04-110204WD03C	WIRING DIAGRAM SECTION 2A FEEDER 3A SWITCH-10
MVS04-110204WD04C	WIRING DIAGRAM SECTION 2B FEEDER 3B SWITCH-15
MVS04-110204WD05C	WIRING DIAGRAM SECTION 3A FEEDER 2A SWITCH-5
MVS04-110204WD06C	WIRING DIAGRAM SECTION 3B FEEDER 2B SWITCH-9
MVS04-110204WD07C	WIRING DIAGRAM SECTION 4A FEEDER 1A SWITCH-4
MVS04-110204WD08C	WIRING DIAGRAM SECTION 4B FEEDER 1B SWITCH-1
MVS04-110204WD13C	WIRING DIAGRAM SECTION 7A RESERVE INCOMING LINE VT'S
MVS04-110204WD14C	WIRING DIAGRAM SECTION 7B MAIN BREAKER AMEREN RESERVE LAT. 25384
MVS04-110204WD15C	WIRING DIAGRAM SECTION 8A PREFERRED INCOMING LINE VT'S
MVS04-110204WD16C	WIRING DIAGRAM SECTION 8B MAIN BREAKER AMEREN PREFERRED LAT. 25385
MVS04-110204WD17C	WIRING DIAGRAM SECTION 9A 48VDC BATTERY CHARGER AND BATTERIES

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

FOR RECORD

ASCHINGER ELECTRIC
BHC
BELLEFONTAINE NEIGHBORS, MO

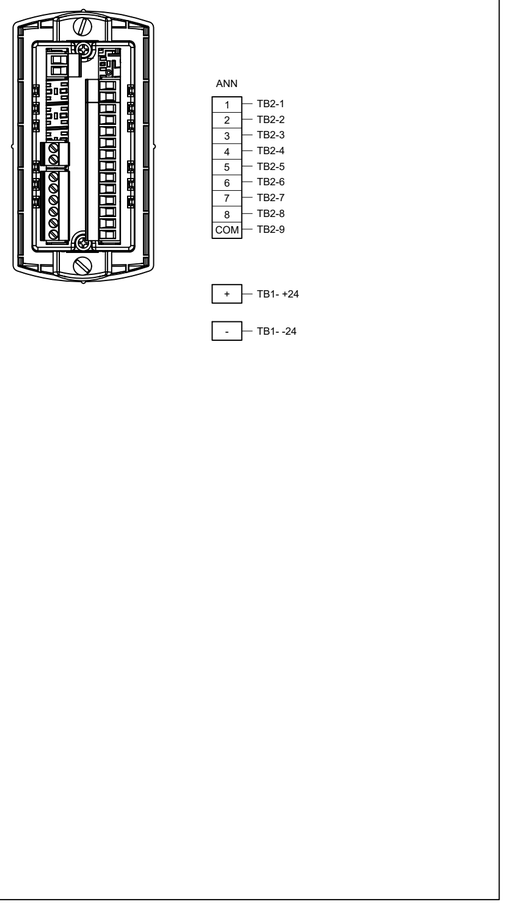
DRAFTER: TWM	ENGR: DJW	DATE: 01/02/2019
CHECKER: MAB	APPD: DJW	SCALE: NTS

REV	DATE	DESCRIPTION
0	10 MAY 19	CONTROLS UPGRADES
1	29 APR 20	FOR RECORD

CONSTRUCTION NOTES

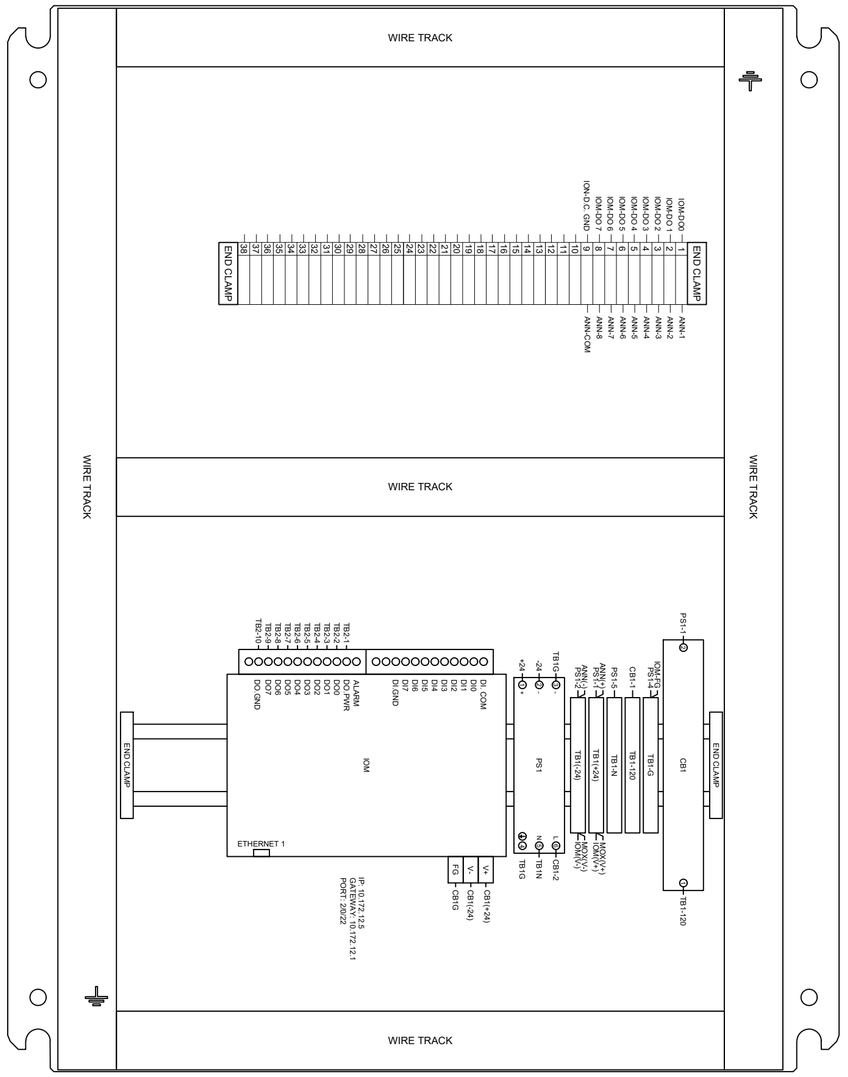
DRAWING NO. D-5000

REV. 1



REAR VIEW DOOR

SCALE: 6" = 1'-0"



BACK VIEW PANEL

SCALE: 6" = 1'-0"

NOTES:

1. THE REMOTE ANNUNCIATOR PANEL MUST BE FABRICATED BY A UL 508A CERTIFIED INDUSTRIAL CONTROL PANEL SHOP, MUST BE UL 508A LISTED AND LABELED, AND MUST BE LABELED WITH THE SCCR THAT MUST BE A MINIMUM OF 10kA PER SPECIFICATION 261327-2.12 O.1.

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

FOR RECORD

ASCHINGER ELECTRIC
BHC
BELLEFONTAINE NEIGHBORS, MO

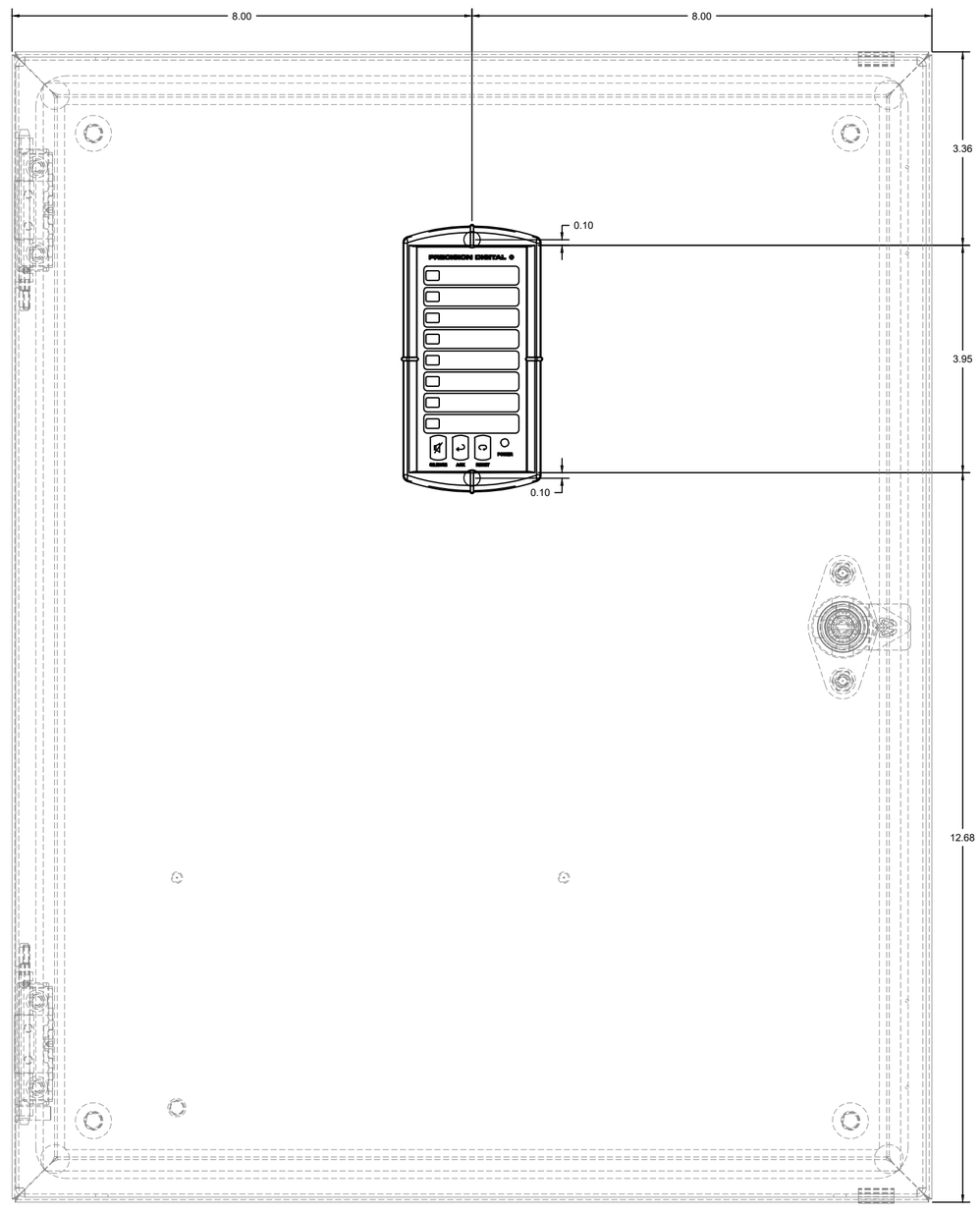
DRAFTER: TWM	ENGR: DJW	DATE: 01/02/2019
CHECKER: MAB	APPD: DJW	SCALE: AS SHOWN

REV	DATE	DESCRIPTION
0	10 MAY 19	CONTROLS UPGRADES
1	29 APR 20	FOR RECORD

REMOTE ANNUNCIATOR PANEL
WIRING DIAGRAM

DRAWING NO. D-5001

REV. 1



FRONT VIEW DOOR

SCALE: 6" = 1'-0"

CONSTRUCTION NOTE:

1. REMOTE ANNUNICATOR PANEL TO BE INSTALLED BY CONTRACTOR, LOCATION IS SPECIFIED ON CONTRACTOR DRAWINGS.

NOTES:

1. THE REMOTE ANNUNCIATOR PANEL MUST BE FABRICATED BY A UL 508A CERTIFIED INDUSTRIAL CONTROL PANEL SHOP, MUST BE UL 508A LISTED AND LABELED, AND MUST BE LABELED WITH THE SCCR THAT MUST BE A MINIMUM OF 10kA PER SPECIFICATION 261327-2.12 O.1.

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

FOR RECORD

ASCHINGER ELECTRIC
BHC
BELLEFONTAINE NEIGHBORS, MO

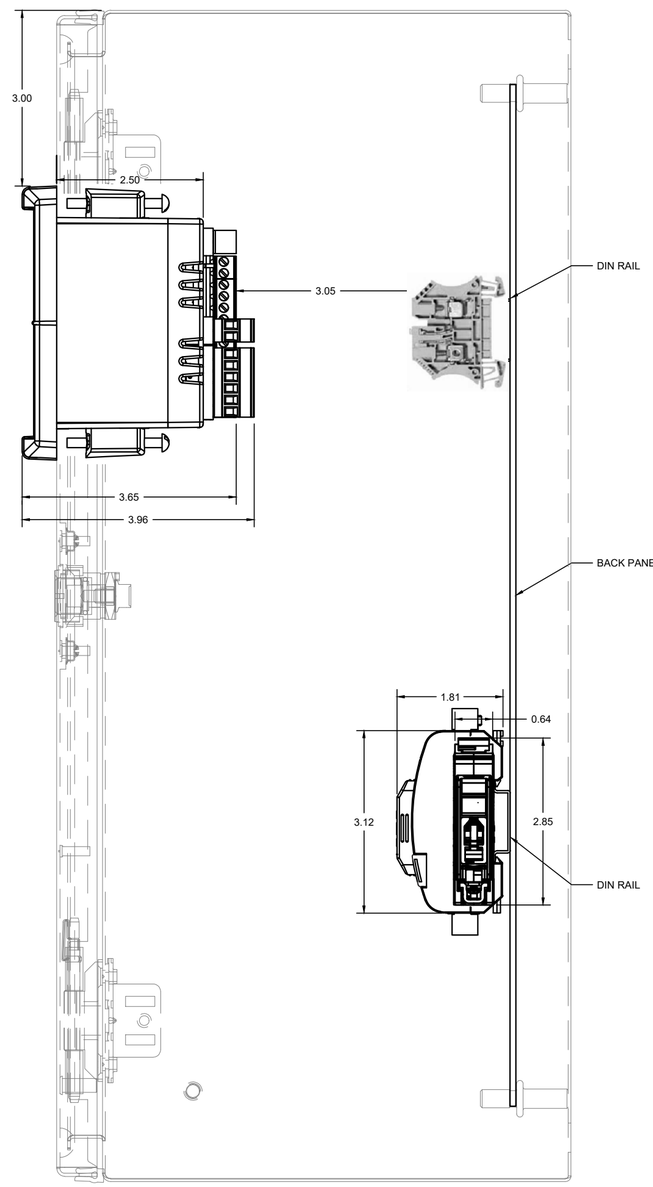
DRAFTER: TWM	ENGR: DJW	DATE: 01/02/2019
CHECKER: MAB	APPD: DJW	SCALE: AS SHOWN

REV	DATE	DESCRIPTION
0	10 MAY 19	CONTROLS UPGRADES
1	29 APR 20	FOR RECORD

REMOTE ANNUNCIATOR PANEL, FRONT LAYOUT

DRAWING NO. D-5002

REV. 1



SIDE VIEW PANEL

SCALE: 6" = 1'-0"

NOTES:

1. THE REMOTE ANNUNCIATOR PANEL MUST BE FABRICATED BY A UL 508A CERTIFIED INDUSTRIAL CONTROL PANEL SHOP, MUST BE UL 508A LISTED AND LABELED, AND MUST BE LABELED WITH THE SCCR THAT MUST BE A MINIMUM OF 10kA PER SPECIFICATION 261327-2.12 O.1.

These design drawings have been altered to indicate as-built information supplied by the installer. The Engineer-of-Record did not personally verify said information and therefore, cannot attest to its accuracy. A record of as-designed drawings is maintained by the Owner.

ENGINEER OF RECORD
Samuel D. Erter
Registered Professional Engineer
MO #PE-2003001029
04/29/20

FOR RECORD

ASCHINGER ELECTRIC
BHC
BELLEFONTAINE NEIGHBORS, MO

DRAFTER: TWM		ENGR: DJW	DATE: 01/02/2019
CHECKER: MAB		APPD: DJW	SCALE: AS SHOWN

REV	DATE	DESCRIPTION
0	10 MAY 19	CONTROLS UPGRADES
1	29 APR 20	FOR RECORD

REMOTE ANNUNCIATOR
PANEL, SIDE LAYOUT

DRAWING NO. D-5003

REV. 1

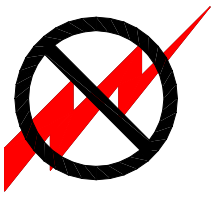
Arc Flash Risk Assessment

Bellefontaine Habilitation Center

10695 Bellefontaine Road
Bellefontaine, Missouri 63137

Power System Study

Performed for: Rogers-Schmidt Engineering Company



Vincent Kunderman, PE, LLC
PO Box 11
Eureka, Missouri 63025

(314) 303-5978 office
vince@kundermanpe.com

POWER SYSTEM STUDY
Revision 1 – September 18, 2018

Arc Flash Risk Assessment

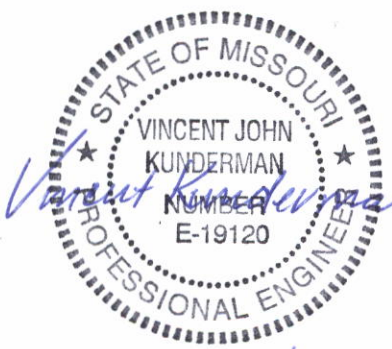
Bellefontaine Habilitation Center

10695 Bellefontaine Road
Bellefontaine, Missouri 63137

TABLE OF CONTENTS

Performed for: Rogers-Schmidt Engineering Company

Consultant: Vincent Kunderman, PE, LLC
MO State Certificate of Authority #005599



Vincent Kunderman, Member
Electrical Engineer
MO # E-19120
September 18, 2018

9/18/18

TAB 1

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

An arc flash risk assessment is provided for all locations at the Bellefontaine Habilitation Center, 10695 Bellefontaine Road, in Bellefontaine, Missouri. The study includes short circuit calculations, protective device evaluations, protective device coordination analysis and an arc flash risk assessment for all electrical equipment within the facility. All work is performed in accordance with IEEE Standards 242, 399, 141, 1584 and NFPA 70E-2018.

Background information for this study was obtained from previous studies for the following State of Missouri projects, project number is shown:

- M0203-01 – “Electrical System Replacement” – This project included installation of the 12470 Volt switchgear and upgrade of the distribution system.
- M1001-01 – “New Group Homes” – This project included installation of the 15xx Group Homes and the facility emergency generator.

Extensive field verification of existing equipment and connections were made on site. The AC and DC short circuit reports in TAB 5 and the "Input Data Report", included in TAB 6, contain information for all equipment in this study.

Abbreviations for individual buildings at the Bellefontaine Habilitation Center, used in this report are as follows. Note that within the report, the building name or description is shown first, followed by the panel or load name.

- DON = Donnelly
- GEN = Generator
- GH = Group Home
- MP = Multipurpose
- PT = Physical Therapy
- SW = 12.47kV padmount switch
- SWGR = 12.47kV switchgear
- U1 = U1 Maintenance building
- WH = Warehouse
- GARAGE = Garage
- When buildings are identified by number, the building number is used.

The software used as an aid to the preparation of this study is SKM Power*Tools Win/300 V6.5.1, serial number 100949. The modules used are as follows:

a. “DAPPER” - fault calculations
b. “Captor” - selective device coordination
c. “Equipment Evaluation” - equipment evaluation
d. “Arc Fault” – arc flash risk assessment per IEEE 1584-2004a and NFPA 70E-2018.
e. DC System Analysis

Short circuit calculations are computed to determine fault values at locations within the facility assuming the normal operation for each of the three cases as shown below. Results for Preferred Source (Case 1) are included in this report. The available utility fault values were provided by Ameren Missouri personnel and are included as Figure 1 to follow. Service information at the facility 12470 volt switchgear used to prepare this study is as follows:

Case 1 -	Ameren Preferred (Feeder 167-52): Three Phase = 2380A Line to Ground = 1980A
Case 2 -	Ameren Reserve (Feeder 167-56): Three Phase = 2380A Line to Ground = 1930A
Case 3 -	Generator: This is a 1280KW (1600kVA) generator connected to the 12470 Volt bus via a 1500 KVA step-up transformer (see nameplate on Figure 2)

Short circuit analysis from the Utility service to all locations were performed using the actual impedances of the equipment and cables comprising the distribution system.

Equipment Evaluation - The calculated short circuit fault values are adjusted per IEEE Standard 1015-1997 (Blue Book) to obtain the interrupting fault values that are shown on Table 1, “Equipment Evaluation Report”. Although the short circuit values were calculated for each of the three “cases” discussed above, only the worst case short circuit values, which result for Case 1 are shown on Table 1. Instructions for interpretation of the tables are contained on the first page of the table. These values are then compared to the design ratings of the new electrical equipment to verify safe operation of the equipment as required by the National Electrical Code Article 110, "Requirements for Electrical Installations".

Distribution Equipment - Fully rated values are shown on Table 1 "Equipment Evaluation Report". It has been verified that all distribution equipment within the scope of this study is rated to safely withstand or interrupt maximum fault levels available on the electrical distribution system during normal operation for except as follows:

1. Panel GH-1505a and 1505b in Group Home #1505.
2. Panels DP-2 and DP-3 in the Warehouse.
3. Marginal panels are identified on Table 1.

Utilization Equipment - Utilization equipment is identified as “U (Note 4)” on Table 1 “Equipment Evaluation Report” with a “Dev Isc kA” value entered as “5kA”. NEC NFPA-70 articles referenced below, require that equipment nameplates contain the short circuit current rating of the equipment. Compliance requires that the component or equipment rating equals or exceeds the available short circuit value as calculated and shown on Table 1. Since the manufacturing date of most equipment precedes this requirement, it is difficult to verify actual SCCR ratings and “5kA” is used for this report. We are recommending that SCCR ratings of all Utilization equipment be investigated when equipment replacement is required or when extensive modifications to the associated building are contemplated.

SCCR Marking Requirements per NFPA-70:

- 230.82(3) - meter disconnect switches
- 285.6 - surge protective devices
- 409.110 - industrial control panels
- 430.8 - motor controllers
- 440.4(B) - HVAC and Refrigeration Equipment
- 670.3(A) - industrial machinery electrical panels

Selective coordination is required by Article 240, "Overcurrent Protection" in the National Electrical Code. Coordination of relays and breakers using the recommended settings results in good coordination. Settings are included on Table 2, "Protective Device Settings" in TAB 3. All other breakers and fuses have a fixed characteristic. A short narrative is included on each Time Current Characteristic curve contained in TAB 4.

Arc Flash Hazard Risk Assessment – An arc flash hazard risk assessment is contained in Tab 7 “Arc Flash Risk Assessment”. It includes an introduction and an arc flash hazard report for all equipment covered in this study. Arc flash warning labels are prepared in accordance with NFPA70E-2018 Article 130.5 (F) using the incident energy method. Sample arc flash labels are included. Energized Work Permits should be prepared using data from Table 5ac and 5dc when an Electrically Safe Working Condition cannot be established. Energized work shall be

permitted where the employer can demonstrate that de-energizing introduces additional hazards or increased risk, but an energized work permit must be prepared and approved prior to this work.

Workmen should select proper Personal Protective Equipment (PPE) in accordance with NFPA70E-2018 Table 130.5 (G) "Selection of Arc-Rated Clothing and Other PPE for Use When Incident Energy Exposure is Used" should be referenced.

Disclaimer: This arc flash analysis is based upon fuse sizes and settings shown in Table 2 - “Overcurrent Protective Device Settings”. Any modifications or alterations to any equipment contained here-in shall render any and all calculations, category ratings and recommendations null and void.

Personal Protective Equipment (PPE) recommended by any calculation method will NOT provide complete protection for all arc flash hazards. Injury can be expected when wearing recommended PPE.

Recommendations and Conclusions

1. It has been verified that all equipment within the scope of this study is rated to safely withstand or interrupt maximum fault levels available on the electrical distribution system during normal operation except as follows:

    a. Panel GH-1505a and 1505b in Group Home #1505 should be replaced with panels rated 22kAIC.
    b. Panels DP-2 and DP-3 in the Warehouse should be replaced with panels rated 22kAIC.
    c. SCCR ratings of all utilization equipment should be investigated when equipment replacement is required or when extensive modifications to the associated building are contemplated.

2. Verify that all relays and adjustable breakers are set in accordance with Table 2 “Protective Device Settings”. Breaker settings are determined to provide optimum selective coordination and low arc flash incident energies. No changes are recommended for any existing relay, fuse or breaker at this time except for the 480 Volt generator main breaker, see Table 2.

3. Arc flash warning labels have been prepared in accordance with NFPA70E-2018 Article 130.5 (F) using the incident energy analysis method. A typical arc flash label is included in Tab 7. Install arc flash warning labels at locations designated “Bus” as shown on the bottom, left side of the arc flash label. “Prot” refers to the location of the upstream source feeder at the “Bus”.

4. Energized Work Permits should be prepared using data from Table 2 “Arc Flash Risk Assessment” when an Electrically Safe Working Condition cannot be established.

5. Workmen should select proper Personal Protective Equipment (PPE) in accordance with NFPA70E-2018 Table 130.5 (G) "Selection of Arc-Rated Clothing and Other PPE for Use When Incident Energy Exposure is Used".

6. Condition of power panels PP and P2 in the Pool Area electrical room in the Physical Therapy building are in very poor condition due to corrosion, heat and rust. Replacement of these panels should be considered.

7. Several low voltage panelboards are shown as “marginal” on Table 1, “Equipment Evaluation Report”. When the equipment kAIC rating is within 10% of the adjusted short circuit fault, the equipment is designated as “marginal”. Replacement of these panels with new panels rated 22kAIC should be considered.

8. The site lighting transformer is rated 500kVA and carries less than 30kVA of lighting load for less than 12 hours a day. This lightly loaded transformer results in a very low power factor for which a penalty can be imposed by Ameren Missouri. Replacement of this transformer with a smaller, more efficient unit should be considered.

   In addition, the #4 AWG conductors connected to the secondary side of the existing 500kVA transformer are not adequately protected by the overcurrent protective devices on the primary side of the transformer during short circuit conditions. This issue could also be resolved by replacing the existing transformer with one that is more appropriately sized for the connected load.

9. T11, serving the Apartments, has a 25 Ampere fuse and a full load ampere rating of 13.9 Amperes. The 25 Ampere transformer fuse and the upstream 50E feeder fuse do not coordinate well and are both likely to blow in the event of a transformer failure. We are not recommending the replacement of the 25 Ampere fuse at this time as the existing fuse does properly protect the transformer. No other loads are served off of the SW 3-2B feeder which would be de-energized in the event of the failure of T-11 and the subsequent melting of the 50E fuse.

Date: 03/20/18

Fault Level Request Data

Utility Contact Information

Name: Tensley Robinson
Phone: (314) 992-8616
Email: TRobinson@ameren.com

Customer Information

Service Address: 10695 Bellefontaine Rd, Saint Louis, 63137
Premise #: 647000061
Supply Voltage: 12.47kV

Fault Analysis

Fault location: Feeder 167-52 (preferred supply)
Fault Voltage: 12.47kV
3ph fault current: 2.38kA
System X / R ratio: 1.51
L-G fault current: 1.98kA
System X_0 / R_0 ratio: 1.49

Fault Analysis

Fault location: Feeder 167-56 (reserve supply)
Fault Voltage: 12.47kV
3ph fault current: 2.38kA
System X / R ratio: 1.79
L-G fault current: 1.93kA
System X_0 / R_0 ratio: 1.80

Primary protection device

Fuse*
Make: Cooper
Model: T Link
Rating: 80 A

Note that these fuses were replaced with 100T links on 6/7/2018

*There is an 80T fuse on each supply.

Note: The fault current values provided are calculated values, based on the current state of the system and the service configuration proposed or provided to the customer's equipment. Given the dynamic nature of the distribution system, the possibility always exists for the available fault current values to increase or decrease (i.e. changes in the distribution system, feeder and/or substation assignments, or substation configurations). Additionally, this calculated fault current does not include any contributions by customer motors, either upstream or downstream of the service connection point, or fault current asymmetry. This fault calculation accounts for the current utility contribution only. Ameren Missouri personnel shall not be held responsible for any damage to property or person resulting from the use of this data.

Figure 1 - Ameren Missouri Utility Data

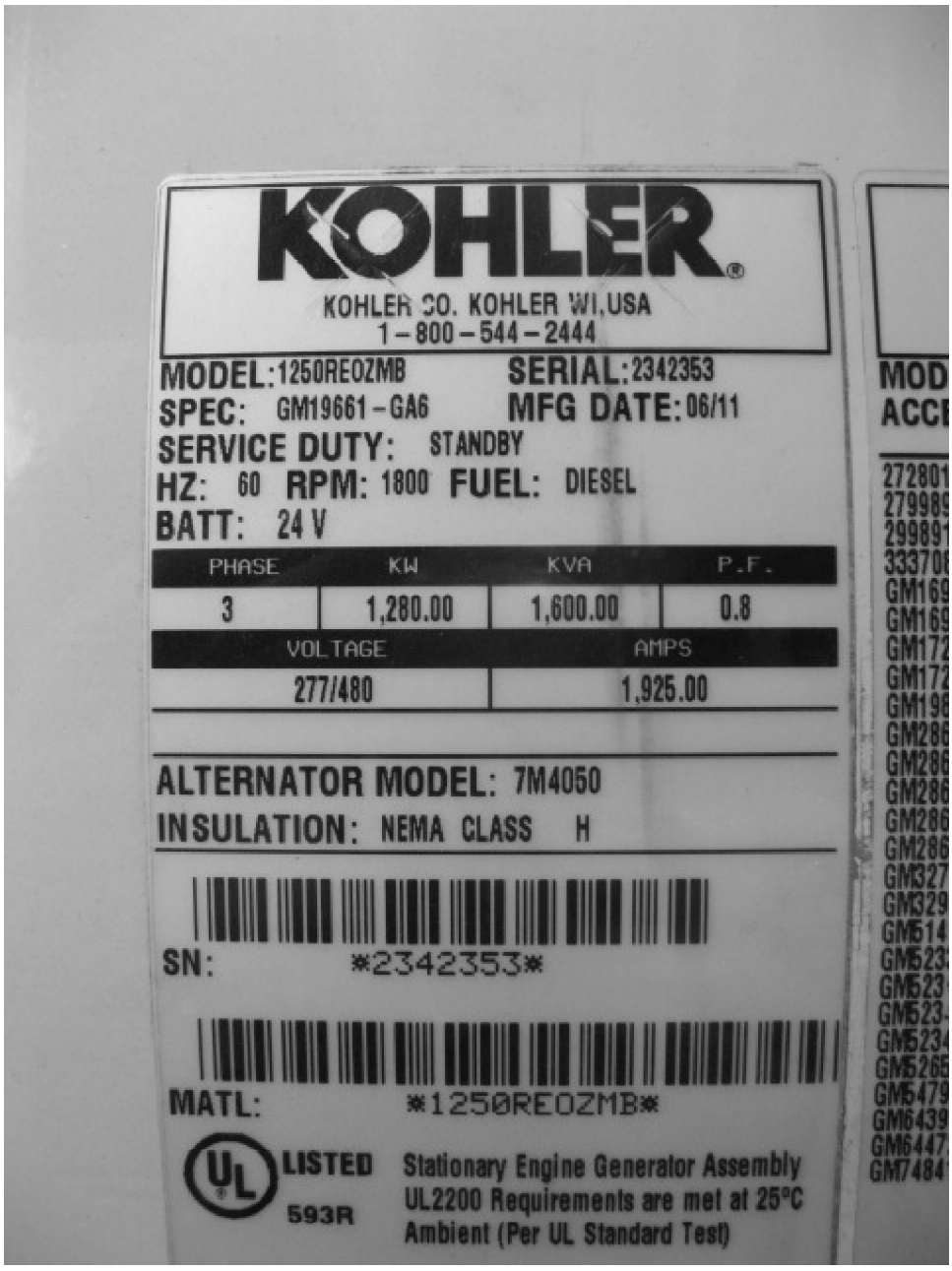


Figure 2 - Nameplate - Stationary Engine Generator Assembly

TAB 2

Table 1 - Equipment Evaluation Report

Equipment Evaluation Report - Table 1

Equipment Evaluation Report Based on ANSI Fault Analysis

Bus	Manufacturer	Status	Description	Bus Voltage (V)	Calc Isc kA	Dev Isc kA	Series Rating kA	Isc Rating %	Calc Mom kA	Dev Mom kA	Mom Rating %
CB-1	ACME	Pass	LV Panelboard	480	18.90	22.00		85.92	8.72	40.00	21.80
Bus Name	Manufacturer	Pass, Fail or Marginal		Bus Voltage	Calculated Fault	Equipment Rating	Series Rating *1				

Notes: *1 - C-L rating (Close/Latch), Momentary and Series ratings are used only when applicable. Space is empty if not used.

2 - Low voltage devices are rated to withstand and interrupt specified symmetrical RMS currents. Manufacturers test their breakers using asymmetrical waveshapes with power factors and X/R values per IEEE Std. C37.13. These test values are shown on the following table:

Protective Device	Test PF (%)	Test X/R	Tested Asym Withstand
LV Power Circuit Breaker	15.00	6.60	1.62
MCB > 20 KAIC	20.00	4.90	1.53
MCB 10 to 20 KAIC	30.00	3.20	1.38
MCB < 10 KAIC	50.00	1.70	1.15

3 - For consistancy, common abreviations are as follows:

MCB	Main Circuit Breaker
MCCB	Molded Case Circuit Breaker
PNL	Panelboard

4 - Utilization equipment - see Tab 1 - "Executive Summary"

5 - "Marginal" - when the equipment kAIC rating is within 10% of the adjusted short circuit fault, the equipment is designated "Marginal". "Calc Isc kA" and "Isc Rating %" are shown with an "*".

Equipment Evaluation Report - Table 1

Equipment Evaluation Report Based on ANSI Fault Analysis

Bus	Manufacturer	Status	Description	Bus Voltage (V)	Calc Isc kA	Dev Isc kA	Series Rating kA	Isc Rating %	Calc Mom kA	Dev Mom kA	Mom Rating %
1601	UL 67	Passed	LV Panelboard	240	8.87	10.00		88.73			
1602	UL 67	Passed	LV Panelboard	240	8.87	10.00		88.73			
1603	UL 67	Passed	LV Panelboard	240	8.87	10.00		88.68			
1604	UL 67	Passed	LV Panelboard	240	8.87	10.00		88.68			
1605	UL 67	Passed	LV Panelboard	240	8.85	10.00		88.53			
1606	UL 67	Passed	LV Panelboard	240	8.85	10.00		88.53			
1607	UL 67	Passed	LV Panelboard	240	8.81	10.00		88.06			
1608	UL 67	Passed	LV Panelboard	240	8.82	10.00		88.18			
1609	UL 67	Passed	LV Panelboard	240	8.82	10.00		88.18			
1610	UL 67	Passed	LV Panelboard	240	8.83	10.00		88.28			
1801	UL 67	Marginal	LV Panelboard	240	*9.57	10.00		*95.72			
1802	UL 67	Marginal	LV Panelboard	240	*9.57	10.00		*95.72			
1803	UL 67	Passed	LV Panelboard	240	8.86	10.00		88.57			
1804	UL 67	Marginal	LV Panelboard	240	*9.61	10.00		*96.11			
1805	UL 67	Marginal	LV Panelboard	240	*9.61	10.00		*96.11			
1806	UL 67	Marginal	LV Panelboard	240	*9.60	10.00		*95.98			
1807	UL 67	Marginal	LV Panelboard	240	*9.60	10.00		*95.98			
1808	UL 67	Marginal	LV Panelboard	240	*9.59	10.00		*95.88			
1809	UL 67	Marginal	LV Panelboard	240	*9.56	10.00		*95.62			
1810	UL 67	Marginal	LV Panelboard	240	*9.56	10.00		*95.62			
1901/1902 MDP BUS	SQUARE D	Passed	LV Panelboard	208	8.71	50.00		17.42			
1901/1902-DRYER-08	UTIL EQUIP	Passed	U (Note 4)	208	2.13	5.00		42.52			
1901/1902-LP1	UL 67	Passed	LV Panelboard	208	8.10	10.00		80.97			
1901/1902-MDP	SQUARE D	Passed	LV Panelboard	208	8.74	50.00		17.47			
1901/1902-RANGE-08	UTIL EQUIP	Passed	U (Note 4)	208	3.85	5.00		77.03			
1901/1902-RTU-5	UTIL EQUIP	Failed	U (Note 4)	208	*6.28	5.00		*125.55			
1903/1904 MDP BUS	SQUARE D	Passed	LV Panelboard	208	5.89	50.00		11.79			
1903/1904-DRYER-07	UTIL EQUIP	Passed	U (Note 4)	208	1.91	5.00		38.18			

Equipment Evaluation Report - Table 1

Equipment Evaluation Report Based on ANSI Fault Analysis

Bus	Manufacturer	Status	Description	Bus Voltage (V)	Calc Isc kA	Dev Isc kA	Series Rating kA	Isc Rating %	Calc Mom kA	Dev Mom kA	Mom Rating %
1903/1904-LP1	UL 67	Passed	LV Panelboard	208	5.59	10.00		55.93			
1903/1904-MDP	SQUARE D	Passed	LV Panelboard	208	5.91	50.00		11.81			
1903/1904-RANGE-07	UTIL EQUIP	Passed	U (Note 4)	208	3.16	5.00		63.24			
1903/1904-RTU-4	UTIL EQUIP	Marginal	U (Note 4)	208	*4.64	5.00		*92.79			
1905/1906 MDP BUS	SQUARE D	Passed	LV Panelboard	208	6.38	50.00		12.77			
1905/1906-DRYER-06	UTIL EQUIP	Passed	U (Note 4)	208	1.96	5.00		39.12			
1905/1906-LP-1	UL 67	Passed	LV Panelboard	208	6.04	10.00		60.37			
1905/1906-MDP	SQUARE D	Passed	LV Panelboard	208	6.40	50.00		12.80			
1905/1906-RANGE-06	UTIL EQUIP	Passed	U (Note 4)	208	3.30	5.00		66.02			
1905/1906-RTU-6	UTIL EQUIP	Marginal	U (Note 4)	208	*4.94	5.00		*98.89			
1908	UL 67	Passed	LV Panelboard	240	8.83	10.00		88.28			
APARTMENT A	UL 67	Marginal	LV Panelboard	240	*9.47	10.00		*94.74			
APARTMENT B	UL 67	Passed	LV Panelboard	240	3.62	10.00		36.24			
DON-AHU-1	UTIL EQUIP	Passed	U (Note 4)	208	1.95	5.00		39.09			
DON-AHU-1 DRIVE	UTIL EQUIP	Passed	U (Note 4)	208	0.89	5.00		17.90			
DON-AHU-2	UTIL EQUIP	Passed	U (Note 4)	208	3.33	5.00		66.56			
DON-AHU-2 DRIVE	UTIL EQUIP	Passed	U (Note 4)	208	1.60	5.00		31.92			
DON-CH PUMP 1	UTIL EQUIP	Passed	U (Note 4)	208	3.44	5.00		68.78			
DON-CH PUMP 2	UTIL EQUIP	Passed	U (Note 4)	208	3.03	5.00		60.54			
DON-CH-1	UTIL EQUIP	Failed	U (Note 4)	208	*9.73	5.00		*194.65			
DON-COMP RM AC UNIT	UTIL EQUIP	Passed	U (Note 4)	208	0.89	5.00		17.90			
DON-CRAC-1	UTIL EQUIP	Passed	U (Note 4)	208	0.43	5.00		8.57			
DON-CU-3	UTIL EQUIP	Passed	U (Note 4)	208	0.97	5.00		19.48			
DON-DP1	GE	Passed	LV Panelboard	208	12.24	22.00		55.64			
DON-DP2	GE	Passed	LV Panelboard	208	9.53	22.00		43.33			
DON-HP1	GE	Passed	LV Panelboard	208	7.94	10.00		79.39			
DON-HP2	GE	Passed	LV Panelboard	208	3.05	10.00		30.54			
DON-HP3	GE	Passed	LV Panelboard	208	2.24	10.00		22.36			

Equipment Evaluation Report - Table 1

Equipment Evaluation Report Based on ANSI Fault Analysis

Bus	Manufacturer	Status	Description	Bus Voltage (V)	Calc Isc kA	Dev Isc kA	Series Rating kA	Isc Rating %	Calc Mom kA	Dev Mom kA	Mom Rating %
DON-MDP sec 1: DONNELLY	GE	Passed	LV Switchboard	208	13.35	65.00		20.53			
DON-MDP sec 2: DONNELLY	GE	Passed	LV Panelboard	208	13.23	65.00		20.35			
DON-MDP: DONNELLY	GE	Passed	LV Switchboard	208	13.37	65.00		20.57			
DON-VFD: P1	UTIL EQUIP	Passed	U (Note 4)	208	1.27	5.00		25.45			
DON-VFD: P2	UTIL EQUIP	Passed	U (Note 4)	208	1.27	5.00		25.45			
DON-VFD: P3	UTIL EQUIP	Passed	U (Note 4)	208	0.95	5.00		19.05			
DON-VFD: P4	UTIL EQUIP	Passed	U (Note 4)	208	1.03	5.00		20.57			
DON-WH-1	UTIL EQUIP	Passed	U (Note 4)	208	1.78	5.00		35.53			
GARAGE	SQUARE D	Passed	LV Panelboard	240	8.22	10.00		82.16			
GARAGE BUS	SQUARE D	Passed	LV Panelboard	240	8.07	10.00		80.70			
GEN- LTG PANEL	SIEMENS	Passed	LV Panelboard	208	2.58	10.00		25.76			
GH-1502a	SIEMENS	Passed	LV Panelboard	208	5.63	10.00		56.28			
GH-1502b	SIEMENS	Passed	LV Panelboard	208	5.57	10.00		55.69			
GH-1503a	SIEMENS	Passed	LV Panelboard	208	7.90	10.00		79.02			
GH-1503b	SIEMENS	Passed	LV Panelboard	208	7.79	10.00		77.86			
GH-1504a	SIEMENS	Marginal	LV Panelboard	208	*9.44	10.00		*94.42			
GH-1504b	SIEMENS	Marginal	LV Panelboard	208	*9.28	10.00		*92.78			
GH-1505a	SIEMENS	Failed	LV Panelboard	208	*16.56	10.00		*165.60			
GH-1505b	SIEMENS	Failed	LV Panelboard	208	*16.06	10.00		*160.60			
GH-CC1	SIEMENS	Passed	LV Panelboard	208	3.46	10.00		34.62			
GH-DP/GH	SIEMENS	Passed	LV Switchboard	208	19.79	65.00		30.45			
GH-DP/GH BUS	SIEMENS	Passed	LV Switchboard	208	19.63	65.00		30.21			
MP-AHU 1	UTIL EQUIP	Passed	U (Note 4)	208	0.59	5.00		11.75			
MP-AHU 2	UTIL EQUIP	Passed	U (Note 4)	208	0.57	5.00		11.47			
MP-AHU 3	UTIL EQUIP	Passed	U (Note 4)	208	0.91	5.00		18.15			
MP-AHU3-RF	UTIL EQUIP	Passed	U (Note 4)	208	0.84	5.00		16.84			
MP-AHU3-SF	UTIL EQUIP	Passed	U (Note 4)	208	0.84	5.00		16.84			
MP-AHU4	UTIL EQUIP	Passed	U (Note 4)	208	2.76	5.00		55.29			

Equipment Evaluation Report - Table 1

Equipment Evaluation Report Based on ANSI Fault Analysis

Bus	Manufacturer	Status	Description	Bus Voltage (V)	Calc Isc kA	Dev Isc kA	Series Rating kA	Isc Rating %	Calc Mom kA	Dev Mom kA	Mom Rating %
MP-AHU4-RF	UTIL EQUIP	Passed	U (Note 4)	208	2.46	5.00		49.26			
MP-AHU4-SF	UTIL EQUIP	Passed	U (Note 4)	208	2.46	5.00		49.26			
MP-CHILLER 1	UTIL EQUIP	Failed	U (Note 4)	208	*13.46	5.00		*269.30			
MP-CHILLER 2	UTIL EQUIP	Failed	U (Note 4)	208	*13.12	5.00		*262.43			
MP-CT	UTIL EQUIP	Passed	U (Note 4)	208	2.03	5.00		40.53			
MP-CT PUMP P4	UTIL EQUIP	Passed	U (Note 4)	208	3.15	5.00		63.02			
MP-CWP-P3	UTIL EQUIP	Passed	U (Note 4)	208	3.15	5.00		63.02			
MP-HTG PUMP	UTIL EQUIP	Passed	U (Note 4)	208	1.19	5.00		23.86			
MP-HWP-A2	UTIL EQUIP	Passed	U (Note 4)	208	3.15	5.00		63.02			
MP-IT SERVER	UTIL EQUIP	Passed	U (Note 4)	208	2.85	5.00		57.03			
MP-LP-A1	GE	Marginal	LV Panelboard	208	*9.36	10.00		*93.64			
MP-LP-A2	GE	Marginal	LV Panelboard	208	*9.16	10.00		*91.63			
MP-LP-B	GE	Passed	LV Panelboard	208	3.07	10.00		30.75			
MP-LP-C	GE	Passed	LV Panelboard	208	3.59	10.00		35.94			
MP-LP-D	GE	Passed	LV Panelboard	208	7.21	10.00		72.06			
MP-LP-E1	SQUARE D	Passed	LV Panelboard	208	1.56	10.00		15.57			
MP-LP-E2	UL 67	Passed	LV Panelboard	208	0.81	10.00		8.09			
MP-LP: DIMMER PANEL	GE	Passed	LV Panelboard	208	2.85	10.00		28.47			
MP-MDP	UL 891	Passed	LV Switchboard	208	21.16	50.00		42.31			
MP-MDP BUS	UL 891	Passed	LV Switchboard	208	20.72	50.00		41.44			
MP-SUMP PUMP	UTIL EQUIP	Passed	U (Note 4)	208	2.05	5.00		41.04			
MP-SUMP PUMP 2	UTIL EQUIP	Passed	U (Note 4)	208	1.19	5.00		23.86			
MP-WELDING	UTIL EQUIP	Failed	U (Note 4)	208	*12.83	5.00		*256.58			
PT AHU-2	UTIL EQUIP	Passed	U (Note 4)	208	1.16	5.00		23.18			
PT CHILLER	UTIL EQUIP	Passed	U (Note 4)	208	0.97	5.00		19.38			
PT OTPT HEAT	UTIL EQUIP	Passed	U (Note 4)	208	1.16	5.00		23.18			
PT P2	FPE	Passed	LV Panelboard	208	5.93	10.00		59.34			
PT POOL	UTIL EQUIP	Marginal	U (Note 4)	208	*4.50	5.00		*90.06			

Equipment Evaluation Report - Table 1

Equipment Evaluation Report Based on ANSI Fault Analysis

Bus	Manufacturer	Status	Description	Bus Voltage (V)	Calc Isc kA	Dev Isc kA	Series Rating kA	Isc Rating %	Calc Mom kA	Dev Mom kA	Mom Rating %
PT TBP1	SQUARE D	Passed	LV Panelboard	208	3.29	10.00		32.88			
PT- L1	FPE	Passed	LV Panelboard	208	3.64	10.00		36.38			
PT-AHU-3W	UTIL EQUIP	Passed	U (Note 4)	208	3.38	5.00		67.61			
PT-COND PUMP	UTIL EQUIP	Passed	U (Note 4)	208	3.22	5.00		64.42			
PT-L2	FPE	Passed	LV Panelboard	208	5.01	10.00		50.10			
PT-L2 BUS	FPE	Passed	LV Panelboard	208	5.00	10.00		49.97			
PT-P1	SQUARE D	Passed	LV Panelboard	208	5.11	50.00		10.22			
PT-P1: MCB	WESTINGHOUSE	Passed	LV Panelboard	208	6.47	42.00		15.41			
PT-PP	SQUARE D	Passed	LV Panelboard	208	6.57	50.00		13.14			
PT-RTU	UTIL EQUIP	Passed	U (Note 4)	208	2.67	5.00		53.34			
SITE LTG PANEL	GE	Passed	LV Panelboard	480	10.50	14.00		74.98			
SITE LTG PANEL BUS	GE	Passed	LV Panelboard	480	10.45	14.00		74.65			
SW 1	S & C	Passed	MV Padmount Swgr	12470	2.38	12.50		19.02	2.41	12.50	19.31
SW 10	S & C	Passed	MV Padmount Swgr	12470	2.27	12.50		18.13	2.29	12.50	18.32
SW 11	S & C	Passed	MV Padmount Swgr	12470	2.21	12.50		17.71	2.23	12.50	17.86
SW 12	S & C	Passed	MV Padmount Swgr	12470	2.17	12.50		17.34	2.18	12.50	17.47
SW 13	S & C	Passed	MV Padmount Swgr	12470	2.19	12.50		17.54	2.21	12.50	17.68
SW 14	S & C	Passed	MV Padmount Swgr	12470	2.27	12.50		18.13	2.29	12.50	18.32
SW 15	S & C	Passed	MV Padmount Swgr	12470	2.29	12.50		18.35	2.32	12.50	18.56
SW 3	S & C	Passed	MV Padmount Swgr	12470	2.25	12.50		18.00	2.27	12.50	18.18
SW 4	S & C	Passed	MV Padmount Swgr	12470	2.30	12.50		18.44	2.33	12.50	18.66
SW 5	S & C	Passed	MV Padmount Swgr	12470	2.34	12.50		18.68	2.37	12.50	18.93
SW 6	S & C	Passed	MV Padmount Swgr	12470	2.31	12.50		18.48	2.34	12.50	18.71
SW 7	S & C	Passed	MV Padmount Swgr	12470	2.28	12.50		18.26	2.31	12.50	18.47
SW 8	S & C	Passed	MV Padmount Swgr	12470	2.28	12.50		18.21	2.30	12.50	18.41
SW 9	S & C	Passed	MV Padmount Swgr	12470	2.35	12.50		18.84	2.39	12.50	19.11
SWGR GEN LINE	ANSI C37.06-1997	Passed	MV Switchgear	12470	0.44	20.00		2.22	0.63	52.00	1.20
SWGR PREF LINE	ANSI C37.06-1997	Passed	MV Switchgear	12470	2.38	20.00		11.90	4.08	52.00	7.84

Equipment Evaluation Report - Table 1

Equipment Evaluation Report Based on ANSI Fault Analysis

Bus	Manufacturer	Status	Description	Bus Voltage (V)	Calc Isc kA	Dev Isc kA	Series Rating kA	Isc Rating %	Calc Mom kA	Dev Mom kA	Mom Rating %
SWGR RES LINE	ANSI C37.06-1997	Passed	MV Switchgear	12470	2.38	20.00		11.90	4.13	52.00	7.95
SWGR-BATT CHRG	UTIL EQUIP	Passed	U (Note 4)	208	2.16	5.00		43.13			
SWGR-LPSG	SIEMENS	Passed	LV Panelboard	208	3.21	10.00		32.15			
SWGR-LPSG BUS	SIEMENS	Passed	LV Panelboard	208	3.21	10.00		32.10			
SWGR-MAIN BUS	ANSI C37.06-1997	Passed	MV Switchgear	12470	2.38	20.00		11.90	4.08	52.00	7.84
T24 PBUS	COOPER	Passed	MV Padmount Switch	12470	1.80	2.50		72.10	1.82	2.50	72.66
T25 PBUS	COOPER	Passed	MV Padmount Switch	12470	1.78	2.50		71.34	1.80	2.50	71.86
T26 PBUS	COOPER	Passed	MV Padmount Switch	12470	1.76	2.50		70.46	1.77	2.50	70.93
T27 PBUS	COOPER	Passed	MV Padmount Switch	12470	1.82	2.50		72.62	1.83	2.50	73.22
T28 PBUS	COOPER	Passed	MV Padmount Switch	12470	1.84	2.50		73.51	1.85	2.50	74.16
T29 PBUS	COOPER	Passed	MV Padmount Switch	12470	1.87	2.50		74.67	1.89	2.50	75.41
T30 PBUS	COOPER	Passed	MV Padmount Switch	12470	1.84	2.50		73.74	1.86	2.50	74.41
T31 PBUS	COOPER	Passed	MV Padmount Switch	12470	1.83	2.50		73.23	1.85	2.50	73.86
T32 PBUS	COOPER	Passed	MV Padmount Switch	12470	1.79	2.50		71.72	1.81	2.50	72.26
T33 PBUS	COOPER	Passed	MV Padmount Switch	12470	1.68	2.50		67.24	1.69	2.50	67.57
T34 PBUS	COOPER	Passed	MV Padmount Switch	12470	1.71	2.50		68.28	1.72	2.50	68.66
T35 PBUS	COOPER	Passed	MV Padmount Switch	12470	1.73	2.50		69.23	1.74	2.50	69.64
U1-BOILER RM	SQUARE D	Passed	LV Panelboard	208	2.25	10.00		22.54			
U1-BOILER RM BUS	SQUARE D	Passed	LV Panelboard	208	2.25	10.00		22.52			
U1-D Sw: NCI	UTIL EQUIP	Marginal	U (Note 4)	208	*4.65	5.00		*92.98			
U1-L1	UL 67	Passed	LV Panelboard	208	5.51	10.00		55.05			
U1-L2	UL 67	Passed	LV Panelboard	208	5.46	10.00		54.59			
U1-L3	SQUARE D	Marginal	LV Panelboard	208	*9.54	10.00		*95.37			
U1-L4	UL 67	Passed	LV Panelboard	208	7.52	10.00		75.17			
U1-L5	SQUARE D	Passed	LV Panelboard	208	6.93	10.00		69.32			
U1-MAINT MDP	UL 891	Passed	LV Switchboard	208	13.14	22.00		59.75			
U1-NCI	SQUARE D	Passed	LV Panelboard	208	4.51	10.00		45.14			
U1-P1	UL 67	Passed	LV Panelboard	208	8.13	10.00		81.33			

Equipment Evaluation Report - Table 1

Equipment Evaluation Report Based on ANSI Fault Analysis

Bus	Manufacturer	Status	Description	Bus Voltage (V)	Calc Isc kA	Dev Isc kA	Series Rating kA	Isc Rating %	Calc Mom kA	Dev Mom kA	Mom Rating %
U1-P1 BUS	UL 67	Passed	LV Panelboard	208	8.11	10.00		81.07			
U1-P2	UL 67	Passed	LV Panelboard	208	7.81	10.00		78.14			
U1-P3	UL 67	Passed	LV Panelboard	208	8.29	10.00		82.91			
U1-P4	UL 67	Passed	LV Panelboard	208	5.39	10.00		53.92			
WH-BOOSTER HTR	UTIL EQUIP	Passed	U (Note 4)	208	3.59	5.00		71.85			
WH-COMPRESSOR	UTIL EQUIP	Passed	U (Note 4)	208	1.87	5.00		37.49			
WH-COND REC PMP	UTIL EQUIP	Passed	U (Note 4)	208	1.71	5.00		34.26			
WH-DP-1	Frank Adams	Passed	LV Panelboard	208	7.48	10.00		74.78			
WH-DP-2	Frank Adams	Failed	LV Panelboard	208	*10.34	10.00		*103.40			
WH-DP-2a	SQUARE D	Marginal	LV Panelboard	208	*9.62	10.00		*96.20			
WH-DP-3	Frank Adams	Failed	LV Panelboard	208	*12.58	10.00		*125.79			
WH-DP-3 BUS	Frank Adams	Failed	LV Panelboard	208	*12.50	10.00		*124.99			
WH-DP-4	GE	Passed	LV Panelboard	208	6.71	10.00		67.14			
WH-DS: ELEV	UTIL EQUIP	Passed	U (Note 4)	208	5.13	65.00		7.90			
WH-ELEV	UTIL EQUIP	Marginal	U (Note 4)	208	*4.53	5.00		*90.54			
WH-EXH FAN	UTIL EQUIP	Passed	U (Note 4)	208	0.61	5.00		12.12			
WH-FREEZER	UTIL EQUIP	Passed	U (Note 4)	208	1.96	5.00		39.20			
WH-GARBAGE	UTIL EQUIP	Passed	U (Note 4)	208	0.74	5.00		14.77			
WH-HVAC ROOF	UTIL EQUIP	Passed	U (Note 4)	208	2.26	5.00		45.18			
WH-HWH 4.5kW	UTIL EQUIP	Failed	U (Note 4)	208	*5.33	5.00		*106.67			
WH-MDP	GE	Passed	LV Panelboard	208	14.46	22.00		65.72			
WH-POTS & PANS	UTIL EQUIP	Passed	U (Note 4)	208	2.41	5.00		48.27			
WH-SEWAGE PUMP	UTIL EQUIP	Passed	U (Note 4)	208	2.66	5.00		53.15			
WH-STORE RM A/C	UTIL EQUIP	Passed	U (Note 4)	208	2.07	5.00		41.36			
WH-STORE RM A/C-2	UTIL EQUIP	Passed	U (Note 4)	208	2.07	5.00		41.36			
WH-SWBD: LINE	SQUARE D	Passed	LV Panelboard	208	15.62	65.00		24.03			
WH-WBP-1	UTIL EQUIP	Passed	U (Note 4)	208	3.38	5.00		67.68			

TAB 3

Table 2 – Protective Device Settings

LOCATION	RELAY TYPE	RELAY SETTING				CT/PT RATIO
		FUNCTION	RANGE	SETTING	ACTUAL (PRI)	
MAINS (Existing)	DEV 47	UNDER VOLTAGE (PU)	2-32% by 2%	30	8729	60/1V
	BE1-47	UNDER VOLTAGE (TD)	.1 - 9.9S by .1S	9S		
		NEGATIVE SEQUENCE (PU)	2-32% by 2%	10		60/1V
		NEGATIVE SEQUENCE (TD)	.1 - 9.9S by .1S	6S		
		BASLER BE1-47NE5FE1SC3N4F				
	DEV 51P	PICKUP	.5-15.9 by .1	4	240	300
	BE1-50/51B	TIME CURVE		VERY INV		
		TIME DIAL	0.0-9.9 by .1	2		
		INSTANTANEOUS	1-99 by 1	DISABLE	NA	
		BASLER BE1-50/51B-207				
	DEV 51N	PICKUP	.5-15.9 by .1	4	240	300
	BE1-50/51B	TIME CURVE		VERY INV		
		TIME DIAL	0.0-9.9 by .1	2		
		INSTANTANEOUS	1-99 by 1	DISABLE	NA	
		BASLER BE1-50/51B-207				
FEEDERS (Existing)	GENERAL	ALL FEEDER RELAYS SHALL BE SET USING THE FEEDER_1 LOGIC SCHEME. THE NEGATIVE SEQUENCE SETTING IS NOT PROGRAMMED AS IT HAS LIMITED VALUE FOR THIS SYSTEM. SET THE BACKUP RELAY SETTING TO MATCH THE PRIMARY SETTINGS.				
	DEV 50/51P	PICKUP	.5-15.9 by .1	6	120	100
		TIME CURVE		EXT INV		
		TIME DIAL	0.0-9.9 by .1	1.2		
		INSTANTANEOUS	1-150 by 1	100	2000	
		INSTANTANEOUS DELAY		2 CYCLES		
	DEV 50/51N	PICKUP	.5-15.9 by .1	6	120	100
		TIME CURVE		EXT INV		
		TIME DIAL	0.0-9.9 by .1	1.2		
		INSTANTANEOUS	1-150 by 1	100	2000	
		INSTANTANEOUS DELAY		2 CYCLES		
	Breaker Failure			8 Cycle		
				delay		
		BASLER BE1-851 H5-A1S1N				

LOCATION	RELAY TYPE	RELAY SETTING				CT/PT RATIO
		FUNCTION	RANGE	SETTING	ACTUAL (PRI)	
GENERATOR (Existing)	GENERAL	ALL FEEDER RELAYS SHALL BE SET USING THE FEEDER_1 LOGIC SCHEME. THE NEGATIVE SEQUENCE AND 50/51N SETTINGS ARE NOT PROGRAMMED AS THEY HAVE LIMITED VALUE FOR THIS SYSTEM. SET THE BACKUP RELAY SETTING TO MATCH THE PRIMARY SETTINGS.				
	DEV 50/51P	PICKUP	.5-15.9 by .1	7	140	100
		TIME CURVE		INV		
		TIME DIAL	0.0-9.9 by .1	1		
		INSTANTANEOUS	1-150 by 1	100	2000	
	DEV 50/51N	PICKUP	.5-15.9 by .1	7	140	100
		TIME CURVE		INV		
		TIME DIAL	0.0-9.9 by .1	1		
		INSTANTANEOUS	1-150 by 1	100	2000	
		BASLER BE1-851 H5-A1S1N				

High Voltage Fuses

Prot Dev	Func Name	Connected Bus	Voltage	Manufacturer	Type	Description	Cartridge	Cartridge Size	Trip
AM FUSE PREF	Phase	AM FDR 167-52	12,470	COOPER	T-Tin Fuse Link, 27kV	1T-200T	T-Tin, 100T	100	100
AM FUSE RES	Phase	AM FDR 167-56	12,470	COOPER	T-Tin Fuse Link, 27kV	1T-200T	T-Tin, 100T	100	100
SW 11-2	Phase	SW 11	12,470	S&C	SM-4, 14.4kV E-Rated	3E-200E Standard Speed	SM-4, 20E	20	20
SW 11-3	Phase	SW 11	12,470	S&C	SM-4, 14.4kV E-Rated	3E-200E Standard Speed	SM-4, 50E	50	50
SW 12-2	Phase	SW 12	12,470	S&C	SM-4, 14.4kV E-Rated	3E-200E Standard Speed	SM-4, 10E	10	10
SW 12-3	Phase	SW 12	12,470	S&C	SM-4, 14.4kV E-Rated	3E-200E Standard Speed	SM-4, 30E	30	30
SW 13-2B	Phase	SW 13	12,470	S&C	SM-4, 14.4kV E-Rated	3E-200E Standard Speed	SM-4, 50E	50	50
SW 13-2C	Phase	SW 13	12,470	S&C	SM-4, 14.4kV E-Rated	3E-200E Standard Speed	SM-4, 50E	50	50
SW 14-2B	Phase	SW 14	12,470	S&C	SM-4, 14.4kV E-Rated	3E-200E Standard Speed	SM-4, 50E	50	50
SW 14-2C	Phase	SW 14	12,470	S&C	SM-4, 14.4kV E-Rated	3E-200E Standard Speed	SM-4, 50E	50	50
SW 3-2A	Phase	SW 3	12,470	S&C	SM-4, 14.4kV E-Rated	3E-200E Standard Speed	SM-4, 50E	50	50
SW 3-2B	Phase	SW 3	12,470	S&C	SM-4, 14.4kV E-Rated	3E-200E Standard Speed	SM-4, 50E	50	50
SW 8-2	Phase	SW 8	12,470	S&C	SM-4, 14.4kV E-Rated	3E-200E Standard Speed	SM-4, 20E	20	20

Prot Dev	Func Name	Connected Bus	Voltage	Manufacturer	Type	Description	Cartridge	Cartridge Size	Trip
SWGR-CPT FUSE	Phase	SWGR-MAIN BUS	12,470	GOULD SHAWMUT	CS-3, 15.5kV E-Rated	5E-30E	CS-3, 7E	7	7
T1 PFUSE	Phase	T1 PBUS	12,470	COOPER	Bay-O-Net Current Sensing Fuse Link,	C4-C17	353C10	25	25
T11 PFUSE	Phase	T11 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C10	25	25
T15 PFUSE	Phase	T15 PBUS	12,470	COOPER	Bay-O-Net DE Link, 23kV	C3-C12	108C9	25	25
T17 PFUSE	Phase	T17 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C8	15	15
T22 PFUSE	Phase	T22 PBUS	12,470	COOPER	Bay-O-Net DE Link, 23kV	C3-C12	108C6	12	12
T24 PFUSE	Phase	T24 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C8	15	15
T25 PFUSE	Phase	T25 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C8	15	15
T26 PFUSE	Phase	T26 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C8	15	15
T27 PFUSE	Phase	T27 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C8	15	15
T28 PFUSE	Phase	T28 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C8	15	15
T29 PFUSE	Phase	T29 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C8	15	15
T30 PFUSE	Phase	T30 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C8	15	15
T31 PFUSE	Phase	T31 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C8	15	15
T32 PFUSE	Phase	T32 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C8	15	15
T33 PFUSE	Phase	T33 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C8	15	15
T34 PFUSE	Phase	T34 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C8	15	15
T35 PFUSE	Phase	T35 PBUS	12,470	COOPER	Bay-O-Net DS Link, 23kV	C3-C18	358C8	15	15
T36 PFUSE	Phase	T36 PBUS	12,470	COOPER	Bay-O-Net DE Link, 23kV	C3-C12	108C9	25	25

LOCATION	MANUFACTURE/ TRIP DEVICE	FUNCTION	RANGE (AMPERES)	SETTING	ACTUAL (AMPERES)
1280KW Generator	Square D 'RJ2000'	FRAME			2000
(Original 480V Main)	MICROLOGIC 5.0	SENSOR (In)			2000
	LSI	LONG (Ir)	.4 - 1.0 x In	1	2000
		DELAY (tr)	.5-24 sec @ 6 x Ir	4	
		SHORT TIME (Isd)	1.5 - 10 x Ir	8	16000
		ST DELAY	0 + .1-.4 sec	0.2	
		I SQUARE T	I^2t IN / I^2t OUT	I^2t OUT	
		INSTANTANEOUS	2-15 by .5 x In + OFF	10	20000
1280KW Generator	Square D 'RJ2000'	FRAME			2000
(Proposed 480V Main)	MICROLOGIC 6.0	SENSOR (In)			2000
	LSIG	LONG (Ir)	.4 - 1.0 x In	1	2000
		DELAY (tr)	.5-24 sec @ 6 x Ir	4	
		SHORT TIME (Isd)	1.5 - 10 x Ir	8	16000
		ST DELAY	0 + .1-.4 sec	0.2	
		I SQUARE T	I^2t IN / I^2t OUT	I^2t OUT	
		INSTANTANEOUS	2-15 by .5 x In + OFF	10	20000
		Ground Fault	A-J (500-1200A)	A (500A)	500
		ST DELAY	0 + .1-.4 sec	0.1	
		I SQUARE T	I^2t IN / I^2t OUT	I^2t OUT	

LOW VOLTAGE THERMAL MAGNETIC MOLDED CASE BREAKERS SETTINGS

DESIGNATION		FRAME		TRIP UNIT				
Location/Name	Amps Frame	MFR	TYPE MODEL	Amps Sensor/Plug	Description	TYPE/MODEL	LT SETTING	INST SETTING
DON-DP2 DON-DP-2: WH-1	50	GE	THQB	30 30	15-100A	THQB	Fixed	
DON-DP1 DON-DP1-1: P1	20	GE	THHQB	20 20	15-100A	THHQB	Fixed	
DON-DP1 DON-DP1-1: P2	20	GE	THHQB	20 20	15-100A	THHQB	Fixed	
DON-DP1 DON-DP1-2: P2	20	GE	THHQB	20 20	15-100A	THHQB	Fixed	
DON-DP1 DON-DP1-2: P3	20	GE	THHQB	20 20	15-100A	THHQB	Fixed	
DON-DP1 DON-DP1: CH PUMP 1	50	GE	THHQB	50 50	15-100A	THHQB	Fixed	
DON-DP1 DON-DP1: CH PUMP 2	50	GE	THHQB	50 50	15-100A	THHQB	Fixed	
DON-HP2 DON-HP2: CRAC-1	20	GE	THQB	15 15	15-100A	THQB	Fixed	
DON-HP3 DON-HP3: CU-3	50	GE	THQB	30 30	15-100A	THQB	Fixed	
DON-MDP sec 1: DONNELLY DON-MDP: AHU-1	50	GE	TEY	50 50	15-100A	TEY, 2 & 3-Pole	Fixed	
DON-MDP sec 1: DONNELLY DON-MDP: AHU-1 DRIVE	20	GE	TEY	20 20	15-100A	TEY, 2 & 3-Pole	Fixed	
DON-MDP sec 1: DONNELLY DON-MDP: AHU-2	50	GE	TEY	50 50	15-100A	TEY, 2 & 3-Pole	Fixed	

DESIGNATION		FRAME		TRIP UNIT				
Location/Name	Amps Frame	MFR	TYPE MODEL	Amps Sensor/Plug	Description	TYPE/MODEL	LT SETTING	INST SETTING
DON-MDP sec 1: DONNELLY DON-MDP: AHU-2 DRIVE	20	GE	TEY	20 20	15-100A	TEY, 2 & 3-Pole	Fixed	
DON-MDP sec 2: DONNELLY DON-MDP: CH-1	400	GE	SGDA	300 300	125-400A	SGDA, Spectra RMS	MAX	
DON-MDP sec 1: DONNELLY DON-MDP: COMP RM AC UNIT	30	GE	TEY	30 30	15-100A	TEY, 2 & 3-Pole	Fixed	
DON-MDP sec 2: DONNELLY DON-MDP: DP1	400	GE	SGDA	400 400	125-400A	SGDA, Spectra RMS	MAX	
DON-MDP sec 2: DONNELLY DON-MDP: DP2	250	GE	SFHA	225 225	70-250A	SFHA, Spectra RMS	MAX	
DON-MDP sec 2: DONNELLY DON-MDP: HP1	250	GE	SFHA	200 200	70-250A	SFHA, Spectra RMS	MAX	
DON-MDP sec 2: DONNELLY DON-MDP: HP2	100	GE	TEY	100 100	15-100A	TEY, 2 & 3-Pole	Fixed	
DON-MDP sec 1: DONNELLY DON-MDP: HP3	100	GE	TEY	100 100	15-100A	TEY, 2 & 3-Pole	Fixed	
DON-MDP: DONNELLY DON-MDP: MCB	600	GE	SGHA	600 600	125-600A	SGHA, Spectra RMS	MAX	
GARAGE GARAGE MCB	200	SQUARE D	QB	200 200	70-250A	QB	Fixed	
GH-DP/GH BUS GH-DP: CC1	150	SIEMENS	HFXD6	125 125	70-250A	HFXD6 Sentron	Thermal Curve (Fixed)	INST (LO-HI) HI
GH-DP/GH BUS GH-DP: GH-1502	400	SIEMENS	JXD2-A	400 400	200-400A	JXD2-A Sentron	Thermal Curve (Fixed)	INST (LO-HI) HI
GH-DP/GH BUS GH-DP: GH-1503	400	SIEMENS	JXD2-A	400 400	200-400A	JXD2-A Sentron	Thermal Curve (Fixed)	INST (LO-HI) HI
GH-DP/GH BUS GH-DP: GH-1504	400	SIEMENS	JXD2-A	400 400	200-400A	JXD2-A Sentron	Thermal Curve (Fixed)	INST (LO-HI) HI
GH-DP/GH BUS GH-DP: GH1505	400	SIEMENS	JXD2-A	400 400	200-400A	JXD2-A Sentron	Thermal Curve (Fixed)	INST (LO-HI) HI
GH-DP/GH GH-DP: MCB	1,600	SIEMENS	NPG	1,600 1,600	1200-1600A	PG, 525	Thermal Curve (Fixed)	INST (7-12kA) 12000

DESIGNATION		FRAME		TRIP UNIT				
Location/Name	Amps Frame	MFR	TYPE MODEL	Amps Sensor/Plug	Description	TYPE/MODEL	LT SETTING	INST SETTING
MP-LP-C MP-LP-C: DIMMER PANEL	100	GE	THQB	60 60	15-100A	THQB	Fixed	
MP-LP-E1 MP-LP-E1-12: HTG PUMP	20	GE	THQB	15 15	15-100A	THQB	Fixed	
MP-LP-E1 MP-LP-E1-13: SUMP PUMP 2	20	GE	THQB	20 20	15-100A	THQB	Fixed	
MP-LP-E1 MP-LP-E1-1: LP-E2	100	GE	THQB	100 100	15-100A	THQB	Fixed	
PT P2 PT P2-2: CHILLER	20	CUTLER-HAMMER	BAB	20 20	15-100A	BAB, 3-Pole	Fixed	
PT P2 PT P2-32: TBP1	70	CUTLER-HAMMER	BAB	70 70	15-100A	BAB, 3-Pole	Fixed	
PT-L2 PT-L2 MAIN	200	SQUARE D	QB	200 200	70-250A	QB	Fixed	
PT-L2 BUS PT-L2: PT COND PUMP	30	SQUARE D	QO	30 30	15-100A	QO, 3-Pole	Fixed (730-5, 30A)	
PT-P1: MCB PT-P1 MAIN	400	WESTINGHOUSE	LB	400 400	70-400A	LBB, LB	LTD	INST 5.0
SITE LTG PANEL SITE LTG PANEL: MCB	100	GE	TEY	100 100	15-100A, 2 & 3-Pole	TEY	Fixed	
SWGR-LPSG SWGR-LPSG: MCB	150	SIEMENS	QJ	150 150	125-225A	QJ	Thermal Curve (Fixed)	INST Fixed
U1-BOILER RM U1-BOILER RM: MCB	60	SQUARE D	QO	60 60	15-100A	QO, 3-Pole	Fixed (730-6, 60A)	
U1-MAINT MDP U1-MAINT: L1 & L2	225	FPE	225	200 200	70-225A	NFJ	Thermal Curve	INST HI
U1-MAINT MDP U1-MAINT: L3	150	FPE	150	100 100	70-225A	NFJ	Thermal Curve	INST HI
U1-MAINT MDP U1-MAINT: L4	150	FPE	150	100 100	70-225A	NFJ	Thermal Curve	INST HI
U1-MAINT MDP U1-MAINT: L5	400	FPE	400	300 300	70-400A	NJL	Thermal Curve	INST HI

DESIGNATION		FRAME		TRIP UNIT				
Location/Name	Amps Frame	MFR	TYPE MODEL	Amps Sensor/Plug	Description	TYPE/MODEL	LT SETTING	INST SETTING
U1-MAINT MDP U1-MAINT: P1	400	FPE	400	400 400	70-400A	NJL	Thermal Curve	INST HI
U1-MAINT MDP U1-MAINT: P3	400	FPE	400	300 300	70-400A	NJL	Thermal Curve	INST HI
U1-MAINT MDP U1-MAINT: P4	225	FPE	225	200 200	70-225A	NFJ	Thermal Curve	INST HI
U1-MAINT MDP U1-MAINT: PH	225	FPE	225	200 200	70-225A	NFJ	Thermal Curve	INST HI
U1-L5 U1-P3: L5	225	Generic - Arc Flash	225	200 200	125-400A	MCCB	Thermal Curve	INST HI
WH-DP-3 WH-DP-3 MCB	200	SQUARE D	KD	200 200	100-250A	KD	Fixed	
WH-DP-4 WH-DP-4: BOOSTER HTR	50	GE	THQB	50 50	15-100A	THQB	Fixed	
WH-DP-4 WH-DP-4: FREEZER	50	GE	THQB	30 30	15-100A	THQB	Fixed	
WH-DP-4 WH-DP-4: GARBAGE	20	GE	THQB	20 20	15-100A	THQB	Fixed	
WH-DP-4 WH-DP-4: POTS & PANS	50	GE	THQB	30 30	15-100A	THQB	Fixed	
WH-DP-1 WH-DP1-18: COMPRESSOR	100	GE	THQB	60 60	15-100A	THQB	Fixed	
WH-DP-1 WH-DP1-1: HVAC ROOF	50	GE	THQB	50 50	15-100A	THQB	Fixed	
WH-DP-1 WH-DP1-20: WH EXH FAN	20	GE	THQB	20 20	15-100A	THQB	Fixed	
WH-MDP WH-MDP-13: DP-3	225	GE	THQD	200 200	100-225A	THQD	Fixed	
WH-MDP WH-MDP-1: DP-4	225	GE	THQD	200 200	100-225A	THQD	Fixed	
WH-MDP WH-MDP-20: ELEV	100	GE	THHQB	80 80	15-100A	THHQB	Fixed	

DESIGNATION		FRAME		TRIP UNIT				
Location/Name	Amps Frame	MFR	TYPE MODEL	Amps Sensor/Plug	Description	TYPE/MODEL	LT SETTING	INST SETTING
WH-MDP WH-MDP-25: WBP-1	100	GE	THHQB	60 60	15-100A	THHQB	Fixed	
WH-MDP WH-MDP-2: DP-2	225	GE	THQD	200 200	100-225A	THQD	Fixed	
WH-MDP WH-MDP-32: HWH-4.5kW	50	GE	THHQB	30 30	15-100A	THHQB	Fixed	
WH-MDP WH-MDP-36: COND PUMP	20	GE	THHQB	20 20	15-100A	THHQB	Fixed	
WH-MDP WH-MDP-37: STORE RM A/C	50	GE	THHQB	40 40	15-100A	THHQB	Fixed	
WH-MDP WH-MDP-41: STORE RM A/C-2	50	GE	THHQB	40 40	15-100A	THHQB	Fixed	
WH-MDP WH-MDP-47: SEWAGE PUMP	20	GE	THHQB	20 20	15-100A	THHQB	Fixed	
WH-MDP WH-MDP-8: DP-1	225	GE	THQD	200 200	100-225A	THQD	Fixed	

Low Voltage Fuses

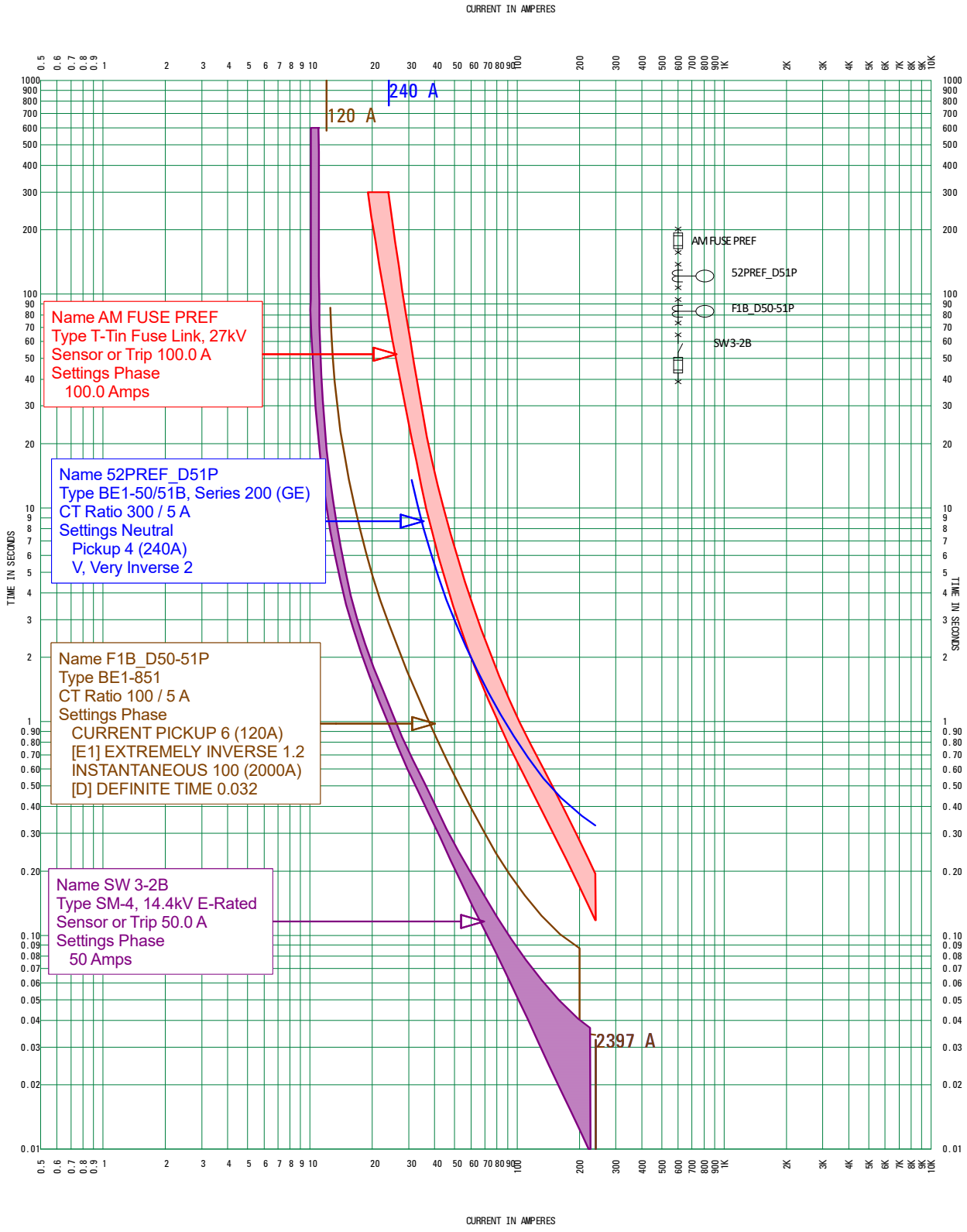
Prot Dev	Func Name	Connected Bus	Voltage	Manufacturer	Type	Description	Cartridge	Cartridge Size	Trip
1901/1902-MDP: DRYER	Phase	1901/1902 MDP BUS	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-30SP	30	30
1901/1902-MDP: LP1	Phase	1901/1902 MDP BUS	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-200SP	200	200
1901/1902-MDP: RANGE	Phase	1901/1902 MDP BUS	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-60SP	60	60
1901/1902-MDP: RTU-5	Phase	1901/1902 MDP BUS	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-200SP	200	200
1901/1902-SE FUSE	Phase	1901/1902-MDP	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-225SP	225	225
1903/1904-MDP: DRYER	Phase	1903/1904 MDP BUS	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-30SP	30	30
1903/1904-MDP: LP1	Phase	1903/1904 MDP BUS	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-200SP	200	200
1903/1904-MDP: RANGE	Phase	1903/1904 MDP BUS	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-60SP	60	60
1903/1904-MDP: RTU-4	Phase	1903/1904 MDP BUS	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-200SP	200	200
1903/1904-SE FUSE	Phase	1903/1904-MDP	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-225SP	225	225
1905/1906 MDP: DRYER	Phase	1905/1906 MDP BUS	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-30SP	30	30
1905/1906 MDP: LP-1	Phase	1905/1906 MDP BUS	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-200SP	200	200
1905/1906 MDP: RANGE	Phase	1905/1906 MDP BUS	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-60SP	60	60

Prot Dev	Func Name	Connected Bus	Voltage	Manufacturer	Type	Description	Cartridge	Cartridge Size	Trip
1905/1906 MDP: RTU-6	Phase	1905/1906 MDP BUS	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-200SP	200	200
1905/1906-SE FUSE	Phase	1905/1906-MDP	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-225SP	225	225
MDP MP: CHILLER 2	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	200	200
MP-MDP: AHU 1 & 2	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	30	30
MP-MDP: AHU 3	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	60	60
MP-MDP: CT	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	30	30
MP-MDP: CWP-P3	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	20	20
MP-MDP: HWP-A2	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	30	30
MP-MDP: SUMP PUMP	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	20	20
MP-MDP: WELDING	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	60	60
MP-MDP: AHU4/RAF4	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	100	100
MP-MDP: CHILLER 1	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	200	200
MP-MDP: CT PUMP P4	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	15	15
MP-MDP: IT SERVER	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	100	100
MP-MDP: LP-A1 & LP-A2	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	350	350
MP-MDP: LP-B	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	200	200
MP-MDP: LP-C	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	200	200
MP-MDP: LP-D	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	100	100
MP-MDP: LP-E1	Phase	MP-MDP BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	100	100
MP-MDP: MCB	Phase	MP-MDP	208	BUSSMANN	KRP-C, 600V Class L	601-6000A	KRP-C	1,200	1,200
PT-P1: AHU	Phase	PT-P1	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-30SP	30	30
PT-P1: L1	Phase	PT-P1	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-200SP	200	200
PT-P1: RTU	Phase	PT-P1	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-100SP	100	100

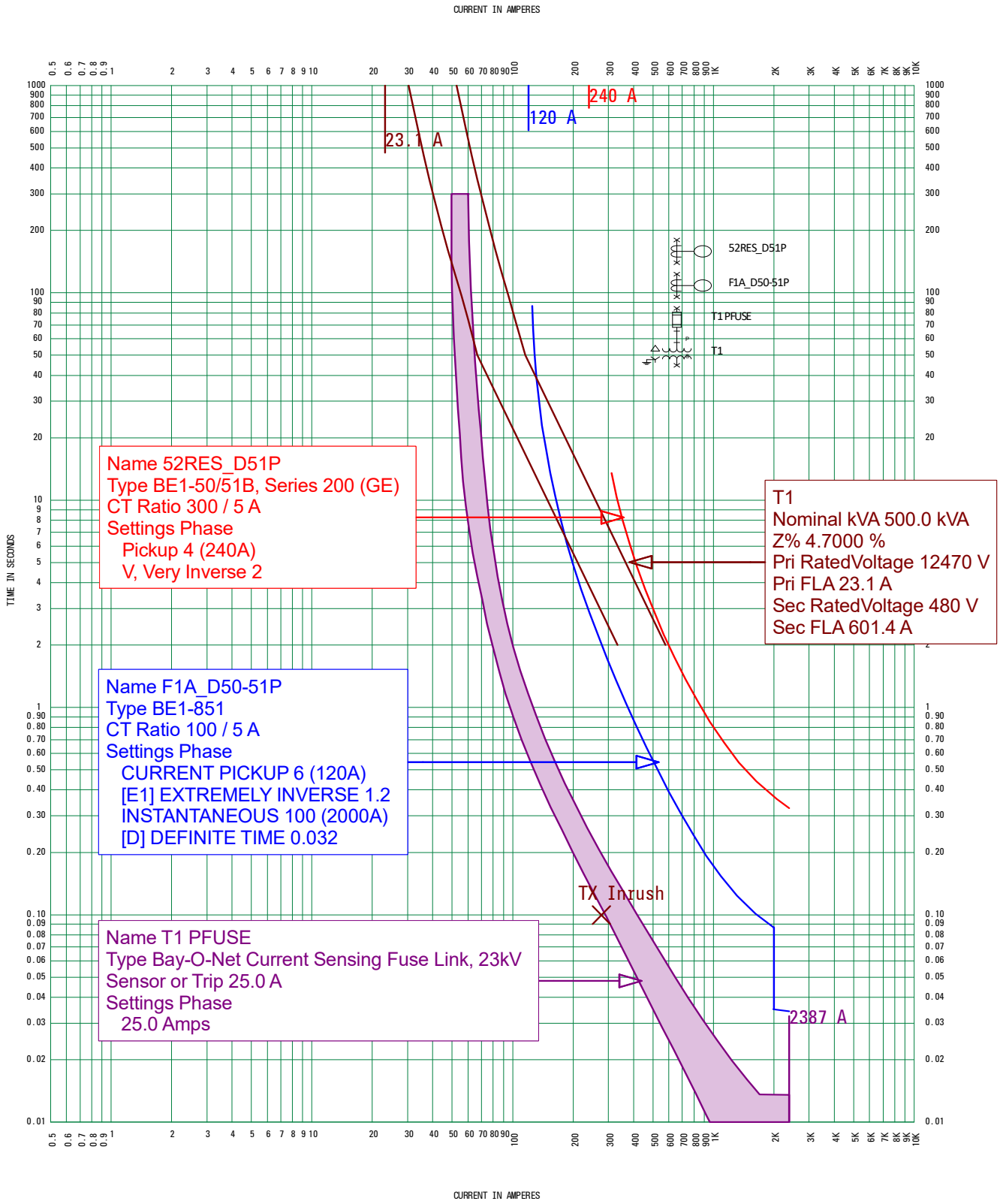
Prot Dev	Func Name	Connected Bus	Voltage	Manufacturer	Type	Description	Cartridge	Cartridge Size	Trip
PT-PP: AHU-2	Phase	PT-PP	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-30SP	30	30
PT-PP: OTPT HEAT	Phase	PT-PP	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-10SP	10	10
PT-PP: P2	Phase	PT-PP	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-200SP	200	200
PT-PP: POOL	Phase	PT-PP	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-60SP	60	60
U1-P1: MCB	Phase	U1-P1	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	200	200
U1-P1: P2	Phase	U1-P1 BUS	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	200	200
U1-P3: L4	Phase	U1-P3	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	100	100
WH SWBD: MAIN FUSE	Phase	WH-SWBD: LINE	208	BUSSMANN	LPN-RK, 250V RK1	1-600A	LPN-RK-600SP	600	600
WH-FUSE: ELEV	Phase	WH-DS: ELEV	208	BUSSMANN	FRN-R, 250V, RK5	0.1-600A	FRN-R	70	70

TAB 4

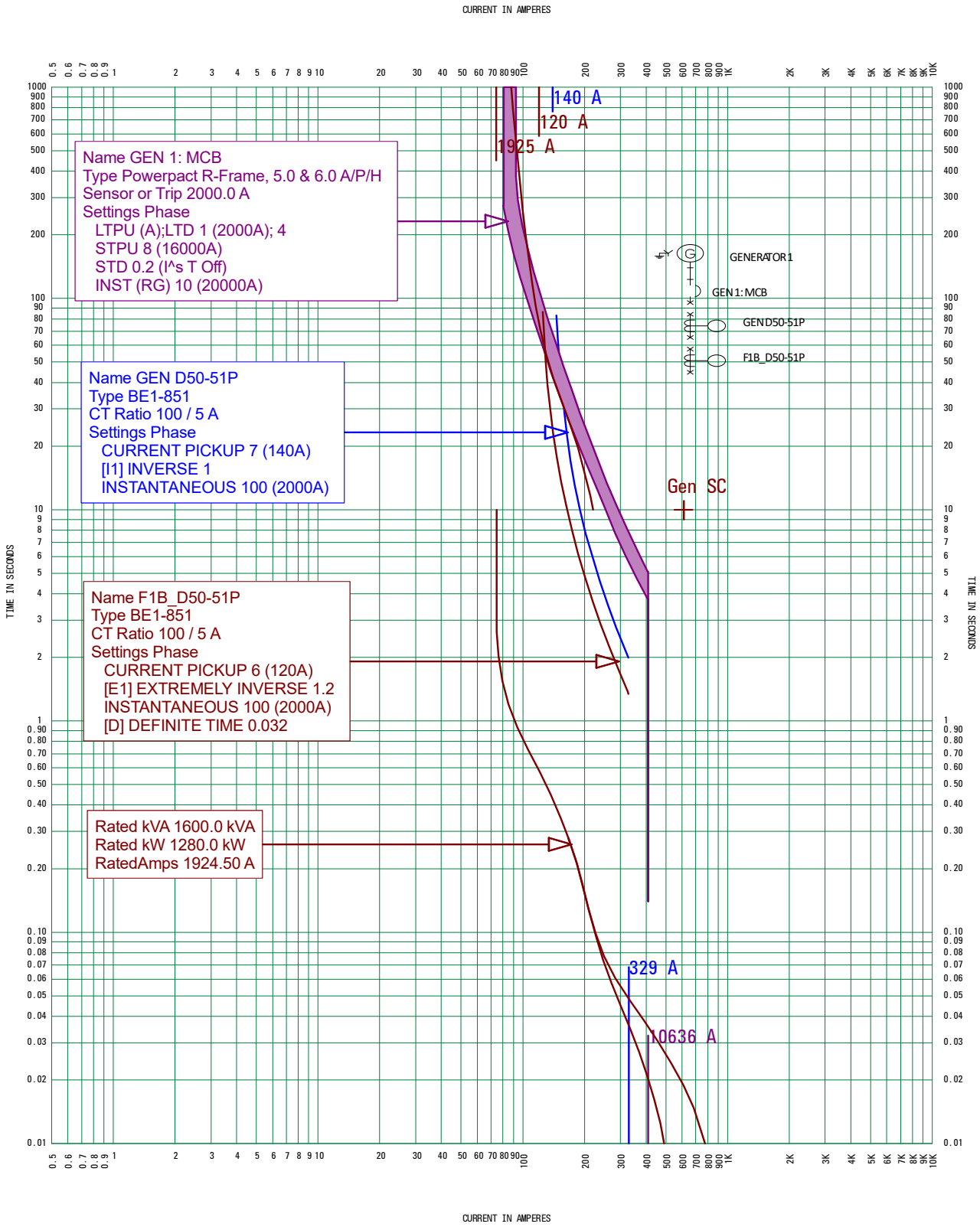
Time Current Characteristic Curves



TCC Name: tn1_AM preferred Current Scale x 10 Reference Voltage: 12470
August 16, 2018
Note: Preferred 12kV source to Bellefontaine Hab Center - settings as approved by Ameren Missouri in 2006.

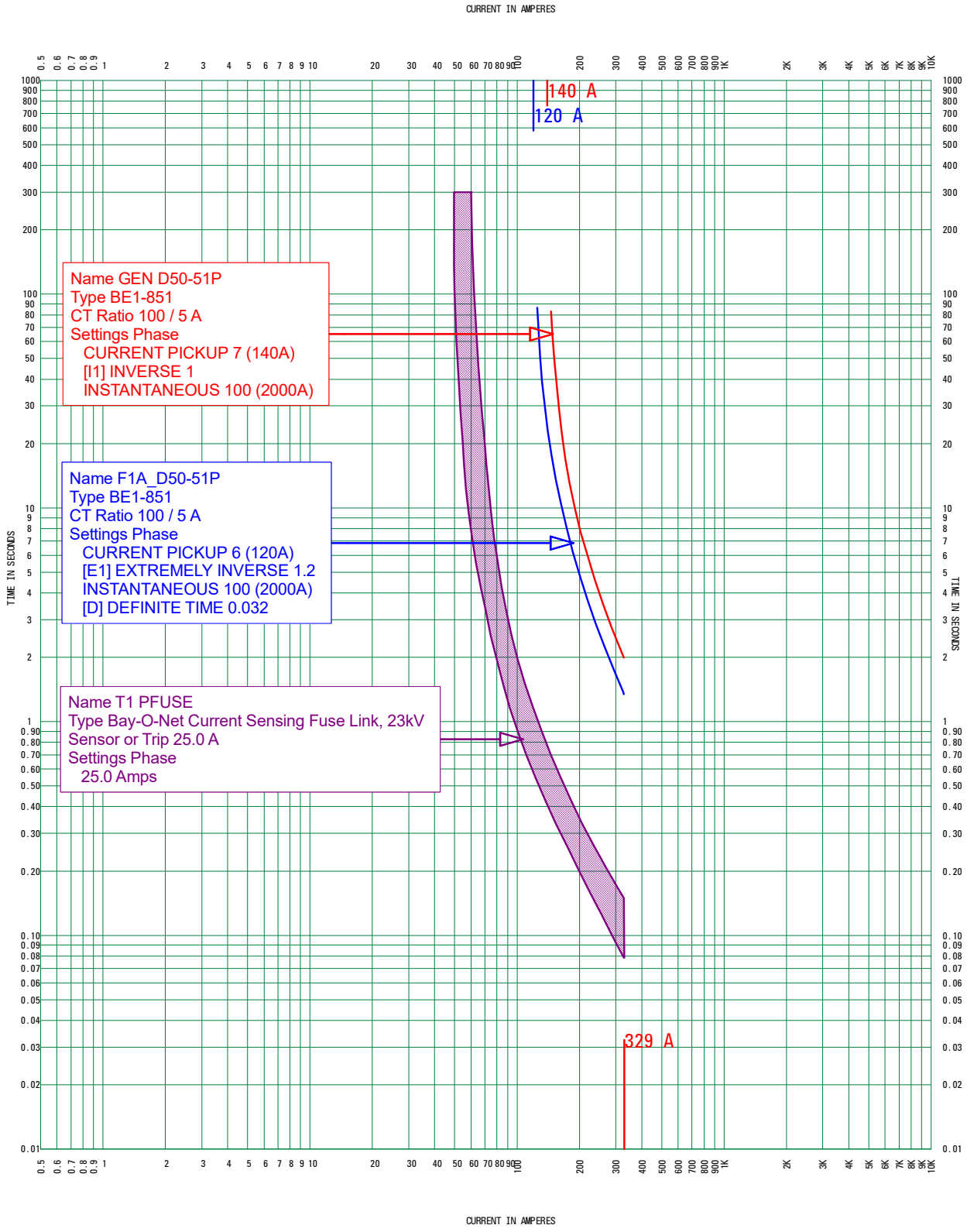


TCC Name: tcc2_am res
Current Scale x 1
Reference Voltage: 12470
August 16, 2018
Note: Reserve 12kV source to Bellefontaine Hab Center - settings as approved by Ameren Missouri in 2006.

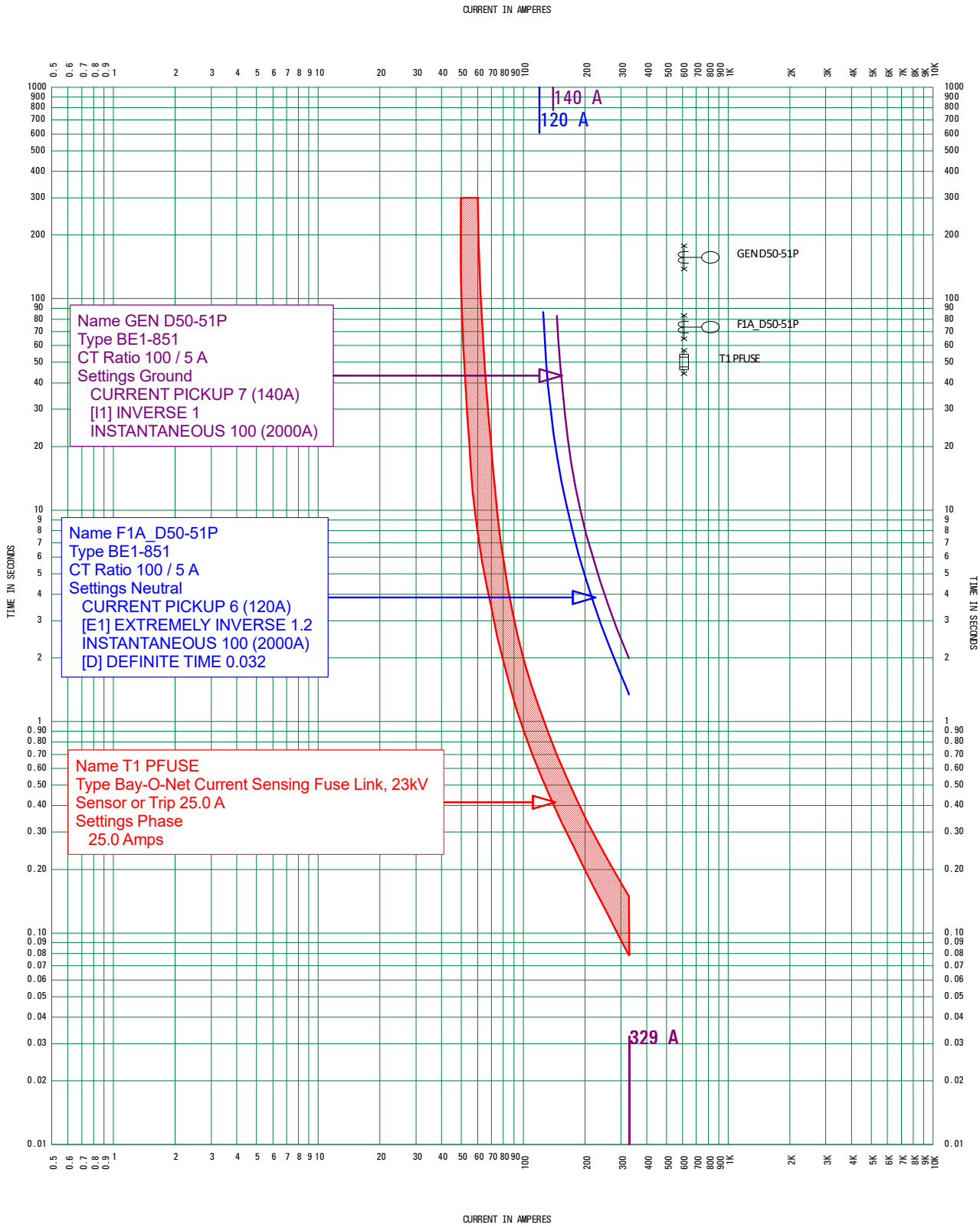


TCC Name: te-gen Current Scale x 1 Reference Voltage: 12470
August 16, 2018
Note: Generator in Emergency Mode, no Utility available. (12470V)
The PHASE setting for the Generator TIE breaker is shown. This setting insures selective coordination with all outgoing Bus Feeders (F1B is shown) with.648 seconds clearing time at maximum fault. Genset = Kohler 1250REOZMB w/ 7M4050 alternator.

TCC 3a.pdf

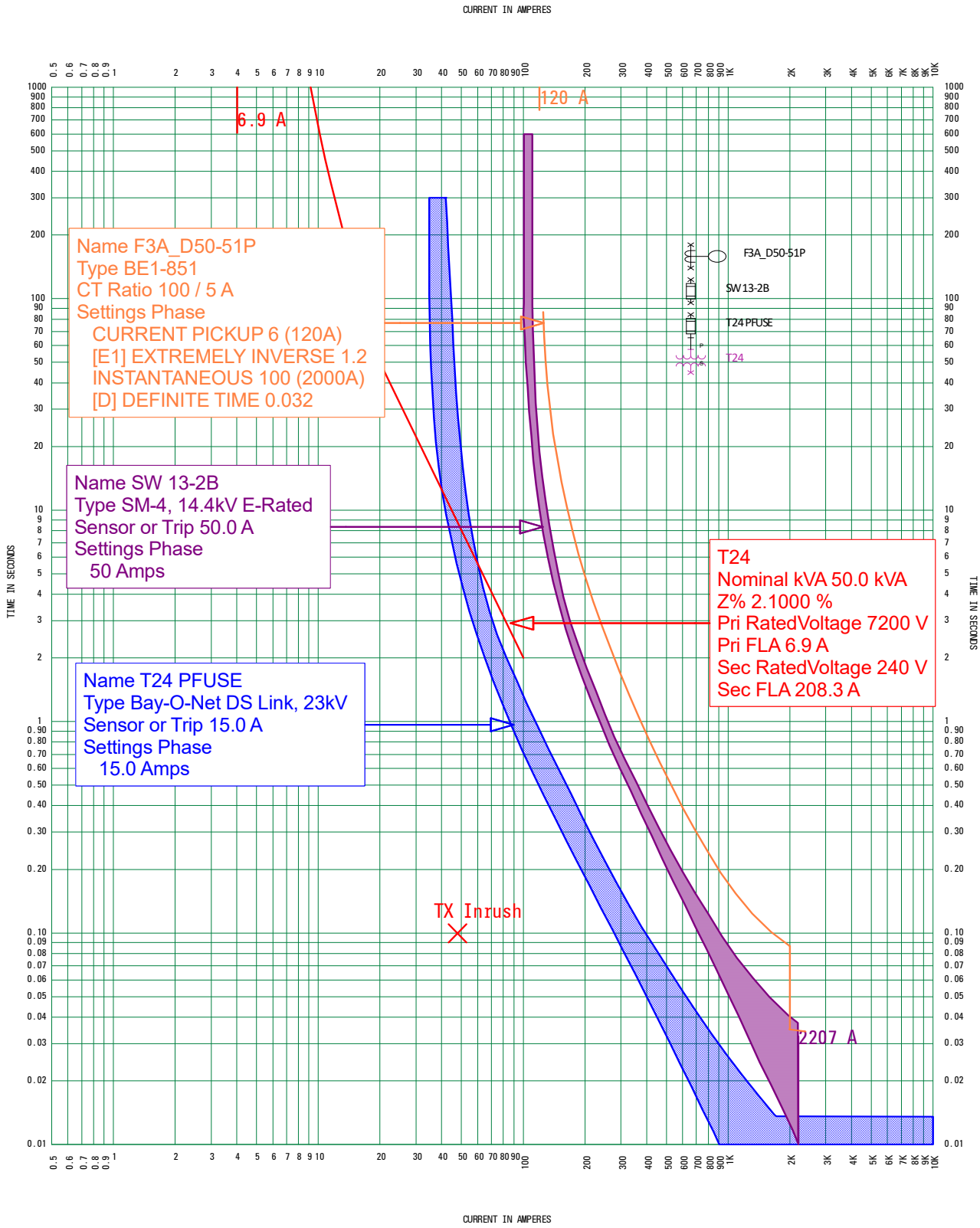


TCC Name: te-gen 51P Current Scale x 1 Reference Voltage: 12470
August 16, 2018
Note: Generator is running in the Emergency Mode with no Utility Source available.
Relay PHASE settings are shown. Selective coordination is good.

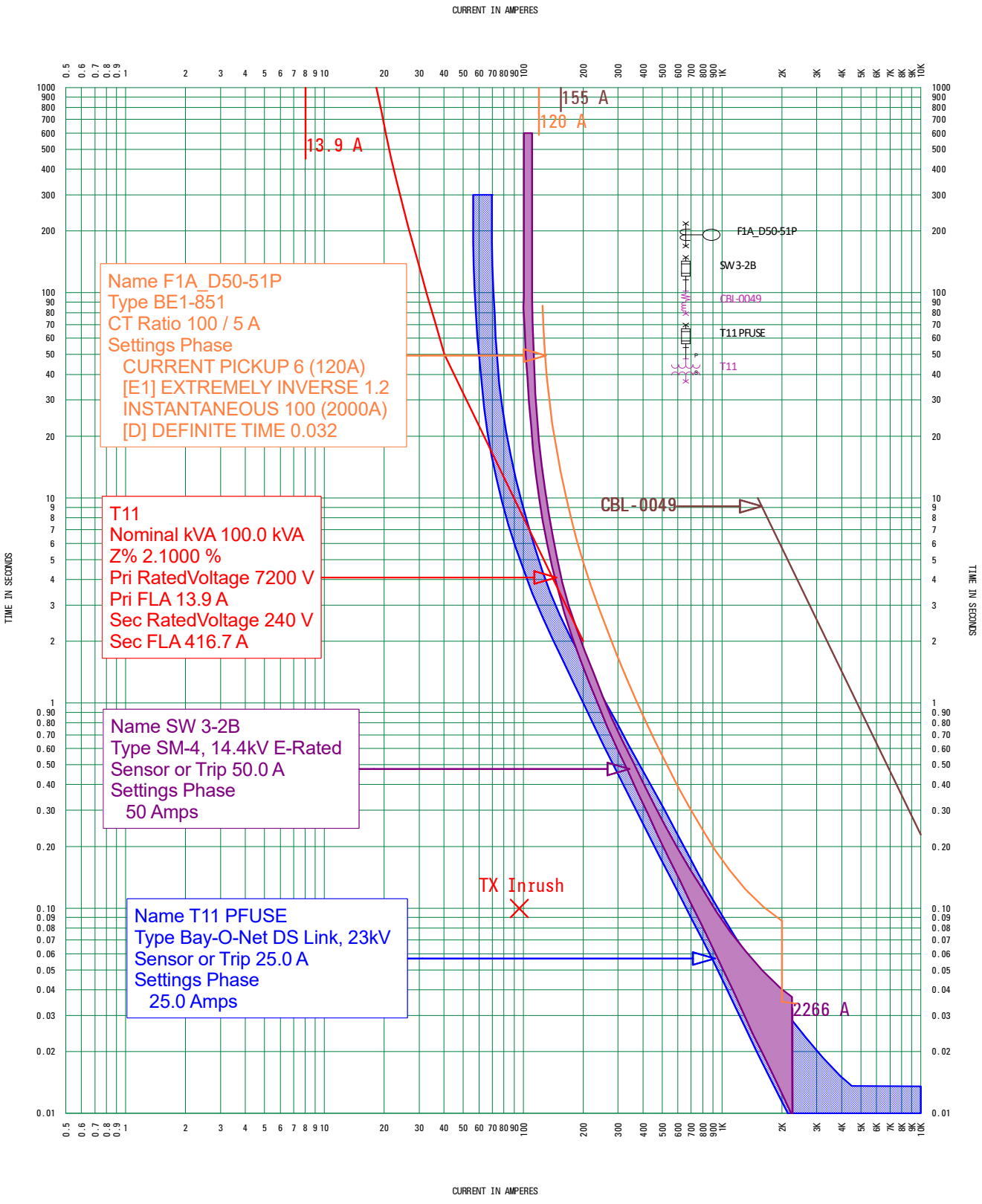


TCC Name: te-gen 51N Current Scale x 1 Reference Voltage: 12470
August 16, 2018
Note: Generator in Emergency Mode w/ no Utility available. GROUND settings shown.
Ground Fault selective coordination is good at all fault levels.

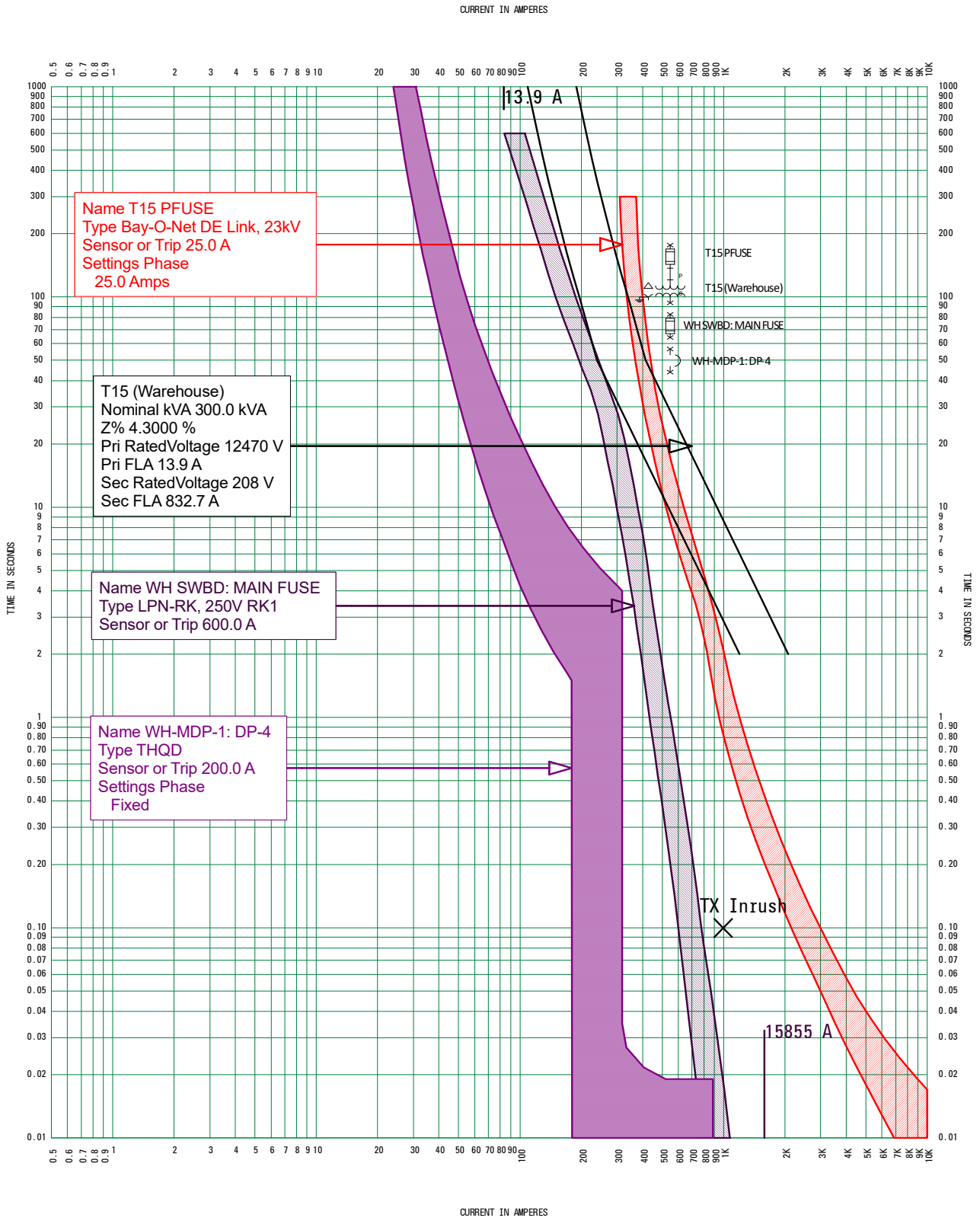
TCC 3c.pdf



TCC Name: tccT24 Current Scale x 1 Reference Voltage: 12470
August 16, 2018
Note: Curve depicts coordination and protection for T24, typical for 50kVA, single phase padmount transformers. Coordination and protection is good.



TCC Name: tccT11 Current Scale x 1 Reference Voltage: 12470
August 22, 2018
Note: Curve depicts coordination and protection for T11, 100kVA, single phase padmount transformer at the Apartments. The T11 primary fuse and the SW 3-2B fuse do not coordinate well, but only one load is served from SW 3-2B, T-11. See Executive Summary for discussion.



TCC Name: tn-t15_warehouse with fuse main Current Scale x 10 Reference Voltage: 208
August 22, 2018
Note: Curve depicts coordination of devices protecting the proposed Warehouse Switchboard with an upstream, remote, isolated, main fused disconnect. The resulting incident energy at the new switchboard is 17.2 cal/cm^2.

TAB 5

Table 3ac – AC Short Circuit Report

Table 3dc – DC Short Circuit Report

Project: skm-1412
Base Project

Bus Fault Contribution

Unbalanced / Single Phase Comprehensive Fault Study Settings

Faulted Bus Selection	Fault All Buses One By One	**Motor Contribution**	No
Fault Current Calculation	RMS	**Transformer Tap**	No
Asym Fault Current at Time	0.50	**Transformer Phase Shift**	Yes

			Initial Symmetrical RMS								Asym. RMS Amps @ 0.50 Cycles		3-Phase Asym Amps (RMS)				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**X/R**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
1601	240	A:	0	0.00	0	0.00	0	0	3P:	1.66	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	SLG:	1.33	0	0	0	0	0	0	0
		C:	6,684	0.93	8,873	1.23	0	0	LLG:	1.00	6,836	8,952	6,836	6,684	6,684	6,684	6,684
1602	240	A:	0	0.00	0	0.00	0	0	3P:	1.66	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	SLG:	1.33	0	0	0	0	0	0	0
		C:	6,684	0.93	8,873	1.23	0	0	LLG:	1.00	6,836	8,952	6,836	6,684	6,684	6,684	6,684

Fault Location Bus Name	Bus LL Voltage		3-Phase Amps	3-Phase MVA	SLG Amps	SLG MVA	LL Amps	LLG Amps			3-Phase Amps	SLG Amps	1/2 Cycles	2 Cycles	3 Cycles	5 Cycles	8 Cycles
			----------Initial Symmetrical RMS----------						-----X/R-----		Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
1603	240	A:	0	0.00	0	0.00	0	0	3P:	1.66	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	SLG:	1.33	0	0	0	0	0	0	0
		C:	6,682	0.93	8,868	1.23	0	0	LLG:	1.00	6,833	8,947	6,833	6,682	6,682	6,682	6,682
1604	240	A:	0	0.00	0	0.00	0	0	3P:	1.66	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	SLG:	1.33	0	0	0	0	0	0	0
		C:	6,682	0.93	8,868	1.23	0	0	LLG:	1.00	6,833	8,947	6,833	6,682	6,682	6,682	6,682
1605	240	A:	0	0.00	0	0.00	0	0	3P:	1.66	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	SLG:	1.33	0	0	0	0	0	0	0
		C:	6,674	0.92	8,853	1.23	0	0	LLG:	1.00	6,824	8,931	6,824	6,674	6,674	6,674	6,674
1606	240	A:	0	0.00	0	0.00	0	0	3P:	1.66	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	SLG:	1.33	0	0	0	0	0	0	0
		C:	6,674	0.92	8,853	1.23	0	0	LLG:	1.00	6,824	8,931	6,824	6,674	6,674	6,674	6,674
1607	240	A:	0	0.00	0	0.00	0	0	3P:	1.65	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	SLG:	1.32	0	0	0	0	0	0	0
		C:	6,649	0.92	8,806	1.22	0	0	LLG:	1.00	6,794	8,881	6,794	6,649	6,649	6,649	6,649
1608	240	A:	0	0.00	0	0.00	0	0	3P:	1.65	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	SLG:	1.32	0	0	0	0	0	0	0
		C:	6,655	0.92	8,818	1.22	0	0	LLG:	1.00	6,802	8,893	6,802	6,655	6,655	6,655	6,655
1609	240	A:	0	0.00	0	0.00	0	0	3P:	1.65	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	SLG:	1.32	0	0	0	0	0	0	0
		C:	6,655	0.92	8,818	1.22	0	0	LLG:	1.00	6,802	8,893	6,802	6,655	6,655	6,655	6,655
1610	240	A:	0	0.00	0	0.00	0	0	3P:	1.65	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	SLG:	1.32	0	0	0	0	0	0	0
		C:	6,661	0.92	8,828	1.22	0	0	LLG:	1.00	6,808	8,904	6,808	6,661	6,661	6,661	6,661
1801	240	A:	0	0.00	0	0.00	0	0	3P:	1.58	0	0	0	0	0	0	0
		B:	7,363	1.02	9,572	1.33	0	7,363	SLG:	1.27	7,499	9,640	7,499	7,363	7,363	7,363	7,363
		C:	0	0.00	0	0.00	0	0	LLG:	1.58	0	0	0	0	0	0	0

			----------Initial Symmetrical RMS----------								Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
1802	240	A:	0	0.00	0	0.00	0	0	**3P:**	1.58	0	0	0	0	0	0	0
		B:	7,363	1.02	9,572	1.33	0	7,363	**SLG:**	1.27	7,499	9,640	7,499	7,363	7,363	7,363	7,363
		C:	0	0.00	0	0.00	0	0	**LLG:**	1.58	0	0	0	0	0	0	0
1803	240	A:	0	0.00	0	0.00	0	0	**3P:**	1.66	0	0	0	0	0	0	0
		B:	6,676	0.93	8,857	1.23	0	6,676	**SLG:**	1.33	6,826	8,935	6,826	6,676	6,676	6,676	6,676
		C:	0	0.00	0	0.00	0	0	**LLG:**	1.66	0	0	0	0	0	0	0
1804	240	A:	0	0.00	0	0.00	0	0	**3P:**	1.59	0	0	0	0	0	0	0
		B:	7,384	1.02	9,611	1.33	0	7,384	**SLG:**	1.28	7,524	9,681	7,524	7,384	7,384	7,384	7,384
		C:	0	0.00	0	0.00	0	0	**LLG:**	1.59	0	0	0	0	0	0	0
1805	240	A:	0	0.00	0	0.00	0	0	**3P:**	1.59	0	0	0	0	0	0	0
		B:	7,384	1.02	9,611	1.33	0	7,384	**SLG:**	1.28	7,524	9,681	7,524	7,384	7,384	7,384	7,384
		C:	0	0.00	0	0.00	0	0	**LLG:**	1.59	0	0	0	0	0	0	0
1806	240	A:	0	0.00	0	0.00	0	0	**3P:**	1.58	0	0	0	0	0	0	0
		B:	7,377	1.02	9,598	1.33	0	7,377	**SLG:**	1.27	7,515	9,667	7,515	7,377	7,377	7,377	7,377
		C:	0	0.00	0	0.00	0	0	**LLG:**	1.58	0	0	0	0	0	0	0
1807	240	A:	0	0.00	0	0.00	0	0	**3P:**	1.58	0	0	0	0	0	0	0
		B:	7,377	1.02	9,598	1.33	0	7,377	**SLG:**	1.27	7,515	9,667	7,515	7,377	7,377	7,377	7,377
		C:	0	0.00	0	0.00	0	0	**LLG:**	1.58	0	0	0	0	0	0	0
1808	240	A:	0	0.00	0	0.00	0	0	**3P:**	1.58	0	0	0	0	0	0	0
		B:	7,371	1.02	9,588	1.33	0	7,371	**SLG:**	1.27	7,509	9,656	7,509	7,371	7,371	7,371	7,371
		C:	0	0.00	0	0.00	0	0	**LLG:**	1.58	0	0	0	0	0	0	0
1809	240	A:	0	0.00	0	0.00	0	0	**3P:**	1.58	0	0	0	0	0	0	0
		B:	7,357	1.02	9,562	1.32	0	7,357	**SLG:**	1.27	7,492	9,629	7,492	7,357	7,357	7,357	7,357
		C:	0	0.00	0	0.00	0	0	**LLG:**	1.58	0	0	0	0	0	0	0
1810	240	A:	0	0.00	0	0.00	0	0	**3P:**	1.58	0	0	0	0	0	0	0
		B:	7,357	1.02	9,562	1.32	0	7,357	**SLG:**	1.27	7,492	9,629	7,492	7,357	7,357	7,357	7,357
		C:	0	0.00	0	0.00	0	0	**LLG:**	1.58	0	0	0	0	0	0	0

			----------Initial Symmetrical RMS----------						Asym. RMS Amps @ 0.50 Cycles			----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
1901/1902 MDP E	208	A:	8,710	1.05	7,054	0.85	7,543	8,612	**3P:**	1.63	8,892	7,104	8,892	8,710	8,710	8,710	8,710
		B:	8,710	1.05	0	0.00	7,543	7,545	**SLG:**	1.27	8,892	0	8,892	8,710	8,710	8,710	8,710
		C:	8,710	1.05	0	0.00	0	0	**LLG:**	1.51	8,892	0	8,892	8,710	8,710	8,710	8,710
1901/1902-DRYE	208	A:	2,126	0.26	1,285	0.15	1,841	1,944	**3P:**	0.28	2,126	1,285	2,126	2,126	2,126	2,126	2,126
		B:	2,126	0.26	0	0.00	1,841	1,851	**SLG:**	0.20	2,126	0	2,126	2,126	2,126	2,126	2,126
		C:	2,126	0.26	0	0.00	0	0	**LLG:**	0.26	2,126	0	2,126	2,126	2,126	2,126	2,126
1901/1902-LP1	208	A:	8,097	0.97	6,391	0.77	7,012	7,959	**3P:**	1.51	8,223	6,421	8,223	8,097	8,097	8,097	8,097
		B:	8,097	0.97	0	0.00	7,012	6,978	**SLG:**	1.17	8,223	0	8,223	8,097	8,097	8,097	8,097
		C:	8,097	0.97	0	0.00	0	0	**LLG:**	1.40	8,223	0	8,223	8,097	8,097	8,097	8,097
1901/1902-MDP	208	A:	8,736	1.05	7,098	0.85	7,565	8,646	**3P:**	1.63	8,920	7,149	8,920	8,736	8,736	8,736	8,736
		B:	8,736	1.05	0	0.00	7,565	7,571	**SLG:**	1.27	8,920	0	8,920	8,736	8,736	8,736	8,736
		C:	8,736	1.05	0	0.00	0	0	**LLG:**	1.51	8,920	0	8,920	8,736	8,736	8,736	8,736
1901/1902-RANG	208	A:	3,851	0.46	2,461	0.30	3,335	3,601	**3P:**	0.52	3,851	2,461	3,851	3,851	3,851	3,851	3,851
		B:	3,851	0.46	0	0.00	3,335	3,302	**SLG:**	0.38	3,851	0	3,851	3,851	3,851	3,851	3,851
		C:	3,851	0.46	0	0.00	0	0	**LLG:**	0.50	3,851	0	3,851	3,851	3,851	3,851	3,851
1901/1902-RTU-	208	A:	6,277	0.75	4,610	0.55	5,436	6,060	**3P:**	1.23	6,316	4,616	6,316	6,277	6,277	6,277	6,277
		B:	6,277	0.75	0	0.00	5,436	5,378	**SLG:**	0.96	6,316	0	6,316	6,277	6,277	6,277	6,277
		C:	6,277	0.75	0	0.00	0	0	**LLG:**	1.16	6,316	0	6,316	6,277	6,277	6,277	6,277
1903/1904 MDP E	208	A:	5,893	0.71	4,296	0.52	5,103	5,666	**3P:**	1.26	5,934	4,304	5,934	5,893	5,893	5,893	5,893
		B:	5,893	0.71	0	0.00	5,103	5,062	**SLG:**	0.99	5,934	0	5,934	5,893	5,893	5,893	5,893
		C:	5,893	0.71	0	0.00	0	0	**LLG:**	1.19	5,934	0	5,934	5,893	5,893	5,893	5,893
1903/1904-DRYE	208	A:	1,909	0.23	1,156	0.14	1,653	1,745	**3P:**	0.32	1,909	1,156	1,909	1,909	1,909	1,909	1,909
		B:	1,909	0.23	0	0.00	1,653	1,662	**SLG:**	0.25	1,909	0	1,909	1,909	1,909	1,909	1,909
		C:	1,909	0.23	0	0.00	0	0	**LLG:**	0.31	1,909	0	1,909	1,909	1,909	1,909	1,909
1903/1904-LP1	208	A:	5,593	0.67	4,031	0.48	4,844	5,363	**3P:**	1.22	5,626	4,037	5,626	5,593	5,593	5,593	5,593
		B:	5,593	0.67	0	0.00	4,844	4,804	**SLG:**	0.96	5,626	0	5,626	5,593	5,593	5,593	5,593
		C:	5,593	0.67	0	0.00	0	0	**LLG:**	1.15	5,626	0	5,626	5,593	5,593	5,593	5,593

			----------Initial Symmetrical RMS----------						Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
1903/1904-MDP	208	A:	5,905	0.71	4,312	0.52	5,114	5,680	**3P:**	1.26	5,946	4,320	5,946	5,905	5,905	5,905	5,905
		B:	5,905	0.71	0	0.00	5,114	5,073	**SLG:**	0.99	5,946	0	5,946	5,905	5,905	5,905	5,905
		C:	5,905	0.71	0	0.00	0	0	**LLG:**	1.19	5,946	0	5,946	5,905	5,905	5,905	5,905
1903/1904-RANG	208	A:	3,162	0.38	2,008	0.24	2,738	2,943	**3P:**	0.57	3,162	2,008	3,162	3,162	3,162	3,162	3,162
		B:	3,162	0.38	0	0.00	2,738	2,722	**SLG:**	0.43	3,162	0	3,162	3,162	3,162	3,162	3,162
		C:	3,162	0.38	0	0.00	0	0	**LLG:**	0.54	3,162	0	3,162	3,162	3,162	3,162	3,162
1903/1904-RTU-	208	A:	4,639	0.56	3,229	0.39	4,018	4,408	**3P:**	1.09	4,654	3,231	4,654	4,639	4,639	4,639	4,639
		B:	4,639	0.56	0	0.00	4,018	3,986	**SLG:**	0.86	4,654	0	4,654	4,639	4,639	4,639	4,639
		C:	4,639	0.56	0	0.00	0	0	**LLG:**	1.03	4,654	0	4,654	4,639	4,639	4,639	4,639
1905/1906 MDP E	208	A:	6,385	0.77	4,736	0.57	5,529	6,168	**3P:**	1.32	6,439	4,747	6,439	6,385	6,385	6,385	6,385
		B:	6,385	0.77	0	0.00	5,529	5,486	**SLG:**	1.03	6,439	0	6,439	6,385	6,385	6,385	6,385
		C:	6,385	0.77	0	0.00	0	0	**LLG:**	1.24	6,439	0	6,439	6,385	6,385	6,385	6,385
1905/1906-DRYE	208	A:	1,956	0.23	1,184	0.14	1,694	1,789	**3P:**	0.31	1,956	1,184	1,956	1,956	1,956	1,956	1,956
		B:	1,956	0.23	0	0.00	1,694	1,703	**SLG:**	0.24	1,956	0	1,956	1,956	1,956	1,956	1,956
		C:	1,956	0.23	0	0.00	0	0	**LLG:**	0.30	1,956	0	1,956	1,956	1,956	1,956	1,956
1905/1906-LP-1	208	A:	6,037	0.72	4,418	0.53	5,228	5,813	**3P:**	1.27	6,079	4,426	6,079	6,037	6,037	6,037	6,037
		B:	6,037	0.72	0	0.00	5,228	5,183	**SLG:**	0.99	6,079	0	6,079	6,037	6,037	6,037	6,037
		C:	6,037	0.72	0	0.00	0	0	**LLG:**	1.19	6,079	0	6,079	6,037	6,037	6,037	6,037
1905/1906-MDP	208	A:	6,399	0.77	4,756	0.57	5,542	6,185	**3P:**	1.32	6,453	4,767	6,453	6,399	6,399	6,399	6,399
		B:	6,399	0.77	0	0.00	5,542	5,498	**SLG:**	1.03	6,453	0	6,453	6,399	6,399	6,399	6,399
		C:	6,399	0.77	0	0.00	0	0	**LLG:**	1.24	6,453	0	6,453	6,399	6,399	6,399	6,399
1905/1906-RANG	208	A:	3,301	0.40	2,099	0.25	2,859	3,075	**3P:**	0.56	3,301	2,099	3,301	3,301	3,301	3,301	3,301
		B:	3,301	0.40	0	0.00	2,859	2,839	**SLG:**	0.42	3,301	0	3,301	3,301	3,301	3,301	3,301
		C:	3,301	0.40	0	0.00	0	0	**LLG:**	0.53	3,301	0	3,301	3,301	3,301	3,301	3,301
1905/1906-RTU-	208	A:	4,944	0.59	3,474	0.42	4,282	4,711	**3P:**	1.12	4,962	3,477	4,962	4,944	4,944	4,944	4,944
		B:	4,944	0.59	0	0.00	4,282	4,245	**SLG:**	0.88	4,962	0	4,962	4,944	4,944	4,944	4,944
		C:	4,944	0.59	0	0.00	0	0	**LLG:**	1.06	4,962	0	4,962	4,944	4,944	4,944	4,944

Fault Location Bus Name	Bus LL Voltage		3-Phase Amps	3-Phase MVA	SLG Amps	SLG MVA	LL Amps	LLG Amps	-----X/R-----		3-Phase Amps	SLG Amps	1/2 Cycles	2 Cycles	3 Cycles	5 Cycles	8 Cycles
			----------Initial Symmetrical RMS----------						Asym. RMS Amps @ 0.50 Cycles				----------3-Phase Asym Amps (RMS)----------				
1908	240	A:	0	0.00	0	0.00	0	0	3P:	1.65	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	SLG:	1.32	0	0	0	0	0	0	0
		C:	6,661	0.92	8,828	1.22	0	0	LLG:	1.00	6,808	8,904	6,808	6,661	6,661	6,661	6,661
AM FDR 167-52	12,470	A:	2,380	17.13	1,980	14.26	2,061	2,237	3P:	1.51	2,417	2,009	2,417	2,380	2,380	2,380	2,380
		B:	2,380	17.13	0	0.00	2,061	2,220	SLG:	1.49	2,417	0	2,417	2,380	2,380	2,380	2,380
		C:	2,380	17.13	0	0.00	0	0	LLG:	1.50	2,417	0	2,417	2,380	2,380	2,380	2,380
AM FDR 167-56	12,470	A:	2,380	17.13	1,930	13.90	2,061	2,212	3P:	1.79	2,450	1,988	2,450	2,380	2,380	2,380	2,380
		B:	2,380	17.13	0	0.00	2,061	2,218	SLG:	1.80	2,450	0	2,450	2,380	2,380	2,380	2,380
		C:	2,380	17.13	0	0.00	0	0	LLG:	1.79	2,450	0	2,450	2,380	2,380	2,380	2,380
APARTMENT A	240	A:	0	0.00	0	0.00	0	0	3P:	1.80	0	0	0	0	0	0	0
		B:	9,169	1.27	9,474	1.31	0	8,081	SLG:	0.43	9,445	9,474	9,445	9,169	9,169	9,169	9,169
		C:	9,169	1.27	0	0.00	0	0	LLG:	0.51	9,445	0	9,445	9,169	9,169	9,169	9,169
APARTMENT B	240	A:	0	0.00	0	0.00	0	0	3P:	1.20	0	0	0	0	0	0	0
		B:	3,624	0.50	2,649	0.37	0	2,539	SLG:	0.23	3,643	2,649	3,643	3,624	3,624	3,624	3,624
		C:	3,624	0.50	0	0.00	0	0	LLG:	0.26	3,643	0	3,643	3,624	3,624	3,624	3,624
DON-AHU-1	208	A:	1,955	0.23	1,173	0.14	1,693	1,782	3P:	0.27	1,955	1,173	1,955	1,955	1,955	1,955	1,955
		B:	1,955	0.23	0	0.00	1,693	1,705	SLG:	0.20	1,955	0	1,955	1,955	1,955	1,955	1,955
		C:	1,955	0.23	0	0.00	0	0	LLG:	0.26	1,955	0	1,955	1,955	1,955	1,955	1,955
DON-AHU-1 DR	208	A:	895	0.11	527	0.06	775	806	3P:	0.13	895	527	895	895	895	895	895
		B:	895	0.11	0	0.00	775	788	SLG:	0.10	895	0	895	895	895	895	895
		C:	895	0.11	0	0.00	0	0	LLG:	0.13	895	0	895	895	895	895	895
DON-AHU-2	208	A:	3,328	0.40	2,051	0.25	2,882	3,074	3P:	0.37	3,328	2,051	3,328	3,328	3,328	3,328	3,328
		B:	3,328	0.40	0	0.00	2,882	2,873	SLG:	0.27	3,328	0	3,328	3,328	3,328	3,328	3,328
		C:	3,328	0.40	0	0.00	0	0	LLG:	0.35	3,328	0	3,328	3,328	3,328	3,328	3,328
DON-AHU-2 DR	208	A:	1,596	0.19	948	0.11	1,382	1,446	3P:	0.18	1,596	948	1,596	1,596	1,596	1,596	1,596
		B:	1,596	0.19	0	0.00	1,382	1,399	SLG:	0.13	1,596	0	1,596	1,596	1,596	1,596	1,596
		C:	1,596	0.19	0	0.00	0	0	LLG:	0.18	1,596	0	1,596	1,596	1,596	1,596	1,596

			----------Initial Symmetrical RMS----------								Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
DON-CH PUMP 1	208	A:	3,439	0.41	2,096	0.25	2,978	3,170	**3P:**	0.36	3,439	2,096	3,439	3,439	3,439	3,439	3,439
		B:	3,439	0.41	0	0.00	2,978	2,970	**SLG:**	0.26	3,439	0	3,439	3,439	3,439	3,439	3,439
		C:	3,439	0.41	0	0.00	0	0	**LLG:**	0.34	3,439	0	3,439	3,439	3,439	3,439	3,439
DON-CH PUMP 2	208	A:	3,027	0.36	1,831	0.22	2,622	2,779	**3P:**	0.33	3,027	1,831	3,027	3,027	3,027	3,027	3,027
		B:	3,027	0.36	0	0.00	2,622	2,623	**SLG:**	0.23	3,027	0	3,027	3,027	3,027	3,027	3,027
		C:	3,027	0.36	0	0.00	0	0	**LLG:**	0.31	3,027	0	3,027	3,027	3,027	3,027	3,027
DON-CH-1	208	A:	9,298	1.12	7,315	0.88	8,052	9,094	**3P:**	2.06	9,727	7,449	9,727	9,298	9,298	9,298	9,298
		B:	9,298	1.12	0	0.00	8,052	8,056	**SLG:**	1.58	9,727	0	9,727	9,298	9,298	9,298	9,298
		C:	9,298	1.12	0	0.00	0	0	**LLG:**	1.90	9,727	0	9,727	9,298	9,298	9,298	9,298
DON-COMP RM	208	A:	895	0.11	527	0.06	775	806	**3P:**	0.13	895	527	895	895	895	895	895
		B:	895	0.11	0	0.00	775	788	**SLG:**	0.10	895	0	895	895	895	895	895
		C:	895	0.11	0	0.00	0	0	**LLG:**	0.13	895	0	895	895	895	895	895
DON-CRAC-1	208	A:	428	0.05	250	0.03	371	384	**3P:**	0.10	428	250	428	428	428	428	428
		B:	428	0.05	0	0.00	371	379	**SLG:**	0.08	428	0	428	428	428	428	428
		C:	428	0.05	0	0.00	0	0	**LLG:**	0.10	428	0	428	428	428	428	428
DON-CU-3	208	A:	974	0.12	576	0.07	843	880	**3P:**	0.20	974	576	974	974	974	974	974
		B:	974	0.12	0	0.00	843	856	**SLG:**	0.16	974	0	974	974	974	974	974
		C:	974	0.12	0	0.00	0	0	**LLG:**	0.20	974	0	974	974	974	974	974
DON-DP1	208	A:	12,209	1.47	10,441	1.25	10,573	12,240	**3P:**	2.50	13,161	10,812	13,161	12,209	12,209	12,209	12,209
		B:	12,209	1.47	0	0.00	10,573	10,713	**SLG:**	1.89	13,161	0	13,161	12,209	12,209	12,209	12,209
		C:	12,209	1.47	0	0.00	0	0	**LLG:**	2.26	13,161	0	13,161	12,209	12,209	12,209	12,209
DON-DP2	208	A:	9,533	1.14	7,292	0.88	8,256	9,396	**3P:**	1.51	9,678	7,316	9,678	9,533	9,533	9,533	9,533
		B:	9,533	1.14	0	0.00	8,256	8,067	**SLG:**	1.10	9,678	0	9,678	9,533	9,533	9,533	9,533
		C:	9,533	1.14	0	0.00	0	0	**LLG:**	1.38	9,678	0	9,678	9,533	9,533	9,533	9,533
DON-HP1	208	A:	7,939	0.95	5,819	0.70	6,875	7,709	**3P:**	1.37	8,018	5,831	8,018	7,939	7,939	7,939	7,939
		B:	7,939	0.95	0	0.00	6,875	6,742	**SLG:**	1.02	8,018	0	8,018	7,939	7,939	7,939	7,939
		C:	7,939	0.95	0	0.00	0	0	**LLG:**	1.27	8,018	0	8,018	7,939	7,939	7,939	7,939

			----------Initial Symmetrical RMS----------						Asym. RMS Amps @ 0.50 Cycles			----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
DON-HP2	208	A:	3,054	0.37	1,875	0.23	2,645	2,818	**3P:**	0.45	3,054	1,875	3,054	3,054	3,054	3,054	3,054
		B:	3,054	0.37	0	0.00	2,645	2,638	**SLG:**	0.34	3,054	0	3,054	3,054	3,054	3,054	3,054
		C:	3,054	0.37	0	0.00	0	0	**LLG:**	0.43	3,054	0	3,054	3,054	3,054	3,054	3,054
DON-HP3	208	A:	2,236	0.27	1,362	0.16	1,937	2,051	**3P:**	0.39	2,236	1,362	2,236	2,236	2,236	2,236	2,236
		B:	2,236	0.27	0	0.00	1,937	1,942	**SLG:**	0.30	2,236	0	2,236	2,236	2,236	2,236	2,236
		C:	2,236	0.27	0	0.00	0	0	**LLG:**	0.37	2,236	0	2,236	2,236	2,236	2,236	2,236
DON-MDP sec 1:	208	A:	13,191	1.58	12,216	1.47	11,424	13,346	**3P:**	2.66	14,384	12,914	14,384	13,192	13,191	13,191	13,191
		B:	13,191	1.58	0	0.00	11,424	12,131	**SLG:**	2.22	14,384	0	14,384	13,192	13,191	13,191	13,191
		C:	13,191	1.58	0	0.00	0	0	**LLG:**	2.46	14,384	0	14,384	13,192	13,191	13,191	13,191
DON-MDP sec 2:	208	A:	13,072	1.57	11,454	1.38	11,321	13,225	**3P:**	2.60	14,189	11,908	14,189	13,073	13,072	13,072	13,072
		B:	13,072	1.57	0	0.00	11,321	11,514	**SLG:**	1.96	14,189	0	14,189	13,073	13,072	13,072	13,072
		C:	13,072	1.57	0	0.00	0	0	**LLG:**	2.33	14,189	0	14,189	13,073	13,072	13,072	13,072
DON-MDP: DON	208	A:	13,312	1.60	13,049	1.57	11,528	13,374	**3P:**	2.73	14,585	14,156	14,585	13,313	13,312	13,312	13,312
		B:	13,312	1.60	0	0.00	11,528	12,991	**SLG:**	2.59	14,585	0	14,585	13,313	13,312	13,312	13,312
		C:	13,312	1.60	0	0.00	0	0	**LLG:**	2.66	14,585	0	14,585	13,313	13,312	13,312	13,312
DON-VFD: P1	208	A:	1,272	0.15	749	0.09	1,102	1,148	**3P:**	0.14	1,272	749	1,272	1,272	1,272	1,272	1,272
		B:	1,272	0.15	0	0.00	1,102	1,119	**SLG:**	0.10	1,272	0	1,272	1,272	1,272	1,272	1,272
		C:	1,272	0.15	0	0.00	0	0	**LLG:**	0.14	1,272	0	1,272	1,272	1,272	1,272	1,272
DON-VFD: P2	208	A:	1,272	0.15	749	0.09	1,102	1,148	**3P:**	0.14	1,272	749	1,272	1,272	1,272	1,272	1,272
		B:	1,272	0.15	0	0.00	1,102	1,119	**SLG:**	0.10	1,272	0	1,272	1,272	1,272	1,272	1,272
		C:	1,272	0.15	0	0.00	0	0	**LLG:**	0.14	1,272	0	1,272	1,272	1,272	1,272	1,272
DON-VFD: P3	208	A:	952	0.11	559	0.07	825	857	**3P:**	0.12	952	559	952	952	952	952	952
		B:	952	0.11	0	0.00	825	840	**SLG:**	0.09	952	0	952	952	952	952	952
		C:	952	0.11	0	0.00	0	0	**LLG:**	0.11	952	0	952	952	952	952	952
DON-VFD: P4	208	A:	1,028	0.12	604	0.07	891	926	**3P:**	0.13	1,028	604	1,028	1,028	1,028	1,028	1,028
		B:	1,028	0.12	0	0.00	891	906	**SLG:**	0.09	1,028	0	1,028	1,028	1,028	1,028	1,028
		C:	1,028	0.12	0	0.00	0	0	**LLG:**	0.12	1,028	0	1,028	1,028	1,028	1,028	1,028

			----------Initial Symmetrical RMS----------						Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
DON-WH-1	208	A:	1,776	0.21	1,054	0.13	1,538	1,612	**3P:**	0.22	1,776	1,054	1,776	1,776	1,776	1,776	1,776
		B:	1,776	0.21	0	0.00	1,538	1,554	**SLG:**	0.16	1,776	0	1,776	1,776	1,776	1,776	1,776
		C:	1,776	0.21	0	0.00	0	0	**LLG:**	0.21	1,776	0	1,776	1,776	1,776	1,776	1,776
GARAGE	240	A:	0	0.00	0	0.00	0	0	**3P:**	1.57	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	**SLG:**	1.26	0	0	0	0	0	0	0
		C:	6,320	0.88	8,216	1.14	0	0	**LLG:**	1.00	6,434	8,272	6,434	6,320	6,320	6,320	6,320
GARAGE BUS	240	A:	0	0.00	0	0.00	0	0	**3P:**	1.58	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	**SLG:**	1.27	0	0	0	0	0	0	0
		C:	6,236	0.86	8,070	1.12	0	0	**LLG:**	1.00	6,351	8,127	6,351	6,236	6,236	6,236	6,236
GEN 1	480	A:	10,232	2.84	9,649	2.67	7,392	11,559	**3P:**	0.84	10,238	9,663	10,238	10,232	10,232	10,232	10,232
		B:	10,232	2.84	0	0.00	7,392	8,498	**SLG:**	0.96	10,238	0	10,238	10,232	10,232	10,232	10,232
		C:	10,232	2.84	0	0.00	0	0	**LLG:**	0.81	10,238	0	10,238	10,232	10,232	10,232	10,232
GEN- LTG PANE	208	A:	2,571	0.31	2,448	0.29	2,226	2,549	**3P:**	1.75	2,640	2,505	2,640	2,571	2,571	2,571	2,571
		B:	2,571	0.31	0	0.00	2,226	2,479	**SLG:**	1.68	2,640	0	2,640	2,571	2,571	2,571	2,571
		C:	2,571	0.31	0	0.00	0	0	**LLG:**	1.72	2,640	0	2,640	2,571	2,571	2,571	2,571
GH-1502a	208	A:	5,510	0.66	3,962	0.48	4,771	5,177	**3P:**	1.88	5,701	4,038	5,701	5,510	5,510	5,510	5,510
		B:	5,510	0.66	0	0.00	4,771	4,848	**SLG:**	1.59	5,701	0	5,701	5,510	5,510	5,510	5,510
		C:	5,510	0.66	0	0.00	0	0	**LLG:**	1.80	5,701	0	5,701	5,510	5,510	5,510	5,510
GH-1502b	208	A:	5,455	0.66	3,918	0.47	4,724	5,124	**3P:**	1.88	5,643	3,993	5,643	5,455	5,455	5,455	5,455
		B:	5,455	0.66	0	0.00	4,724	4,799	**SLG:**	1.59	5,643	0	5,643	5,455	5,455	5,455	5,455
		C:	5,455	0.66	0	0.00	0	0	**LLG:**	1.80	5,643	0	5,643	5,455	5,455	5,455	5,455
GH-1503a	208	A:	7,594	0.91	5,720	0.69	6,577	7,200	**3P:**	2.01	7,923	5,862	7,923	7,594	7,594	7,594	7,594
		B:	7,594	0.91	0	0.00	6,577	6,719	**SLG:**	1.70	7,923	0	7,923	7,594	7,594	7,594	7,594
		C:	7,594	0.91	0	0.00	0	0	**LLG:**	1.92	7,923	0	7,923	7,594	7,594	7,594	7,594
GH-1503b	208	A:	7,491	0.90	5,629	0.68	6,487	7,098	**3P:**	2.01	7,811	5,766	7,811	7,491	7,491	7,491	7,491
		B:	7,491	0.90	0	0.00	6,487	6,625	**SLG:**	1.70	7,811	0	7,811	7,491	7,491	7,491	7,491
		C:	7,491	0.90	0	0.00	0	0	**LLG:**	1.92	7,811	0	7,811	7,491	7,491	7,491	7,491

			----------Initial Symmetrical RMS----------								Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
GH-1504a	208	A:	8,960	1.08	6,964	0.84	7,759	8,547	**3P:**	2.11	9,405	7,170	9,405	8,960	8,960	8,960	8,960
		B:	8,960	1.08	0	0.00	7,759	7,969	**SLG:**	1.79	9,405	0	9,405	8,960	8,960	8,960	8,960
		C:	8,960	1.08	0	0.00	0	0	**LLG:**	2.01	9,405	0	9,405	8,960	8,960	8,960	8,960
GH-1504b	208	A:	8,816	1.06	6,829	0.82	7,635	8,404	**3P:**	2.10	9,247	7,027	9,247	8,816	8,816	8,816	8,816
		B:	8,816	1.06	0	0.00	7,635	7,836	**SLG:**	1.78	9,247	0	9,247	8,816	8,816	8,816	8,816
		C:	8,816	1.06	0	0.00	0	0	**LLG:**	2.00	9,247	0	9,247	8,816	8,816	8,816	8,816
GH-1505a	208	A:	14,784	1.78	13,277	1.59	12,804	14,486	**3P:**	2.63	16,082	14,191	16,082	14,785	14,784	14,784	14,784
		B:	14,784	1.78	0	0.00	12,804	13,801	**SLG:**	2.38	16,082	0	16,082	14,785	14,784	14,784	14,784
		C:	14,784	1.78	0	0.00	0	0	**LLG:**	2.53	16,082	0	16,082	14,785	14,784	14,784	14,784
GH-1505b	208	A:	14,401	1.73	12,804	1.54	12,472	14,087	**3P:**	2.59	15,620	13,634	15,620	14,402	14,401	14,401	14,401
		B:	14,401	1.73	0	0.00	12,472	13,376	**SLG:**	2.32	15,620	0	15,620	14,402	14,401	14,401	14,401
		C:	14,401	1.73	0	0.00	0	0	**LLG:**	2.48	15,620	0	15,620	14,402	14,401	14,401	14,401
GH-CC1	208	A:	3,462	0.42	2,168	0.26	2,998	3,202	**3P:**	0.53	3,462	2,168	3,462	3,462	3,462	3,462	3,462
		B:	3,462	0.42	0	0.00	2,998	2,994	**SLG:**	0.41	3,462	0	3,462	3,462	3,462	3,462	3,462
		C:	3,462	0.42	0	0.00	0	0	**LLG:**	0.51	3,462	0	3,462	3,462	3,462	3,462	3,462
GH-DP/GH	208	A:	19,277	2.32	19,602	2.35	16,695	19,088	**3P:**	3.23	21,865	22,597	21,865	19,286	19,278	19,277	19,277
		B:	19,277	2.32	0	0.00	16,695	19,790	**SLG:**	3.48	21,865	0	21,865	19,286	19,278	19,277	19,277
		C:	19,277	2.32	0	0.00	0	0	**LLG:**	3.36	21,865	0	21,865	19,286	19,278	19,277	19,277
GH-DP/GH BUS	208	A:	19,232	2.31	19,487	2.34	16,656	19,084	**3P:**	3.21	21,775	22,342	21,775	19,240	19,232	19,232	19,232
		B:	19,232	2.31	0	0.00	16,656	19,634	**SLG:**	3.40	21,775	0	21,775	19,240	19,232	19,232	19,232
		C:	19,232	2.31	0	0.00	0	0	**LLG:**	3.30	21,775	0	21,775	19,240	19,232	19,232	19,232
MP-AHU 1	208	A:	588	0.07	345	0.04	509	528	**3P:**	0.16	588	345	588	588	588	588	588
		B:	588	0.07	0	0.00	509	519	**SLG:**	0.13	588	0	588	588	588	588	588
		C:	588	0.07	0	0.00	0	0	**LLG:**	0.16	588	0	588	588	588	588	588
MP-AHU 2	208	A:	573	0.07	336	0.04	496	515	**3P:**	0.16	573	336	573	573	573	573	573
		B:	573	0.07	0	0.00	496	506	**SLG:**	0.13	573	0	573	573	573	573	573
		C:	573	0.07	0	0.00	0	0	**LLG:**	0.16	573	0	573	573	573	573	573

Table 3ac - AC Short Circuit Report - Page 10

Fault Location Bus Name	Bus LL Voltage		Initial Symmetrical RMS: 3-Phase Amps	3-Phase MVA	SLG Amps	SLG MVA	LL Amps	LLG Amps		X/R	Asym. RMS Amps @ 0.50 Cycles: 3-Phase Amps	SLG Amps	3-Phase Asym Amps (RMS): 1/2 Cycles	2 Cycles	3 Cycles	5 Cycles	8 Cycles
MP-AHU 3	208	A:	907	0.11	534	0.06	786	817	3P:	0.18	907	534	907	907	907	907	907
		B:	907	0.11	0	0.00	786	799	SLG:	0.14	907	0	907	907	907	907	907
		C:	907	0.11	0	0.00	0	0	LLG:	0.17	907	0	907	907	907	907	907
MP-AHU3-RF	208	A:	842	0.10	495	0.06	729	758	3P:	0.17	842	495	842	842	842	842	842
		B:	842	0.10	0	0.00	729	742	SLG:	0.14	842	0	842	842	842	842	842
		C:	842	0.10	0	0.00	0	0	LLG:	0.17	842	0	842	842	842	842	842
MP-AHU3-SF	208	A:	842	0.10	495	0.06	729	758	3P:	0.17	842	495	842	842	842	842	842
		B:	842	0.10	0	0.00	729	742	SLG:	0.14	842	0	842	842	842	842	842
		C:	842	0.10	0	0.00	0	0	LLG:	0.17	842	0	842	842	842	842	842
MP-AHU4	208	A:	2,764	0.33	1,673	0.20	2,394	2,529	3P:	0.36	2,764	1,673	2,764	2,764	2,764	2,764	2,764
		B:	2,764	0.33	0	0.00	2,394	2,405	SLG:	0.28	2,764	0	2,764	2,764	2,764	2,764	2,764
		C:	2,764	0.33	0	0.00	0	0	LLG:	0.35	2,764	0	2,764	2,764	2,764	2,764	2,764
MP-AHU4-RF	208	A:	2,463	0.30	1,485	0.18	2,133	2,249	3P:	0.35	2,463	1,485	2,463	2,463	2,463	2,463	2,463
		B:	2,463	0.30	0	0.00	2,133	2,146	SLG:	0.27	2,463	0	2,463	2,463	2,463	2,463	2,463
		C:	2,463	0.30	0	0.00	0	0	LLG:	0.33	2,463	0	2,463	2,463	2,463	2,463	2,463
MP-AHU4-SF	208	A:	2,463	0.30	1,485	0.18	2,133	2,249	3P:	0.35	2,463	1,485	2,463	2,463	2,463	2,463	2,463
		B:	2,463	0.30	0	0.00	2,133	2,146	SLG:	0.27	2,463	0	2,463	2,463	2,463	2,463	2,463
		C:	2,463	0.30	0	0.00	0	0	LLG:	0.33	2,463	0	2,463	2,463	2,463	2,463	2,463
MP-ATS CABIN	208	A:	16,390	1.97	13,951	1.68	14,194	16,693	3P:	1.68	16,776	14,039	16,776	16,390	16,390	16,390	16,390
		B:	16,390	1.97	0	0.00	14,194	14,007	SLG:	1.24	16,776	0	16,776	16,390	16,390	16,390	16,390
		C:	16,390	1.97	0	0.00	0	0	LLG:	1.51	16,776	0	16,776	16,390	16,390	16,390	16,390
MP-CHILLER 1	208	A:	13,465	1.62	11,734	1.41	11,661	12,931	3P:	1.46	13,645	11,865	13,645	13,465	13,465	13,465	13,465
		B:	13,465	1.62	0	0.00	11,661	12,601	SLG:	1.40	13,645	0	13,645	13,465	13,465	13,465	13,465
		C:	13,465	1.62	0	0.00	0	0	LLG:	1.44	13,645	0	13,645	13,465	13,465	13,465	13,465
MP-CHILLER 2	208	A:	13,122	1.58	11,385	1.37	11,364	12,566	3P:	1.42	13,277	11,500	13,277	13,122	13,122	13,122	13,122
		B:	13,122	1.58	0	0.00	11,364	12,283	SLG:	1.37	13,277	0	13,277	13,122	13,122	13,122	13,122
		C:	13,122	1.58	0	0.00	0	0	LLG:	1.40	13,277	0	13,277	13,122	13,122	13,122	13,122

Table 3ac - AC Short Circuit Report - Page 11

			----------Initial Symmetrical RMS----------								Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
MP-CT	208	A:	2,026	0.24	1,200	0.14	1,755	1,833	**3P:**	0.17	2,026	1,200	2,026	2,026	2,026	2,026	2,026
		B:	2,026	0.24	0	0.00	1,755	1,778	**SLG:**	0.12	2,026	0	2,026	2,026	2,026	2,026	2,026
		C:	2,026	0.24	0	0.00	0	0	**LLG:**	0.16	2,026	0	2,026	2,026	2,026	2,026	2,026
MP-CT PUMP P4	208	A:	3,151	0.38	1,888	0.23	2,729	2,872	**3P:**	0.22	3,151	1,888	3,151	3,151	3,151	3,151	3,151
		B:	3,151	0.38	0	0.00	2,729	2,748	**SLG:**	0.15	3,151	0	3,151	3,151	3,151	3,151	3,151
		C:	3,151	0.38	0	0.00	0	0	**LLG:**	0.21	3,151	0	3,151	3,151	3,151	3,151	3,151
MP-CWP-P3	208	A:	3,151	0.38	1,888	0.23	2,729	2,872	**3P:**	0.22	3,151	1,888	3,151	3,151	3,151	3,151	3,151
		B:	3,151	0.38	0	0.00	2,729	2,748	**SLG:**	0.15	3,151	0	3,151	3,151	3,151	3,151	3,151
		C:	3,151	0.38	0	0.00	0	0	**LLG:**	0.21	3,151	0	3,151	3,151	3,151	3,151	3,151
MP-HTG PUMP	208	A:	1,193	0.14	711	0.09	1,033	1,083	**3P:**	0.34	1,193	711	1,193	1,193	1,193	1,193	1,193
		B:	1,193	0.14	0	0.00	1,033	1,044	**SLG:**	0.28	1,193	0	1,193	1,193	1,193	1,193	1,193
		C:	1,193	0.14	0	0.00	0	0	**LLG:**	0.33	1,193	0	1,193	1,193	1,193	1,193	1,193
MP-HWP-A2	208	A:	3,151	0.38	1,888	0.23	2,729	2,872	**3P:**	0.22	3,151	1,888	3,151	3,151	3,151	3,151	3,151
		B:	3,151	0.38	0	0.00	2,729	2,748	**SLG:**	0.15	3,151	0	3,151	3,151	3,151	3,151	3,151
		C:	3,151	0.38	0	0.00	0	0	**LLG:**	0.21	3,151	0	3,151	3,151	3,151	3,151	3,151
MP-IT SERVER	208	A:	2,852	0.34	1,728	0.21	2,470	2,610	**3P:**	0.37	2,852	1,728	2,852	2,852	2,852	2,852	2,852
		B:	2,852	0.34	0	0.00	2,470	2,480	**SLG:**	0.28	2,852	0	2,852	2,852	2,852	2,852	2,852
		C:	2,852	0.34	0	0.00	0	0	**LLG:**	0.35	2,852	0	2,852	2,852	2,852	2,852	2,852
MP-LP-A1	208	A:	8,959	1.08	6,769	0.81	7,759	8,548	**3P:**	2.05	9,366	6,928	9,366	8,959	8,959	8,959	8,959
		B:	8,959	1.08	0	0.00	7,759	7,876	**SLG:**	1.68	9,366	0	9,366	8,959	8,959	8,959	8,959
		C:	8,959	1.08	0	0.00	0	0	**LLG:**	1.94	9,366	0	9,366	8,959	8,959	8,959	8,959
MP-LP-A2	208	A:	8,780	1.05	6,610	0.79	7,603	8,370	**3P:**	2.04	9,172	6,763	9,172	8,780	8,780	8,780	8,780
		B:	8,780	1.05	0	0.00	7,603	7,715	**SLG:**	1.67	9,172	0	9,172	8,780	8,780	8,780	8,780
		C:	8,780	1.05	0	0.00	0	0	**LLG:**	1.93	9,172	0	9,172	8,780	8,780	8,780	8,780
MP-LP-B	208	A:	3,075	0.37	1,980	0.24	2,663	2,856	**3P:**	0.92	3,078	1,980	3,078	3,075	3,075	3,075	3,075
		B:	3,075	0.37	0	0.00	2,663	2,661	**SLG:**	0.76	3,078	0	3,078	3,075	3,075	3,075	3,075
		C:	3,075	0.37	0	0.00	0	0	**LLG:**	0.89	3,078	0	3,078	3,075	3,075	3,075	3,075

			----------Initial Symmetrical RMS----------								Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
MP-LP-C	208	A:	3,594	0.43	2,336	0.28	3,113	3,348	**3P:**	0.95	3,599	2,337	3,599	3,594	3,594	3,594	3,594
		B:	3,594	0.43	0	0.00	3,113	3,107	**SLG:**	0.78	3,599	0	3,599	3,594	3,594	3,594	3,594
		C:	3,594	0.43	0	0.00	0	0	**LLG:**	0.91	3,599	0	3,599	3,594	3,594	3,594	3,594
MP-LP-D	208	A:	7,206	0.87	4,732	0.57	6,241	6,809	**3P:**	0.65	7,207	4,732	7,207	7,206	7,206	7,206	7,206
		B:	7,206	0.87	0	0.00	6,241	6,137	**SLG:**	0.48	7,207	0	7,207	7,206	7,206	7,206	7,206
		C:	7,206	0.87	0	0.00	0	0	**LLG:**	0.62	7,207	0	7,207	7,206	7,206	7,206	7,206
MP-LP-E1	208	A:	1,557	0.19	938	0.11	1,349	1,420	**3P:**	0.43	1,557	938	1,557	1,557	1,557	1,557	1,557
		B:	1,557	0.19	0	0.00	1,349	1,359	**SLG:**	0.35	1,557	0	1,557	1,557	1,557	1,557	1,557
		C:	1,557	0.19	0	0.00	0	0	**LLG:**	0.41	1,557	0	1,557	1,557	1,557	1,557	1,557
MP-LP-E2	208	A:	809	0.10	483	0.06	701	735	**3P:**	0.39	809	483	809	809	809	809	809
		B:	809	0.10	0	0.00	701	708	**SLG:**	0.33	809	0	809	809	809	809	809
		C:	809	0.10	0	0.00	0	0	**LLG:**	0.38	809	0	809	809	809	809	809
MP-LP: DIMME	208	A:	2,847	0.34	1,790	0.21	2,465	2,632	**3P:**	0.71	2,847	1,790	2,847	2,847	2,847	2,847	2,847
		B:	2,847	0.34	0	0.00	2,465	2,465	**SLG:**	0.58	2,847	0	2,847	2,847	2,847	2,847	2,847
		C:	2,847	0.34	0	0.00	0	0	**LLG:**	0.68	2,847	0	2,847	2,847	2,847	2,847	2,847
MP-MDP	208	A:	20,428	2.45	21,141	2.54	17,691	20,447	**3P:**	3.12	22,991	24,130	22,991	20,434	20,428	20,428	20,428
		B:	20,428	2.45	0	0.00	17,691	21,157	**SLG:**	3.33	22,991	0	22,991	20,434	20,428	20,428	20,428
		C:	20,428	2.45	0	0.00	0	0	**LLG:**	3.23	22,991	0	22,991	20,434	20,428	20,428	20,428
MP-MDP BUS	208	A:	20,344	2.44	19,806	2.38	17,619	20,722	**3P:**	3.08	22,831	21,662	22,831	20,350	20,344	20,344	20,344
		B:	20,344	2.44	0	0.00	17,619	19,418	**SLG:**	2.71	22,831	0	22,831	20,350	20,344	20,344	20,344
		C:	20,344	2.44	0	0.00	0	0	**LLG:**	2.89	22,831	0	22,831	20,350	20,344	20,344	20,344
MP-SUMP PUMP	208	A:	2,052	0.25	1,214	0.15	1,777	1,855	**3P:**	0.14	2,052	1,214	2,052	2,052	2,052	2,052	2,052
		B:	2,052	0.25	0	0.00	1,777	1,802	**SLG:**	0.10	2,052	0	2,052	2,052	2,052	2,052	2,052
		C:	2,052	0.25	0	0.00	0	0	**LLG:**	0.14	2,052	0	2,052	2,052	2,052	2,052	2,052
MP-SUMP PUM	208	A:	1,193	0.14	711	0.09	1,033	1,083	**3P:**	0.34	1,193	711	1,193	1,193	1,193	1,193	1,193
		B:	1,193	0.14	0	0.00	1,033	1,044	**SLG:**	0.28	1,193	0	1,193	1,193	1,193	1,193	1,193
		C:	1,193	0.14	0	0.00	0	0	**LLG:**	0.33	1,193	0	1,193	1,193	1,193	1,193	1,193

			----------Initial Symmetrical RMS----------								Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
MP-WELDING	208	A:	12,829	1.54	9,409	1.13	11,110	12,651	**3P:**	0.91	12,842	9,410	12,842	12,829	12,829	12,829	12,829
		B:	12,829	1.54	0	0.00	11,110	10,658	**SLG:**	0.62	12,842	0	12,842	12,829	12,829	12,829	12,829
		C:	12,829	1.54	0	0.00	0	0	**LLG:**	0.83	12,842	0	12,842	12,829	12,829	12,829	12,829
PT AHU-2	208	A:	1,159	0.14	702	0.08	1,004	1,058	**3P:**	0.24	1,159	702	1,159	1,159	1,159	1,159	1,159
		B:	1,159	0.14	0	0.00	1,004	1,011	**SLG:**	0.17	1,159	0	1,159	1,159	1,159	1,159	1,159
		C:	1,159	0.14	0	0.00	0	0	**LLG:**	0.22	1,159	0	1,159	1,159	1,159	1,159	1,159
PT CHILLER	208	A:	969	0.12	582	0.07	839	881	**3P:**	0.20	969	582	969	969	969	969	969
		B:	969	0.12	0	0.00	839	848	**SLG:**	0.14	969	0	969	969	969	969	969
		C:	969	0.12	0	0.00	0	0	**LLG:**	0.19	969	0	969	969	969	969	969
PT OTPT HEAT	208	A:	1,159	0.14	702	0.08	1,004	1,058	**3P:**	0.24	1,159	702	1,159	1,159	1,159	1,159	1,159
		B:	1,159	0.14	0	0.00	1,004	1,011	**SLG:**	0.17	1,159	0	1,159	1,159	1,159	1,159	1,159
		C:	1,159	0.14	0	0.00	0	0	**LLG:**	0.22	1,159	0	1,159	1,159	1,159	1,159	1,159
PT P2	208	A:	5,679	0.68	5,030	0.60	4,918	5,583	**3P:**	2.05	5,936	5,187	5,936	5,679	5,679	5,679	5,679
		B:	5,679	0.68	0	0.00	4,918	5,230	**SLG:**	1.82	5,936	0	5,936	5,679	5,679	5,679	5,679
		C:	5,679	0.68	0	0.00	0	0	**LLG:**	1.96	5,936	0	5,936	5,679	5,679	5,679	5,679
PT POOL	208	A:	4,503	0.54	3,428	0.41	3,900	4,435	**3P:**	0.95	4,509	3,428	4,509	4,503	4,503	4,503	4,503
		B:	4,503	0.54	0	0.00	3,900	3,806	**SLG:**	0.69	4,509	0	4,509	4,503	4,503	4,503	4,503
		C:	4,503	0.54	0	0.00	0	0	**LLG:**	0.87	4,509	0	4,509	4,503	4,503	4,503	4,503
PT TBP1	208	A:	3,288	0.39	2,314	0.28	2,847	3,153	**3P:**	0.80	3,289	2,314	3,289	3,288	3,288	3,288	3,288
		B:	3,288	0.39	0	0.00	2,847	2,800	**SLG:**	0.60	3,289	0	3,289	3,288	3,288	3,288	3,288
		C:	3,288	0.39	0	0.00	0	0	**LLG:**	0.75	3,289	0	3,289	3,288	3,288	3,288	3,288
PT- L1	208	A:	3,638	0.44	2,837	0.34	3,150	3,458	**3P:**	1.47	3,687	2,859	3,687	3,638	3,638	3,638	3,638
		B:	3,638	0.44	0	0.00	3,150	3,253	**SLG:**	1.30	3,687	0	3,687	3,638	3,638	3,638	3,638
		C:	3,638	0.44	0	0.00	0	0	**LLG:**	1.41	3,687	0	3,687	3,638	3,638	3,638	3,638
PT-AHU-3W	208	A:	3,381	0.41	2,462	0.30	2,928	3,239	**3P:**	0.83	3,383	2,463	3,383	3,381	3,381	3,381	3,381
		B:	3,381	0.41	0	0.00	2,928	2,916	**SLG:**	0.66	3,383	0	3,383	3,381	3,381	3,381	3,381
		C:	3,381	0.41	0	0.00	0	0	**LLG:**	0.79	3,383	0	3,383	3,381	3,381	3,381	3,381

			----------Initial Symmetrical RMS----------						Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
PT-COND PUMP	208	A:	3,221	0.39	2,349	0.28	2,789	3,074	**3P:**	0.82	3,222	2,349	3,222	3,221	3,221	3,221	3,221
		B:	3,221	0.39	0	0.00	2,789	2,793	**SLG:**	0.66	3,222	0	3,222	3,221	3,221	3,221	3,221
		C:	3,221	0.39	0	0.00	0	0	**LLG:**	0.78	3,222	0	3,222	3,221	3,221	3,221	3,221
PT-L2	208	A:	4,821	0.58	4,163	0.50	4,175	4,480	**3P:**	2.00	5,026	4,380	5,026	4,821	4,821	4,821	4,821
		B:	4,821	0.58	0	0.00	4,175	4,637	**SLG:**	2.15	5,026	0	5,026	4,821	4,821	4,821	4,821
		C:	4,821	0.58	0	0.00	0	0	**LLG:**	2.05	5,026	0	5,026	4,821	4,821	4,821	4,821
PT-L2 BUS	208	A:	4,812	0.58	4,146	0.50	4,167	4,473	**3P:**	2.00	5,015	4,358	5,015	4,812	4,812	4,812	4,812
		B:	4,812	0.58	0	0.00	4,167	4,621	**SLG:**	2.13	5,015	0	5,015	4,812	4,812	4,812	4,812
		C:	4,812	0.58	0	0.00	0	0	**LLG:**	2.04	5,015	0	5,015	4,812	4,812	4,812	4,812
PT-P1	208	A:	5,110	0.61	4,455	0.54	4,425	4,761	**3P:**	2.24	5,409	4,770	5,409	5,110	5,110	5,110	5,110
		B:	5,110	0.61	0	0.00	4,425	4,928	**SLG:**	2.40	5,409	0	5,409	5,110	5,110	5,110	5,110
		C:	5,110	0.61	0	0.00	0	0	**LLG:**	2.30	5,409	0	5,409	5,110	5,110	5,110	5,110
PT-P1: MCB	208	A:	6,474	0.78	6,104	0.73	5,606	6,246	**3P:**	2.65	7,051	6,696	7,051	6,474	6,474	6,474	6,474
		B:	6,474	0.78	0	0.00	5,606	6,365	**SLG:**	2.75	7,051	0	7,051	6,474	6,474	6,474	6,474
		C:	6,474	0.78	0	0.00	0	0	**LLG:**	2.69	7,051	0	7,051	6,474	6,474	6,474	6,474
PT-PP	208	A:	6,568	0.79	6,229	0.75	5,688	6,355	**3P:**	2.68	7,171	6,848	7,171	6,569	6,568	6,568	6,568
		B:	6,568	0.79	0	0.00	5,688	6,471	**SLG:**	2.78	7,171	0	7,171	6,569	6,568	6,568	6,568
		C:	6,568	0.79	0	0.00	0	0	**LLG:**	2.72	7,171	0	7,171	6,569	6,568	6,568	6,568
PT-RTU	208	A:	2,667	0.32	1,857	0.22	2,310	2,523	**3P:**	0.77	2,668	1,857	2,668	2,667	2,667	2,667	2,667
		B:	2,667	0.32	0	0.00	2,310	2,304	**SLG:**	0.62	2,668	0	2,668	2,667	2,667	2,667	2,667
		C:	2,667	0.32	0	0.00	0	0	**LLG:**	0.74	2,668	0	2,668	2,667	2,667	2,667	2,667
SITE LTG PANE	480	A:	10,110	2.80	10,497	2.91	8,756	10,367	**3P:**	2.49	10,889	11,277	10,889	10,111	10,110	10,110	10,110
		B:	10,110	2.80	0	0.00	8,756	10,267	**SLG:**	2.45	10,889	0	10,889	10,111	10,110	10,110	10,110
		C:	10,110	2.80	0	0.00	0	0	**LLG:**	2.47	10,889	0	10,889	10,111	10,110	10,110	10,110
SITE LTG PANE	480	A:	10,093	2.80	10,451	2.90	8,741	10,350	**3P:**	2.48	10,866	11,212	10,866	10,094	10,093	10,093	10,093
		B:	10,093	2.80	0	0.00	8,741	10,217	**SLG:**	2.43	10,866	0	10,866	10,094	10,093	10,093	10,093
		C:	10,093	2.80	0	0.00	0	0	**LLG:**	2.45	10,866	0	10,866	10,094	10,093	10,093	10,093

Table 3ac - AC Short Circuit Report - Page 15

			----------Initial Symmetrical RMS----------								Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
SW 1	12,470	A:	2,377	17.11	1,977	14.23	2,059	2,234	**3P:**	1.51	2,414	2,006	2,414	2,377	2,377	2,377	2,377
		B:	2,377	17.11	0	0.00	2,059	2,218	**SLG:**	1.49	2,414	0	2,414	2,377	2,377	2,377	2,377
		C:	2,377	17.11	0	0.00	0	0	**LLG:**	1.50	2,414	0	2,414	2,377	2,377	2,377	2,377
SW 10	12,470	A:	2,266	16.31	1,878	13.52	1,962	2,124	**3P:**	1.38	2,290	1,897	2,290	2,266	2,266	2,266	2,266
		B:	2,266	16.31	0	0.00	1,962	2,116	**SLG:**	1.37	2,290	0	2,290	2,266	2,266	2,266	2,266
		C:	2,266	16.31	0	0.00	0	0	**LLG:**	1.38	2,290	0	2,290	2,266	2,266	2,266	2,266
SW 11	12,470	A:	2,213	15.93	1,832	13.19	1,917	2,072	**3P:**	1.33	2,233	1,848	2,233	2,213	2,213	2,213	2,213
		B:	2,213	15.93	0	0.00	1,917	2,068	**SLG:**	1.33	2,233	0	2,233	2,213	2,213	2,213	2,213
		C:	2,213	15.93	0	0.00	0	0	**LLG:**	1.33	2,233	0	2,233	2,213	2,213	2,213	2,213
SW 12	12,470	A:	2,168	15.61	1,792	12.90	1,877	2,027	**3P:**	1.29	2,184	1,805	2,184	2,168	2,168	2,168	2,168
		B:	2,168	15.61	0	0.00	1,877	2,026	**SLG:**	1.29	2,184	0	2,184	2,168	2,168	2,168	2,168
		C:	2,168	15.61	0	0.00	0	0	**LLG:**	1.29	2,184	0	2,184	2,168	2,168	2,168	2,168
SW 13	12,470	A:	2,192	15.78	1,813	13.05	1,898	2,051	**3P:**	1.31	2,210	1,828	2,210	2,192	2,192	2,192	2,192
		B:	2,192	15.78	0	0.00	1,898	2,048	**SLG:**	1.31	2,210	0	2,210	2,192	2,192	2,192	2,192
		C:	2,192	15.78	0	0.00	0	0	**LLG:**	1.31	2,210	0	2,210	2,192	2,192	2,192	2,192
SW 14	12,470	A:	2,266	16.31	1,878	13.52	1,962	2,124	**3P:**	1.38	2,290	1,897	2,290	2,266	2,266	2,266	2,266
		B:	2,266	16.31	0	0.00	1,962	2,116	**SLG:**	1.37	2,290	0	2,290	2,266	2,266	2,266	2,266
		C:	2,266	16.31	0	0.00	0	0	**LLG:**	1.38	2,290	0	2,290	2,266	2,266	2,266	2,266
SW 15	12,470	A:	2,294	16.51	1,903	13.70	1,986	2,151	**3P:**	1.41	2,320	1,924	2,320	2,294	2,294	2,294	2,294
		B:	2,294	16.51	0	0.00	1,986	2,141	**SLG:**	1.40	2,320	0	2,320	2,294	2,294	2,294	2,294
		C:	2,294	16.51	0	0.00	0	0	**LLG:**	1.41	2,320	0	2,320	2,294	2,294	2,294	2,294
SW 3	12,470	A:	2,250	16.20	1,864	13.42	1,948	2,108	**3P:**	1.37	2,272	1,882	2,272	2,250	2,250	2,250	2,250
		B:	2,250	16.20	0	0.00	1,948	2,101	**SLG:**	1.36	2,272	0	2,272	2,250	2,250	2,250	2,250
		C:	2,250	16.20	0	0.00	0	0	**LLG:**	1.36	2,272	0	2,272	2,250	2,250	2,250	2,250
SW 4	12,470	A:	2,304	16.59	1,912	13.77	1,996	2,162	**3P:**	1.42	2,332	1,934	2,332	2,304	2,304	2,304	2,304
		B:	2,304	16.59	0	0.00	1,996	2,151	**SLG:**	1.41	2,332	0	2,332	2,304	2,304	2,304	2,304
		C:	2,304	16.59	0	0.00	0	0	**LLG:**	1.42	2,332	0	2,332	2,304	2,304	2,304	2,304

Table 3ac - AC Short Circuit Report - Page 16

			----------Initial Symmetrical RMS----------								Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
SW 5	12,470	A:	2,336	16.82	1,940	13.97	2,023	2,193	**3P:**	1.46	2,367	1,965	2,367	2,336	2,336	2,336	2,336
		B:	2,336	16.82	0	0.00	2,023	2,180	**SLG:**	1.44	2,367	0	2,367	2,336	2,336	2,336	2,336
		C:	2,336	16.82	0	0.00	0	0	**LLG:**	1.45	2,367	0	2,367	2,336	2,336	2,336	2,336
SW 6	12,470	A:	2,310	16.63	1,917	13.80	2,000	2,167	**3P:**	1.43	2,338	1,940	2,338	2,310	2,310	2,310	2,310
		B:	2,310	16.63	0	0.00	2,000	2,156	**SLG:**	1.42	2,338	0	2,338	2,310	2,310	2,310	2,310
		C:	2,310	16.63	0	0.00	0	0	**LLG:**	1.43	2,338	0	2,338	2,310	2,310	2,310	2,310
SW 7	12,470	A:	2,283	16.43	1,893	13.63	1,977	2,140	**3P:**	1.40	2,308	1,913	2,308	2,283	2,283	2,283	2,283
		B:	2,283	16.43	0	0.00	1,977	2,131	**SLG:**	1.39	2,308	0	2,308	2,283	2,283	2,283	2,283
		C:	2,283	16.43	0	0.00	0	0	**LLG:**	1.40	2,308	0	2,308	2,283	2,283	2,283	2,283
SW 8	12,470	A:	2,276	16.39	1,887	13.59	1,971	2,134	**3P:**	1.39	2,301	1,907	2,301	2,276	2,276	2,276	2,276
		B:	2,276	16.39	0	0.00	1,971	2,125	**SLG:**	1.38	2,301	0	2,301	2,276	2,276	2,276	2,276
		C:	2,276	16.39	0	0.00	0	0	**LLG:**	1.39	2,301	0	2,301	2,276	2,276	2,276	2,276
SW 9	12,470	A:	2,355	16.95	1,957	14.09	2,039	2,212	**3P:**	1.48	2,389	1,984	2,389	2,355	2,355	2,355	2,355
		B:	2,355	16.95	0	0.00	2,039	2,197	**SLG:**	1.46	2,389	0	2,389	2,355	2,355	2,355	2,355
		C:	2,355	16.95	0	0.00	0	0	**LLG:**	1.48	2,389	0	2,389	2,355	2,355	2,355	2,355
SWGR GEN LI	12,470	A:	312	2.25	363	2.61	230	407	**3P:**	1.17	314	371	314	312	312	312	312
		B:	312	2.25	0	0.00	230	444	**SLG:**	1.65	314	0	314	312	312	312	312
		C:	312	2.25	0	0.00	0	0	**LLG:**	1.40	314	0	314	312	312	312	312
SWGR PREF LI	12,470	A:	2,380	17.13	1,980	14.25	2,061	2,237	**3P:**	1.51	2,417	2,009	2,417	2,380	2,380	2,380	2,380
		B:	2,380	17.13	0	0.00	2,061	2,220	**SLG:**	1.49	2,417	0	2,417	2,380	2,380	2,380	2,380
		C:	2,380	17.13	0	0.00	0	0	**LLG:**	1.50	2,417	0	2,417	2,380	2,380	2,380	2,380
SWGR RES LINE	12,470	A:	2,380	17.13	1,930	13.89	2,061	2,212	**3P:**	1.79	2,450	1,988	2,450	2,380	2,380	2,380	2,380
		B:	2,380	17.13	0	0.00	2,061	2,218	**SLG:**	1.80	2,450	0	2,450	2,380	2,380	2,380	2,380
		C:	2,380	17.13	0	0.00	0	0	**LLG:**	1.79	2,450	0	2,450	2,380	2,380	2,380	2,380
SWGR-BATT C	208	A:	2,156	0.26	1,998	0.24	1,867	2,156	**3P:**	1.01	2,160	2,000	2,160	2,156	2,156	2,156	2,156
		B:	2,156	0.26	0	0.00	1,867	2,011	**SLG:**	0.92	2,160	0	2,160	2,156	2,156	2,156	2,156
		C:	2,156	0.26	0	0.00	0	0	**LLG:**	0.97	2,160	0	2,160	2,156	2,156	2,156	2,156

			----------Initial Symmetrical RMS----------								Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
SWGR-CPT SEC	208	A:	3,058	0.37	3,079	0.37	2,648	3,064	**3P:**	2.85	3,378	3,406	3,378	3,058	3,058	3,058	3,058
		B:	3,058	0.37	0	0.00	2,648	3,073	**SLG:**	2.87	3,378	0	3,378	3,058	3,058	3,058	3,058
		C:	3,058	0.37	0	0.00	0	0	**LLG:**	2.86	3,378	0	3,378	3,058	3,058	3,058	3,058
SWGR-LPSG	208	A:	2,930	0.35	2,907	0.35	2,538	2,933	**3P:**	2.44	3,146	3,112	3,146	2,930	2,930	2,930	2,930
		B:	2,930	0.35	0	0.00	2,538	2,904	**SLG:**	2.40	3,146	0	3,146	2,930	2,930	2,930	2,930
		C:	2,930	0.35	0	0.00	0	0	**LLG:**	2.42	3,146	0	3,146	2,930	2,930	2,930	2,930
SWGR-LPSG BU	208	A:	2,927	0.35	2,899	0.35	2,535	2,930	**3P:**	2.44	3,141	3,101	3,141	2,927	2,927	2,927	2,927
		B:	2,927	0.35	0	0.00	2,535	2,896	**SLG:**	2.39	3,141	0	3,141	2,927	2,927	2,927	2,927
		C:	2,927	0.35	0	0.00	0	0	**LLG:**	2.41	3,141	0	3,141	2,927	2,927	2,927	2,927
SWGR-MAIN B	12,470	A:	2,380	17.13	1,979	14.25	2,061	2,236	**3P:**	1.51	2,416	2,008	2,416	2,380	2,380	2,380	2,380
		B:	2,380	17.13	0	0.00	2,061	2,220	**SLG:**	1.49	2,416	0	2,416	2,380	2,380	2,380	2,380
		C:	2,380	17.13	0	0.00	0	0	**LLG:**	1.50	2,416	0	2,416	2,380	2,380	2,380	2,380
T-DP/GH PBUS	12,470	A:	2,145	15.44	1,772	12.76	1,858	2,005	**3P:**	1.27	2,160	1,784	2,160	2,145	2,145	2,145	2,145
		B:	2,145	15.44	0	0.00	1,858	2,006	**SLG:**	1.27	2,160	0	2,160	2,145	2,145	2,145	2,145
		C:	2,145	15.44	0	0.00	0	0	**LLG:**	1.27	2,160	0	2,160	2,145	2,145	2,145	2,145
T-DP/GH SBUS	208	A:	20,608	2.47	21,675	2.60	17,847	20,755	**3P:**	3.47	23,734	25,433	23,734	20,623	20,608	20,608	20,608
		B:	20,608	2.47	0	0.00	17,847	21,616	**SLG:**	3.76	23,734	0	23,734	20,623	20,608	20,608	20,608
		C:	20,608	2.47	0	0.00	0	0	**LLG:**	3.63	23,734	0	23,734	20,623	20,608	20,608	20,608
T1 PBUS	12,470	A:	2,369	17.06	1,970	14.18	2,052	2,226	**3P:**	1.50	2,404	1,998	2,404	2,369	2,369	2,369	2,369
		B:	2,369	17.06	0	0.00	2,052	2,210	**SLG:**	1.48	2,404	0	2,404	2,369	2,369	2,369	2,369
		C:	2,369	17.06	0	0.00	0	0	**LLG:**	1.49	2,404	0	2,404	2,369	2,369	2,369	2,369
T1 SBUS	480	A:	10,702	2.97	11,324	3.14	9,268	10,841	**3P:**	3.55	12,395	13,342	12,395	10,711	10,702	10,702	10,702
		B:	10,702	2.97	0	0.00	9,268	11,247	**SLG:**	3.83	12,395	0	12,395	10,711	10,702	10,702	10,702
		C:	10,702	2.97	0	0.00	0	0	**LLG:**	3.71	12,395	0	12,395	10,711	10,702	10,702	10,702
T11 PBUS	12,470	A:	0	0.00	0	0.00	0	0	**3P:**	1.33	0	0	0	0	0	0	0
		B:	1,832	13.19	1,832	13.19	0	1,832	**SLG:**	1.33	1,848	1,848	1,848	1,832	1,832	1,832	1,832
		C:	0	0.00	0	0.00	0	0	**LLG:**	1.33	0	0	0	0	0	0	0

Table 3ac - AC Short Circuit Report - Page 18

			----------Initial Symmetrical RMS----------								Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
T11 SBUS	240	A:	0	0.00	0	0.00	0	0	**3P:**	2.46	0	0	0	0	0	0	0
		B:	14,757	2.04	25,270	3.50	0	16,944	**SLG:**	0.73	15,867	25,275	15,867	14,758	14,757	14,757	14,757
		C:	14,757	2.04	0	0.00	0	0	**LLG:**	0.84	15,867	0	15,867	14,758	14,757	14,757	14,757
T15 PBUS	12,470	A:	2,281	16.42	1,891	13.62	1,975	2,138	**3P:**	1.40	2,306	1,912	2,306	2,281	2,281	2,281	2,281
		B:	2,281	16.42	0	0.00	1,975	2,130	**SLG:**	1.39	2,306	0	2,306	2,281	2,281	2,281	2,281
		C:	2,281	16.42	0	0.00	0	0	**LLG:**	1.40	2,306	0	2,306	2,281	2,281	2,281	2,281
T15 SBUS	208	A:	17,099	2.05	17,798	2.14	14,808	17,237	**3P:**	3.43	19,652	20,708	19,652	17,111	17,100	17,099	17,099
		B:	17,099	2.05	0	0.00	14,808	17,707	**SLG:**	3.63	19,652	0	19,652	17,111	17,100	17,099	17,099
		C:	17,099	2.05	0	0.00	0	0	**LLG:**	3.54	19,652	0	19,652	17,111	17,100	17,099	17,099
T16 PBUS	12,470	A:	2,267	16.32	1,879	13.53	1,963	2,125	**3P:**	1.38	2,291	1,898	2,291	2,267	2,267	2,267	2,267
		B:	2,267	16.32	0	0.00	1,963	2,117	**SLG:**	1.37	2,291	0	2,291	2,267	2,267	2,267	2,267
		C:	2,267	16.32	0	0.00	0	0	**LLG:**	1.38	2,291	0	2,291	2,267	2,267	2,267	2,267
T16 SBUS	208	A:	12,868	1.55	13,260	1.59	11,144	12,939	**3P:**	3.58	14,928	15,538	14,928	12,880	12,869	12,868	12,868
		B:	12,868	1.55	0	0.00	11,144	13,209	**SLG:**	3.74	14,928	0	14,928	12,880	12,869	12,868	12,868
		C:	12,868	1.55	0	0.00	0	0	**LLG:**	3.67	14,928	0	14,928	12,880	12,869	12,868	12,868
T17 PBUS	12,470	A:	0	0.00	0	0.00	0	0	**3P:**	1.26	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	**SLG:**	1.26	0	0	0	0	0	0	0
		C:	1,798	12.94	1,798	12.94	0	0	**LLG:**	1.00	1,810	1,810	1,810	1,798	1,798	1,798	1,798
T17 SBUS	240	A:	8,445	1.17	14,129	1.96	8,445	8,445	**3P:**	2.50	9,106	14,939	9,106	8,446	8,445	8,445	8,445
		B:	0	0.00	0	0.00	0	0	**SLG:**	2.22	0	0	0	0	0	0	0
		C:	8,445	1.17	0	0.00	8,445	8,445	**LLG:**	2.50	9,106	0	9,106	8,446	8,445	8,445	8,445
T21 PBUS	12,470	A:	2,209	15.90	1,828	13.16	1,913	2,068	**3P:**	1.33	2,228	1,844	2,228	2,209	2,209	2,209	2,209
		B:	2,209	15.90	0	0.00	1,913	2,064	**SLG:**	1.32	2,228	0	2,228	2,209	2,209	2,209	2,209
		C:	2,209	15.90	0	0.00	0	0	**LLG:**	1.32	2,228	0	2,228	2,209	2,209	2,209	2,209
T21 SBUS	208	A:	21,056	2.53	22,157	2.66	18,235	21,261	**3P:**	3.23	23,885	25,518	23,885	21,065	21,057	21,056	21,056
		B:	21,056	2.53	0	0.00	18,235	22,047	**SLG:**	3.47	23,885	0	23,885	21,065	21,057	21,056	21,056
		C:	21,056	2.53	0	0.00	0	0	**LLG:**	3.36	23,885	0	23,885	21,065	21,057	21,056	21,056

Fault Location Bus Name	Bus LL Voltage		3-Phase Amps	3-Phase MVA	SLG Amps	SLG MVA	LL Amps	LLG Amps	-----X/R-----		3-Phase Amps	SLG Amps	1/2 Cycles	2 Cycles	3 Cycles	5 Cycles	8 Cycles
			----------Initial Symmetrical RMS----------						Asym. RMS Amps @ 0.50 Cycles				----------3-Phase Asym Amps (RMS)----------				
T22 PBUS	12,470	A:	2,184	15.72	1,806	13.00	1,891	2,043	3P:	1.30	2,201	1,820	2,201	2,184	2,184	2,184	2,184
		B:	2,184	15.72	0	0.00	1,891	2,041	SLG:	1.30	2,201	0	2,201	2,184	2,184	2,184	2,184
		C:	2,184	15.72	0	0.00	0	0	LLG:	1.30	2,201	0	2,201	2,184	2,184	2,184	2,184
T22 SBUS	208	A:	7,685	0.92	7,829	0.94	6,655	7,712	3P:	3.15	8,666	8,873	8,666	7,688	7,685	7,685	7,685
		B:	7,685	0.92	0	0.00	6,655	7,806	SLG:	3.22	8,666	0	8,666	7,688	7,685	7,685	7,685
		C:	7,685	0.92	0	0.00	0	0	LLG:	3.19	8,666	0	8,666	7,688	7,685	7,685	7,685
T23 PBUS	12,470	A:	2,140	15.40	1,767	12.72	1,853	2,000	3P:	1.26	2,154	1,780	2,154	2,140	2,140	2,140	2,140
		B:	2,140	15.40	0	0.00	1,853	2,001	SLG:	1.26	2,154	0	2,154	2,140	2,140	2,140	2,140
		C:	2,140	15.40	0	0.00	0	0	LLG:	1.26	2,154	0	2,154	2,140	2,140	2,140	2,140
T23 SBUS	208	A:	14,754	1.77	15,303	1.84	12,777	14,852	3P:	3.05	16,530	17,319	16,530	14,758	14,754	14,754	14,754
		B:	14,754	1.77	0	0.00	12,777	15,238	SLG:	3.20	16,530	0	16,530	14,758	14,754	14,754	14,754
		C:	14,754	1.77	0	0.00	0	0	LLG:	3.13	16,530	0	16,530	14,758	14,754	14,754	14,754
T24 PBUS	12,470	A:	0	0.00	0	0.00	0	0	3P:	1.30	0	0	0	0	0	0	0
		B:	1,802	12.98	1,802	12.98	0	1,802	SLG:	1.30	1,817	1,817	1,817	1,802	1,802	1,802	1,802
		C:	0	0.00	0	0.00	0	0	LLG:	1.30	0	0	0	0	0	0	0
T24 SBUS	240	A:	0	0.00	0	0.00	0	0	3P:	2.52	0	0	0	0	0	0	0
		B:	8,443	1.17	14,127	1.96	0	9,125	SLG:	0.72	9,115	14,129	9,115	8,443	8,443	8,443	8,443
		C:	8,443	1.17	0	0.00	0	0	LLG:	0.83	9,115	0	9,115	8,443	8,443	8,443	8,443
T25 PBUS	12,470	A:	0	0.00	0	0.00	0	0	3P:	1.28	0	0	0	0	0	0	0
		B:	1,783	12.84	1,783	12.84	0	1,783	SLG:	1.28	1,796	1,796	1,796	1,783	1,783	1,783	1,783
		C:	0	0.00	0	0.00	0	0	LLG:	1.28	0	0	0	0	0	0	0
T25 SBUS	240	A:	0	0.00	0	0.00	0	0	3P:	2.46	0	0	0	0	0	0	0
		B:	9,595	1.33	16,118	2.23	0	10,497	SLG:	0.71	10,313	16,120	10,313	9,595	9,595	9,595	9,595
		C:	9,595	1.33	0	0.00	0	0	LLG:	0.82	10,313	0	10,313	9,595	9,595	9,595	9,595
T26 PBUS	12,470	A:	0	0.00	0	0.00	0	0	3P:	1.26	0	0	0	0	0	0	0
		B:	1,761	12.68	1,761	12.68	0	1,761	SLG:	1.26	1,773	1,773	1,773	1,761	1,761	1,761	1,761
		C:	0	0.00	0	0.00	0	0	LLG:	1.26	0	0	0	0	0	0	0

Fault Location Bus Name	Bus LL Voltage		3-Phase Amps	3-Phase MVA	SLG Amps	SLG MVA	LL Amps	LLG Amps	-----X/R-----		3-Phase Amps	SLG Amps	1/2 Cycles	2 Cycles	3 Cycles	5 Cycles	8 Cycles
			----------Initial Symmetrical RMS----------						Asym. RMS Amps @ 0.50 Cycles				----------3-Phase Asym Amps (RMS)----------				
T26 SBUS	240	A:	0	0.00	0	0.00	0	0	3P:	2.45	0	0	0	0	0	0	0
		B:	9,578	1.33	16,093	2.23	0	10,487	SLG:	0.71	10,285	16,095	10,285	9,578	9,578	9,578	9,578
		C:	9,578	1.33	0	0.00	0	0	LLG:	0.82	10,285	0	10,285	9,578	9,578	9,578	9,578
T27 PBUS	12,470	A:	0	0.00	0	0.00	0	0	3P:	1.31	0	0	0	0	0	0	0
		B:	1,816	13.07	1,816	13.07	0	1,816	SLG:	1.31	1,830	1,830	1,830	1,816	1,816	1,816	1,816
		C:	0	0.00	0	0.00	0	0	LLG:	1.31	0	0	0	0	0	0	0
T27 SBUS	240	A:	0	0.00	0	0.00	0	0	3P:	2.48	0	0	0	0	0	0	0
		B:	9,619	1.33	16,153	2.24	0	10,510	SLG:	0.72	10,354	16,156	10,354	9,619	9,619	9,619	9,619
		C:	9,619	1.33	0	0.00	0	0	LLG:	0.82	10,354	0	10,354	9,619	9,619	9,619	9,619
T28 PBUS	12,470	A:	0	0.00	0	0.00	0	0	3P:	1.33	0	0	0	0	0	0	0
		B:	1,838	13.23	1,838	13.23	0	1,838	SLG:	1.33	1,854	1,854	1,854	1,838	1,838	1,838	1,838
		C:	0	0.00	0	0.00	0	0	LLG:	1.33	0	0	0	0	0	0	0
T28 SBUS	240	A:	0	0.00	0	0.00	0	0	3P:	2.49	0	0	0	0	0	0	0
		B:	9,635	1.34	16,177	2.24	0	10,520	SLG:	0.72	10,381	16,180	10,381	9,635	9,635	9,635	9,635
		C:	9,635	1.34	0	0.00	0	0	LLG:	0.83	10,381	0	10,381	9,635	9,635	9,635	9,635
T29 PBUS	12,470	A:	0	0.00	0	0.00	0	0	3P:	1.36	0	0	0	0	0	0	0
		B:	1,867	13.44	1,867	13.44	0	1,867	SLG:	1.36	1,885	1,885	1,885	1,867	1,867	1,867	1,867
		C:	0	0.00	0	0.00	0	0	LLG:	1.36	0	0	0	0	0	0	0
T29 SBUS	240	A:	0	0.00	0	0.00	0	0	3P:	2.51	0	0	0	0	0	0	0
		B:	9,656	1.34	16,208	2.25	0	10,532	SLG:	0.72	10,417	16,211	10,417	9,656	9,656	9,656	9,656
		C:	9,656	1.34	0	0.00	0	0	LLG:	0.83	10,417	0	10,417	9,656	9,656	9,656	9,656
T30 PBUS	12,470	A:	0	0.00	0	0.00	0	0	3P:	1.34	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	SLG:	1.34	0	0	0	0	0	0	0
		C:	1,844	13.27	1,844	13.27	0	0	LLG:	1.00	1,860	1,860	1,860	1,844	1,844	1,844	1,844
T30 SBUS	240	A:	8,466	1.17	0	0.00	0	9,138	3P:	2.55	9,155	0	9,155	8,466	8,466	8,466	8,466
		B:	0	0.00	0	0.00	0	0	SLG:	0.73	0	0	0	0	0	0	0
		C:	8,466	1.17	14,160	1.96	0	0	LLG:	2.72	9,155	14,163	9,155	8,466	8,466	8,466	8,466

			----------Initial Symmetrical RMS----------								Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
T31 PBUS	12,470	A:	0	0.00	0	0.00	0	0	**3P:**	1.32	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	**SLG:**	1.32	0	0	0	0	0	0	0
		C:	1,831	13.18	1,831	13.18	0	0	**LLG:**	1.00	1,847	1,847	1,847	1,831	1,831	1,831	1,831
T31 SBUS	240	A:	8,459	1.17	0	0.00	0	9,134	**3P:**	2.54	9,143	0	9,143	8,459	8,459	8,459	8,459
		B:	0	0.00	0	0.00	0	0	**SLG:**	0.73	0	0	0	0	0	0	0
		C:	8,459	1.17	14,150	1.96	0	0	**LLG:**	2.71	9,143	14,152	9,143	8,459	8,459	8,459	8,459
T32 PBUS	12,470	A:	0	0.00	0	0.00	0	0	**3P:**	1.29	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	**SLG:**	1.29	0	0	0	0	0	0	0
		C:	1,793	12.91	1,793	12.91	0	0	**LLG:**	1.00	1,806	1,806	1,806	1,793	1,793	1,793	1,793
T32 SBUS	240	A:	8,437	1.17	0	0.00	0	9,122	**3P:**	2.52	9,106	0	9,106	8,438	8,437	8,437	8,437
		B:	0	0.00	0	0.00	0	0	**SLG:**	0.72	0	0	0	0	0	0	0
		C:	8,437	1.17	14,119	1.96	0	0	**LLG:**	2.70	9,106	14,121	9,106	8,438	8,437	8,437	8,437
T33 PBUS	12,470	A:	0	0.00	0	0.00	0	0	**3P:**	1.18	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	**SLG:**	1.18	0	0	0	0	0	0	0
		C:	1,681	12.10	1,681	12.10	0	0	**LLG:**	1.00	1,689	1,689	1,689	1,681	1,681	1,681	1,681
T33 SBUS	240	A:	8,370	1.16	0	0.00	0	9,084	**3P:**	2.45	8,991	0	8,991	8,370	8,370	8,370	8,370
		B:	0	0.00	0	0.00	0	0	**SLG:**	0.71	0	0	0	0	0	0	0
		C:	8,370	1.16	14,019	1.94	0	0	**LLG:**	2.66	8,991	14,021	8,991	8,370	8,370	8,370	8,370
T34 PBUS	12,470	A:	0	0.00	0	0.00	0	0	**3P:**	1.21	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	**SLG:**	1.21	0	0	0	0	0	0	0
		C:	1,707	12.29	1,707	12.29	0	0	**LLG:**	1.00	1,716	1,716	1,716	1,707	1,707	1,707	1,707
T34 SBUS	240	A:	8,386	1.16	0	0.00	0	9,093	**3P:**	2.47	9,018	0	9,018	8,386	8,386	8,386	8,386
		B:	0	0.00	0	0.00	0	0	**SLG:**	0.71	0	0	0	0	0	0	0
		C:	8,386	1.16	14,043	1.95	0	0	**LLG:**	2.67	9,018	14,045	9,018	8,386	8,386	8,386	8,386
T35 PBUS	12,470	A:	0	0.00	0	0.00	0	0	**3P:**	1.23	0	0	0	0	0	0	0
		B:	0	0.00	0	0.00	0	0	**SLG:**	1.23	0	0	0	0	0	0	0
		C:	1,731	12.46	1,731	12.46	0	0	**LLG:**	1.00	1,741	1,741	1,741	1,731	1,731	1,731	1,731

Fault Location Bus Name	Bus LL Voltage		3-Phase Amps	3-Phase MVA	SLG Amps	SLG MVA	LL Amps	LLG Amps	-----X/R-----		3-Phase Amps	SLG Amps	1/2 Cycles	2 Cycles	3 Cycles	5 Cycles	8 Cycles
			----------Initial Symmetrical RMS----------						Asym. RMS Amps @ 0.50 Cycles				----------3-Phase Asym Amps (RMS)----------				
T35 SBUS	240	A:	8,401	1.16	0	0.00	0	9,101	3P:	2.48	9,043	0	9,043	8,401	8,401	8,401	8,401
		B:	0	0.00	0	0.00	0	0	SLG:	0.72	0	0	0	0	0	0	0
		C:	8,401	1.16	14,065	1.95	0	0	LLG:	2.68	9,043	14,067	9,043	8,401	8,401	8,401	8,401
T36 PBUS	12,470	A:	2,284	16.44	1,894	13.64	1,978	2,141	3P:	1.40	2,309	1,914	2,309	2,284	2,284	2,284	2,284
		B:	2,284	16.44	0	0.00	1,978	2,132	SLG:	1.39	2,309	0	2,309	2,284	2,284	2,284	2,284
		C:	2,284	16.44	0	0.00	0	0	LLG:	1.39	2,309	0	2,309	2,284	2,284	2,284	2,284
T36 SBUS	208	A:	14,395	1.73	14,888	1.79	12,467	14,495	3P:	3.36	16,465	17,195	16,465	14,403	14,396	14,395	14,395
		B:	14,395	1.73	0	0.00	12,467	14,816	SLG:	3.51	16,465	0	16,465	14,403	14,396	14,395	14,395
		C:	14,395	1.73	0	0.00	0	0	LLG:	3.44	16,465	0	16,465	14,403	14,396	14,395	14,395
TR G1 12470V S	12,470	A:	312	2.25	363	2.61	230	407	3P:	1.17	314	371	314	312	312	312	312
		B:	312	2.25	0	0.00	230	444	SLG:	1.66	314	0	314	312	312	312	312
		C:	312	2.25	0	0.00	0	0	LLG:	1.40	314	0	314	312	312	312	312
TR G1 480V SID	480	A:	10,144	2.81	9,539	2.64	7,337	11,399	3P:	0.84	10,150	9,553	10,150	10,144	10,144	10,144	10,144
		B:	10,144	2.81	0	0.00	7,337	8,449	SLG:	0.97	10,150	0	10,150	10,144	10,144	10,144	10,144
		C:	10,144	2.81	0	0.00	0	0	LLG:	0.82	10,150	0	10,150	10,144	10,144	10,144	10,144
U1-BOILER RM	208	A:	2,254	0.27	1,387	0.17	1,952	2,077	3P:	0.40	2,254	1,387	2,254	2,254	2,254	2,254	2,254
		B:	2,254	0.27	0	0.00	1,952	1,951	SLG:	0.30	2,254	0	2,254	2,254	2,254	2,254	2,254
		C:	2,254	0.27	0	0.00	0	0	LLG:	0.39	2,254	0	2,254	2,254	2,254	2,254	2,254
U1-BOILER RM I	208	A:	2,252	0.27	1,385	0.17	1,950	2,074	3P:	0.41	2,252	1,385	2,252	2,252	2,252	2,252	2,252
		B:	2,252	0.27	0	0.00	1,950	1,949	SLG:	0.30	2,252	0	2,252	2,252	2,252	2,252	2,252
		C:	2,252	0.27	0	0.00	0	0	LLG:	0.39	2,252	0	2,252	2,252	2,252	2,252	2,252
U1-D Sw: NCI	208	A:	4,649	0.56	3,376	0.41	4,026	4,437	3P:	1.49	4,716	3,394	4,716	4,649	4,649	4,649	4,649
		B:	4,649	0.56	0	0.00	4,026	4,027	SLG:	1.19	4,716	0	4,716	4,649	4,649	4,649	4,649
		C:	4,649	0.56	0	0.00	0	0	LLG:	1.41	4,716	0	4,716	4,649	4,649	4,649	4,649
U1-L1	208	A:	5,505	0.66	3,990	0.48	4,768	5,311	3P:	1.16	5,530	3,993	5,530	5,505	5,505	5,505	5,505
		B:	5,505	0.66	0	0.00	4,768	4,698	SLG:	0.89	5,530	0	5,530	5,505	5,505	5,505	5,505
		C:	5,505	0.66	0	0.00	0	0	LLG:	1.09	5,530	0	5,530	5,505	5,505	5,505	5,505

Table 3ac - AC Short Circuit Report - Page 23

			Initial Symmetrical RMS								Asym. RMS Amps @ 0.50 Cycles		3-Phase Asym Amps (RMS)				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**X/R**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
U1-L2	208	A:	5,459	0.66	3,949	0.47	4,728	5,264	3P:	1.16	5,483	3,952	5,483	5,459	5,459	5,459	5,459
		B:	5,459	0.66	0	0.00	4,728	4,659	SLG:	0.88	5,483	0	5,483	5,459	5,459	5,459	5,459
		C:	5,459	0.66	0	0.00	0	0	LLG:	1.08	5,483	0	5,483	5,459	5,459	5,459	5,459
U1-L3	208	A:	9,354	1.12	7,712	0.93	8,100	9,537	3P:	1.32	9,433	7,722	9,433	9,354	9,354	9,354	9,354
		B:	9,354	1.12	0	0.00	8,100	7,816	SLG:	0.93	9,433	0	9,433	9,354	9,354	9,354	9,354
		C:	9,354	1.12	0	0.00	0	0	LLG:	1.18	9,433	0	9,433	9,354	9,354	9,354	9,354
U1-L4	208	A:	7,383	0.89	5,953	0.71	6,394	7,236	3P:	1.86	7,629	6,037	7,629	7,383	7,383	7,383	7,383
		B:	7,383	0.89	0	0.00	6,394	6,457	SLG:	1.48	7,629	0	7,629	7,383	7,383	7,383	7,383
		C:	7,383	0.89	0	0.00	0	0	LLG:	1.73	7,629	0	7,629	7,383	7,383	7,383	7,383
U1-L5	208	A:	6,611	0.79	5,244	0.63	5,725	6,392	3P:	2.07	6,923	5,372	6,923	6,611	6,611	6,611	6,611
		B:	6,611	0.79	0	0.00	5,725	5,838	SLG:	1.70	6,923	0	6,923	6,611	6,611	6,611	6,611
		C:	6,611	0.79	0	0.00	0	0	LLG:	1.95	6,923	0	6,923	6,611	6,611	6,611	6,611
U1-MAINT MDP	208	A:	12,824	1.54	13,144	1.58	11,106	12,941	3P:	3.53	14,826	15,251	14,826	12,835	12,825	12,824	12,824
		B:	12,824	1.54	0	0.00	11,106	13,041	SLG:	3.58	14,826	0	14,826	12,835	12,825	12,824	12,824
		C:	12,824	1.54	0	0.00	0	0	LLG:	3.56	14,826	0	14,826	12,835	12,825	12,824	12,824
U1-NCI	208	A:	4,514	0.54	3,259	0.39	3,910	4,303	3P:	1.46	4,574	3,275	4,574	4,514	4,514	4,514	4,514
		B:	4,514	0.54	0	0.00	3,910	3,908	SLG:	1.17	4,574	0	4,574	4,514	4,514	4,514	4,514
		C:	4,514	0.54	0	0.00	0	0	LLG:	1.38	4,574	0	4,574	4,514	4,514	4,514	4,514
U1-P1	208	A:	7,464	0.90	6,146	0.74	6,464	7,240	3P:	2.38	7,979	6,403	7,979	7,464	7,464	7,464	7,464
		B:	7,464	0.90	0	0.00	6,464	6,687	SLG:	1.99	7,979	0	7,979	7,464	7,464	7,464	7,464
		C:	7,464	0.90	0	0.00	0	0	LLG:	2.24	7,979	0	7,979	7,464	7,464	7,464	7,464
U1-P1 BUS	208	A:	7,446	0.89	6,115	0.73	6,448	7,220	3P:	2.37	7,957	6,367	7,957	7,446	7,446	7,446	7,446
		B:	7,446	0.89	0	0.00	6,448	6,664	SLG:	1.98	7,957	0	7,957	7,446	7,446	7,446	7,446
		C:	7,446	0.89	0	0.00	0	0	LLG:	2.24	7,957	0	7,957	7,446	7,446	7,446	7,446
U1-P2	208	A:	7,267	0.87	5,916	0.71	6,293	7,048	3P:	2.27	7,710	6,121	7,710	7,267	7,267	7,267	7,267
		B:	7,267	0.87	0	0.00	6,293	6,473	SLG:	1.88	7,710	0	7,710	7,267	7,267	7,267	7,267
		C:	7,267	0.87	0	0.00	0	0	LLG:	2.14	7,710	0	7,710	7,267	7,267	7,267	7,267

			----------Initial Symmetrical RMS----------						Asym. RMS Amps @ 0.50 Cycles		----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
U1-P3	208	A:	7,791	0.94	6,452	0.77	6,747	7,622	**3P:**	2.19	8,220	6,642	8,220	7,791	7,791	7,791	7,791
		B:	7,791	0.94	0	0.00	6,747	6,928	**SLG:**	1.79	8,220	0	8,220	7,791	7,791	7,791	7,791
		C:	7,791	0.94	0	0.00	0	0	**LLG:**	2.04	8,220	0	8,220	7,791	7,791	7,791	7,791
U1-P4	208	A:	5,392	0.65	3,890	0.47	4,669	5,195	**3P:**	1.15	5,414	3,893	5,414	5,392	5,392	5,392	5,392
		B:	5,392	0.65	0	0.00	4,669	4,602	**SLG:**	0.88	5,414	0	5,414	5,392	5,392	5,392	5,392
		C:	5,392	0.65	0	0.00	0	0	**LLG:**	1.08	5,414	0	5,414	5,392	5,392	5,392	5,392
WH-BOOSTER H	208	A:	3,593	0.43	2,457	0.30	3,337	3,593	**3P:**	0.55	3,593	2,457	3,593	3,593	3,593	3,593	3,593
		B:	3,314	0.40	0	0.00	3,337	3,314	**SLG:**	0.44	3,314	0	3,314	3,314	3,314	3,314	3,314
		C:	0	0.00	0	0.00	0	0	**LLG:**	0.55	0	0	0	0	0	0	0
WH-COMPRESS	208	A:	1,875	0.23	1,130	0.14	1,624	1,710	**3P:**	0.32	1,875	1,130	1,875	1,875	1,875	1,875	1,875
		B:	1,875	0.23	0	0.00	1,624	1,635	**SLG:**	0.24	1,875	0	1,875	1,875	1,875	1,875	1,875
		C:	1,875	0.23	0	0.00	0	0	**LLG:**	0.30	1,875	0	1,875	1,875	1,875	1,875	1,875
WH-COND REC 1	208	A:	1,713	0.21	1,125	0.14	1,636	1,713	**3P:**	0.16	1,713	1,125	1,713	1,713	1,713	1,713	1,713
		B:	1,655	0.20	0	0.00	1,636	1,655	**SLG:**	0.12	1,655	0	1,655	1,655	1,655	1,655	1,655
		C:	0	0.00	0	0.00	0	0	**LLG:**	0.16	0	0	0	0	0	0	0
WH-DP-1	208	A:	7,478	0.90	5,515	0.66	6,476	7,230	**3P:**	1.24	7,526	5,523	7,526	7,478	7,478	7,478	7,478
		B:	7,478	0.90	0	0.00	6,476	6,403	**SLG:**	0.96	7,526	0	7,526	7,478	7,478	7,478	7,478
		C:	7,478	0.90	0	0.00	0	0	**LLG:**	1.16	7,526	0	7,526	7,478	7,478	7,478	7,478
WH-DP-2	208	A:	10,340	1.24	8,421	1.01	8,955	10,244	**3P:**	1.64	10,564	8,482	10,564	10,340	10,340	10,340	10,340
		B:	10,340	1.24	0	0.00	8,955	8,958	**SLG:**	1.28	10,564	0	10,564	10,340	10,340	10,340	10,340
		C:	10,340	1.24	0	0.00	0	0	**LLG:**	1.52	10,564	0	10,564	10,340	10,340	10,340	10,340
WH-DP-2a	208	A:	9,620	1.16	7,633	0.92	8,331	9,475	**3P:**	1.53	9,776	7,670	9,776	9,620	9,620	9,620	9,620
		B:	9,620	1.16	0	0.00	8,331	8,291	**SLG:**	1.18	9,776	0	9,776	9,620	9,620	9,620	9,620
		C:	9,620	1.16	0	0.00	0	0	**LLG:**	1.41	9,776	0	9,776	9,620	9,620	9,620	9,620
WH-DP-3	208	A:	12,098	1.45	10,526	1.26	10,477	12,132	**3P:**	2.01	12,617	10,737	12,617	12,098	12,098	12,098	12,098
		B:	12,098	1.45	0	0.00	10,477	10,735	**SLG:**	1.61	12,617	0	12,617	12,098	12,098	12,098	12,098
		C:	12,098	1.45	0	0.00	0	0	**LLG:**	1.85	12,617	0	12,617	12,098	12,098	12,098	12,098

Fault Location Bus Name	Bus LL Voltage		3-Phase Amps	3-Phase MVA	SLG Amps	SLG MVA	LL Amps	LLG Amps	-----X/R-----		3-Phase Amps	SLG Amps	1/2 Cycles	2 Cycles	3 Cycles	5 Cycles	8 Cycles
			----------Initial Symmetrical RMS----------						Asym. RMS Amps @ 0.50 Cycles				----------3-Phase Asym Amps (RMS)----------				
WH-DP-3 BUS	208	A:	12,040	1.45	10,411	1.25	10,427	12,060	3P:	2.00	12,547	10,611	12,547	12,040	12,040	12,040	12,040
		B:	12,040	1.45	0	0.00	10,427	10,655	SLG:	1.59	12,547	0	12,547	12,040	12,040	12,040	12,040
		C:	12,040	1.45	0	0.00	0	0	LLG:	1.84	12,547	0	12,547	12,040	12,040	12,040	12,040
WH-DP-4	208	A:	6,714	0.81	4,832	0.58	5,814	6,448	3P:	1.16	6,744	4,837	6,744	6,714	6,714	6,714	6,714
		B:	6,714	0.81	0	0.00	5,814	5,749	SLG:	0.90	6,744	0	6,744	6,714	6,714	6,714	6,714
		C:	6,714	0.81	0	0.00	0	0	LLG:	1.09	6,744	0	6,744	6,714	6,714	6,714	6,714
WH-DS: ELEV	208	A:	5,134	0.62	3,325	0.40	4,446	4,826	3P:	0.55	5,134	3,325	5,134	5,134	5,134	5,134	5,134
		B:	5,134	0.62	0	0.00	4,446	4,385	SLG:	0.40	5,134	0	5,134	5,134	5,134	5,134	5,134
		C:	5,134	0.62	0	0.00	0	0	LLG:	0.52	5,134	0	5,134	5,134	5,134	5,134	5,134
WH-ELEV	208	A:	4,527	0.54	2,887	0.35	3,921	4,231	3P:	0.50	4,527	2,887	4,527	4,527	4,527	4,527	4,527
		B:	4,527	0.54	0	0.00	3,921	3,881	SLG:	0.36	4,527	0	4,527	4,527	4,527	4,527	4,527
		C:	4,527	0.54	0	0.00	0	0	LLG:	0.48	4,527	0	4,527	4,527	4,527	4,527	4,527
WH-EXH FAN	208	A:	606	0.07	355	0.04	525	544	3P:	0.11	606	355	606	606	606	606	606
		B:	606	0.07	0	0.00	525	535	SLG:	0.09	606	0	606	606	606	606	606
		C:	606	0.07	0	0.00	0	0	LLG:	0.11	606	0	606	606	606	606	606
WH-FREEZER	208	A:	1,960	0.24	1,179	0.14	1,697	1,787	3P:	0.29	1,960	1,179	1,960	1,960	1,960	1,960	1,960
		B:	1,960	0.24	0	0.00	1,697	1,710	SLG:	0.22	1,960	0	1,960	1,960	1,960	1,960	1,960
		C:	1,960	0.24	0	0.00	0	0	LLG:	0.28	1,960	0	1,960	1,960	1,960	1,960	1,960
WH-GARBAGE	208	A:	739	0.09	434	0.05	640	664	3P:	0.13	739	434	739	739	739	739	739
		B:	739	0.09	0	0.00	640	652	SLG:	0.10	739	0	739	739	739	739	739
		C:	739	0.09	0	0.00	0	0	LLG:	0.12	739	0	739	739	739	739	739
WH-HVAC ROO	208	A:	2,259	0.27	1,368	0.16	1,956	2,066	3P:	0.32	2,259	1,368	2,259	2,259	2,259	2,259	2,259
		B:	2,259	0.27	0	0.00	1,956	1,966	SLG:	0.24	2,259	0	2,259	2,259	2,259	2,259	2,259
		C:	2,259	0.27	0	0.00	0	0	LLG:	0.31	2,259	0	2,259	2,259	2,259	2,259	2,259
WH-HWH 4.5kW	208	A:	5,334	0.64	3,662	0.44	4,904	5,334	3P:	0.46	5,334	3,662	5,334	5,334	5,334	5,334	5,334
		B:	4,823	0.58	0	0.00	4,904	4,823	SLG:	0.33	4,823	0	4,823	4,823	4,823	4,823	4,823
		C:	0	0.00	0	0.00	0	0	LLG:	0.46	0	0	0	0	0	0	0

			----------Initial Symmetrical RMS----------						Asym. RMS Amps @ 0.50 Cycles			----------3-Phase Asym Amps (RMS)----------				
Fault Location Bus Name	**Bus LL Voltage**		**3-Phase Amps**	**3-Phase MVA**	**SLG Amps**	**SLG MVA**	**LL Amps**	**LLG Amps**	**-----X/R-----**		**3-Phase Amps**	**SLG Amps**	**1/2 Cycles**	**2 Cycles**	**3 Cycles**	**5 Cycles**	**8 Cycles**
WH-MDP	208	A:	14,404	1.73	13,687	1.64	12,475	14,458	**3P:**	2.79	15,846	14,759	15,846	14,406	14,404	14,404	14,404
		B:	14,404	1.73	0	0.00	12,475	13,675	**SLG:**	2.50	15,846	0	15,846	14,406	14,404	14,404	14,404
		C:	14,404	1.73	0	0.00	0	0	**LLG:**	2.66	15,846	0	15,846	14,406	14,404	14,404	14,404
WH-POTS & PA	208	A:	2,414	0.29	1,467	0.18	2,090	2,211	**3P:**	0.34	2,414	1,467	2,414	2,414	2,414	2,414	2,414
		B:	2,414	0.29	0	0.00	2,090	2,098	**SLG:**	0.26	2,414	0	2,414	2,414	2,414	2,414	2,414
		C:	2,414	0.29	0	0.00	0	0	**LLG:**	0.33	2,414	0	2,414	2,414	2,414	2,414	2,414
WH-SEWAGE P	208	A:	2,658	0.32	1,757	0.21	2,515	2,658	**3P:**	0.23	2,658	1,757	2,658	2,658	2,658	2,658	2,658
		B:	2,524	0.30	0	0.00	2,515	2,524	**SLG:**	0.16	2,524	0	2,524	2,524	2,524	2,524	2,524
		C:	0	0.00	0	0.00	0	0	**LLG:**	0.23	0	0	0	0	0	0	0
WH-STORE RM 4	208	A:	2,068	0.25	1,363	0.16	1,964	2,068	**3P:**	0.23	2,068	1,363	2,068	2,068	2,068	2,068	2,068
		B:	1,979	0.24	0	0.00	1,964	1,979	**SLG:**	0.17	1,979	0	1,979	1,979	1,979	1,979	1,979
		C:	0	0.00	0	0.00	0	0	**LLG:**	0.23	0	0	0	0	0	0	0
WH-STORE RM 4	208	A:	2,068	0.25	1,363	0.16	1,964	2,068	**3P:**	0.23	2,068	1,363	2,068	2,068	2,068	2,068	2,068
		B:	1,979	0.24	0	0.00	1,964	1,979	**SLG:**	0.17	1,979	0	1,979	1,979	1,979	1,979	1,979
		C:	0	0.00	0	0.00	0	0	**LLG:**	0.23	0	0	0	0	0	0	0
WH-SWBD: LIN	208	A:	15,496	1.86	15,275	1.83	13,420	15,617	**3P:**	3.02	17,323	16,874	17,323	15,500	15,496	15,496	15,496
		B:	15,496	1.86	0	0.00	13,420	15,154	**SLG:**	2.85	17,323	0	17,323	15,500	15,496	15,496	15,496
		C:	15,496	1.86	0	0.00	0	0	**LLG:**	2.93	17,323	0	17,323	15,500	15,496	15,496	15,496
WH-WBP-1	208	A:	3,384	0.41	2,085	0.25	2,930	3,122	**3P:**	0.36	3,384	2,085	3,384	3,384	3,384	3,384	3,384
		B:	3,384	0.41	0	0.00	2,930	2,926	**SLG:**	0.26	3,384	0	3,384	3,384	3,384	3,384	3,384
		C:	3,384	0.41	0	0.00	0	0	**LLG:**	0.34	3,384	0	3,384	3,384	3,384	3,384	3,384

Fri Jul 06 16:40:40 2018

ALL INFORMATION PRESENTED IS FOR REVIEW, APPROVAL,

INTERPRETATION AND APPLICATION BY A REGISTERED ENGINEER ONLY

SKM DISCLAIMS ANY RESPONSIBILITY AND LIABILITY RESULTING

FROM THE USE AND INTERPRETATION OF THIS SOFTWARE

SKM POWER*TOOLS FOR WINDOWS

DC ANSI SHORT CIRCUIT ANALYSIS REPORT

All Sources in Project: skm-1412\Study1_DCSCANSI

SOURCE NAME	STATUS	VOLTAGE	KW
BAT-0001	1	48.000	N/A
REC-0001	1	48.000	N/A

********** PRE-FAULT VOLTAGE PROFILE **********

BUS NAME	VOLTAGE (Volts)	ANGLE (D)
dcBUS-0003	48.000	0.000
dcBUS-0002	48.000	0.000

********** FAULT ANALYSIS REPORT **********

FAULT TYPE: BUS FAULT

Fault Bus: dcBUS-0003
Peak SC Current Ip = 618.97 (Amp)
Rate of Rise di/dt = 29979703.86 (Amp/Sec)
Time Constant T = 0.00002 (Sec)
THEVENIN RESISTANCE R = 0.07755 (Ohm)

PEAK CURRENT and RATE OF RISE in all the lines and sources :

dcBUS-0002	dcBUS-0003	Current = 618.97	(Amp)	Rate of Rise = 29979703.86 (Amp/Sec)
BAT-0001	dcBUS-0002	Current = 596.23	(Amp)	Rate of Rise = 29903785.65 (Amp/Sec)
REC-0001	dcBUS-0002	Current = 22.74	(Amp)	Rate of Rise = 75918.21 (Amp/Sec)

Fault Bus: dcBUS-0002
Peak SC Current Ip = 651.99 (Amp)
Rate of Rise di/dt = 92542038.39 (Amp/Sec)
Time Constant T = 0.00001 (Sec)
THEVENIN RESISTANCE R = 0.07362 (Ohm)

PEAK CURRENT and RATE OF RISE in all the lines and sources :

dcBUS-0002	dcBUS-0003	Current = 0.00	(Amp)	Rate of Rise = 0.00 (Amp/Sec)
BAT-0001	dcBUS-0002	Current = 628.04	(Amp)	Rate of Rise = 92307692.31 (Amp/Sec)
REC-0001	dcBUS-0002	Current = 23.96	(Amp)	Rate of Rise = 234346.08 (Amp/Sec)

********** FAULT ANALYSIS SUMMARY **********

BUS NAME	VOLTAGE (Volts)	PEAK CURRENT (Amps)	RATE of RISE (Amps/Sec)
dcBUS-0003	48.000	618.969	29979703.863
dcBUS-0002	48.000	651.994	92542038.388

********** FAULT ANALYSIS REPORT COMPLETED **********

TAB 6

Table 4 - Input Data Report

Project: skm-1412
Base Project

Input Report (English)

Utilities

Contribution From Name	Bus Name	In/Out Service	Nominal Voltage	-------- Contribution Data -------- DutyUnits			X/R	PU (100 MVA Base)	R PU	X PU
AM PREF	AM FDR 167-52	In	12,470	3P:	2,380	Amps	1.51	Pos:	1.074	1.622
				SLG:	1,980	Amps	1.49	Zero:	1.761	2.581
AM RESERVE	AM FDR 167-56	In	12,470	3P:	2,380	Amps	1.79	Pos:	0.949	1.698
				SLG:	1,930	Amps	1.80	Zero:	1.598	2.895

Generators

Name Connection	Bus Name	In/Out Service	Rated Size PF	Units	Rated Voltage	# of poles	-------- Contribution Data -------- Base kVA	X"	X/R
GENERATOR 1	GEN 1	In	1600.0	kVA	480	4	1,600.00	0.12	0.84
Wye-Ground			0.80	Leading				0.23	1.57
								0.07	0.47

Induction Motors

Name Phases	# of Motors	Bus Name Connection	In/Out Service	L-L Volts	Status	# of Poles	------- Contribution Data ------- Base kVA	Xd"	X/R
MTR: AHU3-RF	1	MP-AHU3-RF	In	208	Running	4	5.01	0.151	4.9
ABC		Wye							
MTR: AHU3-SF	1	MP-AHU3-SF	In	208	Running	4	15.04	0.151	4.9
ABC		Wye							
MTR: AHU4-RF	1	MP-AHU4-RF	In	208	Running	4	5.01	0.151	4.9
ABC		Wye							
MTR: AHU4-SF	1	MP-AHU4-SF	In	208	Running	4	15.04	0.151	4.9

Name Phases	# of Motors	Bus Name Connection	In/Out Service	L-L Volts	Status	# of Poles	------- Contribution Data ------- Base kVA	Xd"	X/R
ABC		Wye							
MTR: CT	1	MP-CT	In	208	Running	4	7.52	0.151	4.9
ABC		Wye							
MTR: ELEV	1	WH-ELEV	In	208	Running	4	20.05	0.151	4.9
ABC		Wye							

Cables

Name Phases	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------ Size	Cond. Type	Duct Type	Insul	Ohms/ 1000 feet R	jX
CBL-0003	SWGR-MAIN BUS	In	1	20	2	Copper	Non-Magnetic	EPR	Pos: 0.200	0.055
ABC	SW 1								Zero: 0.321	0.139
CBL-0004	SW 1	In	1	65	2	Copper	Non-Magnetic	EPR	Pos: 0.200	0.055
ABC	T1 PBUS								Zero: 0.321	0.139
CBL-0007	SWGR-MAIN BUS	In	1	620	2	Copper	Non-Magnetic	EPR	Pos: 0.200	0.055
ABC	SW 4								Zero: 0.321	0.139
CBL-0008	SW 4	In	1	470	2	Copper	Non-Magnetic	EPR	Pos: 0.200	0.055
ABC	SW 3								Zero: 0.321	0.139
CBL-0009	SWGR-MAIN BUS	In	1	360	2	Copper	Non-Magnetic	EPR	Pos: 0.200	0.055
ABC	SW 5								Zero: 0.321	0.139
CBL-0011	SW 5	In	1	215	2	Copper	Non-Magnetic	EPR	Pos: 0.200	0.055
ABC	SW 6								Zero: 0.321	0.139
CBL-0012	SW 6	In	1	230	2	Copper	Non-Magnetic	EPR	Pos: 0.200	0.055
ABC	SW 7								Zero: 0.321	0.139
CBL-0013	SWGR-MAIN BUS	In	1	200	2	Copper	Non-Magnetic	EPR	Pos: 0.200	0.055
ABC	SW 9								Zero: 0.321	0.139
CBL-0014	SW 9	In	1	660	2	Copper	Non-Magnetic	EPR	Pos: 0.200	0.055
ABC	SW 8								Zero: 0.321	0.139
CBL-0015	SW 7	In	1	370	2	Copper	Non-Magnetic	EPR	Pos: 0.200	0.055
ABC	SW 8								Zero: 0.321	0.139
CBL-0017	SW 7	In	1	15	2	Copper	Non-Magnetic	EPR	Pos: 0.200	0.055
ABC	T15 PBUS								Zero: 0.321	0.139
CBL-0018	SW 8	In	1	80	2	Copper	Non-Magnetic	EPR	Pos: 0.200	0.055
ABC	T16 PBUS								Zero: 0.321	0.139
CBL-0019	SW 8	In	1	425	6	Copper	Non-Magnetic	EPR	Pos: 0.510	0.064
C	T17 PBUS								Zero: 0.811	0.162
CBL-0021	SWGR-MAIN BUS	In	1	950	2	Copper	Non-Magnetic	EPR	Pos: 0.200	0.055
ABC	SW 10								Zero: 0.321	0.139

Name Phases	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------ Size	Cond. Type	Duct Type	Insul	Ohms/ 1000 feet R	jX
CBL-0023 ABC	SW 10 SW 11	In	1	460	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0024 ABC	SW 11 SW 12	In	1	410	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0025 ABC	SWGR-MAIN BUS SW 15	In	1	710	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0026 ABC	SW 15 SW 14	In	1	240	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0027 ABC	SW 12 SW 13	In	1	675	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0028 ABC	SW 11 T21 PBUS	In	1	45	1	Copper	Non-Magnetic	EPR	Pos: 0.160 Zero: 0.254	0.054 0.137
CBL-0029 ABC	SW 12 T23 PBUS	In	1	260	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0030 B	SW 13 T24 PBUS	In	1	110	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0031 ABC	SW 12 T-DP/GH PBUS	In	1	210	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0032 ABC	SW 15 T36 PBUS	In	1	40	6	Copper	Non-Magnetic	EPR	Pos: 0.510 Zero: 0.811	0.064 0.162
CBL-0033 ABC	SW 14 SW 13	In	1	650	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0034 ABC	SW 11 T22 PBUS	In	1	265	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0038 ABC	TR G1 12470V SID SWGR GEN LI	In	1	20	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0049 B	SW 3 T11 PBUS	In	1	320	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0050 B	T25 PBUS T26 PBUS	In	1	235	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0051 B	T24 PBUS T25 PBUS	In	1	200	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0052 B	T26 PBUS T27 PBUS	In	1	400	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0053 B	T27 PBUS T28 PBUS	In	1	225	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0054 B	T28 PBUS T29 PBUS	In	1	290	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139

Name Phases	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------ Size	Cond. Type	Duct Type	Insul	Ohms/ 1000 feet R	jX
CBL-0055 B	SW 14 T29 PBUS	In	1	110	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0056 C	SW 13 T35 PBUS	In	1	880	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0057 C	T34 PBUS T33 PBUS	In	1	300	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0058 C	T35 PBUS T34 PBUS	In	1	265	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0059 C	T33 PBUS T32 PBUS	In	1	275	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0060 C	T32 PBUS T31 PBUS	In	1	390	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0061 C	T31 PBUS T30 PBUS	In	1	130	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0062 C	SW 14 T30 PBUS	In	1	340	2	Copper	Non-Magnetic	EPR	Pos: 0.200 Zero: 0.321	0.055 0.139
CBL-0063 ABC	AM FDR 167-52 SWGR PREF LI	In	1	5	1200	Copper	Bus	****	Pos: 0.010 Zero: 0.071	0.062 0.331
CBL-0064 ABC	AM FDR 167-56 SWGR RES LINE	In	1	5	1200	Copper	Bus	****	Pos: 0.010 Zero: 0.071	0.062 0.331
CBL-0065 ABC	T1 SBUS SITE LTG PANE	In	1	10	4	Copper	Non-Magnetic	PVC	Pos: 0.320 Zero: 0.496	0.051 0.129
CBL-0071 ABC	T21 SBUS MP-MDP	In	3	12	500	Copper	Non-Magnetic	PVC	Pos: 0.030 Zero: 0.044	0.037 0.100
CBL-0072 ABC	T36 SBUS 1901/1902-MDP	In	1	75	4/0	Copper	Magnetic	PVC	Pos: 0.060 Zero: 0.202	0.050 0.122
CBL-0073 ABC	T36 SBUS 1903/1904-MDP	In	1	160	4/0	Copper	Magnetic	PVC	Pos: 0.060 Zero: 0.202	0.050 0.122
CBL-0074 ABC	T36 SBUS 1905/1906-MDP	In	1	140	4/0	Copper	Magnetic	PVC	Pos: 0.060 Zero: 0.202	0.050 0.122
CBL-0075 ABC	SWGR PREF LINE SWGR-MAIN B	In	1	5	1200	Copper	Bus	****	Pos: 0.010 Zero: 0.071	0.062 0.331
CBL-0076 ABC	SWGR RES LINE SWGR-MAIN B	In	1	5	1200	Copper	Bus	****	Pos: 0.010 Zero: 0.071	0.062 0.331
CBL-0077 BC	T11 SBUS APARTMENT A	In	1	112	500	Copper	Magnetic	PVC	Pos: 0.030 Zero: 0.093	0.035 0.086
CBL-0078 BC	T11 SBUS APARTMENT B	In	1	480	350	Copper	Magnetic	PVC	Pos: 0.040 Zero: 0.119	0.037 0.092

Name Phases	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------ Size	Cond. Type	Duct Type	Insul	Ohms/ 1000 feet R	jX
CBL-0079 ABC	SWGR-MAIN BUS SWGR GEN LI	In	1	5	1200	Copper	Bus	****	Pos: 0.010 Zero: 0.071	0.062 0.331
CBL-0080 ABC	T23 SBUS DON-MDP: DON	In	2	30	350	Copper	Magnetic	PVC	Pos: 0.040 Zero: 0.119	0.049 0.121
CBL-0081 ABC	T15 SBUS WH-SWBD: LIN	In	2	25	350	Copper	Magnetic	PVC	Pos: 0.040 Zero: 0.119	0.049 0.121
CBL-0082 ABC	WH-SWBD: LINE WH-MDP	In	2	20	350	Copper	Magnetic	PVC	Pos: 0.040 Zero: 0.119	0.049 0.121
CBL-0084 ABC	T-DP/GH SBUS GH-DP/GH	In	4	38	600	Copper	Non-Magnetic	PVC	Pos: 0.020 Zero: 0.038	0.037 0.094
CBL-0085 ABC	GH-DP/GH BUS GH-1502a	In	1	285	500	Copper	Magnetic	PVC	Pos: 0.030 Zero: 0.093	0.047 0.115
CBL-0086 ABC	GH-DP/GH BUS GH-1503a	In	1	176	500	Copper	Magnetic	PVC	Pos: 0.030 Zero: 0.093	0.047 0.115
CBL-0087 ABC	GH-DP/GH BUS GH-1504a	In	1	132	500	Copper	Magnetic	PVC	Pos: 0.030 Zero: 0.093	0.047 0.115
CBL-0088 ABC	GH-DP/GH BUS GH-1505a	In	1	35	500	Copper	Magnetic	PVC	Pos: 0.030 Zero: 0.093	0.047 0.115
CBL-0089 ABC	DON-MDP sec 2: D DON-DP1	In	1	12	500	Copper	Magnetic	PVC	Pos: 0.030 Zero: 0.093	0.047 0.115
CBL-0090 ABC	DON-MDP sec 2: D DON-CH-1	In	1	62	350	Copper	Magnetic	PVC	Pos: 0.040 Zero: 0.119	0.049 0.121
CBL-0091 ABC	GH-DP/GH BUS GH-CC1	In	1	180	1	Copper	Magnetic	PVC	Pos: 0.160 Zero: 0.504	0.057 0.140
CBL-0092 ABC	DON-MDP sec 1: D DON-HP3	In	1	180	3	Copper	Magnetic	PVC	Pos: 0.260 Zero: 0.820	0.061 0.150
CBL-0093 ABC	DON-MDP sec 1: D DON-AHU-1	In	1	110	6	Copper	Magnetic	PVC	Pos: 0.510 Zero: 1.607	0.069 0.169
CBL-0094 ABC	DON-MDP sec 1: D DON-AHU-2	In	1	60	6	Copper	Magnetic	PVC	Pos: 0.510 Zero: 1.607	0.069 0.169
CBL-0095 ABC	GEN 1 TR G1 480V SID	In	5	28	600	Copper	Non-Magnetic	PVC	Pos: 0.020 Zero: 0.038	0.037 0.094
CBL-0096 ABC	GH-1502a GH-1502b	In	1	4	500	Copper	Magnetic	PVC	Pos: 0.030 Zero: 0.093	0.047 0.115
CBL-0097 C	T35 SBUS 1610	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0098 C	T34 SBUS 1608	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106

Name Phases	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------				Ohms/ 1000 feet	
					Size	Cond. Type	Duct Type	Insul	R	jX
CBL-0099 C	T33 SBUS 1607	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0100 C	T32 SBUS 1605	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0101 C	T31 SBUS 1603	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0102 C	T30 SBUS 1601	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0103 B	T24 SBUS 1803	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0104 B	T25 SBUS 1801	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0105 B	T26 SBUS 1809	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0106 B	T27 SBUS 1808	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0107 B	T28 SBUS 1806	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0108 B	T29 SBUS 1804	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0109 C	T30 SBUS 1602	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0110 C	T31 SBUS 1604	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0111 C	T32 SBUS 1606	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0112 C	T34 SBUS 1609	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0113 C	T35 SBUS 1908	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0114 B	T25 SBUS 1802	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0115 B	T26 SBUS 1810	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0116 B	T28 SBUS 1807	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0117 B	T29 SBUS 1805	In	1	50	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106

Name Phases	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------ Size	Cond. Type	Duct Type	Insul	Ohms/ 1000 feet R	jX
CBL-0118	DON-MDP sec 1: D	In	1	110	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	DON-COMP RM .								Zero: 3.719	0.210
CBL-0119	DON-MDP sec 1: D	In	1	110	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	DON-AHU-1 DR								Zero: 3.719	0.210
CBL-0120	DON-MDP sec 1: D	In	1	60	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	DON-AHU-2 DR								Zero: 3.719	0.210
CBL-0121	DON-MDP sec 2: D	In	1	70	3/0	Copper	Magnetic	PVC	Pos: 0.080	0.052
ABC	DON-HP1								Zero: 0.254	0.128
CBL-0122	DON-MDP sec 2: D	In	1	125	3	Copper	Magnetic	PVC	Pos: 0.260	0.061
ABC	DON-HP2								Zero: 0.820	0.150
CBL-0123	DON-MDP sec 2: D	In	1	36	2/0	Copper	Magnetic	PVC	Pos: 0.100	0.053
ABC	DON-DP2								Zero: 0.321	0.131
CBL-0124	DON-DP1	In	1	48	12	Copper	Magnetic	PVC	Pos: 1.870	0.091
ABC	DON-VFD: P1								Zero: 5.893	0.224
CBL-0125	DON-DP1	In	1	48	12	Copper	Magnetic	PVC	Pos: 1.870	0.091
ABC	DON-VFD: P2								Zero: 5.893	0.224
CBL-0126	DON-DP1	In	1	36	8	Copper	Magnetic	PVC	Pos: 0.810	0.075
ABC	DON-CH PUMP 1								Zero: 2.556	0.186
CBL-0127	DON-MDP sec 1: D	In	1	4	600	Copper	Busway	Epoxy	Pos: 0.020	0.013
ABC	DON-MDP sec 2:								Zero: 0.496	0.256
CBL-0128	DON-HP3	In	1	60	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	DON-CU-3								Zero: 3.719	0.210
CBL-0129	DON-HP2	In	1	130	12	Copper	Magnetic	PVC	Pos: 1.870	0.091
ABC	DON-CRAC-1								Zero: 5.893	0.224
CBL-0130	DON-DP2	In	1	50	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	DON-WH-1								Zero: 3.719	0.210
CBL-0131	DON-DP1	In	1	65	12	Copper	Magnetic	PVC	Pos: 1.870	0.091
ABC	DON-VFD: P3								Zero: 5.893	0.224
CBL-0132	DON-DP1	In	1	60	12	Copper	Magnetic	PVC	Pos: 1.870	0.091
ABC	DON-VFD: P4								Zero: 5.893	0.224
CBL-0133	DON-DP1	In	1	42	8	Copper	Magnetic	PVC	Pos: 0.810	0.075
ABC	DON-CH PUMP 2								Zero: 2.556	0.186
CBL-0134	DON-MDP: DONN	In	1	4	600	Copper	Busway	Epoxy	Pos: 0.020	0.013
ABC	DON-MDP sec 1:								Zero: 0.496	0.256
CBL-0135	WH-MDP	In	1	110	3/0	Copper	Magnetic	PVC	Pos: 0.080	0.052
ABC	WH-DP-4								Zero: 0.254	0.128
CBL-0136	WH-MDP	In	1	40	3/0	Copper	Magnetic	PVC	Pos: 0.080	0.052
ABC	WH-DP-2								Zero: 0.254	0.128

Name Phases	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------ Size	Cond. Type	Duct Type	Insul	Ohms/ 1000 feet R	jX
CBL-0137	WH-MDP	In	1	20	3/0	Copper	Magnetic	PVC	Pos: 0.080	0.052
ABC	WH-DP-3								Zero: 0.254	0.128
CBL-0138	WH-MDP	In	1	90	3/0	Copper	Magnetic	PVC	Pos: 0.080	0.052
ABC	WH-DP-1								Zero: 0.254	0.128
CBL-0139	WH-MDP	In	1	55	4	Copper	Magnetic	PVC	Pos: 0.320	0.063
ABC	WH-DS: ELEV								Zero: 1.012	0.156
CBL-0140	WH-MDP	In	1	60	6	Copper	Magnetic	PVC	Pos: 0.510	0.069
ABC	WH-WBP-1								Zero: 1.607	0.169
CBL-0141	WH-DS: ELEV	In	1	10	4	Copper	Magnetic	PVC	Pos: 0.320	0.063
ABC	WH-ELEV								Zero: 1.012	0.156
CBL-0142	WH-MDP	In	1	20	8	Copper	Magnetic	PVC	Pos: 0.810	0.075
AB	WH-HWH 4.5kW								Zero: 2.556	0.186
CBL-0143	WH-MDP	In	1	60	8	Copper	Magnetic	PVC	Pos: 0.810	0.075
AB	WH-STORE RM 4								Zero: 2.556	0.186
CBL-0144	WH-MDP	In	1	32	12	Copper	Magnetic	PVC	Pos: 1.870	0.091
AB	WH-COND REC I								Zero: 5.893	0.224
CBL-0145	WH-MDP	In	1	60	8	Copper	Magnetic	PVC	Pos: 0.810	0.075
AB	WH-STORE RM 4								Zero: 2.556	0.186
CBL-0146	GH-1503a	In	1	4	500	Copper	Magnetic	PVC	Pos: 0.030	0.047
ABC	GH-1503b								Zero: 0.093	0.115
CBL-0147	WH-MDP	In	1	20	12	Copper	Magnetic	PVC	Pos: 1.870	0.091
AB	WH-SEWAGE P								Zero: 5.893	0.224
CBL-0148	GH-1504a	In	1	4	500	Copper	Magnetic	PVC	Pos: 0.030	0.047
ABC	GH-1504b								Zero: 0.093	0.115
CBL-0149	WH-DP-4	In	1	30	6	Copper	Magnetic	PVC	Pos: 0.510	0.069
AB	WH-BOOSTER H								Zero: 1.607	0.169
CBL-0150	WH-DP-4	In	1	80	12	Copper	Magnetic	PVC	Pos: 1.870	0.091
ABC	WH-GARBAGE								Zero: 5.893	0.224
CBL-0151	WH-DP-4	In	1	40	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	WH-FREEZER								Zero: 3.719	0.210
CBL-0152	WH-DP-4	In	1	30	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	WH-POTS & PA								Zero: 3.719	0.210
CBL-0153	WH-DP-3	In	1	1	225	Copper	Busway	Epoxy	Pos: 0.040	0.032
ABC	WH-DP-3 BUS								Zero: 0.253	0.173
CBL-0154	WH-DP-2a	In	1	10	3/0	Copper	Magnetic	PVC	Pos: 0.080	0.052
ABC	WH-DP-2								Zero: 0.254	0.128
CBL-0155	WH-DP-1	In	1	50	8	Copper	Magnetic	PVC	Pos: 0.810	0.075
ABC	WH-HVAC ROO								Zero: 2.556	0.186

Name Phases	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------ Size	Cond. Type	Duct Type	Insul	Ohms/ 1000 feet R	jX
CBL-0156 ABC	WH-DP-1 WH-COMPRESS	In	1	100	6	Copper	Magnetic	PVC	Pos: 0.510 Zero: 1.607	0.069 0.169
CBL-0157 ABC	WH-DP-1 WH-EXH FAN	In	1	100	12	Copper	Magnetic	PVC	Pos: 1.870 Zero: 5.893	0.091 0.224
CBL-0158 ABC	T16 SBUS U1-MAINT MDP	In	1	4	1200	Copper	Busway	Epoxy	Pos: 0.010 Zero: 0.066	0.005 0.028
CBL-0159 ABC	U1-MAINT MDP U1-P1	In	1	125	500	Copper	Magnetic	PVC	Pos: 0.030 Zero: 0.093	0.047 0.115
CBL-0160 ABC	U1-MAINT MDP U1-P3	In	1	102	350	Copper	Magnetic	PVC	Pos: 0.040 Zero: 0.119	0.049 0.121
CBL-0161 ABC	GH-1505a GH-1505b	In	1	4	500	Copper	Magnetic	PVC	Pos: 0.030 Zero: 0.093	0.047 0.115
CBL-0162 ABC	U1-MAINT MDP U1-L1	In	1	145	3/0	Copper	Magnetic	PVC	Pos: 0.080 Zero: 0.254	0.052 0.128
CBL-0163 ABC	U1-MAINT MDP U1-L5	In	1	150	400	Copper	Magnetic	PVC	Pos: 0.040 Zero: 0.112	0.049 0.121
CBL-0164 ABC	U1-MAINT MDP U1-P4	In	1	150	3/0	Copper	Magnetic	PVC	Pos: 0.080 Zero: 0.254	0.052 0.128
CBL-0165 ABC	U1-MAINT MDP U1-L3	In	1	20	3	Copper	Magnetic	PVC	Pos: 0.260 Zero: 0.820	0.061 0.150
CBL-0166 ABC	U1-MAINT MDP U1-BOILER RM	In	1	180	3	Copper	Magnetic	PVC	Pos: 0.260 Zero: 0.820	0.061 0.150
CBL-0167 ABC	U1-P1 BUS U1-P2	In	1	5	3/0	Copper	Magnetic	PVC	Pos: 0.080 Zero: 0.254	0.052 0.128
CBL-0168 ABC	U1-BOILER RM U1-BOILER RM I	In	1	1	225	Copper	Busway	Epoxy	Pos: 0.040 Zero: 0.253	0.032 0.173
CBL-0169 C	T17 SBUS GARAGE	In	1	60	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0170 C	GARAGE GARAGE BUS	In	1	2	225	Copper	Busway	Epoxy	Pos: 0.040 Zero: 0.253	0.032 0.173
CBL-0171 ABC	T22 SBUS PT-PP	In	1	60	500	Copper	Non-Magnetic	PVC	Pos: 0.030 Zero: 0.044	0.037 0.100
CBL-0172 ABC	MP-MDP MP-MDP BUS	In	1	2	1200	Copper	Busway	Epoxy	Pos: 0.010 Zero: 0.671	0.008 0.356
CBL-0173 ABC	MP-MDP BUS MP-CHILLER 2	In	1	45	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0174 ABC	MP-MDP BUS MP-LP-A1	In	1	138	500	Copper	Magnetic	PVC	Pos: 0.030 Zero: 0.093	0.047 0.115

Name Phases	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------ Size	Cond. Type	Duct Type	Insul	Ohms/ 1000 feet R	jX
CBL-0175 ABC	MP-MDP BUS MP-LP-C	In	1	350	4/0	Copper	Magnetic	PVC	Pos: 0.060 Zero: 0.202	0.050 0.122
CBL-0176 ABC	MP-MDP BUS MP-LP-B	In	1	420	4/0	Copper	Magnetic	PVC	Pos: 0.060 Zero: 0.202	0.050 0.122
CBL-0177 ABC	MP-MDP BUS MP-CHILLER 1	In	1	42	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080 Zero: 0.122	0.042 0.106
CBL-0178 ABC	MP-MDP BUS MP-AHU4	In	1	150	3	Copper	Magnetic	PVC	Pos: 0.260 Zero: 0.820	0.061 0.150
CBL-0179 ABC	MP-MDP BUS MP-IT SERVER	In	1	145	3	Copper	Magnetic	PVC	Pos: 0.260 Zero: 0.820	0.061 0.150
CBL-0180 ABC	MP-MDP BUS MP-LP-D	In	1	60	2	Copper	Magnetic	PVC	Pos: 0.200 Zero: 0.637	0.059 0.144
CBL-0181 ABC	MP-MDP BUS MP-AHU 1	In	1	392	6	Copper	Magnetic	PVC	Pos: 0.510 Zero: 1.607	0.069 0.169
CBL-0182 ABC	MP-MDP BUS MP-AHU 3	In	1	252	6	Copper	Magnetic	PVC	Pos: 0.510 Zero: 1.607	0.069 0.169
CBL-0183 ABC	MP-MDP BUS MP-CT	In	1	48	10	Copper	Magnetic	PVC	Pos: 1.180 Zero: 3.719	0.085 0.210
CBL-0184 ABC	MP-MDP BUS MP-WELDING	In	1	10	6	Copper	Magnetic	PVC	Pos: 0.510 Zero: 1.607	0.069 0.169
CBL-0185 ABC	MP-MDP BUS MP-HWP-A2	In	1	30	10	Copper	Magnetic	PVC	Pos: 1.180 Zero: 3.719	0.085 0.210
CBL-0186 ABC	MP-MDP BUS MP-CT PUMP P4	In	1	30	10	Copper	Magnetic	PVC	Pos: 1.180 Zero: 3.719	0.085 0.210
CBL-0187 ABC	MP-MDP BUS MP-CWP-P3	In	1	30	10	Copper	Magnetic	PVC	Pos: 1.180 Zero: 3.719	0.085 0.210
CBL-0188 ABC	MP-MDP BUS MP-SUMP PUMP	In	1	30	12	Copper	Magnetic	PVC	Pos: 1.870 Zero: 5.893	0.091 0.224
CBL-0189 ABC	MP-MDP BUS MP-ATS CABIN	In	1	12	1	Copper	Magnetic	PVC	Pos: 0.160 Zero: 0.504	0.057 0.140
CBL-0190 ABC	MP-LP-E1 MP-LP-E2	In	1	420	1	Copper	Magnetic	PVC	Pos: 0.160 Zero: 0.504	0.057 0.140
CBL-0191 ABC	MP-LP-E1 MP-SUMP PUM	In	1	30	8	Copper	Magnetic	PVC	Pos: 0.810 Zero: 2.556	0.075 0.186
CBL-0192 ABC	MP-LP-E1 MP-HTG PUMP	In	1	30	8	Copper	Magnetic	PVC	Pos: 0.810 Zero: 2.556	0.075 0.186
CBL-0193 ABC	1905/1906-MDP 1905/1906 MDP B	In	1	1	400	Copper	Busway	Epoxy	Pos: 0.030 Zero: 0.173	0.030 0.161

Name Phases	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	Size	------ Cable Description ------ Cond. Type	Duct Type	Insul	Ohms/ 1000 feet R	jX
CBL-0194	1905/1906 MDP BU	In	1	40	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	1905/1906-DRYE								Zero: 3.719	0.210
CBL-0195	1903/1904-MDP	In	1	1	400	Copper	Busway	Epoxy	Pos: 0.030	0.030
ABC	1903/1904 MDP B								Zero: 0.173	0.161
CBL-0196	1905/1906 MDP BU	In	1	40	6	Copper	Magnetic	PVC	Pos: 0.510	0.069
ABC	1905/1906-RANG								Zero: 1.607	0.169
CBL-0197	1905/1906 MDP BU	In	1	12	3/0	Copper	Magnetic	PVC	Pos: 0.080	0.052
ABC	1905/1906-LP-1								Zero: 0.254	0.128
CBL-0198	1905/1906 MDP BU	In	1	60	3/0	Copper	Magnetic	PVC	Pos: 0.080	0.052
ABC	1905/1906-RTU-								Zero: 0.254	0.128
CBL-0199	PT-PP	In	1	80	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	PT AHU-2								Zero: 3.719	0.210
CBL-0200	PT-PP	In	1	6	500	Copper	Non-Magnetic	PVC	Pos: 0.030	0.037
ABC	PT-P1: MCB								Zero: 0.044	0.100
CBL-0201	PT-PP	In	1	16	8	Copper	Magnetic	PVC	Pos: 0.810	0.075
ABC	PT POOL								Zero: 2.556	0.186
CBL-0202	PT-PP	In	1	36	3/0	Copper	Magnetic	PVC	Pos: 0.080	0.052
ABC	PT P2								Zero: 0.254	0.128
CBL-0203	PT-PP	In	1	80	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	PT OTPT HEAT								Zero: 3.719	0.210
CBL-0204	PT P2	In	1	60	4	Copper	Magnetic	PVC	Pos: 0.320	0.063
ABC	PT TBP1								Zero: 1.012	0.156
CBL-0205	PT P2	In	1	60	12	Copper	Magnetic	PVC	Pos: 1.870	0.091
ABC	PT CHILLER								Zero: 5.893	0.224
CBL-0206	PT-P1	In	1	110	500	Copper	Non-Magnetic	PVC	Pos: 0.030	0.037
ABC	PT-P1: MCB								Zero: 0.044	0.100
CBL-0207	PT-P1	In	1	15	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	PT-AHU-3W								Zero: 3.719	0.210
CBL-0209	PT-P1	In	1	20	3/0	Copper	Non-Magnetic	PVC	Pos: 0.080	0.042
ABC	PT-L2								Zero: 0.122	0.106
CBL-0210	PT-L2 BUS	In	1	15	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	PT-COND PUMP								Zero: 3.719	0.210
CBL-0211	PT-P1	In	1	100	3	Copper	Magnetic	PVC	Pos: 0.260	0.061
ABC	PT-RTU								Zero: 0.820	0.150
CBL-0212	MP-LP-C	In	1	20	6	Copper	Magnetic	PVC	Pos: 0.510	0.069
ABC	MP-LP: DIMME								Zero: 1.607	0.169
CBL-0213	MP-ATS CABINET	In	1	420	1	Copper	Magnetic	PVC	Pos: 0.160	0.057
ABC	MP-LP-E1								Zero: 0.504	0.140

Name Phases	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	Size	------ Cable Description ------ Cond. Type	Duct Type	Insul	Ohms/ 1000 feet R	jX
CBL-0214	U1-P3	In	1	5	3	Copper	Magnetic	PVC	Pos: 0.260	0.061
ABC	U1-L4								Zero: 0.820	0.150
CBL-0215	U1-L5	In	1	102	4/0	Copper	Magnetic	PVC	Pos: 0.060	0.050
ABC	U1-D Sw: NCI								Zero: 0.202	0.122
CBL-0216	U1-P1	In	1	1	400	Copper	Busway	Epoxy	Pos: 0.030	0.030
ABC	U1-P1 BUS								Zero: 0.173	0.161
CBL-0217	U1-L1	In	1	2	3/0	Copper	Magnetic	PVC	Pos: 0.080	0.052
ABC	U1-L2								Zero: 0.254	0.128
CBL-0218	MP-LP-A1	In	1	5	500	Copper	Magnetic	PVC	Pos: 0.030	0.047
ABC	MP-LP-A2								Zero: 0.093	0.115
CBL-0219	GH-DP/GH	In	1	2	1600	Copper	Busway	Epoxy	Pos: 0.010	0.005
ABC	GH-DP/GH BUS								Zero: 0.055	0.026
CBL-0220	MP-AHU4	In	1	20	3	Copper	Magnetic	PVC	Pos: 0.260	0.061
ABC	MP-AHU4-SF								Zero: 0.820	0.150
CBL-0221	MP-AHU4	In	1	20	3	Copper	Magnetic	PVC	Pos: 0.260	0.061
ABC	MP-AHU4-RF								Zero: 0.820	0.150
CBL-0222	MP-AHU 1	In	1	10	6	Copper	Magnetic	PVC	Pos: 0.510	0.069
ABC	MP-AHU 2								Zero: 1.607	0.169
CBL-0223	MP-AHU 3	In	1	20	6	Copper	Magnetic	PVC	Pos: 0.510	0.069
ABC	MP-AHU3-SF								Zero: 1.607	0.169
CBL-0224	MP-AHU 3	In	1	20	6	Copper	Magnetic	PVC	Pos: 0.510	0.069
ABC	MP-AHU3-RF								Zero: 1.607	0.169
CBL-0225	1903/1904 MDP BU	In	1	40	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	1903/1904-DRYE								Zero: 3.719	0.210
CBL-0226	1903/1904 MDP BU	In	1	40	6	Copper	Magnetic	PVC	Pos: 0.510	0.069
ABC	1903/1904-RANG								Zero: 1.607	0.169
CBL-0227	1903/1904 MDP BU	In	1	12	3/0	Copper	Magnetic	PVC	Pos: 0.080	0.052
ABC	1903/1904-LP1								Zero: 0.254	0.128
CBL-0228	1903/1904 MDP BU	In	1	60	3/0	Copper	Magnetic	PVC	Pos: 0.080	0.052
ABC	1903/1904-RTU-								Zero: 0.254	0.128
CBL-0229	1901/1902-MDP	In	1	1	400	Copper	Busway	Epoxy	Pos: 0.030	0.030
ABC	1901/1902 MDP B								Zero: 0.173	0.161
CBL-0230	1901/1902 MDP BU	In	1	40	10	Copper	Magnetic	PVC	Pos: 1.180	0.085
ABC	1901/1902-DRYE								Zero: 3.719	0.210
CBL-0231	1901/1902 MDP BU	In	1	40	6	Copper	Magnetic	PVC	Pos: 0.510	0.069
ABC	1901/1902-RANG								Zero: 1.607	0.169
CBL-0232	1901/1902 MDP BU	In	1	12	3/0	Copper	Magnetic	PVC	Pos: 0.080	0.052
ABC	1901/1902-LP1								Zero: 0.254	0.128

Name Phases	From Bus To Bus	In/Out Service	Qty /Ph	Length Feet	------ Cable Description ------ Size	Cond. Type	Duct Type	Insul	Ohms/ 1000 feet R	jX
CBL-0233 ABC	1901/1902 MDP BU 1901/1902-RTU-	In	1	60	3/0	Copper	Magnetic	PVC	Pos: 0.080 Zero: 0.254	0.052 0.128
CBL-0234 ABC	U1-D Sw: NCI U1-NCI	In	1	10	4/0	Copper	Magnetic	PVC	Pos: 0.060 Zero: 0.202	0.050 0.122
CBL-0235 ABC	PT-P1 PT- L1	In	1	112	3/0	Copper	Magnetic	PVC	Pos: 0.080 Zero: 0.254	0.052 0.128
CBL-0248 ABC	PT-L2 PT-L2 BUS	In	1	1	225	Copper	Busway	Epoxy	Pos: 0.040 Zero: 0.253	0.032 0.173
CBL-0250 ABC	SITE LTG PANEL SITE LTG PANE	In	1	1	225	Copper	Busway	Epoxy	Pos: 0.040 Zero: 0.253	0.032 0.173
CBL-0251 ABC	SWGR-CPT SEC SWGR-LPSG	In	1	20	1/0	Copper	Non-Magnetic	PVC	Pos: 0.130 Zero: 0.202	0.043 0.110
CBL-0252 ABC	SWGR-LPSG SWGR-LPSG BU	In	1	1	225	Copper	Busway	Epoxy	Pos: 0.040 Zero: 0.253	0.032 0.173
CBL-0253 ABC	SWGR-LPSG BUS GEN- LTG PANE	In	1	60	1/0	Copper	Non-Magnetic	PVC	Pos: 0.130 Zero: 0.202	0.043 0.110
CBL-0254 ABC	SWGR-LPSG BUS SWGR-BATT C	In	1	20	10	Copper	Non-Magnetic	PVC	Pos: 1.180 Zero: 1.876	0.082 0.209

2-Winding Transformers

Name 1 / 3Phase	In/Out	----------Primary & Secondary---------- Phases	Bus	Conn.	Volts	FLA	Nominal kVA		Percent Z in % R	jX
CPT	In	ABC	SWGR-MAIN BUS	D	12,470	2	45.0	Pos:	1.30	3.78
3Phase			SWGR-CPT SEC	WG	208	125		Zero:	1.30	3.78
T1	In	ABC	T1 PBUS	D	12,470	23	500.0	Pos:	0.98	4.60
3Phase			T1 SBUS	WG	480	601		Zero:	0.98	4.60
T11	In	B	T11 PBUS	WG	7,200	14	100.0	Pos:	0.61	2.01
1Phase			T11 SBUS	D	240	417		Zero:	0.61	2.01
T15 (Warehouse)	In	ABC	T15 PBUS	D	12,470	14	300.0	Pos:	1.01	4.18
3Phase			T15 SBUS	WG	208	833		Zero:	1.01	4.18
T16	In	ABC	T16 PBUS	D	12,470	14	300.0	Pos:	1.38	5.74
3Phase			T16 SBUS	WG	208	833		Zero:	1.38	5.74
T17	In	C	T17 PBUS	WG	7,200	7	50.0	Pos:	0.67	1.99
1Phase			T17 SBUS	D	240	208		Zero:	0.67	1.99
T21	In	ABC	T21 PBUS	D	12,470	14	300.0	Pos:	0.79	3.28
3Phase			T21 SBUS	WG	208	833		Zero:	0.79	3.28

Name 1 / 3Phase	In/Out	Primary & Secondary					Nominal kVA		Percent Z in % R	 jX
		Phases	Bus	Conn.	Volts	FLA				
T22	In	ABC	T22 PBUS	D	12,470	5	112.5	Pos:	1.09	3.68
3Phase			T22 SBUS	WG	208	312		Zero:	1.09	3.68
T23	In	ABC	T23 PBUS	D	12,470	7	150.0	Pos:	0.68	2.43
3Phase			T23 SBUS	WG	208	416		Zero:	0.68	2.43
T24	In	B	T24 PBUS	WG	7,200	7	50.0	Pos:	0.67	1.99
1Phase			T24 SBUS	D	240	208		Zero:	0.67	1.99
T25	In	B	T25 PBUS	WG	7,200	10	50.0	Pos:	0.58	1.70
1Phase			T25 SBUS	D	240	313		Zero:	0.58	1.70
T26	In	B	T26 PBUS	WG	7,200	10	50.0	Pos:	0.58	1.70
1Phase			T26 SBUS	D	240	313		Zero:	0.58	1.70
T27	In	B	T27 PBUS	WG	7,200	10	50.0	Pos:	0.58	1.70
1Phase			T27 SBUS	D	240	313		Zero:	0.58	1.70
T28	In	B	T28 PBUS	WG	7,200	10	50.0	Pos:	0.58	1.70
1Phase			T28 SBUS	D	240	313		Zero:	0.58	1.70
T29	In	B	T29 PBUS	WG	7,200	10	50.0	Pos:	0.58	1.70
1Phase			T29 SBUS	D	240	313		Zero:	0.58	1.70
T30	In	C	T30 PBUS	WG	7,200	7	50.0	Pos:	0.67	1.99
1Phase			T30 SBUS	D	240	208		Zero:	0.67	1.99
T31	In	C	T31 PBUS	WG	7,200	7	50.0	Pos:	0.67	1.99
1Phase			T31 SBUS	D	240	208		Zero:	0.67	1.99
T32	In	C	T32 PBUS	WG	7,200	7	50.0	Pos:	0.67	1.99
1Phase			T32 SBUS	D	240	208		Zero:	0.67	1.99
T33	In	C	T33 PBUS	WG	7,200	7	50.0	Pos:	0.67	1.99
1Phase			T33 SBUS	D	240	208		Zero:	0.67	1.99
T34	In	C	T34 PBUS	WG	7,200	7	50.0	Pos:	0.67	1.99
1Phase			T34 SBUS	D	240	208		Zero:	0.67	1.99
T35	In	C	T35 PBUS	WG	7,200	7	50.0	Pos:	0.67	1.99
1Phase			T35 SBUS	D	240	208		Zero:	0.67	1.99
T36	In	ABC	T36 PBUS	D	12,470	14	225.0	Pos:	0.97	3.79
3Phase			T36 SBUS	WG	208	833		Zero:	0.97	3.79
T-DP/GH	In	ABC	T-DP/GH PBUS	D	12,470	23	500.0	Pos:	1.20	5.62
3Phase			T-DP/GH SBUS	WG	208	1,388		Zero:	1.20	5.62
TR G1	In	ABC	TR G1 480V SIDE	D	480	1,804	1,500.0	Pos:	0.83	5.44
3Phase			TR G1 12470V SID	WG	12,470	69		Zero:	0.83	5.44

Table 4 - Input Data Report - Page 15

TAB 7

Table 5ac – AC Arc Flash Risk Report

Table 5dc – DC Arc Flash Risk Report

Arc Flash Hazard Risk Assessment

This Arc Flash Hazard Risk Assessment has been performed per IEEE 1584-2002, 1584a-2004 and NFPA 70E 2018, Annex D to determine the Flash Protection Boundary and Available Incident Energy at a distance so that personnel can select arc rated clothing for use within the Flash Protection Boundary. The incident energy at a distance is listed for each location in the facility so that the proper equipment can be selected when an electrically safe work condition cannot be established.

It is beyond the scope of this study to provide a detailed explanation of arc flash causes, theory of calculation, code implications, etc.

It should not be implied that work on energized equipment with exposure to live parts is an acceptable practice. OSHA 29 CRF Subpart S.1910.333 limits the situations in which work is performed near energized equipment or circuits as follows; “Live parts to which an employee may be exposed shall be de-energized before the employee works on or near them, unless the employer can demonstrate that de-energizing introduces additional or increased hazards or is infeasible due to equipment design or operational limitations.” NFPA 70E-2018 Article 130 – “Work Involving Electrical Hazards” contains information regarding the establishment of electrically safe working conditions and discusses when energized work is permitted.

It is clearly stated in NFPA 70E-2018, Article 105-3 “Responsibility" that "The employer shall provide the safety-related work practices and shall train the employee, who shall then implement them.

This analysis has been performed in strict accordance with IEEE 1584-2002, 1584a-2004 and NFPA 70E-2018. When outside of the range listed below, the Lee equation is followed. The ranges of the model are as follows:

1. Bus voltage between 208V and 15kV
2. Bolted bus fault current at the bus between 700A and 106kA
3. Bus bar gap between 13mm and 153mm

Refer to the Executive Summary for specific information about the Arc Flash calculations at this location. A general summary of the procedure for “any” location is as follows:

1. When an arc flash hazard exists, an approach limit at a distance from exposed live parts within which a person could receive a second degree burn if an electrical arc flash were to occur. The arc flash protection boundary and the incident energy exposure of a worker within this boundary are calculated using the arc fault currents available at the location and the fault clearing times of each upstream over-current protective device to each location. Locations are switchboards, panel boards, industrial control panels,

meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing or maintenance while energized. When an incident energy value at a distance is determined, personnel can then select protective clothing and personal protection equipment.

2. The short-circuit currents and corresponding incident energy values are calculated for all possible system scenarios at a location. The Arc Flash Report shows the worst case incident energy generated from all scenarios on a single table.
3. Settings are determined to achieve the optimum combination of system coordination with the lowest possible hazard rating for downstream equipment in order to minimize the arc flash incident energy value of 8 calories/cm^2 or less, if possible. This is necessary as one could just set all breakers to minimum and achieve absolute minimum arc hazard ratings, but the loss of device selectivity would result in nuisance tripping of breakers due to motor start inrush, faults on single phase lighting and receptacle circuits, and transformer magnetizing inrush, thus rendering the power system unreliable.
4. Cleared Fault Threshold determines the portion of the Total Arcing Fault current at the Bus that needs to be interrupted by protective devices to extinguish the arc. Therefore the remaining portion of Arcing Fault current, if any, cannot sustain the arc and will not be considered in the accumulated incident energy. There is no recommendation in the NFPA or IEEE1584 for the "Fault Clear Threshold". But the assumption comes from the fact that when certain percentage of fault (like 80%) is interrupted by the protective devices then the remaining bolted/arcing fault percentage/current cannot sustain the arc and naturally cannot be added to the accumulated energy. Since the last 5% - 15% of the contribution may take a very long time to trip (a small current has a long delay time), it is not practical to accumulate the energy up to 100%, as the calculated incident energy would be much bigger than reality.
5. Per IEEE Std. 1584-2002, Annex B, paragraph B.1.2, if an arcing fault can be initiated on the line side of a main protective device in an enclosure, that protective device should not be utilized for the calculations. Instead, the remote, isolated, upstream protective device should be used. That is because only an upstream protective device can be considered to provide protection for an arcing fault on the line side of the main protective device in a downstream enclosure when the line and bus components are not isolated by suitable barriers. This applies directly to all panelboards, switchboards and motor control centers. For this reason the Line Side / Load Side hazard labels are used for switchgear only, as these labels are confusing when used on panelboards, switchboards and motor control centers. Switchgear is designed and built to meet requirements of ANSI C37.20.1 and is listed to UL 1558.

Arc Flash Risk Assessment - Standards and Assumptions

Disclaimer: This arc flash analysis is based upon the electrical distribution system configuration, fuse sizes and settings shown on the single line diagram included in this report. Any modifications or alterations to any equipment contained here-in shall render any and all calculations, category ratings and recommendations null and void.

The following standards were followed and assumptions were made during the preparation of this Arc Flash Risk Assessment:

1. Standard: IEEE 1584-2002 and IEEE 1584a-2004 equations presented in NFPA70E-2018, Annex D.
2. Units: English
3. Maximum arcing duration: 2 Seconds
4. Transformer phase shift included.
5. Clear Fault Threshold: 80%
6. Upstream Miscoordination Checked.
7. Grounded is defined as SLG/3P Fault greater than or equal to 5%
8. For voltage above 1kV and trip time <= 0.1s, 1.2 cal/cm^2 (6.276 J/cm^2) is used for flash boundary calculations.
9. Induction motor decay is assumed for 5 cycles.
10. All fuses are assumed as Current Limiting. Manufacturer's equipment specific Incident Energy equations are used if available.
11. Per IEEE 1584-2002 Annex B paragraph B.1.2, if an arcing fault can be initiated on the line side side of the main protective device in an enclosure, only the remote, isolated upstream protective device is considered suitable to provide protection for an arcing fault in a switchboard, panelboard or MCC.

SKM Notes on Arc Flash Report Table:

(*N3) - Arcing Curren (*N3) - Ar (*N3) - Ar (*N3) - Ar (*N3) - Arcing Current Low Tolerances Used

(*N4a) - Equipment Specific Equations Used

(*N4b) - Current Limiting Fuse

(*N9) - Max Arcing Duration Reached

(*N11) - Out of IEEE 1584 Range, Lee Equation Used. Applicable for Open Air only. Existing Equipment type is not Open Air!

(*N15) - Report as <1.2 calories/cm^2 if fed by one transformer size < 125 kVA

(*S0) - Base Scenario, Normal power mode

(*S1) - Scenario 1, Emergency generator mode

Workmen should select proper Personal Protective Equipment (PPE) in accordance with NFPA70E-2018 Table 130.5 (G) "Selection of Arc-Rated Clothing and Other PPE for Use When Incident Energy Exposure is Used".

Table 5ac - AC Arc Flash Risk Assessment

Bus Name (Bus)	Protective Device Name (Prot)	Bus kV	AC Bus Bolted Fault (kA)	AC Bus Arcing Fault (kA)	Trip Delay Time (sec.)	Breaker Opening Time/Tol (sec.)	Ground	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	Notes (See Table 5, Page 1)
1601	T30 PFUSE	0.24	6.69	3.42	2	0.0000	Yes	103	18	20.8	(*N9) (*S0)
1602	T30 PFUSE	0.24	6.69	3.42	2	0.0000	Yes	103	18	20.8	(*N9) (*S0)
1603	T31 PFUSE	0.24	6.68	3.42	2	0.0000	Yes	103	18	20.8	(*N9) (*S0)
1604	T31 PFUSE	0.24	6.68	3.42	2	0.0000	Yes	103	18	20.8	(*N9) (*S0)
1605	T32 PFUSE	0.24	6.68	3.41	2	0.0000	Yes	103	18	20.8	(*N9) (*S0)
1606	T32 PFUSE	0.24	6.68	3.41	2	0.0000	Yes	103	18	20.8	(*N9) (*S0)
1607	T33 PFUSE	0.24	6.65	3.40	2	0.0000	Yes	102	18	20.7	(*N9) (*S0)
1608	T34 PFUSE	0.24	6.66	3.41	2	0.0000	Yes	102	18	20.7	(*N9) (*S0)
1609	T34 PFUSE	0.24	6.66	3.41	2	0.0000	Yes	102	18	20.7	(*N9) (*S0)
1610	T35 PFUSE	0.24	6.66	3.41	2	0.0000	Yes	102	18	20.7	(*N9) (*S0)
1801	T25 PFUSE	0.24	7.36	3.66	2	0.0000	Yes	107	18	22.4	(*N9) (*S0)
1802	T25 PFUSE	0.24	7.36	3.66	2	0.0000	Yes	107	18	22.4	(*N9) (*S0)
1803	T24 PFUSE	0.24	6.68	3.41	2	0.0000	Yes	103	18	20.8	(*N9) (*S0)
1804	T29 PFUSE	0.24	7.39	3.67	2	0.0000	Yes	108	18	22.5	(*N9) (*S0)
1805	T29 PFUSE	0.24	7.39	3.67	2	0.0000	Yes	108	18	22.5	(*N9) (*S0)
1806	T28 PFUSE	0.24	7.38	3.67	2	0.0000	Yes	108	18	22.4	(*N9) (*S0)
1807	T28 PFUSE	0.24	7.38	3.67	2	0.0000	Yes	108	18	22.4	(*N9) (*S0)
1808	T27 PFUSE	0.24	7.37	3.67	2	0.0000	Yes	107	18	22.4	(*N9) (*S0)
1809	T26 PFUSE	0.24	7.36	3.66	2	0.0000	Yes	107	18	22.4	(*N9) (*S0)
1810	T26 PFUSE	0.24	7.36	3.66	2	0.0000	Yes	107	18	22.4	(*N9) (*S0)
1901/1902-DRYER-08	1901/1902-MDP: DRYER	0.208	2.13	1.47		0.0000	Yes	7	18	0.25	(*N4a) (*S0)
1901/1902-LP1	1901/1902-MDP: LP1	0.208	8.10	3.75		0.0000	Yes	7	18	0.25	(*N4a) (*S0)
1901/1902-MDP	T36 PFUSE	0.208	8.74	3.96	2	0.0000	Yes	113	18	24.4	(*N9) (*S0)
1901/1902-RANGE-08	1901/1902-MDP: RANGE	0.208	3.85	2.23		0.0000	Yes	7	18	0.25	(*N4a) (*S0)
1901/1902-RTU-5	1901/1902-MDP: RTU-5	0.208	6.28	3.14		0.0000	Yes	7	18	0.25	(*N4a) (*S0)
1903/1904-DRYER-07	1903/1904-MDP: DRYER	0.208	1.91	1.36		0.0000	Yes	7	18	0.25	(*N4a) (*S0)
1903/1904-LP1	1903/1904-MDP: LP1	0.208	5.60	2.89		0.0000	Yes	7	18	0.25	(*N4a) (*S0)
1903/1904-MDP	T36 PFUSE	0.208	5.91	3.01	2	0.0000	Yes	94	18	18.1	(*N9) (*S0)
1903/1904-RANGE-07	1903/1904-MDP: RANGE	0.208	3.16	1.94		0.0000	Yes	7	18	0.25	(*N4a) (*S0)

Table 5ac - AC Arc Flash Risk Assessment

Bus Name (Bus)	Protective Device Name (Prot)	Bus kV	AC Bus Bolted Fault (kA)	AC Bus Arcing Fault (kA)	Trip Delay Time (sec.)	Breaker Opening Time/Tol (sec.)	Ground	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	Notes (See Table 5, Page 1)
1903/1904-RTU-4	1903/1904-MDP: RTU-4	0.208	4.64	2.54		0.0000	Yes	7	18	0.25	(*N4a) (*S0)
1905/1906-DRYER-06	1905/1906 MDP: DRYER	0.208	1.96	1.38		0.0000	Yes	7	18	0.25	(*N4a) (*S0)
1905/1906-LP-1	1905/1906 MDP: LP-1	0.208	6.04	3.05		0.0000	Yes	7	18	0.25	(*N4a) (*S0)
1905/1906-MDP	T36 PFUSE	0.208	6.40	3.18	2	0.0000	Yes	98	18	19.2	(*N9) (*S0)
1905/1906-RANGE-06	1905/1906 MDP: RANGE	0.208	3.30	2.00		0.0000	Yes	7	18	0.25	(*N4a) (*S0)
1905/1906-RTU-6	1905/1906 MDP: RTU-6	0.208	4.95	2.65		0.0000	Yes	7	18	0.25	(*N4a) (*S0)
1908	T35 PFUSE	0.24	6.66	3.41	2	0.0000	Yes	102	18	20.7	(*N9) (*S0)
AM FDR 167-52	AM FUSE PREF	12.47	2.40	2.03	0.2748	0.0000	Yes	18	36	0.62	(*N3) (*S0)
AM FDR 167-56	AM FUSE RES	12.47	2.38	2.01	0.2747	0.0000	Yes	18	36	0.62	(*N3) (*S0)
APARTMENT A	T11 PFUSE	0.24	9.17	4.29	2	0.0000	Yes	119	18	26.6	(*N9) (*S0)
APARTMENT B	T11 PFUSE	0.24	3.62	2.20	2	0.0000	Yes	77	18	12.9	(*N9) (*S0)
DON-AHU-1	DON-MDP: AHU-1	0.208	1.82	1.12	0.3843	0.0000	Yes	18	18	1.19	(*N3) (*S1)
DON-AHU-1 DRIVE	DON-MDP: AHU-1 DRIVE	0.208	0.87	0.67	0.1632	0.0000	Yes	8	18	0.29	(*N3) (*S1)
DON-AHU-2	DON-MDP: AHU-2	0.208	2.95	1.57	0.2044	0.0000	Yes	15	18	0.91	(*N3) (*S1)
DON-AHU-2 DRIVE	DON-MDP: AHU-2 DRIVE	0.208	1.60	1.20	0.0178	0.0000	Yes	3	18	0.06	(*S0)
DON-CH PUMP 1	DON-DP1: CH PUMP 1	0.208	3.04	1.60	0.186	0.0000	Yes	15	18	0.85	(*N3) (*S1)
DON-CH PUMP 2	DON-DP1: CH PUMP 2	0.208	2.72	1.48	0.217	0.0000	Yes	15	18	0.91	(*N3) (*S1)
DON-CH-1	DON-MDP: CH-1	0.208	6.66	2.78	0.3732	0.0000	Yes	32	18	3.07	(*N3) (*S1)
DON-COMP RM AC UNIT	DON-MDP: COMP RM AC UNIT	0.208	0.87	0.67	0.3661	0.0000	Yes	12	18	0.65	(*N3) (*S1)
DON-CRAC-1	DON-HP2: CRAC-1	0.208	0.42	0.42	0.2376	0.0000	Yes	4	18	0.05	(*N11) (*S1)
DON-CU-3	DON-HP3: CU-3	0.208	0.94	0.70	0.3432	0.0000	Yes	12	18	0.65	(*N3) (*S1)
DON-DP1	DON-MDP: DP1	0.208	8.06	3.18	0.4827	0.0000	Yes	41	18	4.58	(*N3) (*S1)
DON-DP2	DON-MDP: DP2	0.208	9.54	4.21	0.025	0.0000	Yes	8	18	0.33	(*S0)
DON-HP1	DON-MDP: HP1	0.208	7.94	3.70	0.025	0.0000	Yes	7	18	0.28	(*S0)
DON-HP2	DON-MDP: HP2	0.208	2.72	1.48	0.9204	0.0000	Yes	37	18	3.86	(*N3) (*S1)
DON-HP3	DON-MDP: HP3	0.208	2.06	1.22	1.356	0.0000	Yes	41	18	4.60	(*N3) (*S1)
DON-MDP: DONNELLY	SW 12-2	0.208	8.54	3.31	1.006	0.0000	Yes	66	18	9.95	(*N3) (*S1)
DON-VFD: P1	DON-DP1-1: P1	0.208	1.22	0.84	0.0271	0.0000	Yes	3	18	0.06	(*N3) (*S1)
DON-VFD: P2	DON-DP1-2: P2	0.208	1.22	0.84	0.0271	0.0000	Yes	3	18	0.06	(*N3) (*S1)

Table 5ac - AC Arc Flash Risk Assessment

Bus Name (Bus)	Protective Device Name (Prot)	Bus kV	AC Bus Bolted Fault (kA)	AC Bus Arcing Fault (kA)	Trip Delay Time (sec.)	Breaker Opening Time/Tol (sec.)	Ground	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	Notes (See Table 5, Page 1)
DON-VFD: P3	DON-DP1-1: P2	0.208	0.92	0.69	0.1582	0.0000	Yes	8	18	0.29	(*N3) (*S1)
DON-VFD: P4	DON-DP1-2: P3	0.208	1.00	0.73	0.1429	0.0000	Yes	7	18	0.28	(*N3) (*S1)
DON-WH-1	DON-DP-2: WH-1	0.208	1.67	1.05	0.1553	0.0000	Yes	10	18	0.45	(*N3) (*S1)
GARAGE	T17 PFUSE	0.24	6.32	3.28	2	0.0000	Yes	100	18	19.9	(*N9) (*S0)
GEN 1	GEN 1: MCB	0.48	10.64	6.91	2	0.0000	Yes	160	18	43.0	(*N9) (*S1)
GEN- LTG PANEL	SWGR-LPSG: MCB	0.208	2.31	1.32	2	0.0000	Yes	18	18	< 1.2	(*N3) (*N9) (*N15)
GH-1502a	GH-DP: GH-1502	0.208	5.51	2.86	2	0.0000	Yes	91	18	17.2	(*N9) (*S0)
GH-1502b	GH-DP: GH-1502	0.208	5.46	2.84	2	0.0000	Yes	91	18	17.0	(*N9) (*S0)
GH-1503a	GH-DP: GH-1503	0.208	7.60	3.59	2	0.0000	Yes	106	18	21.9	(*N9) (*S0)
GH-1503b	GH-DP: GH-1503	0.208	7.49	3.55	2	0.0000	Yes	105	18	21.7	(*N9) (*S0)
GH-1504a	GH-DP: GH-1504	0.208	8.96	4.03	2	0.0000	Yes	114	18	24.8	(*N9) (*S0)
GH-1504b	GH-DP: GH-1504	0.208	8.82	3.98	2	0.0000	Yes	113	18	24.5	(*N9) (*S0)
GH-1505a	GH-DP: GH1505	0.208	9.11	4.07	2	0.0000	Yes	114	18	24.7	(*N9) (*S1)
GH-1505b	GH-DP: GH1505	0.208	14.41	4.78	2	0.0000	Yes	128	18	29.9	(*N3) (*N9) (*S0)
GH-CC1	GH-DP: CC1	0.208	3.46	1.76	2	0.0000	Yes	66	18	10.1	(*N3) (*N9) (*S0)
GH-DP/GH	SW 12-3	0.208	19.30	6.90	2	0.0000	Yes	163	18	44.4	(*N9) (*S0)
MP-AHU 1	MP-MDP: AHU 1 & 2	0.208	0.58	0.58	0.0223	0.0000	Yes	1	18	0.01	(*N11) (*S1)
MP-AHU 2	MP-MDP: AHU 1 & 2	0.208	0.56	0.56	0.0236	0.0000	Yes	1	18	0.01	(*N11) (*S1)
MP-AHU 3	MP-MDP: AHU 3	0.208	1.08	0.77	0.3455	0.0000	Yes	12	18	0.64	(*N3) (*S1)
MP-AHU3-RF	MP-MDP: AHU 3	0.208	1.00	0.73	0.4586	0.0000	Yes	14	18	0.80	(*N3) (*S1)
MP-AHU3-SF	MP-MDP: AHU 3	0.208	1.01	0.74	0.4523	0.0000	Yes	14	18	0.79	(*N3) (*S1)
MP-AHU4	MP-MDP: AHU4/RAF4	0.208	2.73	1.48	0.1287	0.0000	Yes	11	18	0.53	(*N3) (*S1)
MP-AHU4-RF	MP-MDP: AHU4/RAF4	0.208	2.45	1.38	0.1713	0.0000	Yes	12	18	0.64	(*N3) (*S1)
MP-AHU4-SF	MP-MDP: AHU4/RAF4	0.208	2.46	1.38	0.1705	0.0000	Yes	12	18	0.64	(*N3) (*S1)
MP-ATS CABINET	MP-MDP: LP-E1	0.208	16.87	6.28	0.0083	0.0000	Yes	5	18	0.17	(*N4b) (*S0)
MP-CHILLER 1	MP-MDP: CHILLER 1	0.208	8.81	3.38	0.0643	0.0000	Yes	13	18	0.66	(*N3) (*S1)
MP-CHILLER 2	MDP MP: CHILLER 2	0.208	8.66	3.34	0.0662	0.0000	Yes	13	18	0.67	(*N3) (*S1)
MP-CT	MP-MDP: CT	0.208	2.08	1.44	0.0083	0.0000	Yes	2	18	0.03	(*N4b) (*S0)
MP-CT PUMP P4	MP-MDP: CT PUMP P4	0.208	3.16	1.94	0.0042	0.0000	Yes	2	18	0.02	(*N4b) (*S0)

Table 5ac - AC Arc Flash Risk Assessment

Bus Name (Bus)	Protective Device Name (Prot)	Bus kV	AC Bus Bolted Fault (kA)	AC Bus Arcing Fault (kA)	Trip Delay Time (sec.)	Breaker Opening Time/Tol (sec.)	Ground	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	Notes (See Table 5, Page 1)
MP-CWP-P3	MP-MDP: CWP-P3	0.208	3.16	1.94	0.0042	0.0000	Yes	2	18	0.02	(*N4b) (*S0)
MP-HTG PUMP	MP-LP-E1-12: HTG PUMP	0.208	1.19	0.98	0.0175	0.0000	Yes	3	18	0.05	(*S0)
MP-HWP-A2	MP-MDP: HWP-A2	0.208	3.16	1.65	0.0083	0.0000	Yes	2	18	0.04	(*N3) (*N4b) (*S0)
MP-IT SERVER	MP-MDP: IT SERVER	0.208	2.59	1.43	0.1073	0.0000	Yes	10	18	0.43	(*N3) (*S1)
MP-LP: DIMMER PANEL	MP-LP-C: DIMMER PANEL	0.208	2.86	1.81	0.0183	0.0000	Yes	4	18	0.10	(*S0)
MP-LP-A1	MP-MDP: LP-A1 & LP-A2	0.208	6.67	2.78	2	0.0000	Yes	88	18	16.1	(*N3) (*N9) (*S1)
MP-LP-A2	MP-MDP: LP-A1 & LP-A2	0.208	6.57	2.75	2	0.0000	Yes	87	18	15.9	(*N3) (*N9) (*S1)
MP-LP-B	MP-MDP: LP-B	0.208	3.09	1.62	1.842	0.0000	Yes	60	18	8.52	(*N3) (*S0)
MP-LP-C	MP-MDP: LP-C	0.208	3.15	1.64	1.685	0.0000	Yes	57	18	7.81	(*N3) (*S1)
MP-LP-D	MP-MDP: LP-D	0.208	5.65	2.47	0.0283	0.0000	Yes	6	18	0.21	(*N3) (*S1)
MP-LP-E1	MP-MDP: LP-E1	0.208	1.47	0.96	0.6419	0.0000	Yes	22	18	1.69	(*N3) (*S1)
MP-LP-E2	MP-LP-E1-1: LP-E2	0.208	0.81	0.74	2	0.0000	Yes	38	18	4.00	(*N9) (*S0)
MP-MDP	SW 11-2	0.208	11.57	4.82	2	0.0000	Yes	124	18	28.5	(*N9) (*S1)
MP-SUMP PUMP	MP-MDP: SUMP PUMP	0.208	1.93	1.16	0.0083	0.0000	Yes	2	18	0.03	(*N3) (*N4b) (*S1)
MP-SUMP PUMP 2	MP-LP-E1-13: SUMP PUMP 2	0.208	1.15	0.81	0.0295	0.0000	Yes	3	18	0.06	(*N3) (*S1)
MP-WELDING	MP-MDP: WELDING	0.208	13.08	4.46	0.0083	0.0000	Yes	4	18	0.12	(*N3) (*N4b) (*S0)
PT AHU-2	PT-PP: AHU-2	0.208	1.11	0.93		0.0000	Yes	17	18	1.12	(*N4a) (*N15) (*S1)
PT CHILLER	PT P2-2: CHILLER	0.208	0.97	0.84	0.01	0.0000	Yes	2	18	0.02	(*N15) (*S0)
PT- L1	PT-P1: L1	0.208	3.14	1.93		0.0000	Yes	8	18	0.33	(*N4a) (*N15) (*S1)
PT OTPT HEAT	PT-PP: OTPT HEAT	0.208	1.11	0.93		0.0000	Yes	17	18	1.12	(*N4a) (*N15) (*S1)
PT P2	PT-PP: P2	0.208	5.68	2.92		0.0000	Yes	7	18	0.25	(*N4a) (*N15) (*S0)
PT POOL	PT-PP: POOL	0.208	4.50	2.48		0.0000	Yes	7	18	0.25	(*N4a) (*N15) (*S0)
PT TBP1	PT P2-32: TBP1	0.208	3.29	1.99	0.01	0.0000	Yes	3	18	0.06	(*N15) (*S0)
PT-AHU-3W	PT-P1: AHU	0.208	3.38	2.03		0.0000	Yes	7	18	0.25	(*N4a) (*N15) (*S0)
PT-COND PUMP	PT-L2: PT COND PUMP	0.208	3.22	1.96	0.0167	0.0000	Yes	4	18	0.10	(*N15) (*S0)
PT-L2	PT-P1 MAIN	0.208	4.82	2.22	2	0.0000	Yes	18	18	< 1.2	(*N3) (*N9) (*N15)
PT-L2 BUS	PT-P1 MAIN	0.208	4.81	2.21	2	0.0000	Yes	18	18	< 1.2	(*N3) (*N9) (*N15)
PT-P1	PT-P1 MAIN	0.208	5.11	2.31	2	0.0000	Yes	18	18	< 1.2	(*N3) (*N9) (*N15)
PT-P1: MCB	T22 PFUSE	0.208	6.48	3.21	2	0.0000	Yes	18	18	< 1.2	(*N9) (*N15) (*S0)

Table 5ac - AC Arc Flash Risk Assessment

Bus Name (Bus)	Protective Device Name (Prot)	Bus kV	AC Bus Bolted Fault (kA)	AC Bus Arcing Fault (kA)	Trip Delay Time (sec.)	Breaker Opening Time/Tol (sec.)	Ground	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	Notes (See Table 5, Page 1)
PT-PP	T22 PFUSE	0.208	6.57	3.24	2	0.0000	Yes	18	18	< 1.2	(*N9) (*N15) (*S0)
PT-RTU	PT-P1: RTU	0.208	2.67	1.72		0.0000	Yes	7	18	0.25	(*N4a) (*N15) (*S0)
SITE LTG PANEL	T1 PFUSE	0.48	5.07	3.12	1.21	0.0000	Yes	70	18	11.1	(*N3) (*S1)
SW 1	F1A_D50-51P	12.47	0.33	0.33	1.343	0.0833	Yes	61	36	3.41	(*N11) (*S1)
SW 10	F3A_D50-51P	12.47	0.33	0.33	1.482	0.0833	Yes	63	36	3.71	(*N11) (*S1)
SW 11	F3A_D50-51P	12.47	0.33	0.33	1.494	0.0833	Yes	64	36	3.73	(*N11) (*S1)
SW 12	F3A_D50-51P	12.47	0.33	0.33	1.505	0.0833	Yes	64	36	3.75	(*N11) (*S1)
SW 13	F3B_D50-51P	12.47	0.33	0.33	1.38	0.0833	Yes	61	36	3.46	(*N11) (*S1)
SW 14	F3B_D50-51P	12.47	0.33	0.33	1.365	0.0833	Yes	61	36	3.44	(*N11) (*S1)
SW 15	F3B_D50-51P	12.47	0.33	0.33	1.359	0.0833	Yes	61	36	3.43	(*N11) (*S1)
SW 3	F1B_D50-51P	12.47	0.33	0.33	1.368	0.0833	Yes	61	36	3.44	(*N11) (*S1)
SW 4	F1B_D50-51P	12.47	0.33	0.33	1.357	0.0833	Yes	61	36	3.43	(*N11) (*S1)
SW 5	F2A_D50-51P	12.47	0.33	0.33	1.4	0.0833	Yes	62	36	3.54	(*N11) (*S1)
SW 6	F2A_D50-51P	12.47	0.33	0.33	1.405	0.0833	Yes	62	36	3.54	(*N11) (*S1)
SW 7	F2A_D50-51P	12.47	0.33	0.33	1.411	0.0833	Yes	62	36	3.55	(*N11) (*S1)
SW 8	F2B_D50-51P	12.47	0.33	0.33	1.363	0.0833	Yes	61	36	3.44	(*N11) (*S1)
SW 9	F2B_D50-51P	12.47	0.33	0.33	1.347	0.0833	Yes	61	36	3.42	(*N11) (*S1)
SWGR GEN LINE	GEN 1: MCB	12.47	0.33	0.33	2	0.0000	Yes	72	36	4.78	(*N9) (*N11) (*S1)
SWGR PREF LINE	AM FUSE PREF	12.47	2.40	2.03	0.2748	0.0000	Yes	18	36	0.62	(*N3) (*S0)
SWGR RES LINE	AM FUSE RES	12.47	2.38	2.01	0.2748	0.0000	Yes	18	36	0.62	(*N3) (*S0)
SWGR-BATT CHRG	SWGR-LPSG: MCB	0.208	2.16	1.26	2	0.0000	Yes	18	18	< 1.2	(*N3) (*N9) (*N15)
SWGR-CPT SEC	SWGR-CPT FUSE	0.208	3.06	1.89	2	0.0000	Yes	18	18	< 1.2	(*N9) (*N15) (*S0)
SWGR-LPSG	SWGR-CPT FUSE	0.208	2.93	1.84	2	0.0000	Yes	18	18	< 1.2	(*N9) (*N15) (*S0)
SWGR-LPSG BUS	SWGR-LPSG: MCB	0.208	2.93	1.84	0.0112	0.0000	Yes	3	18	0.06	(*N15) (*S0)
SWGR-MAIN BUS	GEN D50-51P	12.47	0.33	0.33	1.917	0.0830	Yes	72	36	4.78	(*N9) (*N11) (*S1)
T1 PBUS	F1A_D50-51P	12.47	0.33	0.33	1.345	0.0833	Yes	61	36	3.41	(*N11) (*S1)
T1 SBUS	T1 PFUSE	0.48	5.27	3.22	1.107	0.0000	Yes	68	18	10.5	(*N3) (*S1)
T11 PBUS	SW 3-2B	12.47	0.38	0.38	0.4569	0.0000	Yes	37	36	1.26	(*N11) (*S1)
T11 SBUS	T11 PFUSE	0.24	14.77	5.14	2	0.0000	Yes	134	18	32.3	(*N3) (*N9) (*S0)

Table 5ac - AC Arc Flash Risk Assessment

Bus Name (Bus)	Protective Device Name (Prot)	Bus kV	AC Bus Bolted Fault (kA)	AC Bus Arcing Fault (kA)	Trip Delay Time (sec.)	Breaker Opening Time/Tol (sec.)	Ground	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	Notes (See Table 5, Page 1)
T15 PBUS	F2A_D50-51P	12.47	0.33	0.33	1.411	0.0833	Yes	62	36	3.55	(*N11) (*S1)
T15 SBUS	T15 PFUSE	0.208	17.46	6.43	2	0.0000	Yes	154	18	40.6	(*N9) (*S0)
T16 PBUS	SW 8-2	12.47	0.33	0.33	0.1422	0.0000	Yes	19	36	0.35	(*N11) (*S1)
T16 SBUS	SW 8-2	0.208	12.88	4.42	2	0.0000	Yes	121	18	27.4	(*N3) (*N9) (*S0)
T17 PBUS	F2B_D50-51P	12.47	0.38	0.38	0.9862	0.0833	Yes	56	36	2.93	(*N11) (*S1)
T17 SBUS	T17 PFUSE	0.24	5.33	2.47	2	0.0000	Yes	82	18	14.3	(*N3) (*N9) (*S1)
T21 PBUS	SW 11-2	12.47	0.33	0.33	0.151	0.0000	Yes	20	36	0.37	(*N11) (*S1)
T21 SBUS	SW 11-2	0.208	11.75	4.87	2	0.0000	Yes	125	18	28.9	(*N9) (*S1)
T22 PBUS	SW 11-3	12.47	0.33	0.33	0.6215	0.0000	Yes	40	36	1.47	(*N11) (*S1)
T22 SBUS	T22 PFUSE	0.208	7.69	3.62	2	0.0000	Yes	18	18	< 1.2	(*N9) (*N15) (*S0)
T23 PBUS	SW 12-2	12.47	0.32	0.32	0.0637	0.0000	Yes	13	36	0.16	(*N11) (*S1)
T23 SBUS	SW 12-2	0.208	9.14	3.47	0.9143	0.0000	Yes	64	18	9.52	(*N3) (*S1)
T24 PBUS	SW 13-2B	12.47	0.38	0.38	0.4597	0.0000	Yes	37	36	1.27	(*N11) (*S1)
T24 SBUS	T24 PFUSE	0.24	5.33	2.46	2	0.0000	Yes	82	18	14.3	(*N3) (*N9) (*S1)
T25 PBUS	SW 13-2B	12.47	0.38	0.38	0.4615	0.0000	Yes	37	36	1.27	(*N11) (*S1)
T25 SBUS	T25 PFUSE	0.24	5.76	2.61	1.854	0.0000	Yes	81	18	14.1	(*N3) (*S1)
T26 PBUS	SW 13-2B	12.47	0.38	0.38	0.4638	0.0000	Yes	37	36	1.27	(*N11) (*S1)
T26 SBUS	T26 PFUSE	0.24	5.75	2.61	1.857	0.0000	Yes	81	18	14.1	(*N3) (*S1)
T27 PBUS	SW 14-2B	12.47	0.38	0.38	0.4584	0.0000	Yes	37	36	1.26	(*N11) (*S1)
T27 SBUS	T27 PFUSE	0.24	5.77	2.61	1.849	0.0000	Yes	81	18	14.1	(*N3) (*S1)
T28 PBUS	SW 14-2B	12.47	0.38	0.38	0.4563	0.0000	Yes	37	36	1.26	(*N11) (*S1)
T28 SBUS	T28 PFUSE	0.24	5.77	2.61	1.845	0.0000	Yes	81	18	14.0	(*N3) (*S1)
T29 PBUS	SW 14-2B	12.47	0.38	0.38	0.4536	0.0000	Yes	37	36	1.26	(*N11) (*S1)
T29 SBUS	T29 PFUSE	0.24	5.78	2.62	1.841	0.0000	Yes	81	18	14.0	(*N3) (*S1)
T30 PBUS	SW 14-2C	12.47	0.38	0.38	0.4558	0.0000	Yes	37	36	1.26	(*N11) (*S1)
T30 SBUS	T30 PFUSE	0.24	5.34	2.47	2	0.0000	Yes	82	18	14.3	(*N3) (*N9) (*S1)
T31 PBUS	SW 14-2C	12.47	0.38	0.38	0.457	0.0000	Yes	37	36	1.26	(*N11) (*S1)
T31 SBUS	T31 PFUSE	0.24	5.33	2.47	2	0.0000	Yes	82	18	14.3	(*N3) (*N9) (*S1)
T32 PBUS	SW 14-2C	12.47	0.38	0.38	0.4606	0.0000	Yes	37	36	1.27	(*N11) (*S1)

Table 5ac - AC Arc Flash Risk Assessment

Bus Name (Bus)	Protective Device Name (Prot)	Bus kV	AC Bus Bolted Fault (kA)	AC Bus Arcing Fault (kA)	Trip Delay Time (sec.)	Breaker Opening Time/Tol (sec.)	Ground	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	Notes (See Table 5, Page 1)
T32 SBUS	T32 PFUSE	0.24	5.32	2.46	2	0.0000	Yes	82	18	14.3	(*N3) (*N9) (*S1)
T33 PBUS	SW 13-2C	12.47	0.37	0.37	0.4723	0.0000	Yes	37	36	1.28	(*N11) (*S1)
T33 SBUS	T33 PFUSE	0.24	5.29	2.45	2	0.0000	Yes	82	18	14.3	(*N3) (*N9) (*S1)
T34 PBUS	SW 13-2C	12.47	0.37	0.37	0.4694	0.0000	Yes	37	36	1.28	(*N11) (*S1)
T34 SBUS	T34 PFUSE	0.24	5.30	2.46	2	0.0000	Yes	82	18	14.3	(*N3) (*N9) (*S1)
T35 PBUS	SW 13-2C	12.47	0.38	0.38	0.4669	0.0000	Yes	37	36	1.28	(*N11) (*S1)
T35 SBUS	T35 PFUSE	0.24	5.31	2.46	2	0.0000	Yes	82	18	14.3	(*N3) (*N9) (*S1)
T36 PBUS	F3B_D50-51P	12.47	0.33	0.33	1.361	0.0833	Yes	61	36	3.43	(*N11) (*S1)
T36 SBUS	T36 PFUSE	0.208	14.40	5.62	2	0.0000	Yes	142	18	35.6	(*N9) (*S0)
T-DP/GH PBUS	SW 12-3	12.47	0.32	0.32	0.2908	0.0000	Yes	27	36	0.69	(*N11) (*S1)
T-DP/GH SBUS	SW 12-3	0.208	20.63	7.23	2	0.0000	Yes	168	18	46.7	(*N9) (*S0)
TR G1 12470V SIDE	GEN 1: MCB	12.47	0.33	0.33	2	0.0000	Yes	72	36	4.78	(*N9) (*N11) (*S1)
TR G1 480V SIDE	GEN 1: MCB	0.48	10.55	6.86	2	0.0000	Yes	159	18	42.7	(*N9) (*S1)
U1-BOILER RM	U1-MAINT: L4	0.208	2.07	1.22	0.0377	0.0000	Yes	5	18	0.13	(*N3) (*S1)
U1-BOILER RM BUS	U1-MAINT: L4	0.208	2.07	1.22	0.0377	0.0000	Yes	5	18	0.13	(*N3) (*S1)
U1-D Sw: NCI	U1-P3: L5	0.208	3.87	2.23	2	0.0000	Yes	77	18	13.0	(*N9) (*S1)
U1-L1	U1-MAINT: L1 & L2	0.208	4.44	2.09	2	0.0000	Yes	74	18	12.1	(*N3) (*N9) (*S1)
U1-L2	U1-MAINT: L1 & L2	0.208	4.41	2.08	2	0.0000	Yes	74	18	12.1	(*N3) (*N9) (*S1)
U1-L3	U1-MAINT: L3	0.208	9.36	4.15	0.0167	0.0000	Yes	6	18	0.21	(*S0)
U1-L4	U1-P3: L4	0.208	5.61	2.46	0.0286	0.0000	Yes	6	18	0.21	(*N3) (*S1)
U1-L5	U1-MAINT: L5	0.208	6.61	3.25	2	0.0000	Yes	99	18	19.7	(*N9) (*S0)
U1-MAINT MDP	SW 8-2	0.208	12.83	4.40	2	0.0000	Yes	121	18	27.4	(*N3) (*N9) (*S0)
U1-NCI	U1-P3: L5	0.208	3.77	2.19	2	0.0000	Yes	76	18	12.8	(*N9) (*S1)
U1-P1	U1-MAINT: P1	0.208	7.47	3.54	2	0.0000	Yes	105	18	21.6	(*N9) (*S0)
U1-P1 BUS	U1-MAINT: P1	0.208	7.45	3.54	2	0.0000	Yes	105	18	21.6	(*N9) (*S0)
U1-P2	U1-P1: P2	0.208	5.56	2.45	0.1724	0.0000	Yes	18	18	1.24	(*N3) (*S1)
U1-P3	U1-MAINT: P3	0.208	7.79	3.10	2	0.0000	Yes	96	18	18.7	(*N3) (*N9) (*S0)
U1-P4	U1-MAINT: P4	0.208	5.39	2.40	2	0.0000	Yes	81	18	14.2	(*N3) (*N9) (*S0)
WH-BOOSTER HTR	WH-DP-4: BOOSTER HTR	0.208	3.20	1.66	0.1733	0.0000	Yes	14	18	0.82	(*N3) (*S1)

Table 5ac - AC Arc Flash Risk Assessment

Bus Name (Bus)	Protective Device Name (Prot)	Bus kV	AC Bus Bolted Fault (kA)	AC Bus Arcing Fault (kA)	Trip Delay Time (sec.)	Breaker Opening Time/Tol (sec.)	Ground	Arc Flash Boundary (in)	Working Distance (in)	Incident Energy (cal/cm2)	Notes (See Table 5, Page 1)
WH-COMPRESSOR	WH-DP1-18: COMPRESSOR	0.208	1.76	1.09	1.172	0.0000	Yes	35	18	3.52	(*N3) (*S1)
WH-COND REC PMP	WH-MDP-36: COND PUMP	0.208	1.72	1.26	0.0178	0.0000	Yes	3	18	0.06	(*S0)
WH-DP-1	WH-MDP-8: DP-1	0.208	7.57	3.04	2	0.0000	Yes	95	18	18.2	(*N3) (*N9) (*S0)
WH-DP-2	WH-MDP-2: DP-2	0.208	7.32	2.97	2	0.0000	Yes	92	18	17.3	(*N3) (*N9) (*S1)
WH-DP-2a	WH-MDP-2: DP-2	0.208	6.95	2.86	2	0.0000	Yes	90	18	16.7	(*N3) (*N9) (*S1)
WH-DP-3	WH-MDP-13: DP-3	0.208	8.19	3.21	0.0342	0.0000	Yes	8	18	0.33	(*N3) (*S1)
WH-DP-3 BUS	WH-MDP-13: DP-3	0.208	8.17	3.21	0.0346	0.0000	Yes	8	18	0.34	(*N3) (*S1)
WH-DP-4	WH-MDP-1: DP-4	0.208	6.79	2.82	2	0.0000	Yes	90	18	16.7	(*N3) (*N9) (*S0)
WH-DS: ELEV	WH-MDP-20: ELEV	0.208	5.38	2.81	0.0173	0.0000	Yes	5	18	0.15	(*S0)
WH-ELEV	WH-FUSE: ELEV	0.208	4.06	1.96	0.0281	0.0000	Yes	5	18	0.16	(*N3) (*S1)
WH-EXH FAN	WH-DP1-20: WH EXH FAN	0.208	0.60	0.60	0.2137	0.0000	Yes	4	18	0.06	(*N11) (*S1)
WH-FREEZER	WH-DP-4: FREEZER	0.208	1.84	1.13	0.1363	0.0000	Yes	10	18	0.43	(*N3) (*S1)
WH-GARBAGE	WH-DP-4: GARBAGE	0.208	0.72	0.58	0.2216	0.0000	Yes	8	18	0.34	(*N3) (*S1)
WH-HVAC ROOF	WH-DP1-1: HVAC ROOF	0.208	2.09	1.23	0.3109	0.0000	Yes	17	18	1.07	(*N3) (*S1)
WH-HWH 4.5kW	WH-MDP-32: HWH-4.5kW	0.208	5.36	2.81	0.017	0.0000	Yes	5	18	0.14	(*S0)
WH-MDP	WH SWBD: MAIN FUSE	0.208	9.27	4.12		0.0000	Yes	91	18	17.2	(*N4a) (*N9) (*S1)
WH-POTS & PANS	WH-DP-4: POTS & PANS	0.208	2.22	1.29	0.0284	0.0000	Yes	4	18	0.10	(*N3) (*S1)
WH-SEWAGE PUMP	WH-MDP-47: SEWAGE PUMP	0.208	2.66	1.72	0.017	0.0000	Yes	4	18	0.08	(*S0)
WH-STORE RM A/C	WH-MDP-37: STORE RM A/C	0.208	1.96	1.18	0.2198	0.0000	Yes	13	18	0.72	(*N3) (*S1)
WH-STORE RM A/C-2	WH-MDP-41: STORE RM A/C-2	0.208	1.96	1.18	0.2198	0.0000	Yes	13	18	0.72	(*N3) (*S1)
WH-SWBD: LINE	T15 PFUSE	0.208	15.86	6.01	2	0.0000	Yes	147	18	37.7	(*N9) (*S0)
WH-WBP-1	WH-MDP-25: WBP-1	0.208	3.40	2.04	0.0172	0.0000	Yes	4	18	0.10	(*S0)

WARNING

Arc Flash and Shock Risk
Appropriate PPE Required

FLASH PROTECTION

Flash Risk at **18 in**
Min. Arc Rating: **< 1.2 cal/cm^2**
Flash Protection Boundary: **18 in**

SHOCK PROTECTION

Shock Risk when cover is removed **208 VAC**
Limited Approach **42 in**
Restricted Approach **Avoid Contact**

Warning: Update label following changes in system configurations or equipment settings.

VK P#: 1412 Date: August, 2018

Bus: PT-PP Prot: T22 PFUSE

Typical Arc Flash Label - AC System

Table 5dc - DC Arc Flash Risk Assessment

Bus Name	Protective Device Name	Bus kV	DC Bus Bolted Fault (kA)	DC Bus Arcing Fault (kA)	Bus Equiv Resist (Ohms)	Trip Delay Time (sec)	Duration of Arc (Sec)	Working Distance (in)	Arc Flash Boundary (in)	Incident Energy (cal/cm2)	Notes (See Table 5, Page 1)
dcBUS-0002	MaxTripTime @2.0s	0.05	0.652	0.326	0.0736	2	0	18	6	0.15	(*N2) (*N9) (*S0)
Battery Cabinet	MaxTripTime @2.0s	0.05	0.635	0.318	0.0756	2	0	18	6	0.15	(*N2) (*N9) (*S0)

WARNING

Arc Flash and Shock Risk
Appropriate PPE Required

FLASH PROTECTION

Flash Risk at **18 in**
Min. Arc Rating: **0.15 cal/cm^2**
Flash Protection Boundary: **6 in**

SHOCK PROTECTION

Shock Risk when cover is removed **48 VDC**
Limited Approach **Not Specified**
Restricted Approach **Not Specified**

Warning: Update label following changes in system configurations or equipment settings.

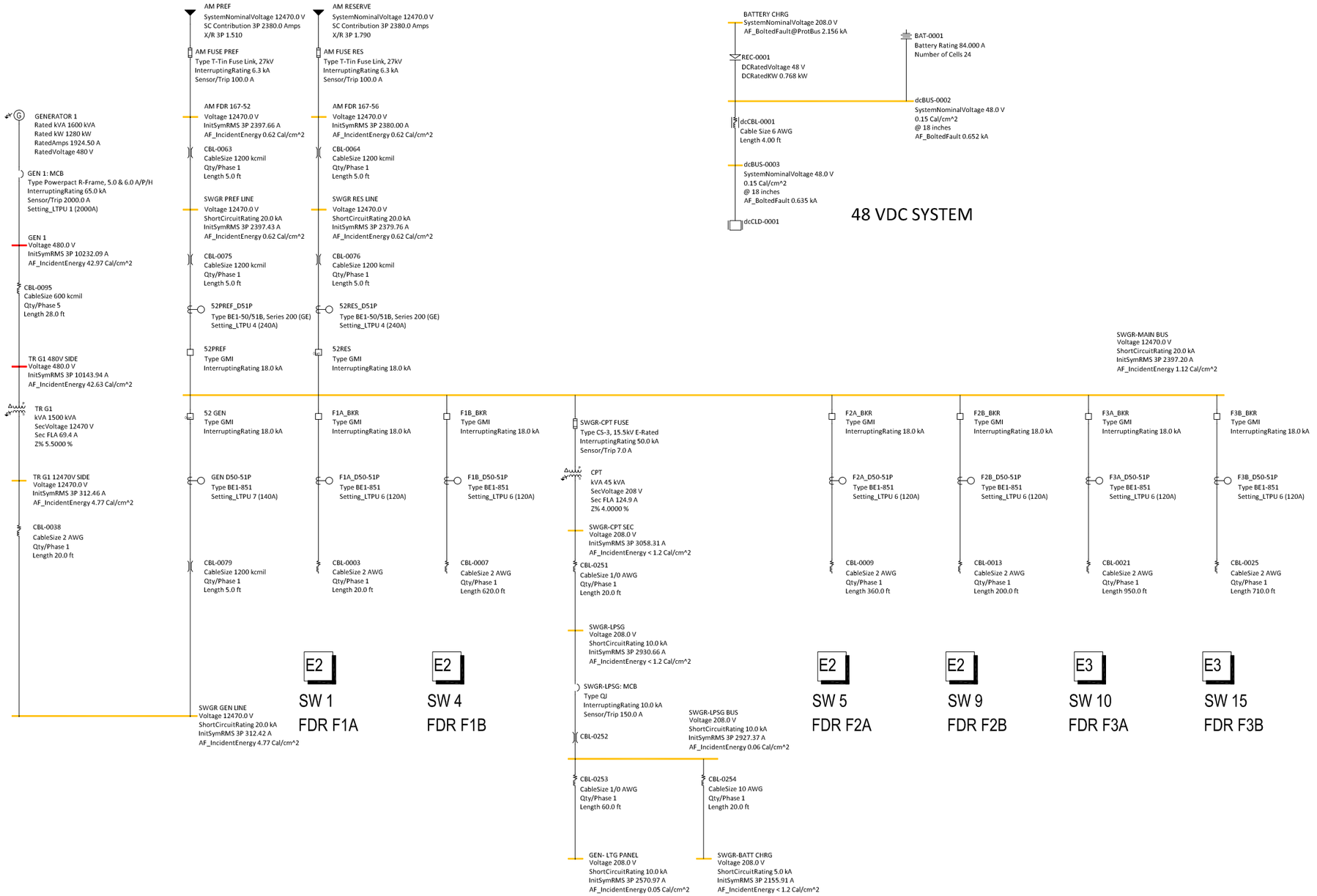
VK P#: 1412 Date: August, 2018

Bus: BATTERY CABINET Prot: MaxTripTime @2.0s

Typical Arc Flash Label - DC System

TAB 8

Single Line Diagrams



DRAWING LISTING:

E1 12KV SWITCHGEAR, GENERATOR & 48 VDC
E2 12KV FEEDERS F2A & F2B
E3 12KV FEEDERS F3A & F3B
E4 UNIT 1 / MAINTENANCE
E5 WAREHOUSE / FOOD DISTRIBUTION CENTER
E6 PHYSICAL THERAPY / GROUP HOME 1500s
E7 MULTIPURPOSE
E8 DONNELLY (ADMINISTRATION)
E9 1900 BLDGs
E10 SINGLE PHASE LOADS – FEEDER F1B
E11 SINGLE PHASE LOADS – FEEDERS F3A & F3B

NO:	DATE	REVISIONS
1	5-1-2015	Original Issue
2	2-16-2018	Revised per Review Comments
3	7-9-2018	Revised per Field Notes
4	9-18-2018	Revised per Review Comments

ABBREVIATIONS

AC	ALTERNATING CURRENT	MTS	MANUAL TRANSFER SWITCH
ATS	AUTOMATIC TRANSFER SWITCH	N	NORMAL POWER SOURCE
BD	BUS DUCT	NC	NORMALLY CLOSED BREAKER
DC	DIRECT CURRENT	NO	NORMALLY OPEN BREAKER
DP	DISTRIBUTION PANEL	PDP	POWER DISTRIBUTION PANEL
DSw	DISCONNECT SWITCH	PRI	PRIMARY
E	EMERGENCY POWER SOURCE	SEC	SECONDARY
FDR	FEEDER	SLG	SINGLE LINE TO GROUND
kA	AMPERES (THOUSANDS)	SW	SWITCH
kAIC	INTERRUPTING CURRENT	SWBD	SWITCHBOARD
MCB	MAIN CIRCUIT BREAKER	UPS	UNINTERRUPTABLE POWER SUPPLY
MCCB	MOLDED CASE CIRCUIT BREAKER	VFD	VARIABLE FREQUENCY DRIVE
MSB	MAIN SWITCHBOARD		

GENERAL NOTES

1. INPUT DATA SHOWN ON THIS SINGLE LINE DIAGRAM ARE "PER UNIT" VALUES WITH A 100MVA BASE.
2. THE UTILITY FAULT CONTRIBUTIONS USED FOR THIS STUDY ARE DISCUSSED IN TAB 1 – "EXECUTIVE SUMMARY".
3. THREE PHASE SYMMETRICAL FAULT VALUES ARE SHOWN ON THIS DRAWING. OTHER FAULT TYPES ARE SHOWN ON TABLE 4 IN TAB 6 (THREE PHASE, SINGLE PHASE & DC)
4. THE "kAIC" RATINGS SHOWN WITH EACH PROTECTIVE DEVICE ARE THE FULLY RATED DEVICE VALUES UNLESS NOTED.
5. ALL BREAKERS ARE ASSUMED CLOSED. OPEN BREAKERS ARE SHOWN "NO" = NORMALLY OPEN.
6. ARC FLASH RISK INDICATOR (WORST CASE):
   0 – < or = 8 CAL/CM^2
   > 8 – 40 CAL/CM^2
   > 40 CAL/CM^2

E3 SYMBOL INDICATES A CONTINUATION, EITHER "FROM DRAWING E3" OR "TO DRAWING E3".

SINGLE PHASE COMPONENT OR LOAD

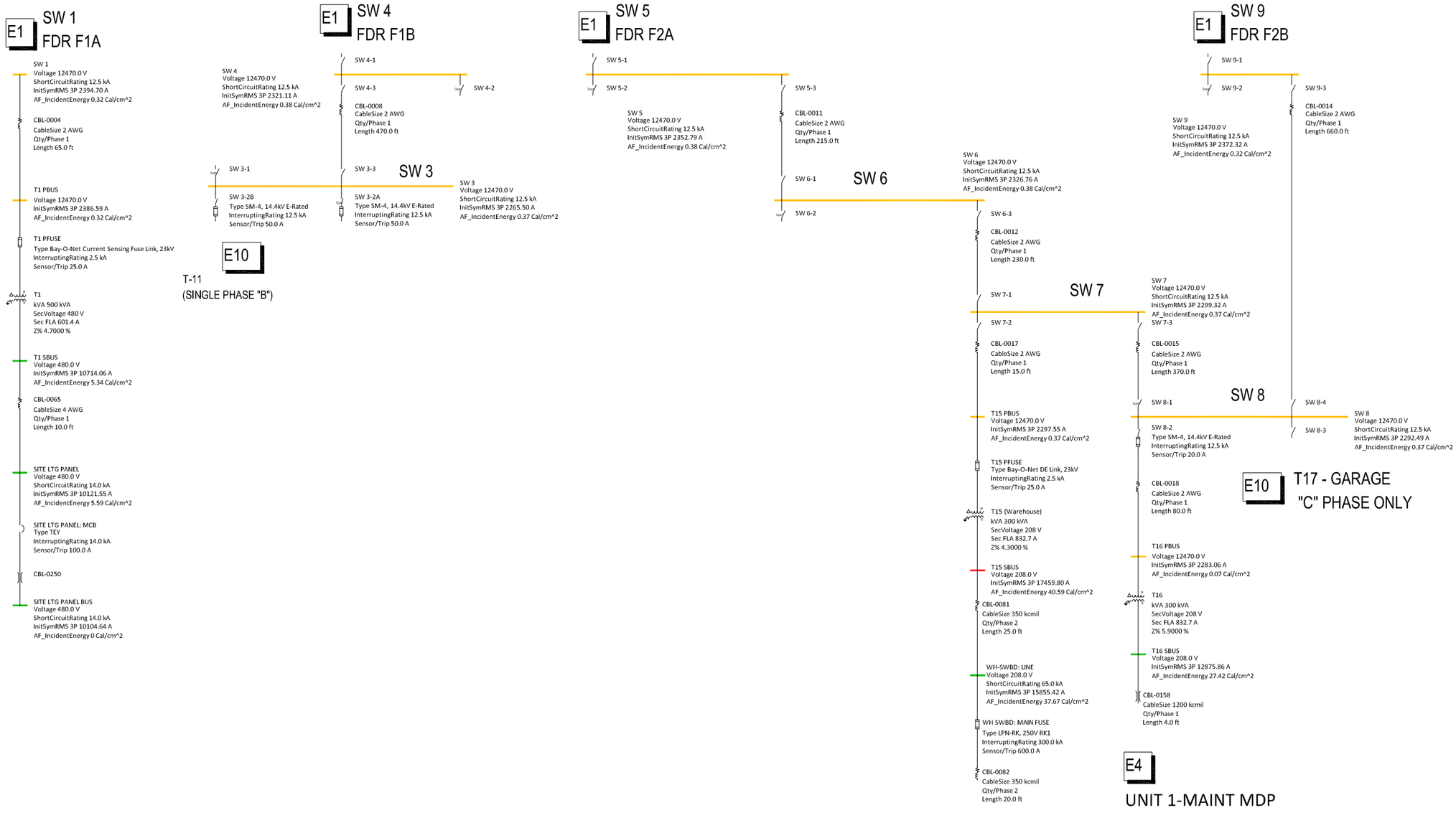
Rogers–Schmidt Engineering Co., P.C.
1736 West Park Center Drive, Suite 204
St. Louis, Missouri 63026
(636) 600–1551

Vincent Kunderman, PE
PO Box 11
Eureka, Missouri 63025
(314) 303–5978 office
MO State Certificate of Authority #005599

POWER SYSTEM STUDY
Single Line Diagram

Drawing Title:
Bellefontaine Habilitation Center
10695 Bellefontaine Road
Bellefontaine, Missouri 63137

Drawn By:	VJK	Size		Date Plotted	Plot Number / Job Number / Cor Number	Sheet No.
Date:	5-1-2015					E1
Scale:	N.T.S.	24" x 36"				
CAD File:	1412E.dwg			Approvals		
REF File:	NA		Drafting	Engineering	Others	
Checked By:	VJK		VJK	VJK		



DRAWING LISTING:

E1 12KV SWITCHGEAR, GENERATOR & 48 VDC
E2 12KV FEEDERS F2A & F2B
E3 12KV FEEDERS F3A & F3B
E4 UNIT 1 / MAINTENANCE
E5 WAREHOUSE / FOOD DISTRIBUTION CENTER
E6 PHYSICAL THERAPY / GROUP HOME 1500s
E7 MULTIPURPOSE
E8 DONNELLY (ADMINISTRATION)
E9 1900 BLDGs
E10 SINGLE PHASE LOADS – FEEDER F1B
E11 SINGLE PHASE LOADS – FEEDERS F3A & F3B

NO:	DATE	REVISIONS
1	5-1-2015	Original Issue
2	2-16-2018	Revised per Review Comments
3	7-9-2018	Revised per Field Notes
4	9-18-2018	Revised per Review Comments

ABBREVIATIONS

AC	ALTERNATING CURRENT	MTS	MANUAL TRANSFER SWITCH
ATS	AUTOMATIC TRANSFER SWITCH	N	NORMAL POWER SOURCE
BD	BUS DUCT	NC	NORMALLY CLOSED BREAKER
DC	DIRECT CURRENT	NO	NORMALLY OPEN BREAKER
DP	DISTRIBUTION PANEL	PDP	POWER DISTRIBUTION PANEL
DSw	DISCONNECT SWITCH	PRI	PRIMARY
E	EMERGENCY POWER SOURCE	SEC	SECONDARY
FDR	FEEDER	SLG	SINGLE LINE TO GROUND
kA	AMPERES (THOUSANDS)	SW	SWITCH
kAIC	INTERRUPTING CURRENT	SWBD	SWITCHBOARD
MCB	MAIN CIRCUIT BREAKER	UPS	UNINTERRUPTABLE POWER SUPPLY
MCCB	MOLDED CASE CIRCUIT BREAKER	VFD	VARIABLE FREQUENCY DRIVE
MSB	MAIN SWITCHBOARD		

GENERAL NOTES

1. INPUT DATA SHOWN ON THIS SINGLE LINE DIAGRAM ARE "PER UNIT" VALUES WITH A 100MVA BASE.
2. THE UTILITY FAULT CONTRIBUTIONS USED FOR THIS STUDY ARE DISCUSSED IN TAB 1 – "EXECUTIVE SUMMARY".
3. THREE PHASE SYMMETRICAL FAULT VALUES ARE SHOWN ON THIS DRAWING. OTHER FAULT TYPES ARE SHOWN ON TABLE 4 IN TAB 6 (THREE PHASE, SINGLE PHASE & DC)
4. THE "kAIC" RATINGS SHOWN WITH EACH PROTECTIVE DEVICE ARE THE FULLY RATED DEVICE VALUES UNLESS NOTED.
5. ALL BREAKERS ARE ASSUMED CLOSED. OPEN BREAKERS ARE SHOWN "NO" = NORMALLY OPEN.
6. ARC FLASH RISK INDICATOR (WORST CASE):
   0 – < or = 8 CAL/CM^2
   > 8 – 40 CAL/CM^2
   > 40 CAL/CM^2

E3 SYMBOL INDICATES A CONTINUATION, EITHER "FROM DRAWING E3" OR "TO DRAWING E3".

SINGLE PHASE COMPONENT OR LOAD

Rogers–Schmidt Engineering Co., P.C.
1736 West Park Center Drive, Suite 204
St. Louis, Missouri 63026
(636) 600–1551

Vincent Kunderman, PE
PO Box 11
Eureka, Missouri 63025
(314) 303–5978 office
MO State Certificate of Authority #005599

POWER SYSTEM STUDY
Single Line Diagram

Drawing Title:
Bellefontaine Habilitation Center
10695 Bellefontaine Road
Bellefontaine, Missouri 63137

Drawn By:	VJK	Size	Date Plotted	Plot Number	Sheet No.
Date:	5-1-2015			Job Number / Cat Number	E2
Scale:	N.T.S.	24" x 36"			
CAD File:	1412E.dwg		Approvals		
REF File:	NA	Drafting	Engineering	Others	
Checked By:	VJK	VJK	VJK		

E1 SW 10
FDR F3A

SW 10
Voltage 12470.0 V
ShortCircuitRating 12.5 kA
InitSymRMS 3P 2282.83 A
AF_IncidentEnergy 0.37 Cal/cm^2

SW 10-1

SW 10-4

CBL-0023
CableSize 2 AWG
Qty/Phase 1
Length 460.0 ft

SW 11-1

SW 11

SW 11
Voltage 12470.0 V
ShortCircuitRating 12.5 kA
InitSymRMS 3P 2230.05 A
AF_IncidentEnergy 0.37 Cal/cm^2

SW 11-2
Type SM-4, 14.4kV E-Rated
InterruptingRating 12.5 kA
Sensor/Trip 20.0 A

CBL-0028
CableSize 1 AWG
Qty/Phase 1
Length 45.0 ft

T21 PBUS
Voltage 12470.0 V
InitSymRMS 3P 2225.77 A
AF_IncidentEnergy 0.07 Cal/cm^2

T21
kVA 300 kVA
SecVoltage 208 V
Sec FLA 832.7 A
Z% 3.3700 %

T21 SBUS
Voltage 208.0 V
InitSymRMS 3P 21829.28 A
AF_IncidentEnergy 22.11 Cal/cm^2

CBL-0071
CableSize 500 kcmil
Qty/Phase 3
Length 12.0 ft

SW 11-3
Type SM-4, 14.4kV E-Rated
InterruptingRating 12.5 kA
Sensor/Trip 50.0 A

CBL-0034
CableSize 2 AWG
Qty/Phase 1
Length 265.0 ft

T22 PBUS
Voltage 12470.0 V
InitSymRMS 3P 2200.15 A
AF_IncidentEnergy 0.09 Cal/cm^2

T22 PFUSE
Type Bay-O-Net DE Link, 23kV
InterruptingRating 2.5 kA
Sensor/Trip 12.0 A

T22
kVA 112.5 kVA
SecVoltage 208 V
Sec FLA 312.3 A
Z% 3.8400 %

T22 SBUS
Voltage 208.0 V
InitSymRMS 3P 7687.84 A
AF_IncidentEnergy < 1.2 Cal/cm^2

SW 11-4

CBL-0024
CableSize 2 AWG
Qty/Phase 1
Length 410.0 ft

SW 12-1

SW 12

SW 12
Voltage 12470.0 V
ShortCircuitRating 12.5 kA
InitSymRMS 3P 2184.03 A
AF_IncidentEnergy 0.36 Cal/cm^2

SW 12-2
Type SM-4, 14.4kV E-Rated
InterruptingRating 12.5 kA
Sensor/Trip 10.0 A

CBL-0029
CableSize 2 AWG
Qty/Phase 1
Length 260.0 ft

T23 PBUS
Voltage 12470.0 V
InitSymRMS 3P 2155.55 A
AF_IncidentEnergy 0.06 Cal/cm^2

T23
kVA 150 kVA
SecVoltage 208 V
Sec FLA 416.4 A
Z% 2.5200 %

SW 12-3
Type SM-4, 14.4kV E-Rated
InterruptingRating 12.5 kA
Sensor/Trip 30.0 A

CBL-0031
CableSize 2 AWG
Qty/Phase 1
Length 210.0 ft

T-DP/GH PBUS
Voltage 12470.0 V
InitSymRMS 3P 2160.99 A
AF_IncidentEnergy 0.08 Cal/cm^2

T-DP/GH
kVA 500 kVA
SecVoltage 208 V
Sec FLA 1387.9 A
Z% 5.7500 %

T-DP/GH SBUS
Voltage 208.0 V
InitSymRMS 3P 20628.22 A
AF_IncidentEnergy 46.74 Cal/cm^2

CBL-0084
CableSize 600 kcmil
Qty/Phase 4
Length 38.0 ft

GH-DP/GH
Voltage 208.0 V
ShortCircuitRating 65.0 kA
InitSymRMS 3P 19295.46 A
AF_IncidentEnergy 44.43 Cal/cm^2

GH-DP: MCB
Type PG, 525
InterruptingRating 65.0 kA
Sensor/Trip 1600.0 A

CBL-0219

SW 12-4

CBL-0027
CableSize 2 AWG
Qty/Phase 1
Length 675.0 ft

SW 13

SW 13-1

SW 13-3

SW 13
Voltage 12470.0 V
ShortCircuitRating 12.5 kA
InitSymRMS 3P 2207.19 A
AF_IncidentEnergy 0.36 Cal/cm^2

SW 13-2B
Type SM-4, 14.4kV E-Rated
InterruptingRating 12.5 kA
Sensor/Trip 50.0 A

SW 13-2C
Type SM-4, 14.4kV E-Rated
InterruptingRating 12.5 kA
Sensor/Trip 50.0 A

SW 13 (SINGLE PHASE LOADS)

E11

E7
MULTI-PURPOSE

E6
PHYSICAL THERAPY

E8
DONNELLY

E6
GROUP HOME - DP/GH

E1 SW 15
FDR F3B

SW 15
Voltage 12470.0 V
ShortCircuitRating 12.5 kA
InitSymRMS 3P 2310.32 A
AF_IncidentEnergy 0.38 Cal/cm^2

SW 15-1

SW 15-3

CBL-0026
CableSize 2 AWG
Qty/Phase 1
Length 240.0 ft

SW 14-1

SW 14

SW 14
Voltage 12470.0 V
ShortCircuitRating 12.5 kA
InitSymRMS 3P 2281.88 A
AF_IncidentEnergy 0.37 Cal/cm^2

SW 14-3

CBL-0033
CableSize 2 AWG
Qty/Phase 1
Length 650.0 ft

SW 14-2C
Type SM-4, 14.4kV E-Rated
InterruptingRating 12.5 kA
Sensor/Trip 50.0 A

SW 14-2B
Type SM-4, 14.4kV E-Rated
InterruptingRating 12.5 kA
Sensor/Trip 50.0 A

E11 SW 14
SINGLE PHASE LOADS

SW 15-2

CBL-0032
CableSize 6 AWG
Qty/Phase 1
Length 40.0 ft

T36 PBUS
Voltage 12470.0 V
InitSymRMS 3P 2300.08 A
AF_IncidentEnergy 0.37 Cal/cm^2

T36 PFUSE
Type Bay-O-Net DE Link, 23kV
InterruptingRating 2.5 kA
Sensor/Trip 25.0 A

T36
kVA 225 kVA
SecVoltage 208 V
Sec FLA 832.7 A
Z% 3.9100 %

T36 SBUS
Voltage 208.0 V
InitSymRMS 3P 14404.82 A
AF_IncidentEnergy 35.6 Cal/cm^2

CBL-0072
CableSize 4/0 AWG
Qty/Phase 1
Length 75.0 ft

CBL-0073
CableSize 4/0 AWG
Qty/Phase 1
Length 160.0 ft

CBL-0074
CableSize 4/0 AWG
Qty/Phase 1
Length 140.0 ft

E9
BLDG 1901/1902

E9
BLDG 1903/1904

E9
BLDG 1905/1906

DRAWING LISTING:

E1 12KV SWITCHGEAR, GENERATOR & 48 VDC
E2 12KV FEEDERS F2A & F2B
E3 12KV FEEDERS F3A & F3B
E4 UNIT 1 / MAINTENANCE
E5 WAREHOUSE / FOOD DISTRIBUTION CENTER
E6 PHYSICAL THERAPY / GROUP HOME 1500s
E7 MULTIPURPOSE
E8 DONNELLY (ADMINISTRATION)
E9 1900 BLDGs
E10 SINGLE PHASE LOADS – FEEDER F1B
E11 SINGLE PHASE LOADS – FEEDERS F3A & F3B

NO:	DATE	REVISIONS
1	5-1-2015	Original Issue
2	2-16-2018	Revised per Review Comments
3	7-9-2018	Revised per Field Notes
4	9-18-2018	Revised per Review Comments

ABBREVIATIONS

AC	ALTERNATING CURRENT	MTS	MANUAL TRANSFER SWITCH
ATS	AUTOMATIC TRANSFER SWITCH	N	NORMAL POWER SOURCE
BD	BUS DUCT	NC	NORMALLY CLOSED BREAKER
DC	DIRECT CURRENT	NO	NORMALLY OPEN BREAKER
DP	DISTRIBUTION PANEL	PDP	POWER DISTRIBUTION PANEL
DSw	DISCONNECT SWITCH	PRI	PRIMARY
E	EMERGENCY POWER SOURCE	SEC	SECONDARY
FDR	FEEDER	SLG	SINGLE LINE TO GROUND
kA	AMPERES (THOUSANDS)	SW	SWITCH
kAIC	INTERRUPTING CURRENT	SWBD	SWITCHBOARD
MCB	MAIN CIRCUIT BREAKER	UPS	UNINTERRUPTABLE POWER SUPPLY
MCCB	MOLDED CASE CIRCUIT BREAKER	VFD	VARIABLE FREQUENCY DRIVE
MSB	MAIN SWITCHBOARD		

GENERAL NOTES

1. INPUT DATA SHOWN ON THIS SINGLE LINE DIAGRAM ARE "PER UNIT" VALUES WITH A 100MVA BASE.
2. THE UTILITY FAULT CONTRIBUTIONS USED FOR THIS STUDY ARE DISCUSSED IN TAB 1 – "EXECUTIVE SUMMARY".
3. THREE PHASE SYMMETRICAL FAULT VALUES ARE SHOWN ON THIS DRAWING. OTHER FAULT TYPES ARE SHOWN ON TABLE 4 IN TAB 6 (THREE PHASE, SINGLE PHASE & DC)
4. THE "kAIC" RATINGS SHOWN WITH EACH PROTECTIVE DEVICE ARE THE FULLY RATED DEVICE VALUES UNLESS NOTED.
5. ALL BREAKERS ARE ASSUMED CLOSED. OPEN BREAKERS ARE SHOWN "NO" = NORMALLY OPEN.
6. ARC FLASH RISK INDICATOR (WORST CASE):
   0 – < or = 8 CAL/CM^2
   > 8 – 40 CAL/CM^2
   > 40 CAL/CM^2

E3 SYMBOL INDICATES A CONTINUATION, EITHER "FROM DRAWING E3" OR "TO DRAWING E3".

SINGLE PHASE COMPONENT OR LOAD

Rogers–Schmidt Engineering Co., P.C.
1736 West Park Center Drive, Suite 204
St. Louis, Missouri 63026
(636) 600–1551

Vincent Kunderman, PE
PO Box 11
Eureka, Missouri 63025
(314) 303–5978 office
MO State Certificate of Authority #005599

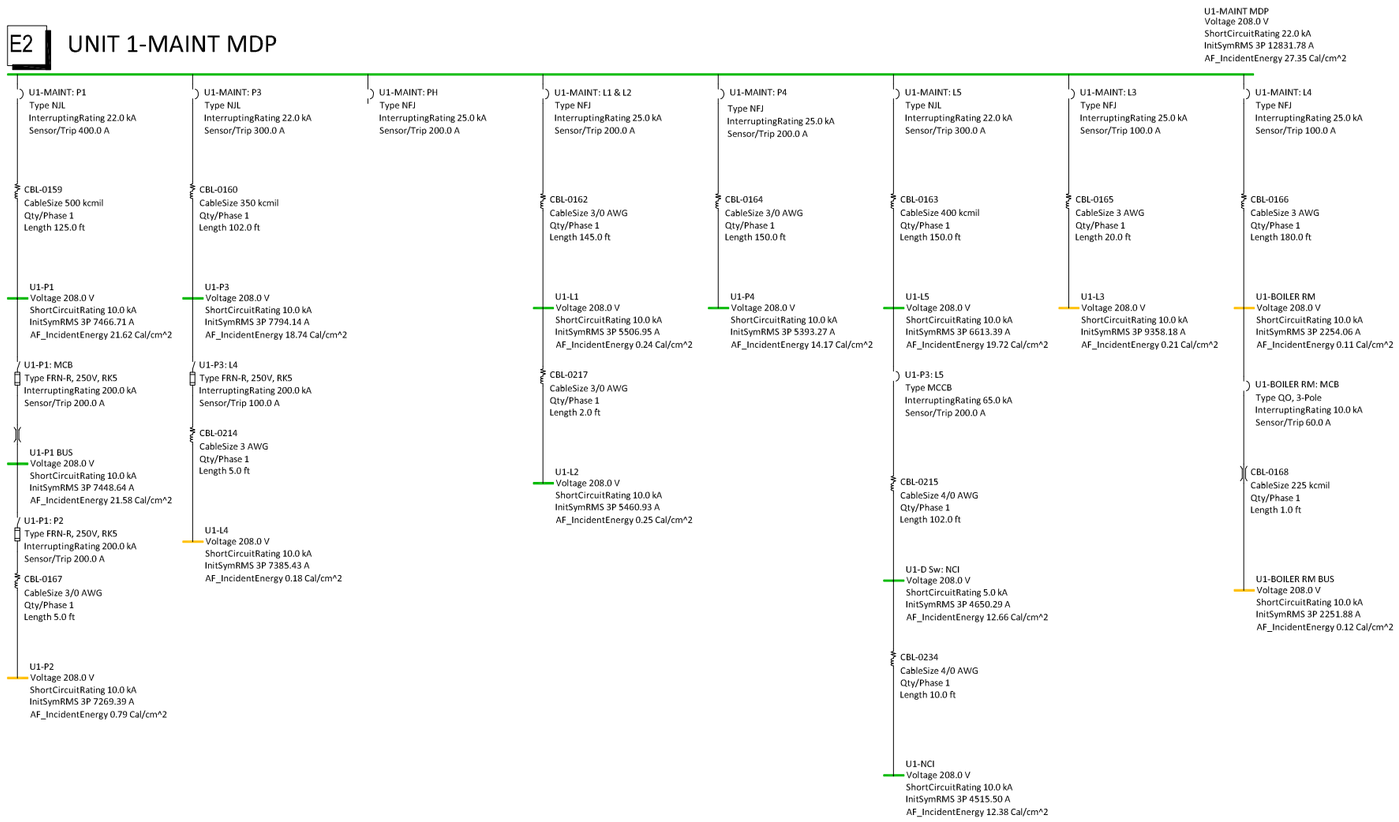
POWER SYSTEM STUDY
Single Line Diagram

Drawing Title:
Bellefontaine Habilitation Center
10695 Bellefontaine Road
Bellefontaine, Missouri 63137

Drawn By:	VJK	Size	Date Plotted	Plot Number	Sheet No.
Date:	5-1-2015			Job Number / Dwg Number	E3
Scale:	N.T.S.	24" x 36"			
CAD File:	1412E.dwg		Approvals		
REF File:	NA	Drafting	Engineering	Others	
Checked By:	VJK	VJK	VJK		

E2

UNIT 1-MAINT MDP



DRAWING LISTING:

NO:	DATE	REVISIONS
1	5-1-2015	Original Issue
2	2-16-2018	Revised per Review Comments
3	7-9-2018	Revised per Field Notes
4	9-18-2018	Revised per Review Comments

ABBREVIATIONS

AC	ALTERNATING CURRENT	MTS	MANUAL TRANSFER SWITCH
ATS	AUTOMATIC TRANSFER SWITCH	N	NORMAL POWER SOURCE
BD	BUS DUCT	NC	NORMALLY CLOSED BREAKER
DC	DIRECT CURRENT	NO	NORMALLY OPEN BREAKER
DP	DISTRIBUTION PANEL	PDP	POWER DISTRIBUTION PANEL
DSw	DISCONNECT SWITCH	PRI	PRIMARY
E	EMERGENCY POWER SOURCE	SEC	SECONDARY
FDR	FEEDER	SLG	SINGLE LINE TO GROUND
kA	AMPERES (THOUSANDS)	SW	SWITCH
kAIC	INTERRUPTING CURRENT	SWBD	SWITCHBOARD
MCB	MAIN CIRCUIT BREAKER	UPS	UNINTERRUPTABLE POWER SUPPLY
MCCB	MOLDED CASE CIRCUIT BREAKER	VFD	VARIABLE FREQUENCY DRIVE
MSB	MAIN SWITCHBOARD		

GENERAL NOTES

1. INPUT DATA SHOWN ON THIS SINGLE LINE DIAGRAM ARE "PER UNIT" VALUES WITH A 100MVA BASE.
2. THE UTILITY FAULT CONTRIBUTIONS USED FOR THIS STUDY ARE DISCUSSED IN TAB 1 – "EXECUTIVE SUMMARY".
3. THREE PHASE SYMMETRICAL FAULT VALUES ARE SHOWN ON THIS DRAWING. OTHER FAULT TYPES ARE SHOWN ON TABLE 4 IN TAB 6 (THREE PHASE, SINGLE PHASE & DC)
4. THE "kAIC" RATINGS SHOWN WITH EACH PROTECTIVE DEVICE ARE THE FULLY RATED DEVICE VALUES UNLESS NOTED.
5. ALL BREAKERS ARE ASSUMED CLOSED. OPEN BREAKERS ARE SHOWN "NO" = NORMALLY OPEN.
6. ARC FLASH RISK INDICATOR (WORST CASE):
   - 0 – < or = 8 CAL/CM^2
   - > 8 – 40 CAL/CM^2
   - > 40 CAL/CM^2

E3 SYMBOL INDICATES A CONTINUATION, EITHER "FROM DRAWING E3" OR "TO DRAWING E3".

SINGLE PHASE COMPONENT OR LOAD

Rogers–Schmidt Engineering Co., P.C.
1736 West Park Center Drive, Suite 204
St. Louis, Missouri 63026
(636) 600–1551

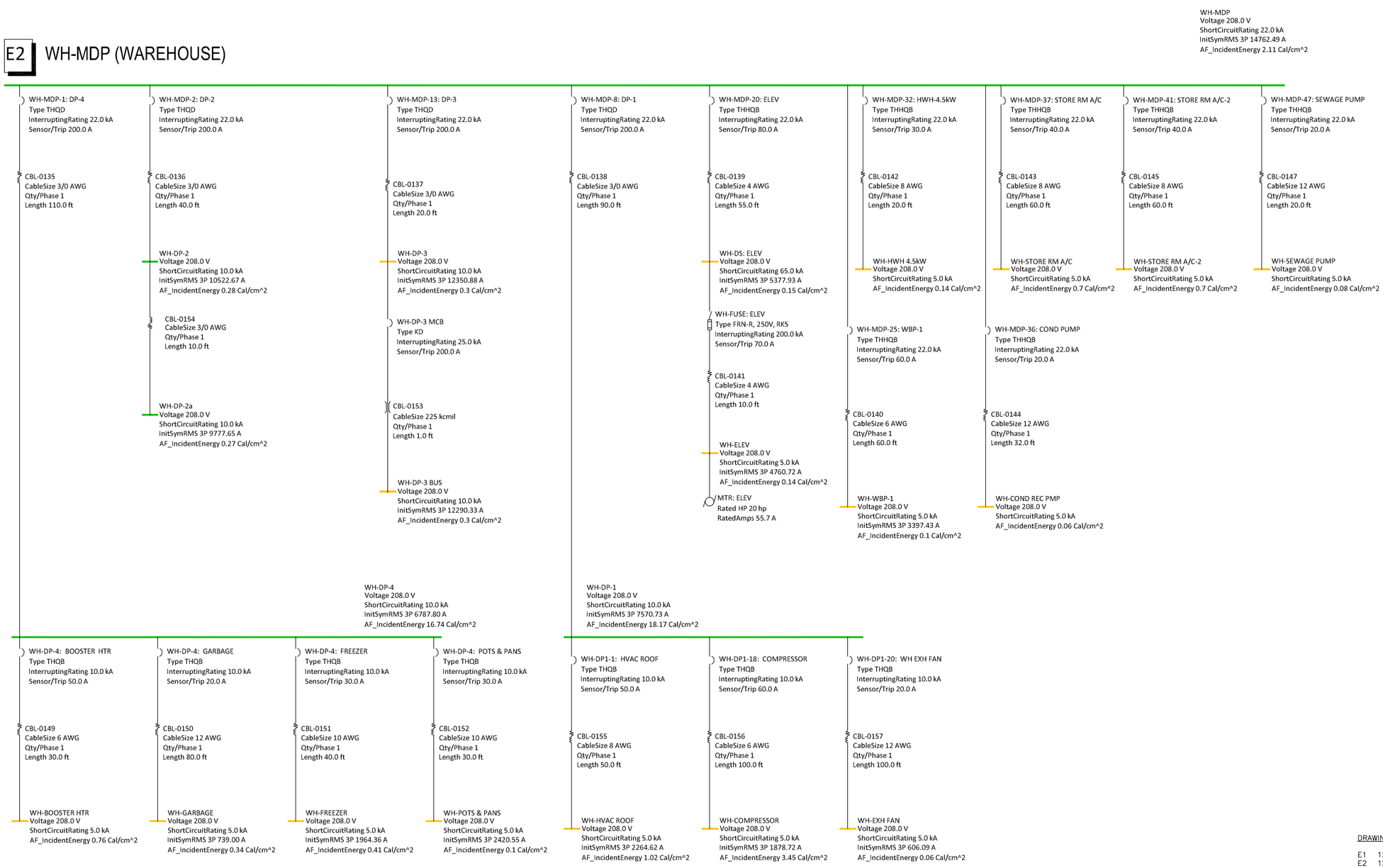
Vincent Kunderman, PE
PO Box 11
Eureka, Missouri 63025
(314) 303–5978 office
MO State Certificate of Authority #005599

POWER SYSTEM STUDY
Single Line Diagram

Drawing Title:
Bellefontaine Habilitation Center
10695 Bellefontaine Road
Bellefontaine, Missouri 63137

Drawn By:	VJK	Size	Date Plotted	Plot Number	Sheet No.
Date:	5-1-2015			Job Number / Cat Number	E4
Scale:	N.T.S.	24" x 36"			
CAD File:	1412E.dwg		Approvals		
REF File:	NA	Drafting	Engineering	Others	
Checked By:	VJK	VJK	VJK		

E2 WH-MDP (WAREHOUSE)



DRAWING LISTING:

E1 12KV SWITCHGEAR, GENERATOR & 48 VDC
E2 12KV FEEDERS F2A & F2B
E3 12KV FEEDERS F3A & F3B
E4 UNIT 1 / MAINTENANCE
E5 WAREHOUSE / FOOD DISTRIBUTION CENTER
E6 PHYSICAL THERAPY / GROUP HOME 1500s
E7 MULTIPURPOSE
E8 DONNELLY (ADMINISTRATION)
E9 1900 BLDGs
E10 SINGLE PHASE LOADS – FEEDER F1B
E11 SINGLE PHASE LOADS – FEEDERS F3A & F3B

NO:	DATE	REVISIONS
1	5-1-2015	Original Issue
2	2-16-2018	Revised per Review Comments
3	7-9-2018	Revised per Field Notes
4	9-18-2018	Revised per Review Comments

ABBREVIATIONS

AC	ALTERNATING CURRENT	MTS	MANUAL TRANSFER SWITCH
ATS	AUTOMATIC TRANSFER SWITCH	N	NORMAL POWER SOURCE
BD	BUS DUCT	NC	NORMALLY CLOSED BREAKER
DC	DIRECT CURRENT	NO	NORMALLY OPEN BREAKER
DP	DISTRIBUTION PANEL	PDP	POWER DISTRIBUTION PANEL
DSw	DISCONNECT SWITCH	PRI	PRIMARY
E	EMERGENCY POWER SOURCE	SEC	SECONDARY
FDR	FEEDER	SLG	SINGLE LINE TO GROUND
kA	AMPERES (THOUSANDS)	SW	SWITCH
kAIC	INTERRUPTING CURRENT	SWBD	SWITCHBOARD
MCB	MAIN CIRCUIT BREAKER	UPS	UNINTERRUPTABLE POWER SUPPLY
MCCB	MOLDED CASE CIRCUIT BREAKER	VFD	VARIABLE FREQUENCY DRIVE
MSB	MAIN SWITCHBOARD		

GENERAL NOTES

1. INPUT DATA SHOWN ON THIS SINGLE LINE DIAGRAM ARE "PER UNIT" VALUES WITH A 100MVA BASE.
2. THE UTILITY FAULT CONTRIBUTIONS USED FOR THIS STUDY ARE DISCUSSED IN TAB 1 – "EXECUTIVE SUMMARY".
3. THREE PHASE SYMMETRICAL FAULT VALUES ARE SHOWN ON THIS DRAWING. OTHER FAULT TYPES ARE SHOWN ON TABLE 4 IN TAB 6 (THREE PHASE, SINGLE PHASE & DC)
4. THE "kAIC" RATINGS SHOWN WITH EACH PROTECTIVE DEVICE ARE THE FULLY RATED DEVICE VALUES UNLESS NOTED.
5. ALL BREAKERS ARE ASSUMED CLOSED. OPEN BREAKERS ARE SHOWN "NO" = NORMALLY OPEN.
6. ARC FLASH RISK INDICATOR (WORST CASE):
   0 – < or = 8 CAL/CM^2
   > 8 – 40 CAL/CM^2
   > 40 CAL/CM^2

E3 SYMBOL INDICATES A CONTINUATION, EITHER "FROM DRAWING E3" OR "TO DRAWING E3".

SINGLE PHASE COMPONENT OR LOAD

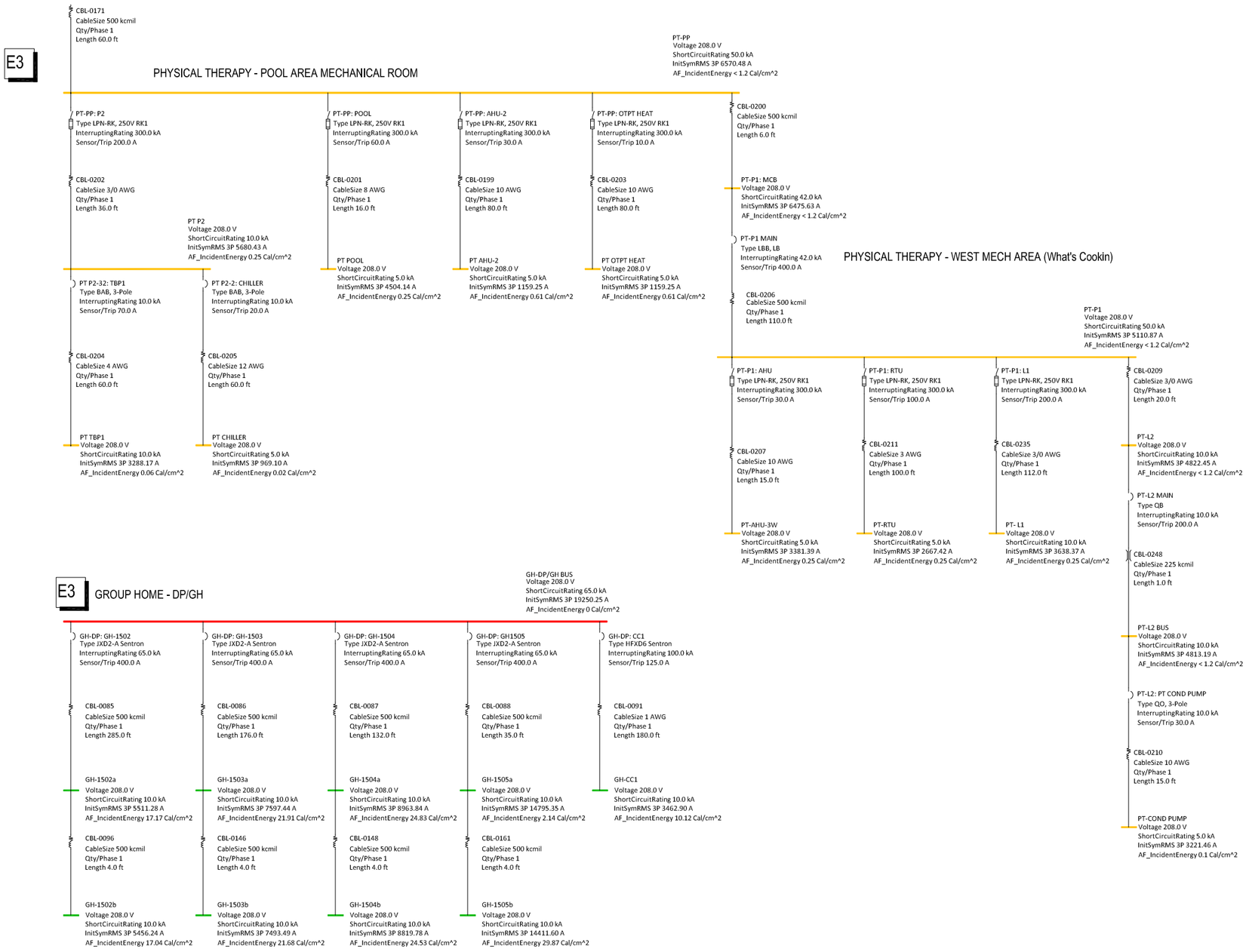
Rogers–Schmidt Engineering Co., P.C.
1736 West Park Center Drive, Suite 204
St. Louis, Missouri 63026
(636) 600–1551

Vincent Kunderman, PE
PO Box 11
Eureka, Missouri 63025
(314) 303–5978 office
MO State Certificate of Authority #005599

POWER SYSTEM STUDY
Single Line Diagram

Drawing Title:
Bellefontaine Habilitation Center
10695 Bellefontaine Road
Bellefontaine, Missouri 63137

Drawn By:	VJK	Size	Date Plotted	Plot Number		Sheet No.
Date:	5-1-2015			Job Number	Dwr Number	E5
Scale:	N.T.S.	24" x 36"				
CAD File:	1412E.dwg		Approvals			
REF File:	NA	Drafting	Engineering	Others		
Checked By:	VJK	VJK	VJK			



DRAWING LISTING:

E1 12KV SWITCHGEAR, GENERATOR & 48 VDC
E2 12KV FEEDERS F2A & F2B
E3 12KV FEEDERS F3A & F3B
E4 UNIT 1 / MAINTENANCE
E5 WAREHOUSE / FOOD DISTRIBUTION CENTER
E6 PHYSICAL THERAPY / GROUP HOME 1500s
E7 MULTIPURPOSE
E8 DONNELLY (ADMINISTRATION)
E9 1900 BLDGs
E10 SINGLE PHASE LOADS – FEEDER F1B
E11 SINGLE PHASE LOADS – FEEDERS F3A & F3B

NO:	DATE	REVISIONS
1	5-1-2015	Original Issue
2	2-16-2018	Revised per Review Comments
3	7-9-2018	Revised per Field Notes
4	9-18-2018	Revised per Review Comments

ABBREVIATIONS

AC	ALTERNATING CURRENT	MTS	MANUAL TRANSFER SWITCH
ATS	AUTOMATIC TRANSFER SWITCH	N	NORMAL POWER SOURCE
BD	BUS DUCT	NC	NORMALLY CLOSED BREAKER
DC	DIRECT CURRENT	NO	NORMALLY OPEN BREAKER
DP	DISTRIBUTION PANEL	PDP	POWER DISTRIBUTION PANEL
DSw	DISCONNECT SWITCH	PRI	PRIMARY
E	EMERGENCY POWER SOURCE	SEC	SECONDARY
FDR	FEEDER	SLG	SINGLE LINE TO GROUND
kA	AMPERES (THOUSANDS)	SW	SWITCH
kAIC	INTERRUPTING CURRENT	SWBD	SWITCHBOARD
MCB	MAIN CIRCUIT BREAKER	UPS	UNINTERRUPTABLE POWER SUPPLY
MCCB	MOLDED CASE CIRCUIT BREAKER	VFD	VARIABLE FREQUENCY DRIVE
MSB	MAIN SWITCHBOARD		

GENERAL NOTES

1. INPUT DATA SHOWN ON THIS SINGLE LINE DIAGRAM ARE "PER UNIT" VALUES WITH A 100MVA BASE.
2. THE UTILITY FAULT CONTRIBUTIONS USED FOR THIS STUDY ARE DISCUSSED IN TAB 1 – "EXECUTIVE SUMMARY".
3. THREE PHASE SYMMETRICAL FAULT VALUES ARE SHOWN ON THIS DRAWING. OTHER FAULT TYPES ARE SHOWN ON TABLE 4 IN TAB 6 (THREE PHASE, SINGLE PHASE & DC)
4. THE "kAIC" RATINGS SHOWN WITH EACH PROTECTIVE DEVICE ARE THE FULLY RATED DEVICE VALUES UNLESS NOTED.
5. ALL BREAKERS ARE ASSUMED CLOSED. OPEN BREAKERS ARE SHOWN "NO" = NORMALLY OPEN.
6. ARC FLASH RISK INDICATOR (WORST CASE):
   0 – < or = 8 CAL/CM^2
   > 8 – 40 CAL/CM^2
   > 40 CAL/CM^2

E3 SYMBOL INDICATES A CONTINUATION, EITHER "FROM DRAWING E3" OR "TO DRAWING E3".

SINGLE PHASE COMPONENT OR LOAD

Rogers–Schmidt Engineering Co., P.C.
1736 West Park Center Drive, Suite 204
St. Louis, Missouri 63026
(636) 600–1551

Vincent Kunderman, PE
PO Box 11
Eureka, Missouri 63025
(314) 303–5978 office
MO State Certificate of Authority #005599

POWER SYSTEM STUDY
Single Line Diagram

Drawing Title:
Bellefontaine Habilitation Center
10695 Bellefontaine Road
Bellefontaine, Missouri 63137

Drawn By: VJK	Size	Date Plotted	Plot Number		Sheet No.
Date: 5-1-2015			Job Number	Dwr Number	E6
Scale: N.T.S.	24" x 36"				
CAD File: 1412E.dwg		Approvals			
REF File: NA	Drafting	Engineering	Others		
Checked By: VJK	VJK	VJK			

E3 MP-MULTIPURPOSE

MP-MDP
Voltage 208.0 V
ShortCircuitRating 50.0 kA
InitSymRMS 3P 21202.01 A
AF_IncidentEnergy 22.64 Cal/cm^2

MP-MDP: MCB
Type KRP-C, 600V Class L
InterruptingRating 300.0 kA
Sensor/Trip 1200.0 A

CBL-0172

MP-MDP BUS
Voltage 208.0 V
ShortCircuitRating 50.0 kA
InitSymRMS 3P 21118.62 A
AF_IncidentEnergy 0 Cal/cm^2

MP-MDP: LP-A1 & LP-A2
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 350.0 A

CBL-0174
CableSize 500 kcmil
Qty/Phase 1
Length 138.0 ft

MP-LP-A1
Voltage 208.0 V
ShortCircuitRating 10.0 kA
InitSymRMS 3P 9103.32 A
AF_IncidentEnergy 8.11 Cal/cm^2

CBL-0218
CableSize 500 kcmil
Qty/Phase 1
Length 5.0 ft

MP-LP-A2
Voltage 208.0 V
ShortCircuitRating 10.0 kA
InitSymRMS 3P 8918.09 A
AF_IncidentEnergy 8.59 Cal/cm^2

MDP MP: CHILLER 2
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 200.0 A

CBL-0173
CableSize 3/0 AWG
Qty/Phase 1
Length 45.0 ft

MP-CHILLER 2
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 13418.03 A
AF_IncidentEnergy 0.45 Cal/cm^2

MP-MDP: LP-B
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 200.0 A

CBL-0176
CableSize 4/0 AWG
Qty/Phase 1
Length 420.0 ft

MP-LP-B
Voltage 208.0 V
ShortCircuitRating 10.0 kA
InitSymRMS 3P 3088.95 A
AF_IncidentEnergy 8.52 Cal/cm^2

MP-MDP: LP-C
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 200.0 A

CBL-0175
CableSize 4/0 AWG
Qty/Phase 1
Length 350.0 ft

MP-LP-C
Voltage 208.0 V
ShortCircuitRating 10.0 kA
InitSymRMS 3P 3614.20 A
AF_IncidentEnergy 4.65 Cal/cm^2

MP-LP-C: DIMMER PANEL
Type THQB
InterruptingRating 10.0 kA
Sensor/Trip 60.0 A

CBL-0212
CableSize 6 AWG
Qty/Phase 1
Length 20.0 ft

MP-LP: DIMMER PANEL
Voltage 208.0 V
ShortCircuitRating 10.0 kA
InitSymRMS 3P 2858.03 A
AF_IncidentEnergy 0.1 Cal/cm^2

MP-MDP: CHILLER 1
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 200.0 A

CBL-0177
CableSize 3/0 AWG
Qty/Phase 1
Length 42.0 ft

MP-CHILLER 1
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 13778.89 A
AF_IncidentEnergy 0.43 Cal/cm^2

MP-MDP: AHU4/RAF4
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 100.0 A

CBL-0178
CableSize 3 AWG
Qty/Phase 1
Length 150.0 ft

MP-AHU4
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 2974.09 A
AF_IncidentEnergy 0.44 Cal/cm^2

CBL-0220
CableSize 3 AWG
Qty/Phase 1
Length 20.0 ft

MP-AHU4-SF
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 2658.90 A
AF_IncidentEnergy 0.54 Cal/cm^2

MTR: AHU4-SF
Rated HP 15 hp
RatedAmps 41.7 A

MP-MDP: LP-D
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 100.0 A

CBL-0180
CableSize 2 AWG
Qty/Phase 1
Length 60.0 ft

MP-LP-D
Voltage 208.0 V
ShortCircuitRating 10.0 kA
InitSymRMS 3P 7275.79 A
AF_IncidentEnergy 0.18 Cal/cm^2

MP-MDP: IT SERVER
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 100.0 A

CBL-0179
CableSize 3 AWG
Qty/Phase 1
Length 145.0 ft

MP-IT SERVER
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 2859.82 A
AF_IncidentEnergy 0.39 Cal/cm^2

CBL-0221
CableSize 3 AWG
Qty/Phase 1
Length 20.0 ft

MP-AHU4-RF
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 2641.42 A
AF_IncidentEnergy 0.54 Cal/cm^2

MTR: AHU4-RF
Rated HP 5 hp
RatedAmps 13.9 A

MP-MDP: CT
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 30.0 A

CBL-0183
CableSize 10 AWG
Qty/Phase 1
Length 48.0 ft

MP-CT
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 2080.67 A
AF_IncidentEnergy 0.03 Cal/cm^2

MTR: CT
Rated HP 7.5 hp
RatedAmps 20.9 A

MP-MDP: AHU 1 & 2
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 30.0 A

CBL-0181
CableSize 6 AWG
Qty/Phase 1
Length 392.0 ft

MP-AHU 1
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 587.94 A
AF_IncidentEnergy 0.01 Cal/cm^2

CBL-0222
CableSize 6 AWG
Qty/Phase 1
Length 10.0 ft

MP-AHU 2
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 573.49 A
AF_IncidentEnergy 0.01 Cal/cm^2

MP-MDP: WELDING
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 60.0 A

CBL-0184
CableSize 6 AWG
Qty/Phase 1
Length 10.0 ft

MP-WELDING
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 13080.47 A
AF_IncidentEnergy 0.12 Cal/cm^2

MP-MDP: AHU 3
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 60.0 A

CBL-0182
CableSize 6 AWG
Qty/Phase 1
Length 252.0 ft

MP-AHU 3
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 1096.84 A
AF_IncidentEnergy 0.6 Cal/cm^2

CBL-0223
CableSize 6 AWG
Qty/Phase 1
Length 20.0 ft

MP-AHU3-SF
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 1023.23 A
AF_IncidentEnergy 0.7 Cal/cm^2

MTR: AHU3-SF
Rated HP 15 hp
RatedAmps 41.7 A

MP-MDP: CT PUMP P4
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 15.0 A

CBL-0186
CableSize 10 AWG
Qty/Phase 1
Length 30.0 ft

MP-CT PUMP P4
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 3158.95 A
AF_IncidentEnergy 0.02 Cal/cm^2

MP-MDP: HWP-A2
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 30.0 A

CBL-0185
CableSize 10 AWG
Qty/Phase 1
Length 30.0 ft

MP-HWP-A2
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 3158.95 A
AF_IncidentEnergy 0.04 Cal/cm^2

CBL-0224
CableSize 6 AWG
Qty/Phase 1
Length 20.0 ft

MP-AHU3-RF
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 1012.50 A
AF_IncidentEnergy 0.71 Cal/cm^2

MTR: AHU3-RF
Rated HP 5 hp
RatedAmps 13.9 A

MP-MDP: SUMP PUMP
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 20.0 A

CBL-0188
CableSize 12 AWG
Qty/Phase 1
Length 30.0 ft

MP-SUMP PUMP
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 2054.90 A
AF_IncidentEnergy 0.02 Cal/cm^2

MP-MDP: CWP-P3
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 20.0 A

CBL-0187
CableSize 10 AWG
Qty/Phase 1
Length 30.0 ft

MP-CWP-P3
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 3158.95 A
AF_IncidentEnergy 0.02 Cal/cm^2

MP-MDP: LP-E1
Type FRN-R, 250V, RK5
InterruptingRating 200.0 kA
Sensor/Trip 100.0 A

CBL-0189
CableSize 1 AWG
Qty/Phase 1
Length 12.0 ft

MP-ATS CABINET
Voltage 208.0 V
InitSymRMS 3P 16868.15 A
AF_IncidentEnergy 0.17 Cal/cm^2

CBL-0213
CableSize 1 AWG
Qty/Phase 1
Length 420.0 ft

MP-LP-E1
Voltage 208.0 V
ShortCircuitRating 10.0 kA
InitSymRMS 3P 1559.83 A
AF_IncidentEnergy 1.37 Cal/cm^2

MP-LP-E1-1: LP-E2
Type THQB
InterruptingRating 10.0 kA
Sensor/Trip 100.0 A

CBL-0190
CableSize 1 AWG
Qty/Phase 1
Length 420.0 ft

MP-LP-E2
Voltage 208.0 V
ShortCircuitRating 10.0 kA
InitSymRMS 3P 809.97 A
AF_IncidentEnergy 4 Cal/cm^2

MP-LP-E1-12: HTG PUMP
Type THQB
InterruptingRating 10.0 kA
Sensor/Trip 15.0 A

CBL-0192
CableSize 8 AWG
Qty/Phase 1
Length 30.0 ft

MP-HTG PUMP
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 1194.35 A
AF_IncidentEnergy 0.05 Cal/cm^2

MP-LP-E1-13: SUMP PUMP 2
Type THQB
InterruptingRating 10.0 kA
Sensor/Trip 20.0 A

CBL-0191
CableSize 8 AWG
Qty/Phase 1
Length 30.0 ft

MP-SUMP PUMP 2
Voltage 208.0 V
ShortCircuitRating 5.0 kA
InitSymRMS 3P 1194.35 A
AF_IncidentEnergy 0.06 Cal/cm^2

DRAWING LISTING:

E1 12KV SWITCHGEAR, GENERATOR & 48 VDC
E2 12KV FEEDEERS F2A & F2B
E3 12KV FEEDERS F3A & F3B
E4 UNIT 1 / MAINTENANCE
E5 WAREHOUSE / FOOD DISTRIBUTION CENTER
E6 PHYSICAL THERAPY / GROUP HOME 1500s
E7 MULTIPURPOSE
E8 DONNELLY (ADMINISTRATION)
E9 1900 BLDGs
E10 SINGLE PHASE LOADS – FEEDER F1B
E11 SINGLE PHASE LOADS – FEEDERS F3A & F3B

NO:	DATE	REVISIONS
1	5-1-2015	Original Issue
2	2-16-2018	Revised per Review Comments
3	7-9-2018	Revised per Field Notes
4	9-18-2018	Revised per Review Comments

ABBREVIATIONS

AC	ALTERNATING CURRENT	MTS	MANUAL TRANSFER SWITCH
ATS	AUTOMATIC TRANSFER SWITCH	N	NORMAL POWER SOURCE
BD	BUS DUCT	NC	NORMALLY CLOSED BREAKER
DC	DIRECT CURRENT	NO	NORMALLY OPEN BREAKER
DP	DISTRIBUTION PANEL	PDP	POWER DISTRIBUTION PANEL
DSw	DISCONNECT SWITCH	PRI	PRIMARY
E	EMERGENCY POWER SOURCE	SEC	SECONDARY
FDR	FEEDER	SLG	SINGLE LINE TO GROUND
kA	AMPERES (THOUSANDS)	SW	SWITCH
kAIC	INTERRUPTING CURRENT	SWBD	SWITCHBOARD
MCB	MAIN CIRCUIT BREAKER	UPS	UNINTERRUPTABLE POWER SUPPLY
MCCB	MOLDED CASE CIRCUIT BREAKER	VFD	VARIABLE FREQUENCY DRIVE
MSB	MAIN SWITCHBOARD		

GENERAL NOTES

1. INPUT DATA SHOWN ON THIS SINGLE LINE DIAGRAM ARE "PER UNIT" VALUES WITH A 100MVA BASE.
2. THE UTILITY FAULT CONTRIBUTIONS USED FOR THIS STUDY ARE DISCUSSED IN TAB 1 – "EXECUTIVE SUMMARY".
3. THREE PHASE SYMMETRICAL FAULT VALUES ARE SHOWN ON THIS DRAWING. OTHER FAULT TYPES ARE SHOWN ON TABLE 4 IN TAB 6 (THREE PHASE, SINGLE PHASE & DC)
4. THE "kAIC" RATINGS SHOWN WITH EACH PROTECTIVE DEVICE ARE THE FULLY RATED DEVICE VALUES UNLESS NOTED.
5. ALL BREAKERS ARE ASSUMED CLOSED. OPEN BREAKERS ARE SHOWN "NO" = NORMALLY OPEN.
6. ARC FLASH RISK INDICATOR (WORST CASE):
   0 – < or = 8 CAL/CM^2
   > 8 – 40 CAL/CM^2
   > 40 CAL/CM^2

E3 SYMBOL INDICATES A CONTINUATION, EITHER "FROM DRAWING E3" OR "TO DRAWING E3".

SINGLE PHASE COMPONENT OR LOAD

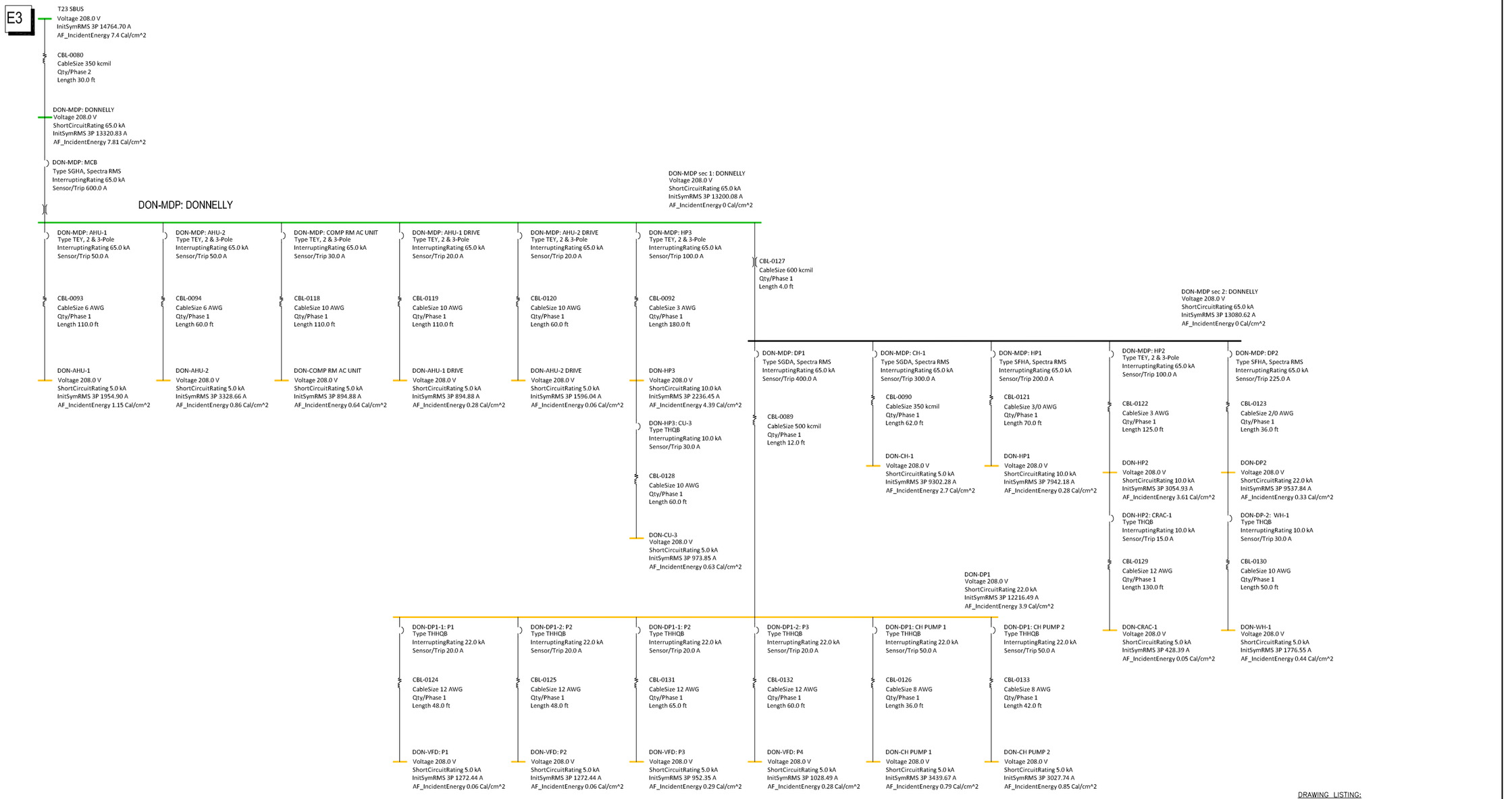
Rogers–Schmidt Engineering Co., P.C.
1736 West Park Center Drive, Suite 204
St. Louis, Missouri 63026
(636) 600–1551

Vincent Kunderman, PE
PO Box 11
Eureka, Missouri 63025
(314) 303–5978 office
MO State Certificate of Authority #005599

POWER SYSTEM STUDY
Single Line Diagram

Drawing Title:
Bellefontaine Habilitation Center
10695 Bellefontaine Road
Bellefontaine, Missouri 63137

Drawn By:	VJK	Size	Date Plotted	Plot Number	Sheet No.
Date:	5-1-2015			Job Number / Cor Number	
Scale:	N.T.S.	24" x 36"			E7
CAD File:	1412E.dwg		Approvals		
REF File:	NA	Drafting	Engineering	Others	
Checked By:	VJK	VJK	VJK		



DRAWING LISTING:

E1 12KV SWITCHGEAR, GENERATOR & 48 VDC
E2 12KV FEEDERS F2A & F2B
E3 12KV FEEDERS F3A & F3B
E4 UNIT 1 / MAINTENANCE
E5 WAREHOUSE / FOOD DISTRIBUTION CENTER
E6 PHYSICAL THERAPY / GROUP HOME 1500s
E7 MULTIPURPOSE
E8 DONNELLY (ADMINISTRATION)
E9 1900 BLDGs
E10 SINGLE PHASE LOADS – FEEDER F1B
E11 SINGLE PHASE LOADS – FEEDERS F3A & F3B

NO:	DATE	REVISIONS
1	5-1-2015	Original Issue
2	2-16-2018	Revised per Review Comments
3	7-9-2018	Revised per Field Notes
4	9-18-2018	Revised per Review Comments

ABBREVIATIONS

AC	ALTERNATING CURRENT	MTS	MANUAL TRANSFER SWITCH
ATS	AUTOMATIC TRANSFER SWITCH	N	NORMAL POWER SOURCE
BD	BUS DUCT	NC	NORMALLY CLOSED BREAKER
DC	DIRECT CURRENT	NO	NORMALLY OPEN BREAKER
DP	DISTRIBUTION PANEL	PDP	POWER DISTRIBUTION PANEL
DSw	DISCONNECT SWITCH	PRI	PRIMARY
E	EMERGENCY POWER SOURCE	SEC	SECONDARY
FDR	FEEDER	SLG	SINGLE LINE TO GROUND
kA	AMPERES (THOUSANDS)	SW	SWITCH
kAIC	INTERRUPTING CURRENT	SWBD	SWITCHBOARD
MCB	MAIN CIRCUIT BREAKER	UPS	UNINTERRUPTABLE POWER SUPPLY
MCCB	MOLDED CASE CIRCUIT BREAKER	VFD	VARIABLE FREQUENCY DRIVE
MSB	MAIN SWITCHBOARD		

GENERAL NOTES

1. INPUT DATA SHOWN ON THIS SINGLE LINE DIAGRAM ARE "PER UNIT" VALUES WITH A 100MVA BASE.
2. THE UTILITY FAULT CONTRIBUTIONS USED FOR THIS STUDY ARE DISCUSSED IN TAB 1 – "EXECUTIVE SUMMARY".
3. THREE PHASE SYMMETRICAL FAULT VALUES ARE SHOWN ON THIS DRAWING. OTHER FAULT TYPES ARE SHOWN ON TABLE 4 IN TAB 6 (THREE PHASE, SINGLE PHASE & DC)
4. THE "kAIC" RATINGS SHOWN WITH EACH PROTECTIVE DEVICE ARE THE FULLY RATED DEVICE VALUES UNLESS NOTED.
5. ALL BREAKERS ARE ASSUMED CLOSED. OPEN BREAKERS ARE SHOWN "NO" = NORMALLY OPEN.
6. ARC FLASH RISK INDICATOR (WORST CASE):
   0 – < or = 8 CAL/CM^2
   > 8 – 40 CAL/CM^2
   > 40 CAL/CM^2

E3 SYMBOL INDICATES A CONTINUATION, EITHER "FROM DRAWING E3" OR "TO DRAWING E3".

SINGLE PHASE COMPONENT OR LOAD

Rogers–Schmidt Engineering Co., P.C.
1736 West Park Center Drive, Suite 204
St. Louis, Missouri 63026
(636) 600–1551

Vincent Kunderman, PE
PO Box 11
Eureka, Missouri 63025
(314) 303–5978 office
MO State Certificate of Authority #005599

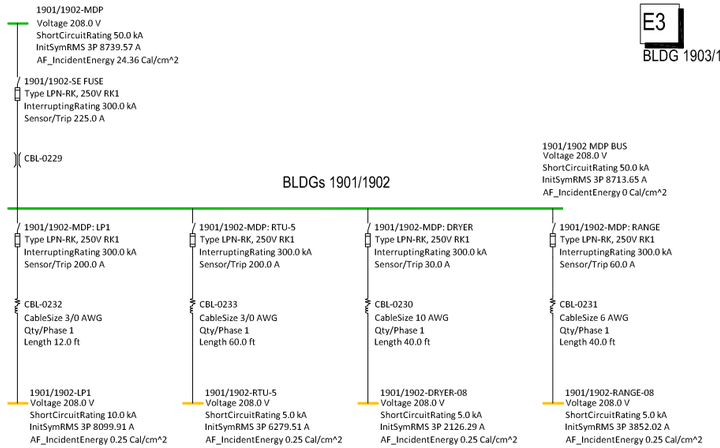
POWER SYSTEM STUDY
Single Line Diagram

Drawing Title:
Bellefontaine Habilitation Center
10695 Bellefontaine Road
Bellefontaine, Missouri 63137

Drawn By:	VJK	Size	Date Plotted	Plot Number		Sheet No.
Date:	5-1-2015			Job Number	Dir Number	E8
Scale:	N.T.S.	24" x 36"				
CAD File:	1412E.dwg		Approvals			
REF File:	NA	Drafting	Engineering	Others		
Checked By:	VJK	VJK	VJK			

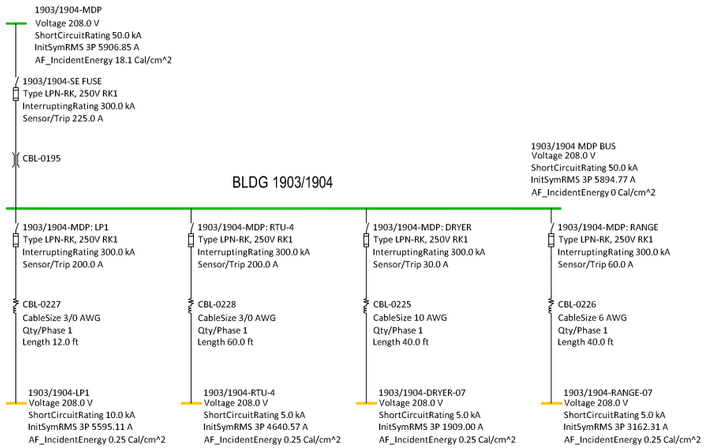
E3

BLDG 1901/1902



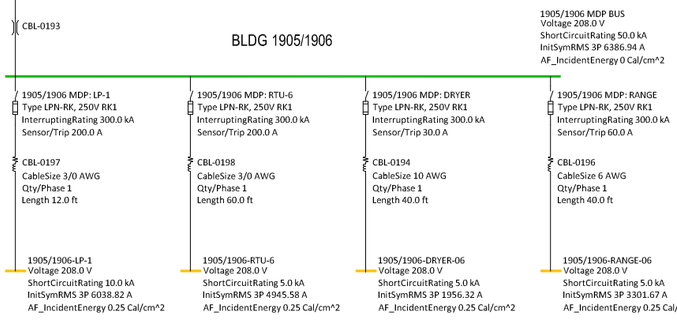
E3

BLDG 1903/1904



E3

BLDG 1905/1906



DRAWING LISTING:

NO:	DATE	REVISIONS
1	5-1-2015	Original Issue
2	2-16-2018	Revised per Review Comments
3	7-9-2018	Revised per Field Notes
4	9-18-2018	Revised per Review Comments

ABBREVIATIONS

AC	ALTERNATING CURRENT	MTS	MANUAL TRANSFER SWITCH
ATS	AUTOMATIC TRANSFER SWITCH	N	NORMAL POWER SOURCE
BD	BUS DUCT	NC	NORMALLY CLOSED BREAKER
DC	DIRECT CURRENT	NO	NORMALLY OPEN BREAKER
DP	DISTRIBUTION PANEL	PDP	POWER DISTRIBUTION PANEL
DSw	DISCONNECT SWITCH	PRI	PRIMARY
E	EMERGENCY POWER SOURCE	SEC	SECONDARY
FDR	FEEDER	SLG	SINGLE LINE TO GROUND
kA	AMPERES (THOUSANDS)	SW	SWITCH
kAIC	INTERRUPTING CURRENT	SWBD	SWITCHBOARD
MCB	MAIN CIRCUIT BREAKER	UPS	UNINTERRUPTABLE POWER SUPPLY
MCCB	MOLDED CASE CIRCUIT BREAKER	VFD	VARIABLE FREQUENCY DRIVE
MSB	MAIN SWITCHBOARD		

GENERAL NOTES

1. INPUT DATA SHOWN ON THIS SINGLE LINE DIAGRAM ARE "PER UNIT" VALUES WITH A 100MVA BASE.
2. THE UTILITY FAULT CONTRIBUTIONS USED FOR THIS STUDY ARE DISCUSSED IN TAB 1 – "EXECUTIVE SUMMARY".
3. THREE PHASE SYMMETRICAL FAULT VALUES ARE SHOWN ON THIS DRAWING. OTHER FAULT TYPES ARE SHOWN ON TABLE 4 IN TAB 6 (THREE PHASE, SINGLE PHASE & DC)
4. THE "kAIC" RATINGS SHOWN WITH EACH PROTECTIVE DEVICE ARE THE FULLY RATED DEVICE VALUES UNLESS NOTED.
5. ALL BREAKERS ARE ASSUMED CLOSED. OPEN BREAKERS ARE SHOWN "NO" = NORMALLY OPEN.
6. ARC FLASH RISK INDICATOR (WORST CASE):
   0 – < or = 8 CAL/CM^2
   > 8 – 40 CAL/CM^2
   > 40 CAL/CM^2

E3 SYMBOL INDICATES A CONTINUATION, EITHER "FROM DRAWING E3" OR "TO DRAWING E3".

SINGLE PHASE COMPONENT OR LOAD

Rogers–Schmidt Engineering Co., P.C.
1736 West Park Center Drive, Suite 204
St. Louis, Missouri 63026
(636) 600–1551

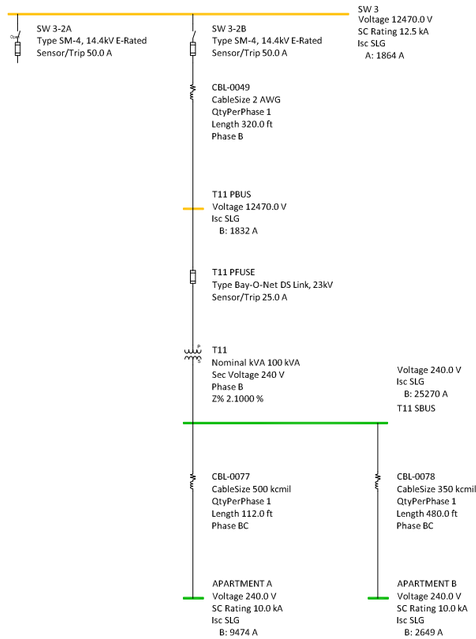
Vincent Kunderman, PE
PO Box 11
Eureka, Missouri 63025
(314) 303–5978 office
MO State Certificate of Authority #005599

POWER SYSTEM STUDY
Single Line Diagram

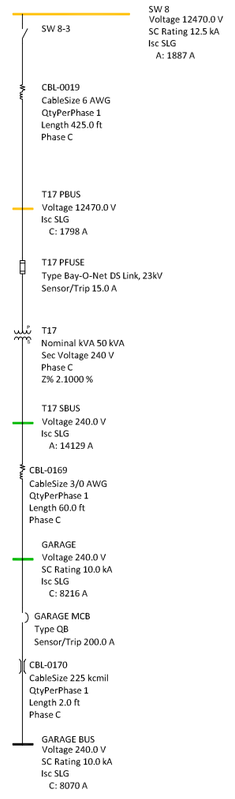
Drawing Title:
Bellefontaine Habilitation Center
10695 Bellefontaine Road
Bellefontaine, Missouri 63137

Drawn By:	VJK	Size	Date Plotted	Plot Number: Job Number	Plot Number: Cad Number	Sheet No.
Date:	5-1-2015					E9
Scale:	N.T.S.	24" x 36"				
CAD File:	1412E.dwg		Approvals			
REF File:	NA	Drafting	Engineering	Others		
Checked By:	VJK	VJK	VJK			

E2 SW 3 - T-11 (Single Phase Loads)



E2 SW 8 - T-17 (Single Phase Loads)



DRAWING LISTING:

NO:	DATE	REVISIONS
1	5-1-2015	Original Issue
2	2-16-2018	Revised per Review Comments
3	7-9-2018	Revised per Field Notes
4	9-18-2018	Revised per Review Comments

ABBREVIATIONS

AC	ALTERNATING CURRENT	MTS	MANUAL TRANSFER SWITCH
ATS	AUTOMATIC TRANSFER SWITCH	N	NORMAL POWER SOURCE
BD	BUS DUCT	NC	NORMALLY CLOSED BREAKER
DC	DIRECT CURRENT	NO	NORMALLY OPEN BREAKER
DP	DISTRIBUTION PANEL	PDP	POWER DISTRIBUTION PANEL
DSw	DISCONNECT SWITCH	PRI	PRIMARY
E	EMERGENCY POWER SOURCE	SEC	SECONDARY
FDR	FEEDER	SLG	SINGLE LINE TO GROUND
kA	AMPERES (THOUSANDS)	SW	SWITCH
kAIC	INTERRUPTING CURRENT	SWBD	SWITCHBOARD
MCB	MAIN CIRCUIT BREAKER	UPS	UNINTERRUPTABLE POWER SUPPLY
MCCB	MOLDED CASE CIRCUIT BREAKER	VFD	VARIABLE FREQUENCY DRIVE
MSB	MAIN SWITCHBOARD		

GENERAL NOTES

1. INPUT DATA SHOWN ON THIS SINGLE LINE DIAGRAM ARE "PER UNIT" VALUES WITH A 100MVA BASE.
2. THE UTILITY FAULT CONTRIBUTIONS USED FOR THIS STUDY ARE DISCUSSED IN TAB 1 – "EXECUTIVE SUMMARY".
3. THREE PHASE SYMMETRICAL FAULT VALUES ARE SHOWN ON THIS DRAWING. OTHER FAULT TYPES ARE SHOWN ON TABLE 4 IN TAB 6 (THREE PHASE, SINGLE PHASE & DC)
4. THE "kAIC" RATINGS SHOWN WITH EACH PROTECTIVE DEVICE ARE THE FULLY RATED DEVICE VALUES UNLESS NOTED.
5. ALL BREAKERS ARE ASSUMED CLOSED. OPEN BREAKERS ARE SHOWN "NO" = NORMALLY OPEN.
6. ARC FLASH RISK INDICATOR (WORST CASE):
   0 – < or = 8 CAL/CM^2
   > 8 – 40 CAL/CM^2
   > 40 CAL/CM^2

E3 SYMBOL INDICATES A CONTINUATION, EITHER "FROM DRAWING E3" OR "TO DRAWING E3".

SINGLE PHASE COMPONENT OR LOAD

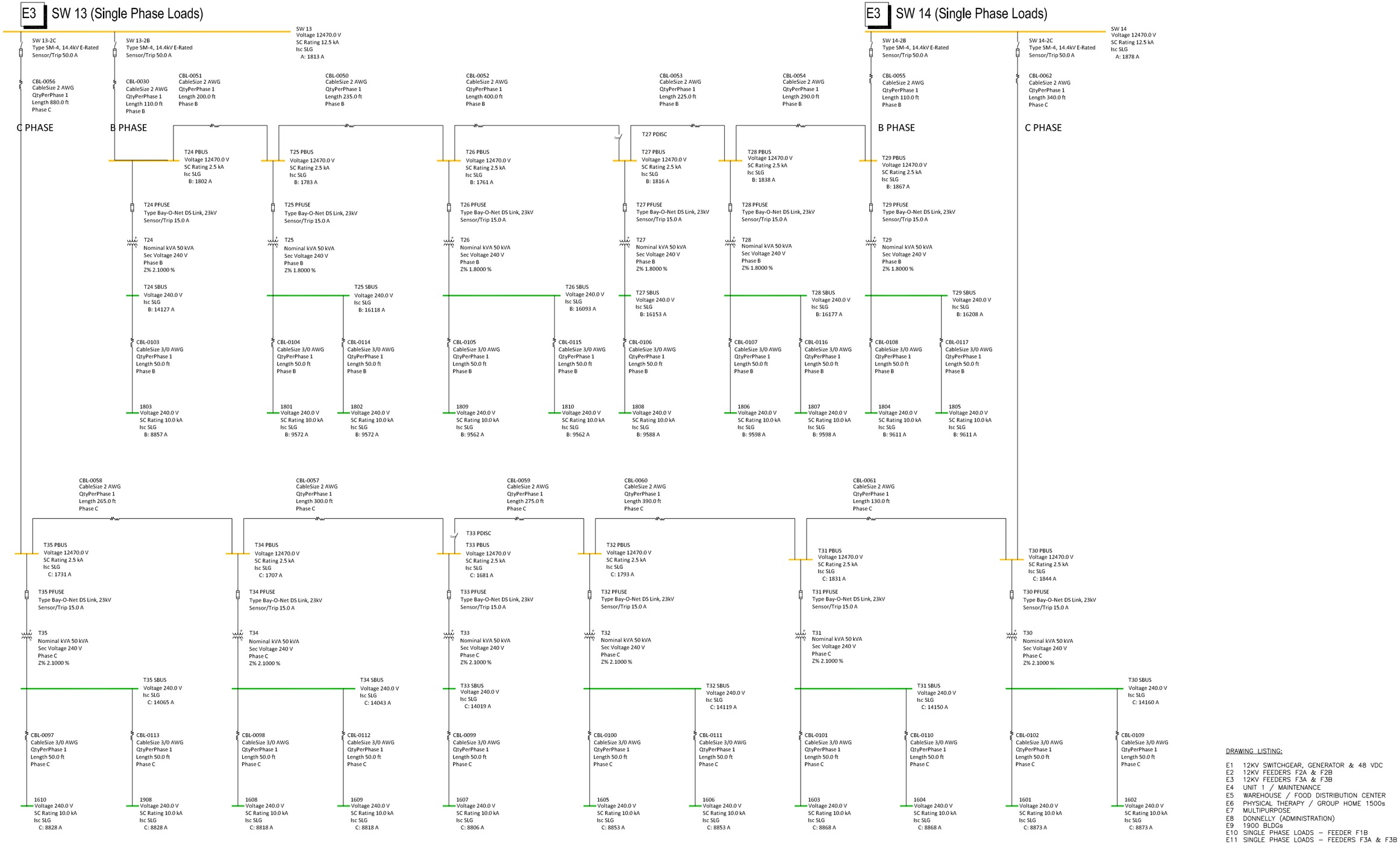
Rogers–Schmidt Engineering Co., P.C.
1736 West Park Center Drive, Suite 204
St. Louis, Missouri 63026
(636) 600–1551

Vincent Kunderman, PE
PO Box 11
Eureka, Missouri 63025
(314) 303–5978 office
MO State Certificate of Authority #005599

POWER SYSTEM STUDY
Single Line Diagram

Drawing Title:
Bellefontaine Habilitation Center
10695 Bellefontaine Road
Bellefontaine, Missouri 63137

Drawn By: VJK	Size	Date Plotted	Plot Number		Sheet No.
Date: 5-1-2015			Job Number	Cat Number	E10
Scale: N.T.S.	24" x 36"				
CAD File: 1412E.dwg		Approvals			
REF File: NA	Drafting	Engineering	Others		
Checked By: VJK	VJK	VJK			



DRAWING LISTING:

E1 12KV SWITCHGEAR, GENERATOR & 48 VDC
E2 12KV FEEDERS F2A & F2B
E3 12KV FEEDERS F3A & F3B
E4 UNIT 1 / MAINTENANCE
E5 WAREHOUSE / FOOD DISTRIBUTION CENTER
E6 PHYSICAL THERAPY / GROUP HOME 1500s
E7 MULTIPURPOSE
E8 DONNELLY (ADMINISTRATION)
E9 1900 BLDGs
E10 SINGLE PHASE LOADS – FEEDER F1B
E11 SINGLE PHASE LOADS – FEEDERS F3A & F3B

NO:	DATE	REVISIONS
1	5-1-2015	Original Issue
2	2-16-2018	Revised per Review Comments
3	7-9-2018	Revised per Field Notes
4	9-18-2018	Revised per Review Comments

ABBREVIATIONS

AC	ALTERNATING CURRENT	MTS	MANUAL TRANSFER SWITCH
ATS	AUTOMATIC TRANSFER SWITCH	N	NORMAL POWER SOURCE
BD	BUS DUCT	NC	NORMALLY CLOSED BREAKER
DC	DIRECT CURRENT	NO	NORMALLY OPEN BREAKER
DP	DISTRIBUTION PANEL	PDP	POWER DISTRIBUTION PANEL
DSw	DISCONNECT SWITCH	PRI	PRIMARY
E	EMERGENCY POWER SOURCE	SEC	SECONDARY
FDR	FEEDER	SLG	SINGLE LINE TO GROUND
kA	AMPERES (THOUSANDS)	SW	SWITCH
kAIC	INTERRUPTING CURRENT	SWBD	SWITCHBOARD
MCB	MAIN CIRCUIT BREAKER	UPS	UNINTERRUPTABLE POWER SUPPLY
MCCB	MOLDED CASE CIRCUIT BREAKER	VFD	VARIABLE FREQUENCY DRIVE
MSB	MAIN SWITCHBOARD		

GENERAL NOTES

1. INPUT DATA SHOWN ON THIS SINGLE LINE DIAGRAM ARE "PER UNIT" VALUES WITH A 100MVA BASE.
2. THE UTILITY FAULT CONTRIBUTIONS USED FOR THIS STUDY ARE DISCUSSED IN TAB 1 – "EXECUTIVE SUMMARY".
3. THREE PHASE SYMMETRICAL FAULT VALUES ARE SHOWN ON THIS DRAWING. OTHER FAULT TYPES ARE SHOWN ON TABLE 4 IN TAB 6 (THREE PHASE, SINGLE PHASE & DC)
4. THE "kAIC" RATINGS SHOWN WITH EACH PROTECTIVE DEVICE ARE THE FULLY RATED DEVICE VALUES UNLESS NOTED.
5. ALL BREAKERS ARE ASSUMED CLOSED. OPEN BREAKERS ARE SHOWN "NO" = NORMALLY OPEN.
6. ARC FLASH RISK INDICATOR (WORST CASE):
   0 – < or = 8 CAL/CM^2
   > 8 – 40 CAL/CM^2
   > 40 CAL/CM^2

E3 SYMBOL INDICATES A CONTINUATION, EITHER "FROM DRAWING E3" OR "TO DRAWING E3".

SINGLE PHASE COMPONENT OR LOAD

Rogers–Schmidt Engineering Co., P.C.
1736 West Park Center Drive, Suite 204
St. Louis, Missouri 63026
(636) 600–1551

Vincent Kunderman, PE
PO Box 11
Eureka, Missouri 63025
(314) 303–5978 office
MO State Certificate of Authority #005599

POWER SYSTEM STUDY
Single Line Diagram

Drawing Title:
Bellefontaine Habilitation Center
10695 Bellefontaine Road
Bellefontaine, Missouri 63137

Drawn By:	VJK	Size	Date Plotted	Plot Number (Job Number / Cell Number)	Sheet No.
Date:	5-1-2015				E11
Scale:	N.T.S.	24" x 36"			
CAD File:	1412E.dwg		Approvals		
REF File:	NA	Drafting	Engineering	Others	
Checked By:	VJK	VJK	VJK		