NEW YORK STATE | Office of General Services

DESIGN & CONSTRUCTION GROUP
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ALBANY, NY 12242

ADDENDUM NO. 2 TO PROJECT NO. 46151

ELECTRICAL WORK
PROVIDE SWITCHGEAR & CONTROL SYSTEM MODIFICATION
FIVE POINTS CORRECTIONAL FACILITY
6600 STATE ROUTE 96
ROMULUS, NY

October 22, 2026

NOTE: This Addendum forms a part of the Contract Documents. Insert it in the Project Manual. Acknowledge receipt of this Addendum in the space provided on the Bid Form.

GENERAL REQUIREMENTS

1. SECTION 012100 ALLOWANCES: Discard the Document bound in the Project Manual and substitute the accompanying Document (pages 012100-1 thru 012100-2) noted "Addendum No. 2, 10/16/2026".

2. SECTION 015113 TEMPORARY GENERATORS AND EQUIPMENT: Discard the Document bound in the Project Manual and substitute the accompanying Document (pages 015113-1 thru 015113-3) noted "Addendum No. 2, 10/16/2026".

SPECIFICATIONS

3. SECTION 260513 MEDIUM-VOLTAGE CABLES: Add the accompanying Section (pages 260513-1 thru 260513-11) to the Project Manual.

4. SECTION 261315 SEQUENCE OF OPERATION FOR ELECTRICAL EQUIPMENT: Discard the Document bound in the Project Manual and substitute the accompanying Document (pages 261315-1 thru 261315-11) noted "Addendum No. 2, 10/16/2026".

5. SECTION 261326 MEDIUM-VOLTAGE, METAL-CLAD SWITCHGEAR: Discard the Document bound in the Project Manual and substitute the accompanying Document (pages 261326-1 thru 261326-40) noted "Addendum No. 2, 10/16/2026".

6. SECTION 263213.13 DIESEL-ENGINE-DRIVEN GENERATOR SETS: Discard the Document bound in the Project Manual and substitute the accompanying Document (pages 263213.13-1 thru 263213.13-5) noted "Addendum No. 2, 10/16/2026".

DRAWINGS

1. Revised Drawings:
   a. Drawing Nos. C-001, C-402, E-403, E-601C, E-603, E-610 and E-807, noted "ADDENDUM NO. 2", accompanies the this Addendum and supersedes the same numbered previously issued drawings.

END OF ADDENDUM

Brady M. Sherlock, P.E.
Director, Division of Design
Design & Construction

SECTION 012100

ALLOWANCES

PART 1 GENERAL

1.01 DESCRIPTION

A. Include in the contract sum the allowances stated in this Section.

B. Should the net cost be more than the specified amount of the allowance, the contract sum will be adjusted by Order on Contract in accordance with the General Conditions. No Work in excess of the allowance will be permitted except by Order on Contract. Should the net cost be less than the specified amount of the allowance, the balance will be deducted from the final payment.

1.02 TOTAL FOR ALLOWANCES

A. The sum of allowances required by this Contract is $486,300.

1.03 ALLOWANCE FOR CONTINGENCIES

A. Include in the contract sum the amount of $276,900 to cover the cost of additional labor and materials for contingent activities within the scope of the Contract as directed in writing by Field Order. The Field Order will include a description of the Work and a method for determining the cost of such Work.

B. The value of the directed Work under this allowance will be determined by one or more of the methods authorized in Section 012200 which will be specified in the Field Order.

1.04 ALLOWANCE FOR GENSET CONTROL PANEL

A. Electrical Work Contract: Include in the contract sum the amount of $209,400 to cover the cost of furnishing the control panel upgrades for three (3) Caterpillar Generator Sets (wiring install and termination by electrical contractor), generator testing, owner training of the new control panels, and startup assistance related to the interaction of the generator upgrades and the new switchgear as shown on the Drawings.
   1. The cost of providing the Work of this allowance will be paid in the amount specified. It is a fixed price allowance. Progress payments will be determined, by the Director, by evaluating the work completed.
   2. Include overhead and profit for administering this allowance separately in the contract sum, not in the allowance.
   3. Cause the products covered by this allowance to be provided by such persons or firm and for such amount as designated.
   4. The amount of the allowance includes furnishing and installing the products in accordance with the requirements of referenced Specification Section(s) and Drawings.

5. Execute agreement with designated persons or firm. Arrange for Samples, Shop Drawings, Product Data, Delivery and Installation in accordance with the requirements of referenced Specification Section(s) and Drawings.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 015113

TEMPORARY GENERATORS AND EQUIPMENT

PART 1 GENERAL

1.01 REFERENCES

A. NEMA MG-1 - Motors and Generators.

B. NEMA ICS-6 - Enclosures for Industrial Control and Systems.

1.02 SYSTEM DESCRIPTION

A. Provide and maintain temporary generator sized and connected as shown in the contract drawings. The temporary generator shall be provided for the durations identified on the contract drawings and it shall be the responsibility of the contractor to maintain the generator, provide fuel, and integrate the generator to automatically start with the existing system.
   a. After temporary generators are deemed operational and while it is not in use, perform monthly tests with load bank and provide operational reports to Director's Representative.
   b. When the contractor is off site, within four hours of being notified of a power outage that results in the operation of the temporary generators provided in this contract, provide labor, material and equipment needed to provide manned coverage of the running generators until power is restored.

B. The cabling from the temporary generator into the building shall be routed through a temporary wall penetration that is installed, sealed, and repaired by the contractor. The location of the temporary penetration shall be approved by the Director's Representative.

1.03 SUBMITTALS

A. Shop Drawings:
   1. Outline drawings showing equipment layout, dimensions and proposed location on site.
   2. Wiring diagrams for electrical power and control wiring.
   3. Fuel pumping performance and system ratings.

B. Product Data:
   1. Catalog sheets and specifications for temporary generator(s) identifying all ratings.
   2. Catalog sheets for temporary cable.
   3. Catalog sheets for temporary cable road protection.
   4. Catalog sheets and specifications for temporary fuel tank identifying all ratings.
   5. Catalog sheets for temporary fuel piping.
   6. Bill of materials.

C. Contract Closeout Submittals:
1. System acceptance test report.
2. Certificate: Affidavit signed by the Company Field Advisor and notarized certifying that the system meets the contract requirements and is operating properly.
3. Operation and Maintenance Data:
a. Deliver 2 copies, covering the installed products, to the Director's Representative. Include:
1) Operation and maintenance data for each product.
2) Parts lists.
3) Lubrication charts.
4) Name, address, and telephone number of nearest fully equipped service organization.

PART 2 PRODUCTS

2.01 TEMPORARY FUEL PUMP, FUEL PIPING, FUEL TANK, CABLING AND GENERATOR

A. Temporary Generator: Diesel fueled, portable type, exterior mounted, with weatherproof enclosure, onboard supply and return pump(s), fuel tank, controls, radiator cooling system, 120 VAC coolant heater, 120 VAC battery charger, exhaust system with silencer and all accessories for safe, unattended operation.
a. Basis of Design:
i. CAT XQ2000 2000kW Trailered Generator
1. Capacity and voltage ratings as shown on the contract drawings.
2. Minimum Fuel Tank Capacity: 48 hours generator operation at full rated load.
3. Pumps: Onboard generator to pull from temporary fuel tank and return to temporary fuel tank.
4. Controls:
a. Permit starting and stopping from a remote voltage-free contact.
b. Controls shall have a voltage-free contact for remote monitoring of generator run status.
c. Maximum Control Voltage: 480 volts.

B. Temporary Fuel Tank: Skid mounted fuel tank complete with accessories for temporary diesel generator(s):
a. Basis of Design:
i. Hart Fueling 12,000 Gallon Fuel Tank
1. Double-walled: Weatherproof secondary containment.
2. Emergency venting on primary tank and secondary containment, overfill prevention valve.

C. Temporary Fuel Piping:
a. Pipe material
i. Steel Pipe: Refer to Specification 231113 "Facility Fuel-Oil Piping"
b. Temporary piping to be field routed by contractor. Refer to Mechanical drawing M-501 for proposed routing and Temporary Generator and Temporary Fuel tank location.
c. Contractor shall provide temporary piping supports at elbows and where needed in straight lengths.

d. Contractor shall provide protective stepovers to be installed when piping is routed at grade or slightly above grade in foot traffic areas.

D. Temporary Feeder Cables:
   a. Temporary Feeder Cables: 6 sets of 4-535MCM DLO Cable + #1/0AWG Ground
   b. Temporary feeder cables shall be routed on the ground parallel to the east wall of Generator Building 17. Space shall be provided for protective covering throughout length of cable between temporary generators and GQC-1.
   c. Contractors shall provide protective covering for length of feeder cable run.
   d. Contractor shall provide stepovers protection for feeder cable not in area of vehicular traffic.
   e. Contractor shall provide drive over protection to be installed in areas directly in front of overhead doors and areas where vehicular traffic is anticipated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install Temporary Generator and Temporary Fuel tank in accordance to the location specified on Civil drawing C-201.
B. Install load-bearing support in compliance with NFPA 37.
C. Install temporary Piping and Feeder Cables as specified in Section 2.01 “TEMPORARY FUEL PUMP, FUEL PIPING, FUEL TANK, CABLING AND GENERATOR”
D. Provide anchorage and restraint needed to allow the pump to operate without undue vibration or noise, and as recommended by the equipment supplier.
E. Temporary Generator, Fuel Tank, Fuel Piping, and Feeder Cables to be contracted for on site use of a minimum six (6) month period of time.

END OF SECTION

SECTION 260513

MEDIUM-VOLTAGE CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes cables and related cable splices, terminations, and accessories for medium-voltage (2001 to 35,000 V) electrical distribution systems.

1.3 DEFINITIONS

A. Jacket: A continuous nonmetallic outer covering for conductors or cables.

B. NETA ATS: Acceptance Testing Specification.

C. Sheath: A continuous metallic covering for conductors or cables.

1.4 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of cable. Include splices and terminations for cables and cable accessories.

E. Samples: 16-inch lengths for each type of cable specified.

F. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

G. Coordination Drawings: Indicate location of each cable, splice, and termination.

H. Qualification Data: For Installer.

I. Material Certificates: For each type of cable and accessory.

J. Design Data: Cable pulling calculations, including conduit size and fill percentage, pulling tensions, cable sidewall pressure, jam probability, voltage drop, and ground wire sizing for each cable.

K. Source quality-control reports.

L. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer: Engage a cable splicer, trained, and certified by splice material manufacturer, to install, splice, and terminate medium-voltage cable.

B. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

C. If brand names other than those specified are proposed for use, furnish the AEIC core and thermo-mechanical qualification test reports. Include a list of 5 Completed Installations indicating name of facility contact person with phone number, voltage, size, and length of EPR cable installed.

D. Equipment Qualifications for Products Other Than Those Specified:

1. At the time of submission provide written notice to the Director of the intent to propose an “or equal” for products other than those specified. Make the “or equal” submission in a timely manner to allow the Director sufficient time to review the proposed product, perform inspections and witness test demonstrations.
2. If products other than those specified are proposed for use furnish the name, address, and telephone numbers of at least 5 comparable installations that can prove the proposed products have performed satisfactorily for 3 years. Certify in writing that the owners of the 5 comparable installations will allow inspection of their installation by the Director's Representative and the Company Field Advisor.

a. Make arrangements with the owners of 2 installations (selected by the Director) for inspection of the installations by the Director's Representative. Also obtain the services of the Company Field Advisor for the proposed products to be present. Notify the Director a minimum of 3 weeks prior to the availability of the installations for the inspection and provide at least one alternative date for each inspection.
b. Only references from the actual owner or owner’s representative (Security Supervisor, Maintenance Supervisor, etc.) will be accepted. References from dealers, system installers or others, who are not the actual owners of the proposed products, are not acceptable.

1) Verify the accuracy of all references submitted prior to submission and certify in writing that the accuracy of the information has been confirmed.

3. The product manufacturer shall have test facilities available that can demonstrate that the proposed products meet the contract requirements.

    a. Make arrangements with the test facility for the Director's Representative to witness test demonstrations. Also obtain the services of the Company Field Advisor for the proposed product to be present at the test facility. Notify the Director a minimum of 3 weeks prior to the availability of the test facility and provide at least one alternative date for the testing.

4. Provide written certification from the manufacturer that the proposed products are compatible for use with all other equipment proposed for use for this system and meet all contract requirements. Include proof that the installed cables:

    a. Have the same rating and construction as the proposed cable.
    b. Have the same insulation compound as the proposed cable.

E. Company Field Advisor: Secure the services of the cable manufacturer's Company Field Advisor for a minimum of 16 working hours for the following:

1. Render advice regarding method of installing cable.
2. Inspection of equipment for installing cable.
3. Witness representative amount of cable pulling.
4. Witness construction of at least one splice and one termination by each cable splicer who will be doing the actual cable splicing.

    a. If the splices or terminations are other than the cable manufacturer's, secure the services of the splice and termination manufacturer's Company Field Advisor to concurrently witness construction of the splices and terminations and also certify with an affidavit that the splices and terminations were constructed in accordance with the splice and termination manufacturer's recommendations.

5. Witness high voltage after installation test.
6. Certify with an affidavit that the aforementioned particulars are satisfactory, and the cable is installed in accordance with cable manufacturer's recommendations.

F. Testing Company: Secure the services of an independent International Electrical Testing Association (NETA) accredited testing company for a high voltage after installation test.

G. Factory Inspection of Ethylene-Propylene Insulated Cables (For Brand Names Other Than Those Specified):

1. An inspector from an independent cable testing laboratory designated by the Director shall witness AEIC electrical tests required for completed cables (ac and dc voltage withstand, partial discharge, jacket spark test, and insulation resistance).
2. Have applicable AEIC qualification tests available for use by the cable inspector to evaluate the tests being made on the completed cable.
3. Request name of independent testing laboratory at least 2 weeks before cable is to be tested. Arrange directly with the testing laboratory for the cable inspector's visit to factory. Pay all expenses.

1.6 FIELD CONDITIONS

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Director's Representative or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Director's Representative no fewer than five days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Director's Representative written permission.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

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

B. Comply with IEEE C2 and NFPA 70.

C. Source Limitations: Obtain cables and accessories from single source from single manufacturer.

2.2 CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. General Cable; Prysmian Group North America.
2. Okonite Company (The).
3. Prysmian Cables and Systems; Prysmian Group North America.
4. Southwire Company.
5. Or equal.

B. Cable Type: Type MV 105

C. Conductor Insulation: Ethylene-propylene rubber.

1. Voltage Rating: 15 kV.
2. Insulation Thickness: 133 percent insulation level.
3. Insulation: Ethylene Propylene rubber (EPR), 105C, colored to contrast with the shield layers. The nominal insulation thickness shall 115 mils for 5kv and 8kv, 220 mils for 15kv and 420 mils for 35kv. Physical and electrical properties of the insulation shall be in accordance with ICEA S-97-682 for Class III insulation.

D. Conductor: Copper

E. Conductor Stranding: **Compact round, concentric lay, Class B**

F. Strand Filling: Conductor interstices are filled with impermeable compound.

G. Insulation Shield: Extruded thermoset semi-conducting polymeric layer, free stripping from the insulation. It shall be in intimate contact with the outer surface of the insulation and shall be free-stripping, leaving no conducting particles or other residue on the insulation surface. The layer shall be legibly identified as being semi-conducting. The thickness and properties of the layer shall be in accordance with ICEA S-97-682.

H. Shielding and Jacket: Corrugated copper drain wires embedded in extruded, chlorinated, polyethylene jacket.

1. Metallic Shield: 5 mil annealed copper tape shield with a nominal 25% overlap. The tape shall meet the requirements of ICEA S-97-682.
2. Jacket: Polyvinyl Chloride (PVC), Thermoset Chlorinated Polyethylene (CPE), or Thermoplastic CPE overlaying jacket with physical properties and thicknesses in accordance with the requirements of UL 1072 and ICEA S-93-639.

I. Three-Conductor Cable Assembly: Three insulated, shielded conductors cabled together with ground conductors.

1. Circuit Identification: Color-coded tape (black, red, blue) under the metallic shielding.

J. Cable Sheath: Interlocked aluminum applied over cable.

K. Cable Jacket: Sunlight-resistant PVC

2.3 CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Adalet.
2. G&W Electric Company.
3. nVent (RAYCHEM).
4. Or equal.

B. Comply with ANSI C119.4 for connectors between aluminum conductors or for connections between aluminum to copper conductors.

C. Copper-Conductor Connectors: Copper barrel crimped connectors.

2.4 SOLID TERMINATIONS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Adalet.
2. G&W Electric Company.
3. nVent (RAYCHEM).

4. Or equal.

B. Ampere Rating: Not less than ampere rating of cable.

C. Voltage Rating: Not less than voltage rating of cable.

D. Shielded-Cable Terminations: Comply with the following classes of IEEE 48. Insulation class shall be equivalent to that of cable. Include shield ground strap for shielded cable terminations.

1. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief tube; multiple, molded-silicone-rubber, insulator modules; shield ground strap; and compression-type connector.
2. Class 1 Terminations: Heat-shrink type with heat-shrink inner stress control and outer nontracking tubes; multiple, molded, nontracking skirt modules; and compression-type connector.
3. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief shield terminator; multiple-wet-process, porcelain, insulator modules; shield ground strap; and compression-type connector.
4. Class 1 Terminations, Indoors: Kit with stress-relief tube, nontracking insulator tube, shield ground strap, compression-type connector, and end seal.
5. Class 2 Terminations, Indoors: Kit with stress-relief tube, nontracking insulator tube, shield ground strap, and compression-type connector. Include silicone-rubber tape; cold-shrink-rubber sleeve; or heat-shrink, plastic-sleeve moisture seal for end of insulation whether or not supplied with kits.
6. Class 3 Terminations: Kit with stress cone and compression-type connector.

2.5 SEPARABLE INSULATED CONNECTORS

A. Description: Modular system, complying with IEEE 386, with disconnecting, single-pole, cable terminators and with matching, stationary, plug-in, dead-front terminals designed for cable voltage and for sealing against moisture.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Cooper Power.
2. Elastimold.
3. nVent (RAYCHEM)
4. Or equal.

C. Terminations at Distribution Points: Modular type, consisting of terminators installed on cables and modular, dead-front, terminal junctions for interconnecting cables.

D. Dead-Break Cable Terminators: Elbow-type unit with 600-A continuous-current rating; designed for de-energized disconnecting and connecting; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.

E. Dead-Front Terminal Junctions: Modular bracket-mounted groups of dead-front stationary terminals that mate and match with above cable terminators. Two-, three-, or four-terminal units as indicated, with fully rated, insulated, watertight conductor connection between terminals and complete with grounding lug, manufacturer's standard accessory stands, stainless-steel mounting brackets, and attaching hardware.

1. Protective Cap: Insulating, electrostatic-shielding, water-sealing cap with drain wire.
2. Portable Feed-Through Accessory: Two-terminal, dead-front junction arranged for removable mounting on accessory stand of stationary terminal junction.
3. Grounding Kit: Jumpered elbows, portable feed-through accessory units, protective caps, test rods suitable for concurrently grounding three phases of feeders and carrying case.
4. Standoff Insulator: Portable, single dead-front terminal for removable mounting on accessory stand of stationary terminal junction. Insulators suitable for fully insulated isolation of energized cable-elbow terminator.

F. Test-Point Fault Indicators: Applicable current-trip ratings and arranged for installation in test points of load-break separable connectors, and complete with self-resetting indicators capable of being installed with shotgun hot stick and tested with test tool.

G. Tool Set: Shotgun hot stick with energized terminal indicator, fault-indicator test tool, and carrying case.

2.6 SPLICE KITS

A. Description: For connecting medium voltage cables; type as recommended by cable or splicing kit manufacturer for the application.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M.
2. Adalet.
3. G&W Electric Company.
4. Or equal.

C. Standard: Comply with IEEE 404.

D. Splicing Products: As recommended, in writing, by splicing kit manufacturer for specific sizes, materials, ratings, and configurations of cable conductors. Include all components required for complete splice, with detailed instructions.

1. Splicing kit must be from a single manufacturer.
2. Combination tape and cold-shrink-rubber sleeve kit with rejacketing by cast-epoxy-resin encasement or other waterproof, abrasion-resistant material.
3. Heat-shrink splicing kit of uniform, cross-section, polymeric construction with outer heat-shrink jacket.
4. Premolded, cold-shrink-rubber, in-line splicing kit.
5. Premolded, EPDM splicing body kit with cable joint sealed by interference fit of mating parts and cable.

6. Separable multiway splice system with all components for the required splice configuration.
7. Splices Installed in Vaults, Manholes (any wet locations): Waterproof and submersible.

2.7 MEDIUM-VOLTAGE TAPES

A. Description: Electrical grade, insulating tape rated for medium voltage application.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M.
2. G&W Electric Company.
3. nVent (RAYCHEM).
4. Or equal.

C. Ethylene/propylene rubber-based, 30-mil splicing tape, rated for 130 deg C operation. Minimum 3/4 inch wide.

D. Silicone rubber-based, 12-mil self-fusing tape, rated for 130 deg C operation. Minimum 1-1/2 inches (38 mm) wide.

E. Insulating-putty, 125-mil elastic filler tape. Minimum 1-1/2 inches wide.

2.8 ARC-PROOFING MATERIALS

A. Description: Fire retardant, providing arc flash protection.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M.
2. G&W Electric Company.
3. nVent (RAYCHEM).
4. Or equal.

C. Tape for First Course on Metal Objects: 10-mil- thick, corrosion-protective, moisture-resistant, PVC pipe-wrapping tape.

D. Arc-Proofing Tape: Fireproof tape, flexible, conformable, intumescent to 0.3 inch thick, and compatible with cable jacket.

E. Glass-Cloth Tape: Pressure-sensitive adhesive type, 1 inch wide.

2.9 ACCESSORIES

A. Pulling Compounds: As recommended by cable manufacturer.

1. Polywater “A”, “G”, “J” or “WJ” lubricants, Plymouth/Bishop No. 45 Cable Pulling Lubricant, Aqua-Gel II (Ideal Industries, Inc.) or Aqua-Gel CW (Ideal Industries, Inc.).

B. Tags: Precision engrave letters and numbers with uniform margins, character size minimum 3/16 inches high.

1. Phenolic: Two color laminated engraver’s stock, 1/16 inch minimum thickness, machine engraved to expose inner core color (white).
2. Aluminum: Standard aluminum alloy plate stock, minimum .032 inches thick, engraved areas enamel filled or background enameled with natural aluminum engraved characters.

2.10 SOURCE QUALITY CONTROL

A. Test and inspect cables according to ICEA S-97-682 before shipping.

B. Test strand-filled cables for water-penetration resistance according to ICEA T-31-610, using a test pressure of 5 psig.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cables according to IEEE 576.

B. Proof conduits prior to conductor installation by passing a wire brush mandrel and then a rubber duct swab through the conduit. Separate the wire brush and the rubber swab by 48 to 72 inches on the pull rope.

1. Wire Brush Mandrel: Consists of a length of brush approximately the size of the conduit inner diameter with stiff steel bristles and an eye on each end for attaching the pull ropes. If an obstruction is felt, pull the brush back and forth repeatedly to break up the obstruction.
2. Rubber Duct Swab: Consists of a series of rubber discs approximately the size of the conduit inner diameter on a length of steel cable with an eye on each end for attaching the pull ropes. Pull the rubber duct swab through the duct to extract loose debris from the duct.

C. Pull Conductors: Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

1. Where necessary, use manufacturer-approved pulling compound or lubricant that does not deteriorate conductor or insulation.
2. Use pulling means, including fish tape, cable, rope, and basket-weave cable grips, that do not damage cables and raceways. Do not use rope hitches for pulling attachment to cable.
3. Use pull-in guides, cable feeders, and draw-in protectors as required to protect cables during installation.
4. Do not pull cables with ends unsealed. Seal cable ends with rubber tape.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

E. Install "buried-cable" warning tape 12 inches above cables.

F. In manholes, handholes, pull boxes, junction boxes, and cable vaults, train cables around walls by the longest route from entry to exit; support cables at intervals adequate to prevent sag.

G. Install sufficient cable length to remove cable ends under pulling grips. Remove length of conductor damaged during pulling.

H. Install cable splices at pull points and elsewhere as indicated; use standard kits. Use dead-front separable watertight connectors in manholes and other locations subject to water infiltration.

I. Install terminations at ends of conductors, and seal multiconductor cable ends with standard kits.

J. Install separable insulated-connector components as follows:

1. Protective Cap: At each terminal junction, with one on each terminal to which no feeder is indicated to be connected.
2. Portable Feed-Through Accessory: At each terminal junction, with one on each terminal.
3. Standoff Insulator: At each terminal junction, with one on each terminal.

K. Arc Proofing: Unless otherwise indicated, arc proof medium-voltage cable at locations not protected by conduit, cable tray, direct burial, or termination materials. In addition to arc-proofing tape manufacturer's written instructions, apply arc proofing as follows:

1. Clean cable sheath.
2. Wrap metallic cable components with 10-mil pipe-wrapping tape.
3. Smooth surface contours with electrical insulation putty.
4. Apply arc-proofing tape in one half-lapped layer with coated side toward cable.
5. Band arc-proofing tape with two layers of 1-inch- wide half-lapped, adhesive, glass-cloth tape at each end of the arc-proof tape.

L. Ground shields of shielded cable at terminations, splices, and separable insulated connectors. Ground metal bodies of terminators, splices, cable and separable insulated-connector fittings, and hardware.

M. Ground shields of shielded cable at one point only. Maintain shield continuity and connections to metal connection hardware at all connection points.

N. Identify phase and circuit number of each conductor at each splice, termination, pull point, and junction box. Arrange identification so that it is unnecessary to move the cable or conductor to read the identification.

3.2 FIELD QUALITY CONTROL

A. High Voltage After Installation Test: (Test Record-Power Cable Proof Test) form (BDC-362).

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a Company Service Advisor to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform the following tests and inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
2. After installing medium-voltage cables and before electrical circuitry has been energized, test for compliance with requirements.
3. Perform direct-current High Potential test of each new conductor according to NETA ATS, Ch. 7.3.3. Do not exceed cable manufacturer's recommended maximum test voltage.
4. Perform Partial Discharge test of each new conductor according to NETA ATS, Ch. 7.3.3 and to test equipment manufacturer's recommendations.
5. Perform Dissipation Factor test of each new conductor according to NETA ATS, Ch. 7.3.3 and to test equipment manufacturer's recommendations.

E. Medium-voltage cables will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 260513

SECTION 261315

SEQUENCE OF OPERATION FOR ELECTRICAL EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes control sequences and acceptance testing criteria for the 15kV electrical system, which is composed of the following subsystems (as identified on drawings E-600 series drawings):
   1. 15kV Switchgear (Switchgear MV-1)
   2. Generator Switchgear
   3. Distribution Switchgear

B. Related Sections include the following:
   1. Section 261314 “Power Monitoring and Control”

C. System Description: The following sequence of operations shall be implemented and designed by the controls integrator via PLC based control and HMI screens located in Building No. 17. In general, the control system shall accommodate the following functionality:
   1. Automatic source transfer between the incoming utility power to the onsite 15KV generators.
   2. Manually initiated automatic test sequences.
   3. Remote operation and monitoring of all circuit breakers.

1.02 SUBMITTAL

A. FPT Test Script: Provide FPT test scripts for review by the engineer and the testing agency. FPT test script basis is provided as an example at the end of this specification section. The FPT Test Script submitted for approval by Contractor shall be based on the submitted and approved proposed sequence of the switchgear system. Contractor shall modify FPT test script to match the programming of the system being provided.

1.03 DEFINITIONS AND ABBREVIATIONS

A. Closed Transfer Timer: Adjustable timer which prevents closed transfer initially set at 250mS (for NYSEG review and approval).

B. Fail Safe: With respect to the control circuits in this Control System, fail safe means the loss or failure of a control component or interconnecting signal wire will cause the system to assume a state known to be safe.

C. HMI: Human Machine Interface.

D. Loss of Voltage/Voltage out of Tolerance: Voltage level below 85% Nominal Voltage for 3 seconds.

E. MOC: Mechanism Operated Contacts used to indicate circuit breaker position. MOC-a = contact open when breaker open, MOC-b = contact closed when breaker open

F. Nominal Voltage: The expected RMS voltage magnitude at each location in the Electric System under normal operation. In this case it is 12.47 kilovolts (kV)

G. Normal Power: Served by the utility source, but with standby generator backup.

H. Operator: the control system user.

I. Overvoltage: Voltage level above a specified minimum level (100% to 120% Nominal Voltage) for a specified time period.

J. PLC: Programmable Logic Controller

K. PT: Potential Transformer

L. System Control Screen: The control screen currently being accessed by the Operator: an HMI screen at the switchgear.

M. Stable Voltage: Voltage level above a specified minimum level for a specified time period; initially set at 95% voltage for 15 minutes.

N. Switchgear Control System: The system of PLC's, input/output devices, communication devices, etc. used to control the 12.47kV Switchgear.

O. TOC: Truck Operated Contacts used to indicate breaker racked-in status. TOC = contact closed when breaker is racked in.

P. Breaker Designations: refers to position of circuit breakers:
1. PF-PS1: 15 kV Switchgear MV-1 Utility Main Circuit Breaker
2. PF-PS2: 15kV Switchgear MV-1 Tie Circuit Breaker to Generator Switchgear
3. PF-11: 15kV Switchgear MV-1 Tie Circuit Breaker to Distribution Switchgear
4. PF-12, PF-13, PF-14: 15kV Switchgear MV-1 Feeder Breakers

5. PF-G1, PF-G2, PF-G3: 15 kV Generator Switchgear Generator Circuit Breaker
6. PF-UM: 15kV Generator Switchgear Tie Circuit Breaker to Switchgear MV-1
7. PF-F1: 15kV Generator Switchgear Tie Circuit Breaker to Distribution Switchgear
8. PF-BT: 15kV Generator Switchgear Tie Breaker
9. PF-1: 15kV Distribution Switchgear Tie Circuit Breaker to Generator Switchgear
10. PF-6: 15kV Distribution Switchgear Tie Circuit Breaker to Switchgear MV-1
11. PF-1, PF-3, PF-5: 15 kV Distribution Switchgear Feeder Breakers

Q. Breaker Position Definition

Condition	MOC Contact Positions	TOC Contact Position	*86 Lock-out Relay Protection Trip	**Relay Failure
Closed	a = closed b = open	open = breaker not racked in closed = breaker racked in	N.C. contact = open N.O. contact = closed	N.C. contact = open N.O. contact = closed
Open	a = open b = closed			

* Lockout relay contains normally open (N.O.) and normally closed (N.C.) contacts that change position when the associated protective function trips the lockout control contact (i.e. N.O. contact will close and N.C. contact will open).

**Relay has programmed output that monitors relay health. This contact is N.C. when relay is operating normally (no faults). The contact will open when either a software or hardware failure occurs.

1.04 NORMAL OPERATING CONDITIONS

A. The 15 kV Main Switchgear (MV-1) is a main-tie-man bus lineup with two utility main breakers, and five outgoing feeder breakers. A single overhead feed from New York State Electrical and Gas (NYSEG) that transitions to an underground raceway supplies main breaker PF-PS1. A single feed from main breaker PF-PS2 is routed underground to feed existing generator switchgear breaker PF-UM. The existing generator switchgear Similarly, three 1230 kW generators supplies breakers PF-G1, PF-G2 and PF-G3 on existing generator switchgear. A single feeder breaker PF-F1 on the generator switchgear will feed the existing distribution switchgear via feeder breaker PF-2.

B. The control system is designed for closed transition between the onsite standby generator and the utility source.
   1. Open Transition Switch: The HMI interface shall include a switch between open and closed transition switching. All closed transition return to utility switching described in the sequences below, shall also have the ability to be implemented in open-transition mode by the control system.

C. Automatic / Manual Operation: The Master Control Panel monitors the Electric System and automatically responds to system inputs as described in this section. While in Auto Mode, any manual intervention such as opening or closing a circuit breaker will force the Master Control Panel into Manual Mode. The forced Manual Mode shall be logged in the Alarm History, and shall be displayed on the HMI. During Manual operation the Master Control Panel monitors the electric system but does not operate any breakers or start the generators automatically under any conditions. All sequences must be carried out manually. Any hardware, circuit breaker, or relay failures which occur in automatic or manual mode shall initiate an audible alarm and visual failure notification on the HMI in the Master Control Panel.

D. Test/Island Mode: The master control panel shall include a physical switch to initiate a generator test intended to be used for a monthly system test. A light above the switch shall flash when Test/Island Mode has been activated. This sequence, while manually initiated, shall be completely automated with closed or open transition switching between sources. The screen interface on the HMI shall include a selection for open or closed transition test, with closed transition selected as default. The test screen interface shall also display the automatic sequence being completed in real time including positions of breakers and status of generator. When 'Initiate Generator Test' is selected, the automatic sequence to transfer to the generator source shall be initiated. When 'Return to Utility' is selected, the automatic sequence to transfer back to the utility source shall be initiated. These sequences shall follow the general procedure outlined below for transfers to and from the generator source, with the user selected open or closed transition switching. If at any time during the test, voltage from the generator falls out of tolerance, or the system is unable to transfer to the generator, an audible alarm and visible warning on the HMI shall be displayed. The generator voltage falling out of tolerance shall also initiate a failure sequence which automatically returns the circuit breakers to the pre-test positions, repowering through the utility source, assuming it is still available, while leaving the visible and audible alarms until manually disabled.

E. Initial Circuit Breaker Positions:
   1. PF-PS1: Closed
   2. PF-PS2: Closed
   3. PF-11: Closed

4. PF-12, 13, 14: Closed
5. PF-G1, G2, G3: Open
6. PF-UM: Closed
7. PF-F1: Closed
8. PF-BT: Open
9. PF-2: Closed
10. PF-6: Open
11. PF-1, 3, 5: Closed

All sequences assume contact positions corresponding with the states above as defined in the definitions. If a non-feeder breaker has a state not corresponding to the defined "Open" or "Closed" then the sequence is not executed.

F. Initial Bus and Source Conditions:
1. MV-1 SWGR Bus: Energized
2. NYSEG Utility Source: Energized
3. Distribution Switchgear: Energized
4. Generator Switchgear: De-energized

1.05 SWITCHGEAR OPERATION

A. The following control sequences shall occur automatically when the Control System is in Automatic mode. Manual sequences are included where applicable.

B. Loss of Voltage at Breaker PF-PS1 (Utility Source):

1. Precondition: Breaker PF-PS1 is racked in with TOC-a Contact Closed. If TOC-a is open, the racked out breaker is considered "Out of Service" and this sequence is not executed. The loss of voltage alarm is logged by the Control System.
2. Loss of voltage is detected by PF-PS1 line-side PT's and undervoltage protective relay. This condition is sensed by the Control System.

a. With the above conditions true, the Switchgear Control System shall read breaker position and relay status PF-UM, PF-F1 AND PF-BT. To proceed with the transfer operation, PF-UM, PF-F1, PF-BT and associated relay must have the following status:

Condition	CB Name	MOC Contact	TOC-a Contact Position	Breaker Tripped	Relay Failure

		Positions		(via 86-Lock Out Relay)	(Self Test) Status
1.	PF-UM	a = Open b = Closed	Closed	Not Tripped	Not Failed
2.	PF-F1	a = Open b = Closed	Closed	Not Tripped	Not Failed
3.	PF-BT	a = Open b = Closed	Open	Not Tripped	Not Failed

b. If the above Conditions are true, proceed to Step 3.
c. If Condition 1 is not met, the Control System shall close CB PF-UM. If after commanding breaker PF-UM to close Condition 1 is met, proceed to Step 3.
d. If Condition 2 is not met, the Control System shall close CB PF-F1. If after commanding breaker PF-F1 to close Condition 2 is met, proceed to Step 3.
e. If Condition 3 is not met, the Control System shall open CB PF-BT. If after commanding breaker PF-BT to open Condition 3 is met, proceed to Step 3.

3. After the Loss of Utility Timer times out, open CB PF-PS1 and proceed to Step 4. A return of the Utility Source voltage during this time delay shall stop the timing sequence and reset the Loss of Utility timer, CB PF-PS1 shall remain closed.
4. Open feeder breakers PF-1, PF-3, PF-5, PF-12, PF-13 and PF-14.
5. A generator start signal is sent to 12.47kV GEN, proceed to Paragraph "Generator Operation – Loss of Utility Source."
6. Manual Operation: The Switchgear Control System should normally be set in "Auto" mode. If in "Manual" mode, the above conditions will be monitored.

C. Generator Operation – Loss of Utility Source:

1. Precondition 1: A generator start signal has been sent to the generator controllers:
2. Precondition 2: The following conditions must be true:

Condition	CB Name	MOC Contact Positions	TOC-a Contact Position	Breaker Tripped (via 86-Lock Out Relay)	Relay Failure (Self Test) Status
1.	PF-PS1	a = Open b = Closed	Open	Not Tripped	Not Failed
2.	PF-PG1, PG2, PG3	a = Open b = Closed	Open	Not Tripped	Not Failed
3.	PF-BT	a = Open b = Closed	Open	Not Tripped	Not Failed

a. If the above Conditions are true, proceed to Step 3.
b. If Condition 1 and 3 are met, but Condition 2 is not met, the Control System shall open CB PF-PG1, PG2, PG3. If after commanding breaker PF-PG1, PG2, PG3 to open Condition 1 is met, proceed to Step 3.
c. If Condition 2 and 3 are met, but Condition 1 is not met, the Control System shall open CB PF-PS1. If after commanding breaker PF-PS1 to open, Condition 2 is met, proceed to Step 3. If CB PF-PS1 fails to open, abort the sequence and annunciate the failure condition on the System Control Screen.
d. If Condition 1 and 2 are met, but Condition 3 is not met, the control system shall open CB PF-BT. If after commanding breaker PF-BT to open, Condition 3 is met, proceed to Step 3. If CB PF-BT fails to open, abort the sequence and annunciate the failure condition on the System Control Screen.
e. If all conditions are met, proceed to Step 3.

3. The 12.47kV GEN generator set starts, ramps up to operating speed and output voltage, and close CB PF-PG1, G2, G3. onto the 15kV Generator SWGR bus. Energizes the 15 Generator SWGR bus. Voltage shall be sensed at the generator PT's on the line side of PF-PG1, G2 and G3.
4. Close tie breaker PF-BT.

5. Sequentially close feeder breakers PF-1, PF-3, PF-5, PF-12, PF-13 and PF-14 with 3 seconds in between to not block load the generator.

D. Manual Generator Operation – Loss of Utility Source:

1. This sequence will be implemented if the automatic sequence is inoperable. All steps in this sequence must be manually initiated by the Operator.
2. Open CB PF-PS1.
3. The Operator manually initiates generator startup for generator through the HMI.
4. The Control System shall start and ramp up the generator.
5. Once at rated speed, the Operator closes CB PF-G1, G2 and G3 to energize the 15 kV Generator SWGR.
6. Once the 15kV Generator SWGR is energized, the Operator closes PF-BT to energize 15kV MV-1 and Distribution SWGR.

E. Generator Operation – Return of Utility Source(s):

1. Stable voltage is detected by CB PF-PS1 line-side PT's and protective relays, allowing the Restored Utility Timer in the Control System to time out.
2. When the Utility Source is restored, the generator shall be feeding the facility under the following Condition:

Condition	CB Name	MOC Contact Positions	TOC-a Contact Position	Breaker Tripped (via 86-Lock Out Relay)	Relay Failure (Self Test) Status
1.	PF-PS1	a = Open b = Closed	Closed	Not Tripped	Not Failed
	PF-BT	a = Closed b = Open	Closed	Not Tripped	Not Failed
	PF-G1, G2, G3	a = Closed b = Open	Closed	Not Tripped	Not Failed

3. With the system in Closed Transition:
   a. If Condition 1 is met, the Control System shall execute the following sequence:
      1) Synchronize Generator to Utility and close CB PF-PS1.
         a) If CB PF-PS1 fails to close, remain on generator power. Annunciate failure condition on System Control Screen.
      2) Live/Live Closed Transfer timer starts. This shall be a hard coded timer set at 250 ms.
      3) Live/Live Closed Transfer timer expires.
      4) CB PF-BT Open:
         a) If CB PF-BT fails to open, open CB PF-PS1. Continue running on generator power.

4. With the system in Open Transition:
   a. If Condition 1 is met, the Control System shall execute the following sequence:
      1) Open CB PF-BT.
         a) If CB PF-BT fails to open, remain on generator power. Annunciate failure condition on System Control Screen.
      2) Open Transition timer starts. This shall be an adjustable timer set at 2 seconds.
      3) Open Transition timer expires.
      4) Close CB PF-PS1.
         a) If CB PF-PS1 fails to close, close CB PF-BT and remain on generator power. Annunciate failure condition on System Control Screen.
      5) Open CB PF-G1, G2 and G3.
         a) If CB PF-G1, G2 or G3 fail to open, procees to Step 5. Annunciate failure condition on System Control Screen.

5. The generators shall run for an adjustable cool down period and shut down.

F. Manual Generator Operation – Return of Utility Source(s):

1. This sequence will be implemented if the automatic sequence is inoperable. All steps in this sequence must be manually initiated by the Operator.

2. The Operator will open and close the circuit breakers manually in the order indicated under open transition.
3. Once utility power is restored, the Operator may shut down the generator manually.

G. Generator Operation – Load Testing:

1. This sequence may be used for periodic generator load testing, or if the facility wants to operate in an island mode due to bad weather that may affect utility service. The System Control Screen shall provide controls to initiate this sequence manually and automatically.
2. Once the Operator initiates this sequence, the steps are the same as listed in "Generator Operation – Loss of Utility Source" for bringing the generators online.

H. Generator Operation – Return from Load Testing:

1. This sequence shall be a manually-initiated automatic sequence upon completion of load testing or once bad weather has passed.
2. Precondition: The selected Utility Source is available and stable.
3. Once the Operator initiates this sequence, the steps are the same as listed in "Generator Operation – Return of Utility Source" for returning to utility power and taking the generator offline.

I. Failure Sequences:

1. In all cases below, each failure sequence shall be uniquely annunciated on the System Control Screen.
2. Protective Relay Failure (Self Test Contact Closure): Any CB with this condition shall not be commanded open. The failure condition shall be annunciated on the System Control Screen. However, any breaker with a failed protective relay shall be blocked from closing in all automatic control sequences.
3. Stuck Breaker Monitor (Non-Fault Trip): When the trip coil on any breaker receives a trip signal from the Control System during an automatic switching sequence, a timer is started. If the breaker fails to open, as verified by monitoring the breaker MOC-a and MOC-b position contacts, the breaker is considered stuck closed. The following stuck breaker conditions apply to each CB on the 15 KVSWGR as follows:

a. CB PF-PS1 Stuck Closed: If attempting to open this breaker during a voluntary transfer (for example, manually initiated transfer to de-energize source for maintenance) and it does not open, re-open generator breaker PF-BT (if it is closed) and terminate the sequence. CB PF-PS1 shall remain closed.
b. CB PF-BT Stuck Closed: If attempting to open this breaker during a transfer and it does not open, re-open main breaker PF-PS1 (if it is closed) and terminate the sequence. CB PF-BT shall remain closed.

4. Breaker Fails to Close (Stuck Open): When the spring release coil on any breaker receives a voltage signal, a timer is started. If the breaker fails to close, as verified by monitoring the breaker MOC-a and MOC-b position contacts, the breaker is considered stuck open. The following stuck breaker conditions apply to each CB on the 15 kV SWGR as follows:

a. CB PF-PS1 Stuck Open: Any sequence involving this breaker shall be terminated. The system shall remain in its current state (generator running).
b. CB PF-BT Stuck Open: Any sequence involving this breaker shall be terminated. The system shall remain in its current state (utility power active).
c. SWGR Feeder Breakers Stuck Open: No further control action will occur. Any downstream loads served by the stuck open feeder will have to be switched to an alternate source, or will remain de-energized.

5. Bus Fault: Bus faults are detected by bus differential relaying. If a bus fault occurs in a differential zone, all circuit breakers connected to that zone will be tripped and locked out (via bus lock out relay).

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 261326

MEDIUM-VOLTAGE, METAL-CLAD SWITCHGEAR

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modifications to Existing Metal-Clad Switchgear.
2. Kirk-key Interlocking
3. Switchgear enclosure.
4. Switchgear construction.
5. Surge arresters.
6. Instruments.
7. Protective relays.
8. Control power supply.
9. Battery system control power supply.
10. Control network.
11. Warning labels and signs.

B. System Description:

1. Control System: The metal clad switchgear shall be responsible for providing with an integral PLC based control system with HMI interface to be powered from the station battery system. The control system shall be capable of displaying status and remotely operating all circuit breakers in the 15kV Switchgear. In addition, metering on all circuit breakers in the 15kV Switchgear shall be displayed on the HMI screen.
2. Pre-Engineered Enclosure: The contractor shall provide a complete pre-engineered outdoor enclosure to house the switchgear, station battery system, PLC panel, lighting, fire alarm, and all other associated sub-systems.
3. Kirk-key Interlocking Scheme:

    a. The Kirk Key interlock system shall provide manual mechanical interlocking to prevent improper operation, backfeeding, and paralleling of distribution sources within the facility. A total of three (3) key types shall be utilized: K1, K2, and K3. Each key type shall have three (3) keys, for a total of nine (9) keys.
    b. Normal Operation:

        1) Breaker PF-PS1: two (2) K1 keys
        2) Breaker PF-PS2: two (2) K2 keys
        3) Breaker PF-F1 (existing): two (2) K3 keys
        4) One (1) spare key of each type (K1, K2, K3) shall be provided

    c. Temporary Generator Operation (Quick Connect) – When the facility is supplied by two temporary generators via the quick connect system:

1) Breaker PF-10: one (1) K1, one (1) K2, one (1) K3
2) Breaker GQC-LB #1: one (1) K1, one (1) K2, one (1) K3
3) Breaker GQC-LB #2: one (1) K1, one (1) K2, one (1) K3
4) This configuration shall prevent backfeeding and paralleling of sources.

d. Load Bank Testing Operation:

1) Breaker PF-10: one (1) K1, one (1) K2, one (1) K3
2) Breaker GQC-LB (either breaker #1 or #2): one (1) K1, one (1) K2, one (1) K3
3) One (1) spare key of each type (K1, K2, K3) shall be provided
4) Either GQC-LB breaker may be used for load bank testing, provided all three keys (K1, K2, K3) are installed in the selected breaker.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Service Grounding and Bonding: 260526.

B. Power Monitoring and Control: 261314.

1.3 DEFINITIONS

A. BIL: Basic Impulse Insulation Level.

B. NETA ATS: InterNational Electrical Testing Association, Acceptance Testing Specification.

C. UPS: Uninterruptable power supply.

D. VRLA: Valve-regulated, recombinant, lead-calcium acid.

E. Manufacturer: The company engaged in the manufacturing of the component parts and fabrication of the switchgear.

F. Fabricator: The assembler of the component parts and their interconnections, complete with interior support and exterior shell to form a fully functional piece of equipment.'

G. Certified Engineering and Instrumentation Service Firm: The process control/instrumentation firm responsible for providing the control system technician who is responsible for implementing control points and relay settings.

H. Hot-Standby PLC: Two identical but physically independent PLCs, powered from two identical but physically independent power supplies. Each PLC and power supply shall have its own visible failure indicator light at the PLC panel and on the generator transfer control panel, illuminated during normal operation of the component. Data transfer between each identical PLC shall occur in real-time so both independent systems contain identical information in the event of a component failure. Both systems may utilize the same I/O module.

1.4 SYSTEM DESCIPTION FOR MODIFICATIONS TO EXISTING METAL-CLAD SWITCHGEAR

A. The existing electrical service is a single incoming 12.47 kilo-volt (kV) overhead feeder from New York State Electrical and Gas (NYSEG). The electrical generator and switchgear is located in Building 17 which is on the west side of the correctional facility outside of the perimeter fence. The generator and switchgear building serves as the central electrical distribution location for the facility buildings which are fed by six (6) underground feeders. There are twenty buildings connected to the underground feeders with two feeders supplied to each with a source selector switch, known as dual radial distribution. The Building 17 switchgear and generator provide both normal and emergency power with a PLC based control system for switching between generator and utility. The control system has resulted in documented failures that have resulted in site-wide electrical utility outages.

B. Replacement control system components are to be added to an external enclosure and existing I/O wiring in existing switchgear extended to it. This system will replace the Enercon control platform with updated control PLC platform, Human Machine Interfaces (HMI) and ancillary control device upgrades. The control platform should provide for a integrated solution that controls all aspects of the generator paralleling system, engine controls, breaker operation, system monitoring and protection. The platform should contain (2) separate PLC controllers for redundancy and allow for manual operation of the system in the event of a catastrophic failure of the control system. The existing generators and switchgear are well maintained and are recommended to remain. The replacement PLC will meet all current industry standards, and proper testing and documentation of the system will be required as part of the equipment acceptance. The stringent system testing requirements will ensure that the design parameters are met and that the system performs as expected in all scenarios.

1.5 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Submittal packages:

1. For Modifications to Existing Metal-Clad Switchgear:

a. Product Data: For each type of product.

1) Include rated capacities, operating characteristics, and furnished specialties and accessories.
2) Time-current characteristic curves for overcurrent protective devices.

b. Shop Drawings: For each medium-voltage, metal-clad switchgear.

1) Include a tabulation of installed devices with features and ratings.

2) Include dimensioned plans and elevations, showing dimensions, shipping sections, and weights of each assembled section. Elevations shall show major components, features, and mimic bus diagram.
3) Include a plan view and cross section of equipment base showing clearances, manufacturer's recommended work space, and locations of penetrations for grounding and conduits. Show location of anchor bolts and leveling channels.
4) Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, and location and size of each field connection.
5) Locate accessory and spare equipment storage.
6) Include single-line diagram.
7) Include control power wiring diagrams.
8) Include batteries, battery rack, equipment base, and room layout.
9) Include copy of nameplate.
10) Test results of enclosure corrosion resistant finish.
11) Ratings the switchgear assembly:

    a) Voltage.
    b) Continuous current.
    c) Short-circuit current.
    d) Lightning impulse full-wave withstand voltage.

12) Utility company's metering provisions with indication of approval by utility company.
13) Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting seismic restraints.
14) Relay settings.
15) Interface data with monitoring or control network.
16) Wiring Diagrams: For each switchgear assembly include the following:

    a) Power, signal, and control wiring.
    b) Three-line diagrams of current and future secondary circuits showing device terminal numbers and internal diagrams.
    c) Schematic control diagrams.
    d) Diagrams showing connections of component devices and equipment.
    e) Schematic diagrams showing connections to remote devices including connection details to the communications network.

2. For Medium Voltage Pad Mounted Switchgear:

    a. Product Data: For each type of product.

        1) Include rated capacities, operating characteristics, and furnished specialties and accessories.
        2) Time-current characteristic curves for overcurrent protective devices.

    b. Shop Drawings: For each medium-voltage, metal-clad switchgear.

        1) Include a tabulation of installed devices with features and ratings.

2) Include dimensioned plans and elevations, showing dimensions, shipping sections, and weights of each assembled section. Elevations shall show major components, features, and mimic bus diagram.
3) Include a plan view and cross section of equipment base showing clearances, manufacturer's recommended work space, and locations of penetrations for grounding and conduits. Show location of anchor bolts and leveling channels.
4) Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, and location and size of each field connection.
5) Locate accessory and spare equipment storage.
6) Include single-line diagram.
7) Include control power wiring diagrams.
8) Include batteries, battery rack, equipment base, and room layout.
9) Include copy of nameplate.
10) Test results of enclosure corrosion resistant finish.
11) Ratings the switchgear assembly:

    a) Voltage.
    b) Continuous current.
    c) Short-circuit current.
    d) Lightning impulse full-wave withstand voltage.

12) Utility company's metering provisions with indication of approval by utility company.
13) Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting seismic restraints.
14) Relay settings.
15) Interface data with monitoring or control network.
16) Wiring Diagrams: For each switchgear assembly include the following:

    a) Power, signal, and control wiring.
    b) Three-line diagrams of current and future secondary circuits showing device terminal numbers and internal diagrams.
    c) Schematic control diagrams.
    d) Diagrams showing connections of component devices and equipment.
    e) Schematic diagrams showing connections to remote devices including connection details to the communications network.

E. Shop Drawing – Kirk Key System:

1. Submittal of the proposed kirk-key system implementation (i.e.: use of gang box kirk-key release systems).
2. Shop drawing shall include proposed placard for facility personnel.

F. Quality Control Submittals:

1. Electric Utility Company Approval:

    a. Also submit shop drawings and product data to the electric utility company for approval.

New York State Electric & Gas (NYSEG)
18 Link Drive, Binghamton, NY 13904
Roy Olcott
1-800-572-1111

b. After shop drawings and product data have been approval by the electric company, forward two copies with utility company letter indicating approval.
c. Switchgear will not be approved until electric utility company approval is received.

2. For Modifications to Existing Metal-Clad Switchgear:

a. Testing Agent Qualification Data: Include:

1) Name, business address and telephone number of NETA certified testing agent secured for performing all any and all NETA ATS required testing services that the Switchgear Manufacturer/Fabricator Company Field Advisor is not performing.
2) Certified statement from the Company listing the qualifications of the Testing Agents.
3) Resume of all testing agents secured for the required services.
4) List of clients for whom service has been rendered: Furnish the name, address, and telephone number of at least 10 clients for whom comparable projects have been completed in the last 5 years.

b. Certified Engineering and Instrumentation Service Firm Data:

1) Name, business address, and telephone number of firm representative.
2) Certified statement from the firm listing qualifications of the firm.
3) Resume of all engineers and technicians secured for the required services.
4) List of clients for whom service has been rendered: Furnish the name, address, and telephone number of at least 10 clients for whom comparable projects have been completed in the last 5 years.

c. Protective Relay Calibration Studies and Reports

1) System Protective Relay Settings Calibration and Testing of System Protective Relays: It shall be the contractor’s responsibility to secure the services of either a NETA certified testing agent or the Switchgear manufacturer to develop the relay setting files for the protective relays provided. The settings files shall be submitted for approval prior to any testing or implementation.
2) All protective function set points shall be set per the Coordination Study provided by the Engineer. All functionality required to execute the sequence of operations and protective scheme outlined in the drawings is the responsibility of the contractor including, but not limited to, programing inputs and outputs, enabling applicable protective functions, and programming the front panel of the relay.

3. For Medium Voltage Pad Mounted Switchgear:

    a. Company Field Advisor Data: Include:

        1) Name, business address and telephone number of Company Field Advisor secured for the required services.
        2) Certified statement from the Company listing the qualifications of the Company Field Advisor.
        3) Services and each product for which authorization is given by the Company listed specifically for this project.

G. Contract Closeout Submittals:

1. Test Report: System acceptance test report.
2. Certificate: Affidavit, signed by the Company Field Advisor and notarized, certifying that the system meets the Contract requirements and is operating properly.
3. Operation and Maintenance Data: Deliver two copies, covering the installed products to the Director's Representative. Include name, address and telephone number of nearest fully equipped service organization.
4. Photographs:

    a. After completion of the work take color photographs of the completed Work of this Section, as follows:

        1) 3 of the load center unit substation from different positions.
        2) 1 overall view of load center unit substation.
        3) Nameplate(s)

    b. Use a digital camera. Use wide angle lens for overall view. Use electronic flash capable of supplying sufficient light to evenly illuminate the overall subject.
    c. Minimum digital requirements:

        1) Format shall be .jpg or .tif
        2) The resolution shall be 12 Megapixels or greater.

    d. Submit photographs to electronic submittal website for approval and record.

H. Coordination Drawings:

1. Outdoor Installations:

    a. Utilities site plan, drawn to scale, showing heavy equipment or truck access paths for maintenance and replacement.
    b. Dimensioned concrete base, outline of the switchgear, conduit entries, and grounding equipment locations.

2. Indoor Installations:

    a. Dimensioned concrete base, outline of the switchgear, conduit entries, and grounding equipment locations.

b. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways, cable trays, busways, overhead hoists, and anchors.
c. Location of lighting fixtures, sprinkler piping and heads, ducts, and diffusers.

I. Qualification Data: For professional engineer and testing agency.

J. Product Certificates: For switchgear and batteries, signed by product manufacturer.

K. Source quality-control reports.

L. Field quality-control reports.

M. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchgear and switchgear components to include in emergency, operation, and maintenance manuals.

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Spare Fuses: Six of each type and rating of fuse and fusible device used, except for medium-voltage fuses and fuses associated with network protector. Include spares for the following:

a. Primary disconnect fuses.
b. Potential transformer fuses.
c. Control power fuses.
d. Fuses and fusible devices for fused circuit breakers.

2. Spare Indicating Lights: Six of each type installed.
3. Touchup Paint: Three half-pint containers of paint matching enclosure's exterior finish.
4. Primary Switch Contact Lubricant: One container(s).

B. Remote Racking Device

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in "Field Quality Control" Article.

B. Equipment Qualifications For Products Other Than Those Specified:

1. At the time of submission provide written notice to the Director of the intent to propose an “or equal” for products other than those specified. Make the “or equal” submission in a timely manner to allow the Director sufficient time to review the proposed product, perform inspections and witness test demonstrations.
2. If products other than those specified are proposed for use furnish the name, address, and telephone numbers of at least 5 comparable installations that can prove the proposed products have performed satisfactorily for 3 years. Certify in writing that the Director’s Representative of the 5 comparable installations will allow inspection of their installation by the Director's Representative and the Company Field Advisor.

    a. Make arrangements with the Director’s Representative of 2 installations (selected by the Director) for inspection of the installations by the Director's Representative. Also obtain the services of the Company Field Advisor for the proposed products to be present. Notify the Director a minimum of 3 weeks prior to the availability of the installations for the inspection, and provide at least one alternative date for each inspection.
    b. Only references from the actual Director’s Representative or Director’s Representative (Security Supervisor, Maintenance Supervisor, etc.) will be accepted. References from dealers, system installers or others, who are not the actual Director’s Representative of the proposed products, are not acceptable.

        1) Verify the accuracy of all references submitted prior to submission and certify in writing that the accuracy of the information has been confirmed.

3. The product manufacturer shall have test facilities available that can demonstrate that the proposed products meet the contract requirements.

    a. Make arrangements with the test facility for the Director's Representative to witness test demonstrations. Also obtain the services of the Company Field Advisor for the proposed product to be present at the test facility. Notify the Director a minimum of 3 weeks prior to the availability of the test facility, and provide at least one alternative date for the testing.

4. Provide written certification from the manufacturer that the proposed products are compatible for use with all other equipment proposed for use for this system and meet all contract requirements.

C. Company Field Advisor: Secure the services of a Company Field Advisor for a minimum of 120 working hours for the following:

1. Render advice regarding the load center unit substation installation, and final adjustment and testing of the load center unit substation devices.
2. Witness final system test and then certify with an affidavit that the load center unit substation is installed in accordance with the contract documents and is operating properly.
3. Train facility personnel on the operation and maintenance of the load center unit substation devices (minimum of three 4 hour sessions).
4. Explain available service programs to facility supervisory personnel for their consideration.

D. Control:

1. Switchgear manufacturer/fabricator will thoroughly review contract design logic and equipment, and notify the Director's Representative of any conflicts at the earliest possible date.
2. The contractor and switchgear manufacturer/fabricator company field advisor shall verify in the field all requirements for the connection of any existing facility power distribution system components (i.e., transformers, diesel generators, other switchgear, etc.)

E. Service Availability: A fully equipped service organization shall be available to service the completed Work.

1.9 WARRANTY

A. Special Battery Warranties: Manufacturer and Installer agree to repair or replace the switchgear control system storage batteries that fail in materials or workmanship within specified warranty period.

1. Warranted Cycle Life for VRLA Batteries: Equal to or greater than that represented in manufacturer's published table, including figures corresponding to the following, based on annual average battery temperature of 77 deg F:

   a. For discharge rate not faster than eight hours, discharge duration not longer than eight hours, and voltage at end of discharge not less than 1.67 V, warranted life must be not fewer than six discharge cycles.
   b. For discharge rate not faster than 30 minutes, discharge duration not longer than 30 minutes, and voltage at end of discharge not less than 1.67 V, warranted life must be not fewer than 20 discharge cycles.
   c. For discharge rate not faster than 15 minutes, discharge duration not longer than 45 seconds, and voltage at end of discharge not less than 1.67 V, warranted life must be not fewer than 120 discharge cycles.

2. Warranted Cycle Life for Premium VRLA Batteries: Equal to or greater than that represented in manufacturer's published table, including figures corresponding to the following, based on annual average battery temperature of 77 deg F:

   a. For discharge rate not faster than eight hours, discharge duration not longer than eight hours, and voltage at end of discharge not less than 1.67 V, warranted life must be not fewer than 40 discharge cycles.

b. For discharge rate not faster than 30 minutes, discharge duration not longer than 30 minutes, and voltage at end of discharge not less than 1.67 V, warranted life must be not fewer than 20 discharge cycles.
c. For discharge rate not faster than 15 minutes, discharge duration not longer than 1.5 minutes, and voltage at end of discharge not less than 1.67 V, warranted life must be not fewer than 750 discharge cycles.

PART 2 - PRODUCTS

2.1 MODIFICATIONS TO EXISTING METAL-CLAD SWITCHGEAR

A. ACCEPTABLE SWITCHGEAR COMPONENT MANUFACTURERS

1. Solid-State Electronic Protective Relays and Metering:

a. Schweitzer Engineering Laboratories (SEL)
b. Approved Equal

B. INSTRUMENT TRANSFORMERS

1. Instrument Transformers: Comply with IEEE C57.13.

a. Potential Transformers: Secondary voltage rating of 120 V and NEMA accuracy class of 0.3 with burdens of W, X, and Y. Winding configurations as indicated on the relaying single-line diagram.

C. PROTECTION RELAYS

1. Relays: Comply with IEEE C37.90
2. Provide integrated digital type protection relays, with current and voltage test blocks and plugs, programmable for the protective functions indicated by the ANSI device function numbers on the single-line diagram.
3. Provide relay test switches for the 15kV protective relays
4. Additional I/O Modules: Should be provided to meet the Input/Output requirements in the drawings.
5. Relay Settings Files: Create relay settings files to execute protective device scheme and automatic operations per the drawings and sequence of operations provided in Specification 261314. It shall be the contractor’s responsibility to engage either a certified testing agent or the switchgear manufacturer to develop the settings files. The set points for the protective elements shall be provided by the Engineer.

2.2 SYSTEM DESCRIPTION

A. Comply with IEEE ANSI C37.20.2.

B. The switchgear ratings shall comply with IEEE ANSI C37.04, and shall be the preferred ratings of IEEE ANSI C37.06.

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

2.3 ACCEPTABLE SWITCHGEAR MANUFACTURERS/FABRICATORS

A. Powercon

B. Eaton Corporation

C. Square D / Schneider Electric

D. Or Approved Equivalent

2.4 ACCEPTABLE SWITCHGEAR COMPONENT MANUFACTURERS

A. Vacuum Interrupter Type Power Circuit Breakers:

1. Eaton - VCP-W.
2. Powell Electric – Powl Vac
3. Schneider Electric – Masterclad VR
4. Siemens Energy & Automation, Inc. - GMI

2.5 GENERAL DESIGN

A. Must meet special restrictions for the design voltage as identified in the NEC, including clearances for installation in the assigned space.

B. Metal-clad switchgear of the indoor type and nominally rated:

1. System Voltage Class : 15 KV
2. Design Voltage: 12.47 KV RMS
3. Basic Impulse Level: 60kV
4. Main Bus Continuous Current Rating: 1200 A
5. Main Bus Conductor: Copper
6. Circuit Interrupting Medium: Vacuum
7. Circuit Breaker Mechanism Type: Spring Operated
8. Circuit Breaker Interrupting Rating: Match rating of Switchgear
9. Circuit Breaker Trip and Close Voltage: 125 V DC

C. Normal Ambient Conditions: The switchgear shall be designed to operate continuously under the following conditions:

1. Ambient Temperature Range: -40 degrees to +104 degrees F
2. Maximum Wind Loading: 90 MPH
3. Normal Precipitation: Heavy Snow, Rain, Ice, Sleet, Hail

2.6 NUMBERING

A. Standing in front of the switchgear the cubicles will be referred to as No. l, No. 2, No. 3, etc., Cubicle No. 1 being at the left hand end.

2.7 NUMBER OF CUBICLES

A. The number of cubicles indicated on the drawings are the minimum number to be provided. Provide additional cubicles if required by the characteristics of the proposed switchgear.

2.8 METAL CLAD CUBICLES

A. Each cubicle except auxiliary cubicles shall consist of a steel enclosed structure containing one removable element (vacuum circuit breaker) and one stationary structure with associated primary and secondary devices (current and potential transformers, buses, connections, metering and secondary control devices, etc.):

1. Stationary Structure: Welded and braced rigid steel frame sections, enclosed with sheet metal panels and barriers, hinged front panels for mounting of control devices, meters and instruments, entire structure painted: All steel surfaces shall be chemically cleaned and hot phosphate treated to provide a bond between the primer paint and metal surfaces. The switchgear exterior will be finished with cathodic electrodeposition of light gray epoxy paint (ANSI 61) for indoor equipment.
2. Auxiliary Cubicles: Same construction as the other cubicles except that provision for the removable element is not required.
3. Bus Compartment: Isolate and house bus in a separate compartment enclosed by metal barriers.
4. Bus Bars: Copper. Main bus of each unit insulated with a flame retardant, track resistant molded insulation having a dielectric strength in excess of that required for the voltage of the switchgear. Completely enclose each bus-bar with insulation except where provision is made for splicing together adjacent units or where connections are made. Provide at such joints, 2 piece molded insulation covers fastened to the bus. Silver plate and form splice plates and ends of the unit buses to obtain self-aligning, silver to silver, high pressure line contact.
5. Ground Bus: Securely attach to the cubicles and the ground connection.
6. Disconnect Devices: Self-aligning disconnect devices shall automatically make or break contact when the circuit breaker is inserted or removed:

    a. Primary Disconnect Devices: Stationary sockets in each cubicle. Studs on each removable element. Silver to silver line contacts. Non-magnetic, non-corrosive springs on the stationary sockets for high pressure line contact. Each stationary socket contact mounted in a one piece glazed wet process porcelain shell.
    b. Secondary Disconnect Devices (for Control or Secondary Wiring): Stationary receptacles in each cubicle. Plug contacts on each removable element.

7. Control Wiring: Factory installed, complete with bundling, lacing, and protection; and complying with the following:

a. Flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.
b. Conductors sized according to NFPA 70 for duty required.
c. Each control wire terminal shall be identified with a unique number. Each control wire shall be identified on each end with a number matching the switchgear terminal number.

8. Cable Terminations: Cubicles shall contain adequate space for cable terminations (including pothead terminated lead covered cables).
9. Surge Arresters: Intermediate class, metal-oxide-varistor type. Comply with NEMA LA 1.

a. Install in Main incoming cable termination compartments in each phase of circuit.
b. Coordinate rating with system voltage.

B. Control Power Transformers: Provide draw-out control power transformers on each bus that include primary and secondary fuse protection in accordance with the NEC. Control Power Transformers are for enclosure auxiliary power only. Switchgear control power shall be from the 125VDC station battery system to be provided with the switchgear.

2.9 REMOVABLE ELEMENT (VACUUM CIRCUIT BREAKER)

A. Consists of vacuum circuit breaker with operating mechanism, positive mechanical interlocks, movable parts of primary and secondary disconnect devices, and control wiring, summarized as follows:

1. Horizontal drawout type (as required by switchgear design) with stored energy mechanism for high-speed operation of the breaker contacts.

a. Total time from open/trip signal received until breaker contacts fully part shall be no more than 3 cycles (50 mS).

2. Removable elements of same type and rating interchangeable with each other.
3. Trip and interlock mechanism to prevent the insertion or removal of the circuit breaker to or from the connected position unless the breaker is open.
4. Circuit breaker isolated from all other primary equipment and arranged so that it may be completely disconnected from the bus by moving it physically from the connected position, after which it may be entirely removed from the cubicle.
5. An automatic safety shutter closes the entrance to the stationary primary disconnect devices when the breaker is in the test or withdrawn position.
6. Interlocks insure the correct sequence of operation.
7. Circuit breaker may be padlocked either in the operating or the disconnected position.
8. Stored energy mechanism pre-charges immediately after a closing operation, or upon insertion of the breaker into the stationary structure, so that the breaker may be tripped and closed manually by front mounted push buttons, even if control power is subsequently lost.
9. A universal electric motor normally charges the stored energy mechanism. A manual handle is used in an emergency.
10. Auxiliary contacts energize an alarm circuit upon breaker opening by action of the overcurrent relays.

11. Breaker operates on 125V DC tripping and charging circuits.

2.10 CUBICLE DIGITAL MULTI-METER

A. LCD or LED display.

B. True RMS voltage and current measurement.

C. Metered parameters:

1. Instantaneous, minimum, and maximum: Phase current, line voltage, phase voltage, frequency, power factor per phase and three phase total, real power per phase and total, reactive power per phase and total, apparent power per phase and total.
2. Total real energy, reactive energy, apparent energy.
3. User configured sliding window for real, reactive and apparent power peak demand with date and time stamp.
4. Phase voltage percent total harmonic distortion.
5. Phase current percent total harmonic distortion.

D. Accuracy:

1. Energy, and demand power: 0.2% in accordance with ANSI C12.20.

E. Instrument current transformers shall be factory wired to shorting blocks or other approved method to prevent open-circuiting the current transformers under energized conditions. The meter shall also be user programmable for current to any CT ratio.

F. Capable of metering up to 600 volts without external potential transformers. The meter shall also be user programmable for voltage range to any PT ratio.

G. Embedded web server that includes real time circuit information in both numeric and graphical visual formats.

H. Communications: Ethernet TCP/IP, 10/100 Base T, RJ-45 connection.

I. The meter shall have a real-time clock with the added capability to synchronize with a network time server to maintain time accuracy.

J. Out of limit event triggers and logging.

K. Historical Trending: Historical trend logging for graphical viewing from an embedded WEB server. The graphical views of historical data shall support both pan and zoom functions.

L. The meter shall have I/O expandability provisions through an optional card slot on the back

2.11 INSTRUMENT TRANSFORMERS

A. Instrument Transformers: Comply with IEEE C57.13.

1. Potential Transformers: Secondary voltage rating of 120 V and NEMA accuracy class of 0.3 with burdens of W, X, and Y. Winding configurations as indicated on the relaying single-line diagram.
2. Current Transformers: ANSI C200 class

    a. Current Transformers for Differential Bus Protection: All CT's shall be the same model, ratio and accuracy class, and shall be provided by a single transformer manufacturer.

2.12 PROTECTION RELAYS

A. Relays: Comply with IEEE C37.90

B. Provide integrated digital type protection relays, with current and voltage test blocks and plugs, programmable for the protective functions indicated by the ANSI device function .

C. Provide relay test switches for the 15kV protective relays

D. Protection relays shall be Schweitzer Engineering Laboratories, Inc. SEL Series, General Electric Company Multilin series, Square D Powerlogic Sepam Series 20 and 40, Eaton / Cutler Hammer Digitrip, ABB microprocessor-based type, Basler Electric, Beckwith Electric, or approved equal.

E. Protective Relay Operating Time: Unintentional delay associated with signal processing time of the relay, and not the settings programmed, shall not exceed 1 cycle (16 mS)

F. Additional I/O Modules: Should be provided to meet the Input/Output requirements in the drawings.

G. Synchronizing Clock: A radio controlled or atomic clock shall be provided that synchronizes all clocks for all protective devices and the control system located in the switchgear enclosure.

H. Generator Differential Protection: Digital/numerical percentage differential protection relay with adjustable alarm and trip level outputs. Relay shall provide high-speed, selective protection of the generator stator windings by comparing currents entering and leaving the protected zone. The protection system shall be immune to external faults, CT saturation, transformer inrush, and system disturbances. The relay shall provide stator differential protection (87G), event recording, fault diagnostics, oscillography, and communications. Upon operation, the relay shall trip only the protected generator unit and associated excitation system while allowing unfaulted generators and distribution equipment to remain in service.

I. Lock-out Relays (ANSI Device No. 86): Provide relays with manual reset function as indicated on the single-line diagrams.

J. Relay Settings Files: Create relay settings files to execute protective device scheme and automatic operations per the drawings and sequence of operations provided in Specification 261314. It shall be the contractor's responsibility to engage either a certified testing agent or the switchgear manufacturer to develop the settings files. The set points for the protective elements shall be provided by the Engineer.

2.13 AUTOMATIC SWITCHING SYSTEM FOR 15KV MAIN SWITCHGEAR

A. Provide a fully automated, PLC-based circuit-breaker control system located in the PLC panel of the switchgear enclosure. The switching system shall switch mains circuit breakers to an alternate source upon loss of a normal source, as described in Section 261314.

1. PLC shall have visible failure lights, illuminated when each Power Supply and PLC is functioning properly and off to indicate an equipment failure.
2. Upon restoration of normal source, control system shall complete a closed-transition switch back to normal source, as described in Section 261315 in no more than 250mS.

B. The switching system controls must be implemented through a hot-standby PLC system as defined in 1.02.C and have failure indicators as shown on drawings. The PLC system shall be the active synchronizer between the utility, bus, and generator.

C. Human Machine Interface (HMI): Provide a touchscreen HMI with color graphics display, 12 inch nominal screen size, NEMA 250 Type 12 enclosure. The HMI shall be an Allen-Bradley Panelview, or approved equal.

1. The HMI shall display a system single-line complete with status (open, closed, tripped) of all main, and feeder breakers on the 15 kV switchgear line-up.
2. The HMI shall allow manual initiation of all automated switching schemes as referenced in Paragraph A above. Alternatively, the HMI shall allow the operator to open and close main abreakers one-at-a-time manually, following the proper sequence for each switching scheme. The HMI shall also provide capability to manually switch each feeder breaker.

D. The PLC panel shall be a separate NEMA 12 control panel. The PLC panel shall be located in the switchgear enclosure in the location shown. The PLC panel shall resemble the elevation shown in the drawings.

1. Touchscreen HMI: As described above.
2. Audible Horn: To sound on any circuit breaker trip. Horn shall be silenced via manual press of a momentary button, located on the PLC panel. A light above the momentary button shall continue to indicate a trip until the trip has been cleared at the switchgear.
3. Automatic/Manual Operation Toggle: A switch with status indicator lights shall be provided to disable the PLC-based transfer sequence for manual operation. Indicators shall show which mode the generator transfer control panel is in.
4. PLC and Power Supply failure indicator lights: Indicator lights that illuminate under normal operation as described in E-609, and go out to show a failure of equipment.
5. Transient-Voltage Surge-Suppression: All components within the Master Control Cabinet shall be protected by a Transient-Voltage Surge-Suppression device.

2.14 CONTROL POWER SUPPLY

A. Control Power Supply: 125VDC for closing, tripping, metering, and switching controls.

B. Low DC Voltage Alarm: Switchgear shall have a monitor for dc control power voltage with a remote alarm indication on the protective relay of each main breaker. Alarm shall be annunciated

if voltage falls to an adjustable value to indicate an impending battery failure. Factory set alarm value at 95 percent of full-charge voltage.

2.15 DC POWER SUPPLY

A. The contractor shall provide a DC power supply manufactured by the switchgear manufacturer for each switchgear line-up capable of operating all connected circuit breaker controls, protective relays, auto-switching controls, and metering equipment on battery power only for 8 hours. The switchgear manufacturer shall calculate the DC system load based on the following assumptions:

1. Auto-switching controls, including the HMI, remain fully operational.
2. Main and tie circuit breakers shall be capable of each tripping and closing twice. All feeder circuit breakers shall each be capable of tripping once.
3. Protective relays and meters remain fully operational.
4. Pilot lights for breaker status on all breakers remain fully operational.

B. System Requirements: Battery shall have number of cells and ampere-hour capacity based on an initial specific gravity of 1.210 at 25 deg C with electrolyte at normal level and minimum ambient temperature of 13 deg C. Cycle battery before shipment to guarantee rated capacity on installation. Arrange battery to operate ungrounded.

C. Battery: Lead-acid type in sealed, clear plastic or glass containers, complete with electrolyte, fully charged, and arranged for shipment with electrolyte in cells. Limit weight of each container to not more than 70 lb (32 kg) and cells per container to not more than 3. System batteries shall be suitable for service at an ambient temperature ranging from minus 18 to 25 deg C. Limit variation of current output to 0.8 percent for each degree below 25 deg C down to minus 8 deg C.

D. Rack: Two-step rack with electrical connections between battery cells and between rows of cells; include two flexible connectors with bolted-type terminals for output leads.

E. Accessories:

1. Thermometers with specific-gravity correction scales.
2. Hydrometer syringes.
3. Set of socket wrenches and other tools required for battery maintenance.
4. Wall-mounting, nonmetallic storage rack fitted to store above items.
5. Set of cell numerals.

F. Charger: Static-type silicon rectifier equipped with automatic regulation and provision for manual and automatic adjustment of charging rate. Unit shall automatically maintain output voltage within 0.5 percent from no load to rated charger output current, with ac input-voltage variation of plus or minus 10 percent and input-frequency variation of plus or minus 3 Hz. Other features of charger include the following:

1. DC ammeter.
2. DC Voltmeter: Maximum error of 5 percent at full-charge voltage; operates with toggle switch to select between battery and charger voltages.

3. Ground Indication: Two appropriately labeled lights to indicate circuit ground, connected in series between negative and positive terminals, with midpoint junction connected to ground by normally open push-button contact.
4. Capacity: Sufficient to supply steady load, float-charge battery between 2.20 and 2.25 V per cell and equalizing charge at 2.33 V per cell.
5. Charging-Rate Switch: Manually operated switch provides for transferring to higher charging rate. Charger operates automatically after switch operation until manually reset.
6. AC power supply is 120 V, 60 Hz, subject to plus or minus 10 percent variation in voltage and plus or minus 3-Hz variation in frequency. After loss of ac power supply for any interval, charger automatically resumes charging battery. Charger regulates rate of charge to prevent damage due to overload and to prevent fuses or circuit breakers from opening.
7. Protective Feature: Current-limiting device or circuit, which limits output current to rating of charger but does not disconnect charger from either battery or ac supply; to protect charger from damage due to overload, including short circuit on output terminals.
8. Electrical Filtering: Reduces charger's audible noise to less than 26 dB.
9. Provide battery power monitoring system with alarm output to interface with the Switchgear Control System.
10. Chargers and disconnects shall be mounted adjacent to the battery racks on wall in enclosure. Mounting height shall facilitate ease of operation and inspection.

2.16 IDENTIFICATION

A. Mimic Bus: Continuous mimic bus applied to front of switchgear, arranged in single-line diagram format, using symbols and lettered designations consistent with approved final mimic-bus diagram.

1. See drawings for visual representation of proposed mimic bus.
2. Mimic-bus segments coordinated with devices in switchgear sections to which applied, to produce a concise visual presentation of principal switchgear components and connections.
3. Medium: Painted graphics, as approved.
4. Color: Contrasting with factory-finish background; selected by manufacturer.

2.17 SOURCE QUALITY CONTROL

A. In-factory inspection and Testing: Provide the Director’s Representatives with 30 days' advance notice of tests in order to enable the Director’s Representatives to witness factory tests.

B. Before shipment of equipment, perform the following tests and prepare test reports:

1. Production tests on circuit breakers according to ANSI C37.09, Section 5.
2. Production tests on completed switchgear assembly according to IEEE C37.20.2, Section 5.3.

C. Assemble switchgear and equipment in manufacturer's plant and perform the following:

1. Functional tests of all relays, instruments, meters, and control devices by application of secondary three-phase voltage to voltage circuits and injection of current in current transformer secondary circuits.

2. Functional test of all control and trip circuits. Connect test devices into circuits to simulate operation of controlled remote equipment such as circuit-breaker trip coils, close coils, and auxiliary contacts. Test proper operation of relay targets.

    a. Perform a full functional test of the automatic switching system for each switchgear line-up. Simulate all switching and failure scenarios and verify proper operation. Simulate the loss of one controller to test the redundant control capability of each controller.

D. Prepare equipment for shipment.

1. Provide suitable crating, blocking, and supports so equipment will withstand expected domestic shipping and handling shocks and vibration.
2. Weatherproof equipment for shipment. Close connection openings to prevent entrance of foreign material during shipment and storage.

2.18 SPARE PARTS AND SPECIAL TOOLS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Six of each type and rating used.
2. Indicating Lights: One Spare and One Spare Lens for each color.

B. Maintenance Tools: Furnish tools and miscellaneous items required for interrupter switchgear test, inspection, maintenance, and operation. Include the following:

1. Extension rails, lifting device, transport or dockable dolly or mobile lift, and all other items necessary to remove circuit breaker from housing and transport to remote location.

C. Racking handle to move circuit breaker manually between connected and disconnected positions, and a secondary test coupler to permit testing of circuit breaker without removal from switchgear.

D. Remote racking device for safe operation of the racking procedure.

2.19 PRE-ENGINEERED ENCLOSURE

A. The enclosure shall be an outdoor, walk-in, weather-proof, single-aisle type construction. It shall be a complete, self-supporting structure, consisting of the required number vertical sections bolted or welded together to form one metal enclosed rigid unit. Seams between adjoining panels shall be gasketed or welded to form a weatherproof housing.

B. Maximum size of the enclosure shall be 45' long by 15' wide.

C. A structural steel base shall be provided using welded structural I-beams and channels capable of supporting the entire structure for loading and off loading. Lifting hooks will be provided where necessary for balancing and handling of equipment. The base shall be constructed so that it can be installed on a concrete pad and bonded.

D. Galvanized Prefabricated Steel entry stairs and platform shall be provided at each entry and exit door. Stairs will be supported by a concrete pad at grade below.

E. The enclosure shall be capable of withstanding forces associated with shipping on a flat bed truck and loading and unloading. If welded construction is provided, lifting provisions shall be provided and shall be fabricated from heavy structural plate that are permanently and integrally welded into the roof and structure of the enclosure. The entire structure and its contents shall be capable of being lifted from the top using cables and hooks attached to the lifting provisions. If bolted assembly is used, similar provisions shall be provided for lifting the enclosure by the base.

F. The roof shall have a minimum slope of ¼" per foot to allow for runoff. The roof shall sufficiently overhang all vents and exterior doors to prevent the entrance of driving rain. Where this is not practical, a rain shield shall be installed. All roof seams shall be bolted and gasketed if not welded. All bolted roof seams shall be vertical flanges with gasketed fasteners and covered with a gasketed weather channel. All external bolted seams are to be gasketed and completely covered with roof caps. The roof system shall be designed to sustain a minimum live load of 40 psf (including snow load) plus loads for equipment that may be hung from the roof, such as lighting fixtures, cable tray, Heating and Ventilation Equipment, etc.

G. Non-flammable, R-30 (min.), thermal insulation shall be installed on the bottom of the roof panels. Roof and ceiling shall be 12 gauge steel (ASTM-A569).

H. Access doors shall be full height hinged doors. Each door must be tamperproof construction without any external hardware. Hinges shall not be visible when the door is closed. There shall be a one inch minimum continuous rain gutter on the sides and the top of each door opening. Door gasketing shall be protected from direct exposure to the elements through the use of an extra return flange on the door. Contact of the door gasket shall be against a flat surface that is a minimum ½" wide. Doors shall have a heavy duty three point latching mechanism with a stainless steel operating handle that is capable of being padlocked. Stops shall be provided on each cubicle door to hold doors open under high winds and so that adjacent cubicle doors can be open without interference. Provision shall be made for releasing the stop from a standing position.

1. Furnish Padlock for each door: Yale/Scovill 7300 Series with hardened steel triple plated shackle, 8 inch brass chain, two No. 47 keys with each padlock.

I. The floor shall be a minimum of ASTM-A36 smooth steel plate welded to the perimeter and longitudinal and/or transverse structural members of the skid. The floor loading shall be not less than 250 psf.

J. The floor shall be provided with floor cutouts where required for power and control cable entry/exit from the equipment. The cutouts shall be provided with removable, 12 gauge galvanized cover plates.

K. Non-flammable, R-19 (min.), thermal insulation shall be installed against the bottom floor plates.

L. The underside of the base shall be given a coat of bitumastic undercoating for corrosion resistance purposes. Top surface of floor shall be painted with skid resistant paint.

M. All wall panels on the perimeter of the enclosure shall be fabricated from 11 gauge steel conforming to ASTM-A569, gasketed and bolted together with hex head bolts. Non- flammable,

R19 (min.), thermal insulation shall be installed on the interior of each behind 16 gauge steel ASTM-A569. Flashing is to be held in place with self-tapping screws. Flashing and wall panels shall be painted on both sides before insulation is installed.

N. Each shipping split shall be provided with two (2) stainless steel ground pads located at opposite corners.

O. Each pre-fabricated module shall have been designed, built, inspected, certified to meet IBC requirements, and have in place a numbered "IBC Certification Label" and "Data Plate" prior to being delivered to the job site. All drawings, specifications, and design calculations must be approved and stamped by a NY Professional Engineer.

P. A common aisle space of sufficient size to permit withdrawal of the circuit breakers for inspection, test or maintenance shall be provided. The floor shall be painted with skid resistant paint.

Q. An extended area of the enclosure shall be provided to house the relay racks, PLC panel, switchgear batteries, etc. The enclosure shall be provided with heating and ventilation to maintain a temperature range between 60 and 104 degrees Fahrenheit, considering the ambient site conditions, the dimensions of the enclosure, the solar heat generated within the enclosure, the installation of lead acid station batteries, and the heat generated by the equipment within the enclosure. The heating and ventilation system shall be comprised of at least two 100% redundant units and shall have remote wall mounted thermostats for temperature control within the enclosure. In no case shall the thermostat be located at the unit.

R. Area around the battery area shall be painted with acid resistant paint.

S. Electrical grade rubber floor mats shall be provided along aisle ways and in front of control panels.

T. The Equipment Vendor shall furnish all electrical distribution equipment necessary for the proper operation of enclosure services and to provide auxiliary power for the main transformers. The operating voltage of all distribution equipment shall be 120/240 V, single phase. All anticipated loads are shown on the panel schedule included in the contract drawings. 20% spare capacity shall be included in the panelboard for the Owner's use.

U. The enclosure shall be provided with LED lighting fixtures, 4000k color temperature, controlled via three-way wall switches to be located at each entry door. The illumination level shall be 50 footcandles (min) at the floor and minimum 30 footcandles on the vertical face of each equipment lineup.

V. The enclosure shall be provided with emergency lighting, on lighting circuit ahead of switching, with integral battery packs. Interior emergency lighting shall provide a minimum of 2 footcandles on vertical surfaces. The emergency lighting system shall provide immediate illumination upon failure of the normal source for a minimum of 1 1/2 hours.

W. Illuminated exit light fixtures, LED type shall be provided above all egress doors.

X. The enclosure shall be provided with 125V, 20A duplex, heavy duty type, GFI receptacles at each entry door and every 12’ along walls opposite switchgear

Y. The enclosure shall be provided with 125V, 20A duplex, heavy duty type, GFI receptacles with weatherproof covers outside each entry door.

Z. The enclosure shall be provided with 70-watt equivalent LED, vapor tight, exterior lights, 4000k color temperature, mounted above each entry door, controlled via photocell.

AA. Provide self-contained eyewash station within close proximity to the DC batteries.

BB. Telephone Interconnect Cabinet – Metal termination cabinet with hinged door to accept a 4" rigid metal conduit

CC. All wiring shall be type THWN, #12 AWG minimum for power circuits, minimum #14 AWG for control circuits. All wiring shall be provided with sleeve type wire markers (wires with "from and to" designations continuously stamped every 3-4 inches along the entire length of each wire is also acceptable).

DD. Field termination cabinets shall be provided to facilitate termination of field cables. Shorting type terminal blocks shall be provided for current transformer connections as required.

EE. Furnish and install all fiber-optic cable, patchcords, terminations, and SEL transceivers as required for equipment included in the 15 kV switchgear and enclosure.

FF. Furnish all data Ethernet communications cable, terminations, as required for interconnection for equipment within the 15 kV switchgear and enclosure.

GG. RGS conduit shall be utilized for indoor and outdoor applications.

HH. All electrical and control systems provided in the enclosure shall be prewired at the factory with the only required site wiring work to be interconnect wiring between shipping sections and connections to outside services.

II. All electrical equipment, raceways, boxes, cabinets, and devices shall be grounded in accordance with the NEC.

JJ. Each shipping split shall be provided with suitable lifting lugs or integral lifting tubes.

KK. A minimum of two (2) suitably sized (min 36"), access doors shall be provided at both ends of the enclosure. Access doors shall be provided, with DOCCS-approved keying locking.

LL. Interconnecting wiring between shipping splits shall be coiled, properly tagged, and supported. Interconnecting wiring shall be marked with "from and to" designations continuously stamped every 3-4 inches along the entire length of each wire.

MM. Provide galvanized steel, gasketed and hinged equipment rear access doors, with 3-point latching system with pad-lockable handles, "DANGER HIGH VOLTAGE" sign, vents with exterior removable filters, captive hardware, and drip shields/water flashing.

NN. The enclosure paint system may be the manufacturers standard, but must have a minimum corrosion resistance of 600 hours to 5% salt spray. Exterior color shall be ANSI 70 Light Gray, and consist of, as a minimum, a primer and two (2) finish coats.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Upon delivery of switchgear and prior to unloading, inspect equipment for damage.

1. Examine tie rods and chains to verify they are undamaged and tight and that blocking and bracing are tight.
2. Verify that there is no evidence of load shifting in transit and that readings from transportation shock recorders, if equipped, are within manufacturer's recommendations.
3. Examine switchgear for external damage, including dents or scratches in doors and sill, and termination provisions.
4. Compare switchgear and accessories received with the bill of materials to verify that the shipment is complete. Verify that switchgear and accessories conform to the manufacturer's quotation and shop drawings. If the shipment is not complete or does not comply with project requirements, notify the manufacturer in writing immediately.
5. Unload switchgear, observing packing label warnings and handling instructions.
6. Open compartment doors and inspect components for damage or displaced parts, loose or broken connections, cracked or chipped insulators, bent mounting flanges, dirt or foreign material, and water or moisture.

B. Handling:

1. Handle switchgear in accordance with manufacturer's recommendations, avoid damage to the enclosure, termination compartments, base, frame, tank, and internal components. Do not subject switchgear to impact, jolting, jarring, or rough handling.
2. Protect switchgear compartments against the entrance of dust, rain, and snow.
3. Transport switchgear upright to avoid internal stresses on equipment mounting assemblies. Do not tilt or tip switchgear.
4. Use spreaders or a lifting beam to obtain a vertical lift and to protect switchgear from straps bearing against the enclosure. Lifting cable pull angles may not be greater than 15 degrees from vertical.
5. Do not damage structure when handling switchgear.

C. Storage:

1. Store switchgear in a location that is clean and protected from weather. Protect switchgear from dirt, water, contamination, and physical damage. Do not store switchgear in the presence of corrosive or explosive gases.
2. Store switchgear with compartment doors closed.
3. Regularly inspect switchgear while in storage and maintain documentation of storage conditions, noting any discrepancies or adverse conditions.

D. Examine roughing-in of conduits and grounding systems to verify the following:

1. Wiring entries comply with layout requirements.
2. Entries are within conduit-entry tolerances specified by manufacturer, and no feeders will have to cross section barriers to reach load or line lugs.

E. Pre-Installation Checks:

1. Verify removal of any shipping bracing after placement.

F. Verify that ground connections are in place and that requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms ohms at switchgear location.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install switchgear components complete and ready for service.

B. Protective Relay Programming: Once relay settings files are approved by the Director's Representative, implement and test relay settings files in all protective relays.

C. Comply with the provisions of IEEE ANSI C37.20.2 subclause titled "Guide for Handling, Storage, and Installation."

D. Equipment Mounting:

1. Install switchgear on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation devices specified in Section 260529 "Hangers and Supports for Electrical Systems."

E. Switchgear shall be installed level and plumb. Switchgear shall tilt less than 1.5 degrees while energized.

F. Maintain minimum clearances and workspace at equipment in accordance with manufacturer's written instructions and NFPA 70.

G. Comply with NECA 1.

H. Comply with NECA 430.

3.3 CONNECTIONS

A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

B. Grounding Connections at Interior Locations:

1. Install bare copper cable not smaller than No. 4/0 AWG for grounding to grounding electrodes.
2. Bond surge arrester and neutrals directly to the switchgear enclosure and then to the grounding electrode system with bare copper conductors.

3. Keep leads as short as practicable with no kinks or sharp bends.
4. Make joints in grounding conductors and loops by exothermic weld or compression connector.

C. Grounding at Exterior Locations:

1. Install tinned bare copper cable not smaller than No. 4/0 AWG, for counterpoise buried not less than 30 inches below grade interconnecting the grounding electrodes.
2. Bond surge arrester and neutrals directly to the switchgear enclosure and then to the grounding electrode system with bare copper conductors, sized as shown.
3. Keep lead lengths as short as practicable with no kinks or sharp bends.
4. Fence and equipment connections shall not be smaller than No. 4 AWG.
5. Ground fence at each gate post and corner post and at intervals not exceeding 10 ft..
6. Bond each gate section to the fence post using 1/8 by 1 inch [**tinned**]flexible braided copper strap and clamps.
7. Make joints in grounding conductors and loops by exothermic weld or compression connector.

D. Terminate grounding and bonding conductors on a common equipment grounding terminal on the switchgear enclosure. Install supplemental terminal bars, lugs, and bonding jumpers as required to accommodate the number of conductors for termination.

E. Complete switchgear grounding and lightning arrester connections prior to making any other electrical connections.

F. Terminate medium-voltage cables in accordance with Section 260513 "Medium-Voltage Cables."

3.4 SIGNS AND LABELS

A. Comply with the installation requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

B. Install warning signs as required to comply with 29 CFR 1910.269.

3.5 FIELD QUALITY CONTROL

A. Field tests must be witnessed by Director’s Representative

B. Administrant for Tests and Inspections:
1. Engage qualified testing agency to administer and perform tests and inspections.
2. Engage Company Service Advisor to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
3. Engage the Switchgear Manufacturer/Fabricator Company Field Advisor and Certified Engineering and Instrumentation Service Technician to perform the following inspections, checks, and supervision of testing:

a. Inspect field-assembled components, equipment installation, and electrical connections for compliance with the switchgear manufacturer's installation recommendations and requirements.
b. Set field-adjustable, protective-relay trip characteristics to the values tabulated in the coordination study report provided by the Engineer.
c. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and components.
d. Supervise tests performed by independent Testing Agent (when utilized during NETA ATS pre-functional tests). Witness initial energization and perform or supervise startup services.
e. Prepare written report to record the following:

1) Inspections and checks carried out on site.
2) Test procedures used.
3) Test results that comply with requirements.
4) Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Administer and perform tests and inspections with assistance of Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

D. Manufacturer's installation instructions shall be provided along with product data.

E. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

F. General Field Testing Requirements:

1. Comply with the provisions of NFPA 70B, "Testing and Test Methods."
2. After installing switchgear and after electrical circuitry has been energized, test for compliance with requirements.
3. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

G. Medium-Voltage Switchgear Assembly Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that fuse and circuit breaker sizes and types correspond to Drawings and coordination study, as well as to the circuit breaker's address in the control network.
b. Verify that current and voltage transformer ratios correspond to Drawings.
c. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
2) Make key exchange with devices operated in off-normal positions.

e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
f. Inspect insulators for evidence of physical damage or contaminated surfaces.
g. Verify correct barrier and shutter installation and operation.
h. Exercise active components.
i. Inspect mechanical indicating devices for correct operation.
j. Verify that filters are in place and vents are clear.
k. Perform visual and mechanical inspection of instrument transformers in accordance with "Instrument Transformer Field Tests" Paragraph.
l. Inspect control power transformers.

1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
2) Verify that primary and secondary fuse or circuit breaker ratings match drawings.
3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.

2. Electrical Tests:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
b. Perform dc voltage insulation-resistance tests on each bus section, phase to phase and phase to ground, for one minute. If the temperature of the bus is other than plus or minus 20 deg C, adjust the resulting resistance as provided in NETA ATS, Table 100.11.

1) Insulation-resistance values of bus insulation shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.
2) Do not proceed to the dielectric withstand voltage tests until insulation-resistance levels are raised above minimum values.

c. Perform a dielectric withstand voltage test on each bus section, each phase to ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it shall be conducted in accordance with NETA ATS, Table 100.2. Apply the test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.

d. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential shall be 500 V dc for 300-volt rated cable and 1000 V dc for 600-V rated cable. Test duration shall be one minute. For units with solid-state components or control devices that cannot tolerate the applied voltage, follow the manufacturer's recommendation.

1) Minimum insulation-resistance values of control wiring shall not be less than two megohms.

e. Control Power Transformers:

1) Perform insulation-resistance tests. Perform measurements from winding to winding and each winding to ground. Insulation-resistance values of winding insulation shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.
2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to a rated secondary voltage source. Verify correct potential at all devices.
3) Verify correct secondary voltage by energizing the primary winding with system voltage. Measure secondary voltage with the secondary wiring disconnected.
4) Verify correct function of control transfer relays located in the switchgear with multiple control power sources.

f. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at all devices.
2) Verify secondary voltages by energizing the primary winding with system voltage.

g. Perform current-injection tests on the entire current circuit in each section of switchgear.

1) Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.
2) Perform current tests by primary injection with magnitudes such that a minimum of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.

h. Perform system function tests in accordance with "System Function Tests" Article.
i. Verify operation of space heaters.
j. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from each source.

H. Medium-Voltage Vacuum Circuit Breaker Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and required clearances.
c. Verify that maintenance devices such as special tools and gages specified by the manufacturer are available for servicing and operating the breaker.
d. Verify the unit is clean.
e. Perform mechanical operation tests on operating mechanism in accordance with manufacturer's published data.
f. Measure critical distances on operating mechanism as recommended by the manufacturer. Critical distances of the operating mechanism shall be in accordance with manufacturer's published data.
g. Verify cell fit and element alignment.
h. Verify racking mechanism operation.
i. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
k. Perform time-travel analysis. Travel and velocity values shall be in accordance with manufacturer's published data.
l. Record as-found and as-left operation counter reading. Operation counter shall advance one digit per close-open cycle.

2. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Insulation-resistance values shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than this table or manufacturer's recommendations. Dielectric-withstand-voltage tests shall not proceed until insulation-resistance levels are raised above minimum values.
b. Perform a contact/pole-resistance test. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value. Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
c. Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the trip and close coils shall comply with manufacturer's published data. In the absence of the manufacturer's published data, comply with NETA ATS, Table 100.20.
d. Verify correct operation of any auxiliary features, such as electrical close and trip operation, trip-free operation, and anti-pump function. Auxiliary features shall operate in accordance with manufacturer's published data.
e. Trip circuit breaker by operation of each protective device. Reset trip logs and indicators.

f. Perform power-factor or dissipation-factor tests on each pole with the breaker open and each phase with the breaker closed. Power-factor or dissipation-factor values shall comply with manufacturer's published data.
g. Perform vacuum bottle integrity (dielectric-withstand-voltage) test across each vacuum bottle, with the contacts in the "open" position in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.
h. Perform a dielectric-withstand-voltage test in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric-withstand-voltage test, the test specimen is considered to have passed the test.
i. Verify operation of heaters.

I. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data complies with Contract Documents.
b. Inspect physical and mechanical condition.
c. Verify correct connection of transformers with system requirements.
d. Verify that adequate clearances exist between primary and secondary circuit wiring.
e. Verify the unit is clean.
f. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.
g. Verify that all required grounding and shorting connections provide contact.
h. Verify correct operation of transformer withdrawal mechanism and grounding operation.
i. Verify correct primary and secondary fuse sizes for voltage transformers.
j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests of Current Transformers:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
b. Perform insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000 V dc for one minute. For units with solid-state components that cannot tolerate the applied voltage, follow manufacturer's recommendations. Investigate and correct values of insulation resistance less than manufacturer's written recommendations or NETA ATS, Table 100.5.
c. Perform a polarity test of each current transformer in accordance with IEEE ANSI C57.13.1. Polarity results shall agree with transformer markings.
d. Perform a ratio-verification test using the voltage or current method in accordance with IEEE ANSI C57.13.1. Ratio errors shall be in accordance with IEEE ANSI C57.13.

e. Perform an excitation test on transformers used for relaying applications in accordance with IEEE ANSI C57.13.1. Excitation results shall match the curve supplied by the manufacturer or be in accordance with IEEE ANSI C57.13.1.
f. Measure current circuit burdens at transformer terminals in accordance with IEEE ANSI C57.13.1. Measured burdens shall be compared with and shall match instrument transformer ratings.
g. Perform insulation-resistance tests on the primary winding with the secondary grounded. Test voltages shall be in accordance with Table 100.5.
h. Perform dielectric withstand tests on the primary winding with the secondary grounded. Test voltages shall be in accordance with Table 100.9.
i. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.
j. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE ANSI C57.13.3. That grounding point should be located as specified by the engineer in the project drawings.

3. Electrical Tests of Voltage Transformers:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
b. Perform insulation-resistance tests winding-to-winding and each winding to ground. Test voltages shall be applied for one minute in accordance with Table 100.5. For units with solid-state components that cannot tolerate the applied voltage, follow manufacturer's recommendations. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.5.
c. Perform a polarity test on each transformer to verify the polarity marks or H1-X1 relationship as applicable. Polarity results shall agree with transformer markings.
d. Perform a turns-ratio test on all tap positions. Ratio errors shall be in accordance with IEEE ANSI C57.13.
e. Measure voltage circuit burdens at transformer terminals. Measured burdens shall be compared with and shall match instrument transformer ratings.
f. Perform a dielectric withstand test on the primary windings with the secondary windings connected to ground. The dielectric voltage shall be in accordance with Table 100.9. The test voltage shall be applied for one minute. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the primary windings are considered to have passed the test.
g. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use test equipment manufacturer's published data.
h. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE ANSI C57.13.3. Test results shall indicate that the circuits are grounded at only one point.

J. Ground Resistance Test:

1. Visual and Mechanical Inspection:

a. Verify ground system complies with Contract Documents and NFPA 70 Article 250, "Grounding and Bonding."
b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections shall be free of corrosion.
c. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.
d. Inspect anchorage.

2. Electrical Tests:

a. Perform fall-of-potential or alternative test in accordance with IEEE Std 81 on the main grounding electrode or system. The resistance between the main grounding electrode and ground shall be no more than 5 ohms.
b. Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 ohm. Compare equipment nameplate data with Contract Documents.
c. Inspect physical and mechanical condition.
d. Inspect bolted electrical connections for high resistance using a low resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

K. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.
c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.
d. Verify the unit is clean.
e. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
b. Verify accuracy of meters at all cardinal points. Meter accuracy shall be in accordance with manufacturer's published data.
c. Calibrate meters in accordance with manufacturer's published data. Calibration results shall be within manufacturer's published tolerances.

d. Verify all instrument multipliers. Instrument multipliers shall be in accordance with system design specifications.
e. Verify that current transformer and voltage transformer secondary circuits are intact. Test results shall confirm the integrity of the secondary circuits of current and voltage transformers.

L. Medium-Voltage Surge Arrester Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data complies with Contract Documents.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify the arresters are clean.
e. Verify that the ground lead on each device is individually attached to a ground bus or ground electrode.
f. Verify that the stroke counter is correctly mounted and electrically connected if applicable. Record the stroke counter reading.

2. Electrical Test:

a. Perform an insulation-resistance test on each arrester, phase terminal-to-ground. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to meet recommended minimum insulation resistance listed in the table.
b. Perform a watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.
c. Test grounding connections. Resistance between the arrester ground terminal and the ground system shall be less than 0.5 ohm.

M. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.
b. Verify operation of light-emitting diodes, display, and targets.
c. Record passwords for each access level.
d. Clean the front panel and remove foreign material from the case.
e. Check tightness of connections.
f. Verify that the frame is grounded in accordance with manufacturer's instructions.
g. Set the relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."
h. Download settings from the relay. Print a copy of the settings for the report and compare the settings to those specified in the coordination study.

2. Electrical Tests:

a. Perform insulation-resistance tests from each circuit to the grounded frame in accordance with manufacturer's published data.

b. Apply voltage or current to analog inputs, and verify correct registration of the relay meter functions.

c. Functional Operation: Check functional operation of each element used in the protection scheme as follows:

1) Timing Relay:

a) Determine time delay.
b) Verify operation of instantaneous contacts.

2) Volts/Hertz Relay:

a) Determine pickup frequency at rated voltage.
b) Determine pickup frequency at a second voltage level.
c) Determine time delay.

3) Sync Check Relay:

a) Determine closing zone at rated voltage.
b) Determine maximum voltage differential that permits closing at zero degrees.
c) Determine live line, live bus, dead line, and dead bus set points.
d) Determine time delay.
e) Verify dead bus/live line, dead line/live bus, and dead bus/dead line control functions.

4) Undervoltage Relay:

a) Determine dropout voltage.
b) Determine time delay.
c) Determine time delay at a second point on the timing curve for inverse time relays.

5) Directional Power Relay:

a) Determine minimum pickup at maximum torque angle.
b) Determine closing zone.
c) Determine maximum torque angle.
d) Determine time delay.
e) Verify time delay at a second point on the timing curve for inverse time relays.
f) Plot the operating characteristic.

6) Current Balance Relay:

a) Determine pickup of each unit.
b) Determine percent slope.
c) Determine time delay.

7) Negative Sequence Current Relay:

a) Determine negative sequence alarm level.
b) Determine negative sequence minimum trip level.
c) Determine maximum time delay.
d) Verify two points on the I-two-squared-t curve.

8) Phase Sequence or Phase Balance Voltage Relay:

a) Determine positive sequence voltage to close the NO contact.
b) Determine positive sequence voltage to open the NC contact (undervoltage trip).
c) Verify negative sequence trip.
d) Determine time delay to close the NO contact with sudden application of 120 percent of pickup.
e) Determine time delay to close the NC contact upon removal of voltage when previously set to rated system voltage.

9) Instantaneous Overcurrent Relay:

a) Determine pickup.
b) Determine dropout.
c) Determine time delay.

10) Time Overcurrent:

a) Determine minimum pickup.
b) Determine time delay at two points on the time current curve.

11) Ground Detector Relay:

a) Determine maximum impedance to ground causing relay pickup.

12) Directional Overcurrent Relay:

a) Determine directional unit minimum pickup at maximum torque angle.
b) Determine closing zone.
c) Determine maximum torque angle.
d) Plot operating characteristics.
e) Determine overcurrent unit pickup.
f) Determine overcurrent unit time delay at two points on the time current curve.

d. Control Verification:

1) Functional Tests:

a) Check operation of all active digital inputs.
b) Check output contacts or silicone-controlled rectifiers (SCRs), preferably by operating the controlled device, such as circuit breaker, auxiliary relay, or alarm.
c) Check internal logic functions used in protection scheme.

d) Upon completion of testing, reset min/max recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.

2) In-Service Monitoring: After the equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.

N. DC System VRLA Batteries Field Test:

1. Visual and Mechanical Inspection:

a. Verify that batteries are adequately located.
b. Verify that battery area ventilation system is operable.
c. Verify existence of suitable eyewash equipment.
d. Verify equipment nameplate data complies with Contract Documents.
e. Inspect physical and mechanical condition.
f. Verify adequacy of battery support racks, mounting, anchorage, alignment, grounding, and clearances.
g. Verify the units are clean.
h. Inspect spill containment installation.
i. Verify application of an oxide inhibitor on battery terminal connections.

2. Electrical Tests:

a. Measure charger float and equalizing voltage levels. Adjust to battery manufacturer's recommended levels.
b. Verify charger functions and that alarms comply with system manufacturer's recommendations.
c. Measure negative post temperature. Negative post temperature shall comply with manufacturer's published data or IEEE Std 1188.
d. Measure charger float and equalizing voltage levels. Charger float and equalizing voltage levels shall be in accordance with the battery manufacturer's published data.
e. Measure each monoblock/cell voltage and total battery voltage with charger energized and in float mode of operation. Monoblock/cell voltages shall be in accordance with manufacturer's published data.
f. Measure intercell connection resistances.
g. Perform internal ohmic measurement tests. Cell internal ohmic values (resistance, impedance, or conductance) shall not vary by more than 25 percent between identical cells that are in a fully charged state. Monoblock/cell internal ohmic values (resistance, impedance, or conductance) shall not vary by more than 25 percent between identical monoblocks/cells in a fully charged state.
h. Perform a load test in accordance with manufacturer's published data or IEEE Std 1188. Replace units that fail to pass the test.
i. Measure the battery system voltage from positive to ground and negative to ground. Voltage measured from positive to ground shall be equal in magnitude to the voltage measured from negative to ground.

O. DC System Vented NiCd Batteries Field Test:

1. Visual and Mechanical Inspection:

a. Verify that batteries are adequately located.
b. Verify that battery area ventilation system is operable.
c. Verify existence of suitable eyewash equipment.
d. Verify equipment nameplate data complies with Contract Documents.
e. Inspect physical and mechanical condition.
f. Verify adequacy of battery support racks, mounting, anchorage, alignment, grounding, and clearances.
g. Verify electrolyte level. Measure pilot-cell electrolyte temperature, and correct as recommended by manufacturer's maintenance procedures to bring the temperature and electrolyte level to within normal limits.
h. Verify the units are clean.
i. Inspect spill containment installation.
j. Verify application of an oxide inhibitor on battery terminal connections.

2. Electrical Tests:

a. Measure charger float and equalizing voltage levels. Adjust to battery manufacturer's recommended levels.
b. Verify charger functions and that alarms comply with system manufacturer's recommendations.
c. Measure each cell voltage and total battery voltage with charger energized and in float mode of operation. Cell voltages shall be within 0.05 volt of each other or in accordance with manufacturer's published data.
d. Measure intercell connection resistances.
e. Perform internal ohmic measurement tests. Cell internal ohmic values (resistance, impedance, or conductance) shall not vary by more than 25 percent between identical cells that are in a fully charged state.
f. Perform a load test in accordance with manufacturer's published data or IEEE Std 1106. Replace units that fail to pass the test.
g. Measure the battery system voltage from positive to ground and negative to ground. Voltage measured from positive-to-ground shall be equal in magnitude to the voltage measured from negative to ground.

P. Nonconforming Work:

1. Switchgear will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

Q. Prepare test and inspection reports. Record as-left set points of adjustable devices.

3.6 SYSTEM FUNCTION TESTS

A. System function tests shall prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and all components have passed specified tests.

1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements

and manufacturer's published data. Test parameters shall be based off the submittal sequence of operations.

2. Scheduling the System Acceptance Test:

    a. Approved Preliminary Testing Report
    b. Notify the Director's Representative at least 10 working days prior to the test so arrangements can be made to have a Facility Representative and a Design & Construction representative present to witness the test.

3. Acceptance Testing: Engage the Generator Company Field Advisor and the Switchgear Manufacturer/Fabricator Company Field Advisor to perform the testing for final system acceptance:

    a. Perform a full functional test of the entire system. Simulate all switching and failure scenarios and verify proper operation. Failure scenarios shall include, but are not limited to, those described in the Submitted and Approved description of operation provided by the Switchgear manufacturer following the approval of the Preliminary Testing. The functional performance test will be considered incomplete until all systems and operations pass the testing.

4. Upon completion of the functional performance test and acceptance of the system: Submit written report of test results signed by Generator Company Field Advisor and the Switchgear Manufacturer/Fabricator Company Field Advisor, Contractor, Design & Construction representative, Facility Representative, and the Director's Representative. Mount a copy of the final report on the plexiglass enclosed frame assembly on the switchgear in a conspicuous location.

3.7 FOLLOW-UP SERVICE

A. Voltage Monitoring and Adjusting: After Substantial Completion, but not more than six months after Final Acceptance, if requested by Director's Representative, perform the following voltage monitoring:

1. During a period of normal load cycles as evaluated by Director's Representative, perform seven days of three-phase voltage recording at the outgoing section of each switchgear. Use voltmeters with calibration traceable to NIST standards and with a chart speed of not less than 1 inch per hour. Voltage unbalance greater than 1 percent between phases, or deviation of phase voltage from the nominal value by more than plus or minus 5 percent during the test period, is unacceptable.
2. Corrective Action: If test results are unacceptable, perform the following corrective action, as appropriate:

    a. Adjust switchgear taps.
    b. Prepare written request for voltage adjustment by electric utility.

3. Retests: Repeat monitoring, after corrective action has been performed, until specified results are obtained.
4. Report:

a. Prepare a written report covering monitoring performed and corrective action taken.

B. Infrared Inspection: Perform the survey during periods of maximum possible loading. Remove covers prior to the inspection.

1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of the electrical power connections of the switchgear.
2. Instrument: Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1 deg C at 30 deg C.
3. Record of Infrared Inspection: Prepare a certified report that identifies the testing technician and equipment used and lists the results as follows:

a. Description of equipment to be tested.
b. Discrepancies.
c. Temperature difference between the area of concern and the reference area.
d. Probable cause of temperature difference.
e. Areas inspected. Identify inaccessible and unobservable areas and equipment.
f. Identify load conditions at time of inspection.
g. Provide photographs and thermograms of the deficient area.

4. Act on inspection results in accordance with the recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Director’s Representative's operations permit. Retest until deficiencies are corrected.

3.8 DEMONSTRATION

A. Engage a Company Service Advisor to train Director’s Representative's maintenance personnel to adjust, operate, and maintain systems.

END OF SECTION

SECTION 263213.13

DIESEL-ENGINE-DRIVEN GENERATOR SETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Neutral Ground Resistor.

1.3 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

D. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for engine generators and functional relationship between all electrical components.

E. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

F. Qualification Data: For Installer.

G. Source Quality-Control Reports: Including, but not limited to, the following:

1. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.

H. Field quality-control reports.

I. Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals.

1. Include the following:

a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
b. Operating instructions laminated and mounted adjacent to generator location.
c. Training plan.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tools: Each tool listed by part number in operations and maintenance manual.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

B. Company Field Advisor: Secure the services of a Company Field Advisor for a minimum of 16 working hours for the following:

1. Render advice regarding installation and final adjustment of the system.
2. Witness final system test and then certify with an affidavit that the system is installed in accordance with the contract documents and is operating properly.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Post Glover Resistors
2. Hubbell
3. MegaResistors
4. Or equal.

2.2 NEUTRAL GROUNDING RESISTOR

A. Provide a neutral grounding resistor, low resistance type. Grounding resistor shall be rated as follows:

1. System Voltage: 12.47 kV
2. Initial Current: 200A for 10 seconds
3. Maximum temperature rise: 760 deg C
4. The neutral grounding resistor shall be designed and factory tested to IEEE standard 32-1972.
5. The resistor shall consist of stainless steel stamped grid edgewound elements, double insulated. The resistor terminals shall be stainless steel. All resistor endgames, hardware, and non-current carrying spacers must be zinc-plated steel. The resistor bank will be mounted on porcelain standoff insulators with a rating equal to or greater than the line to neutral voltage.
6. Provide window type ANSI C200, 200:5 bar type current transformer mounted inside the neutral grounding resistor with shorting blocks, wired by the manufacturer.
7. The neutral grounding resistor shall be suitable for floor mounting per Contract Drawings.
8. B11 Compliance: Comply with B11.19.

2.3 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 404.

B. Coordinate installation with equipment pad and mounting provisions.

3.3 CONNECTIONS

A. Conduit installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.

3.4 IDENTIFICATION

A. Identify system components according to Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Testing Agency:

1. Director’s Representative will engage a qualified testing agency to perform tests and inspections.
2. Engage a qualified testing agency to perform tests and inspections.
3. Engage a Company Service Advisor to test and inspect components, assemblies, and equipment installations, including connections.
4. Perform tests and inspections.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in first two subparagraphs below, as specified in NETA ATS. Certify compliance with test parameters.

    a. Visual and Mechanical Inspection:

        1) Compare equipment nameplate data with Drawings and the Specifications.
        2) Inspect physical and mechanical condition.
        3) Inspect anchorage, alignment, and grounding.
        4) Verify that the unit is clean.

C. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.

D. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.6 DEMONSTRATION

A. Engage a Company Service Advisor to train Director's Representative maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION 263213.13

DRAWING LEGEND	
EXISTING CONDITIONS LEGEND	
SYMBOL	DESCRIPTION
	EXISTING BUILDING
*	*EX. BOLLARD*
X	*EX. FENCE*
	EX. ASPHALT PAVEMENT
	EX. CONCRETE SIDEWALK
	EX. INTERMEDIATE CONTOUR
450	*EX. INDEX CONTOUR*
456	*EX. SPOT ELEVATION*
24" RCP SD SD	*EX. STORM DRAIN*
24" DIP SAN SS	*EX. SANITARY SEWER*
S	*EX. SANITARY SEWER MANHOLE*
4-WAY 4" COMM.	*EX. COMMUNICATIONS DUCTBANK*
C	*EX. COMMUNICATIONS STRUCTURE*
4-WAY 6" POWER P	*EX. POWER DUCTBANK*
P	*EX. POWER STRUCTURE*
6" WATER W	*EX. WATER PIPING*
FH	*EX. FIRE HYDRANT*

DRAWING LEGEND		
REMOVAL LEGEND		
SYMBOL	DESCRIPTION	NOTES
	SAWCUT AND REMOVE EXISTING ASPHALT PAVEMENT	1
X	REMOVAL NOTE	

DRAWING LEGEND	
RESTORATION LEGEND	
SYMBOL	DESCRIPTION
	ASPHALT PAVEMENT
	SWITCHGEAR ENCLOSURE
4"	CONCRETE PAD
	BOLLARD
	ELECTRICAL EQUIPMENT

DRAWING LEGEND	
EROSION AND SEDIMENT CONTROL LEGEND	
SYMBOL	DESCRIPTION
LOD	LIMIT OF DISTURBANCE
	CONSTRUCTION FENCE
SF	SILT FENCE
SCE	STABLIZIED CONSTRUCTION ENTRANCE
	FACILITY VEHICLE ACESS

DRAWING LEGEND	
UTILITIES LEGEND	
SYMBOL	DESCRIPTION
	ELECTRIC DUCTBANK
P	DIRECT BURIED RGS CONDUIT
	SWITCHGEAR ENCLOSURE
4"	CONCRETE PAD
	BOLLARD
	ELECTRICAL EQUIPMENT
X C-4XX	DETAIL CALLOUT
P-XX C-3XX	PROFILE CALLOUT
E1+23.45	STATIONING CALLOUT

PROFILE DESIGNATION:

GENERAL NOTES:

1. INFORMATION CONCERNING EXISTING UNDERGROUND UTILITIES WAS OBTAINED FROM AVAILABLE RECORDS AND IS LIMITED IN NATURE. ALL LOCATIONS OF EXISTING UNDERGROUND UTILITIES SHOWN ARE APPROXIMATE.
2. DETERMINE THE EXACT LOCATION, ELEVATION, AND SIZE OF ALL EXISTING UTILITIES AT PROPOSED UTILITY CROSSINGS PRIOR TO EXCAVATION OR RELEASE OF PROJECT MATERIALS. THIS INCLUDES VERIFYING SHOWN UTILITY CROSSINGS AND IDENTIFYING NEW UTILITY CROSSINGS.
3. CONTACT AND ENGAGE ALL LOCAL AND PUBLIC UTILITY AUTHORITIES FOR PRELIMINARY LOCATION OF PUBLIC UTILITIES. CONTRACTOR SHALL ALSO ENGAGE A PRIVATE UTILITY LOCATING SERVICE TO PERFORM A QUALITY LEVEL B (QL-B) AND QUALITY LEVEL A (QL-A) UTILITY SURVEY IN ACCORDANCE WITH ASCE 38-02 ENCOMPASSING THE LIMITS OF DISTURBANCE. THE QL-A SURVEY MUST BE COMPLETED THROUGH THE USE OF VACUUM EXCAVATED TEST PITTING AND INCLUDE PROVISIONS FOR TEMPORARY TRAFFIC CONTROL.
4. PROVIDE THE RESULTS OF THE PRE-CONSTRUCTION UTILITY LOCATING AS A PRE-CONSTRUCTION SHOP DRAWING PRIOR TO EXCAVATION OR RELEASE OF PROJECT MATERIALS.
5. DISCLOSE AND IMMEDIATELY NOTIFY THE DIRECTOR'S REPRESENTATIVE UPON DISCOVERY AND/OR OMISSIONS OF EXISTING UTILITIES FOUND DURING PRE-CONSTRUCTION INVESTIGATION AND/OR DURING CONSTRUCTION.
6. MAINTAIN SURFACE UTILITY MARKOUT THROUGHOUT CONSTRUCTION. IF UTILITY MARKOUT BECOMES ILLEGIBLE, CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING NEW UTILITY MARKOUT PRIOR TO EXCAVATION IN THE AREA. IF EXISTING UTILITIES AND PROPOSED EXCAVATION ARE DEEPER THAN 5-FEET, REMARK EXISTING UTILITIES AT BOTTOM OF TRENCH IN 5FT DEPTH INTERVALS.
7. TAKE ALL NECESSARY PRECAUTIONS TO PROTECT EXISTING UTILITIES. ANY DAMAGE TO EXISTING UTILITIES DURING CONSTRUCTION SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR AND SHALL NOT RESULT IN ANY EXTRA COST TO THE STATE.
8. WHEN WORKING IN AND AROUND EXISTING BUILDINGS AND STRUCTURES, EXTREME CARE SHALL BE EXERCISED WITH REGARD TO PROTECTION OF THE EXISTING STRUCTURE AND SERVICES WHICH WILL REMAIN. ANY DAMAGES SHALL BE REPAIRED, REPLACED, OR RESTORED TO THE SATISFACTION OF THE OWNER AND SHALL NOT RESULT IN ANY EXTRA COST.
9. IN AREAS WHERE THE PROPOSED TRENCHING WORK EXPOSES BUILDING EXTERIOR WALLS OR UNDERGROUND TUNNEL WALLS, DAMAGED INSULATION AND/OR WATERPROOFING MUST BE REPAIRED PRIOR TO BACKFILL. FOR BIDDING PURPOSES, ASSUME ALL BUILDING AND TUNNEL WALL PENETRATIONS HAVE EXISTING WATERPROOFING SYSTEMS TO BE RESTORED.
10. CONTRACTOR IS RESPONSIBLE FOR ALL EXCAVATION SUPPORT AND EXISTING UTILITY SUPPORT. WORKING AROUND EXISTING UTILITIES, EXCAVATING, SHORING, SUPPORTING IS CONSIDERED MEANS AND METHODS. CONTRACTOR IS REQUIRED TO FOLLOW ALL OSHA AND GOVERNING REGULATIONS.
11. UTILITY SHUTDOWNS WILL BE PERFORMED BY FACILITY PERSONNEL WHEN NEEDED. REQUEST SHUTDOWNS IN WRITING AT LEAST 14 DAYS IN ADVANCE.
12. COORDINATE CONSTRUCTION SCHEDULE AND TRAFFIC CONTROL PLANS WITH THE DIRECTOR'S REPRESENTATIVE AND AUTHORITIES HAVING JURISDICTION IN ORDER TO MAINTAIN ACCESS TO EXISTING FACILITIES AND FOR EMERGENCY VEHICLES. NO VEHICULAR OR PEDESTRIAN CLOSURE (OR PARTIAL CLOSURE) WILL BE PERMITTED WITHOUT PRIOR WRITTEN APPROVAL.
13. PROVIDE TEMPORARY TRAFFIC CONTROL MEASURES (VEHICULAR AND PEDESTRIAN) IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), LATEST EDITION AND OWNER/AUTHORITY HAVING JURISDICTION.
14. PROVIDE TEMPORARY 8-FT. HIGH CONSTRUCTION FENCE AROUND ENTIRE PERIMETER OF ACTIVE WORK SITE AND SECURE AT ALL TIMES. CONTRACTOR SHALL COORDINATE THE LIMITS OF CONSTRUCTION FENCE. LOCKABLE GATES SHALL BE PROVIDED AS NEEDED. LOCKS SHALL BE APPROVED BY DIRECTOR'S REPRESENTATIVE TO ALLOW ACCESS THE CONSTRUCTION AREA.
15. PREVENT SEDIMENT AND DEBRIS FROM LEAVING CONSTRUCTION SITE AND ENTERING STORMWATER CONVEYANCE SYSTEMS.
16. THE CONSTRUCTION AREA SHALL BE MAINTAINED DAILY. THIS INCLUDES, BUT IS NOT LIMITED TO, SWEEPING CONCRETE AND ASPHALT PAVING/SIDEWALK AND INSPECTING CONSTRUCTION FENCE AND SEDIMENT CONTROLS. LEAVE THE SITE IN NEAT AND ORDERLY CONDITION AT THE END OF EACH WORKING DAY.
17. CONSTRUCTION DEBRIS SHALL BE REMOVED FROM FACILITY PROPERTY ON REGULARLY SCHEDULED BASIS.
18. ROADS AND WALKWAYS SHALL BE RESTORED AND RETURNED TO THE FACILITY AS SOON AS POSSIBLE OR IN ACCORDANCE WITH DIRECTOR'S REPRESENTATIVE-APPROVED TRAFFIC CONTROL PLANS. TEMPORARY REPAIRS CAN BE MADE TO ROADS AND WALKWAYS TO ALLOW FOR USE AFTER THE AREA IS VACATED. TEMPORARY REPAIRS SHALL BE MAINTAINED UNTIL PERMANENT REPAIRS ARE MADE.
19. RESTORE ALL PAVEMENTS, CURBS, GUTTERS, SIDEWALKS, SIGNS, PAVEMENT STRIPING, IRRIGATION, SITE LIGHTING AND OTHER EXISTING UTILITIES TO THEIR ORIGINAL PRE-CONSTRUCTION CONDITION FOR ALL DISTURBED AREAS, UNLESS OTHERWISE INDICATED.
20. TOP SOIL, SEED, AND WATER ALL DISTURBED AREAS NOT RESTORED WITH ASPHALT OR CONCRETE.
21. REMOVE ALL EVIDENCE OF WORK INCLUDING DIRT, ASPHALT, TIRE TRACKS, ETC. AND LEAVE THE SITE IN A CLEAN AND SPOTLESS CONDITION.
22. UPON REQUEST, AUTOCAD FILES CAN BE PROVIDED TO CONTRACTOR FOR STAKEOUT PURPOSES.

TRAFFIC CONTROL NOTES:

1. PROVIDE A MINIMUM 10-FOOT WIDE LANE FOR VEHICLES DURING CONSTRUCTION HOURS WITHIN ROADWAYS, DRIVEWAYS, DRIVE AISLES, AND LOADING DOCK ACCESS WAYS. DURING NON-CONSTRUCTION HOURS, THE MINIMUM LANE WIDTH SHALL BE 12-FEET, UNLESS OTHERWISE NOTED.
2. AT NO TIME SHALL A ROADWAY OR DRIVE AISLE BE COMPLETELY CLOSED, UNLESS APPROVED BY THE DIRECTOR'S REPRESENTATIVE AND FACILITY'S SECURITY SUPERVISORY PERSONNEL.
3. ROADS AND WALKWAYS SHALL BE RESTORED AS SOON AS POSSIBLE OR SHALL HAVE TEMPORARY REPAIRS TO MAKE THEM USABLE DURING THE CONSTRUCTION PERIOD. TEMPORARY PATCHES SHALL BE MAINTAINED.

NEW YORK STATE OF OPPORTUNITY. Office of General Services
DESIGN & CONSTRUCTION

CONSULTANT

RMF ENGINEERING, INC. P.C.

ENERGY CODE COMPLIANCE STATEMENT:

TO THE BEST OF THE KNOWLEDGE, BELIEF, AND PROFESSIONAL JUDGEMENT OF THE LICENSED PROFESSIONAL SEALING THESE PLANS AND SPECIFICATIONS, THESE PLANS ARE IN COMPLIANCE WITH THE SUPPLEMENT TO THE 2025 NEW YORK STATE ENERGY CONSERVATION CONSTRUCTION CODE.

WARNING:

THE ALTERATION OF THIS MATERIAL IN ANY WAY, UNLESS DONE UNDER THE DIRECTION OF A COMPARABLE PROFESSIONAL, I.E. ARCHITECT FOR AN ARCHITECT, ENGINEER FOR AN ENGINEER OR LANDSCAPE ARCHITECT FOR A LANDSCAPE ARCHITECT, IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW AND/OR REGULATIONS AND IS A CLASS 'A' MISDEMEANOR.

STATE OF NEW YORK JOSEPH M. WILLIAMS 101654 LICENSED PROFESSIONAL ENGINEER
119170.Q0

CONTRACT:
ELECTRICAL

TITLE:
PROVIDE SWITCHGEAR & CONTROL SYSTEM MODIFICATION

LOCATION:
FIVE POINTS CORRECTIONAL FACILITY
6600 STATE ROUTE 96, ROMULUS, NY

CLIENT:
NYS DEPARTMENT OF CORRECTIONS AND COMMUNUTY SUPERVISION

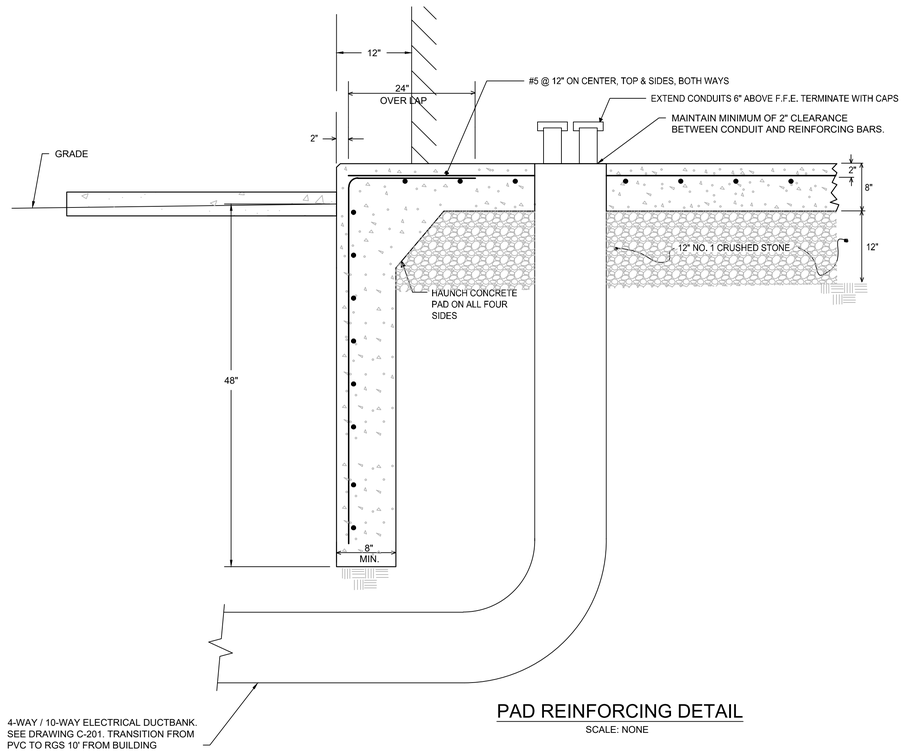
MARK	DATE	DESCRIPTION
1	10/16/2026	ADDENDUM NO. 2
	03/10/2026	BID DOCUMENTS

PROJECT NUMBER:	46151-E
DESIGNED BY:	JDM
DRAWN BY:	JDM
FIELD CHECK:	JTM
APPROVED:	JTM

SHEET TITLE:
CIVIL LEGENDS AND GENERAL NOTES

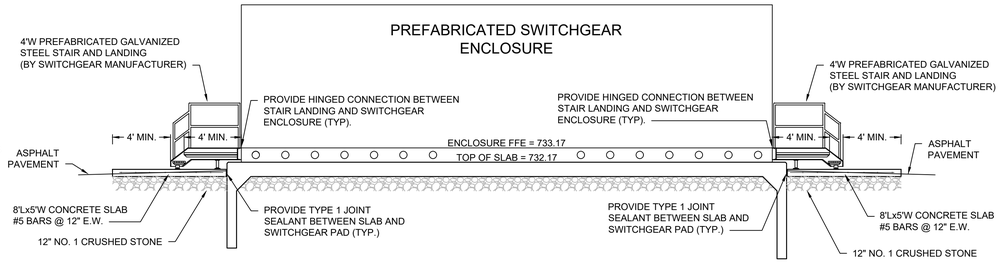
DRAWING NUMBER:
C-001

SHEET 2 OF 48



PAD REINFORCING DETAIL

SCALE: NONE



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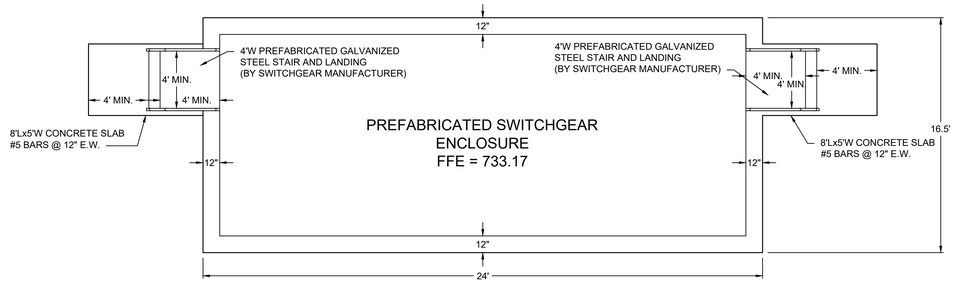


PLAN

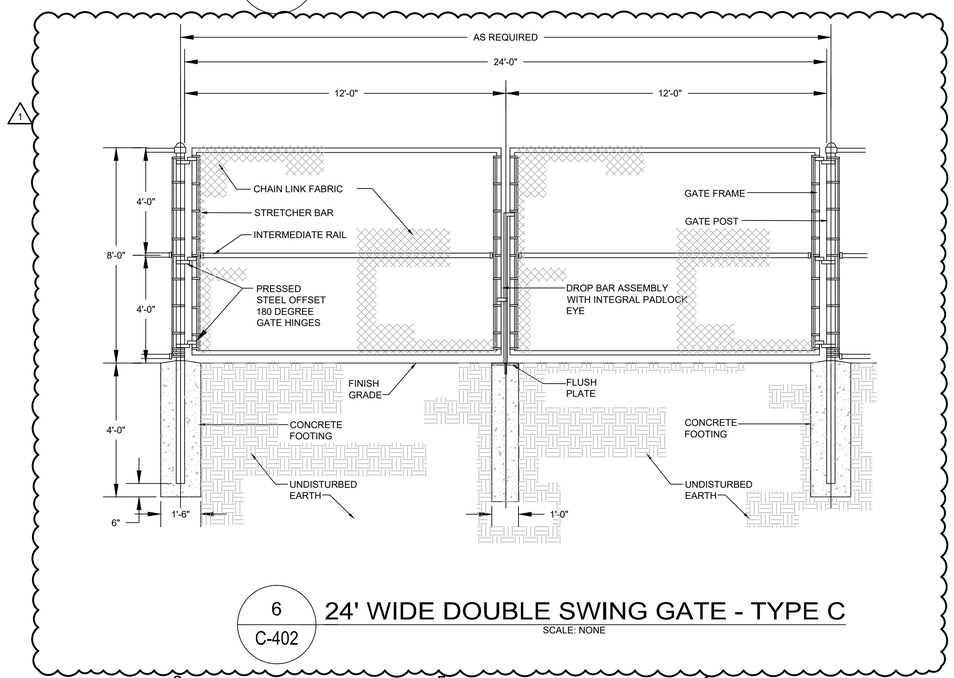
NOTES:

1. COORDINATE FINAL DIMENSIONS OF THE CONCRETE PAD WITH THE PREFABRICATED SWITCHGEAR ENCLOSURE MANUFACTUER.

5 / C-402

SWITCHGEAR ENCLOSURE PAD DETAIL

SCALE: NONE



6 / C-402

24' WIDE DOUBLE SWING GATE - TYPE C

SCALE: NONE

NEW YORK STATE OF OPPORTUNITY. Office of General Services

DESIGN & CONSTRUCTION

CONSULTANT

RMF ENGINEERING, INC. P.C.

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STATE OF NEW YORK · JOHN WILLIAM · LICENSED PROFESSIONAL ENGINEER · 101654

119170.Q0

CONTRACT: ELECTRICAL

TITLE: PROVIDE SWITCHGEAR & CONTROL SYSTEM MODIFICATION

LOCATION: FIVE POINTS CORRECTIONAL FACILITY 6600 STATE ROUTE 96, ROMULUS, NY

CLIENT: NYS DEPARTMENT OF CORRECTIONS AND COMMUNUTY SUPERVISION

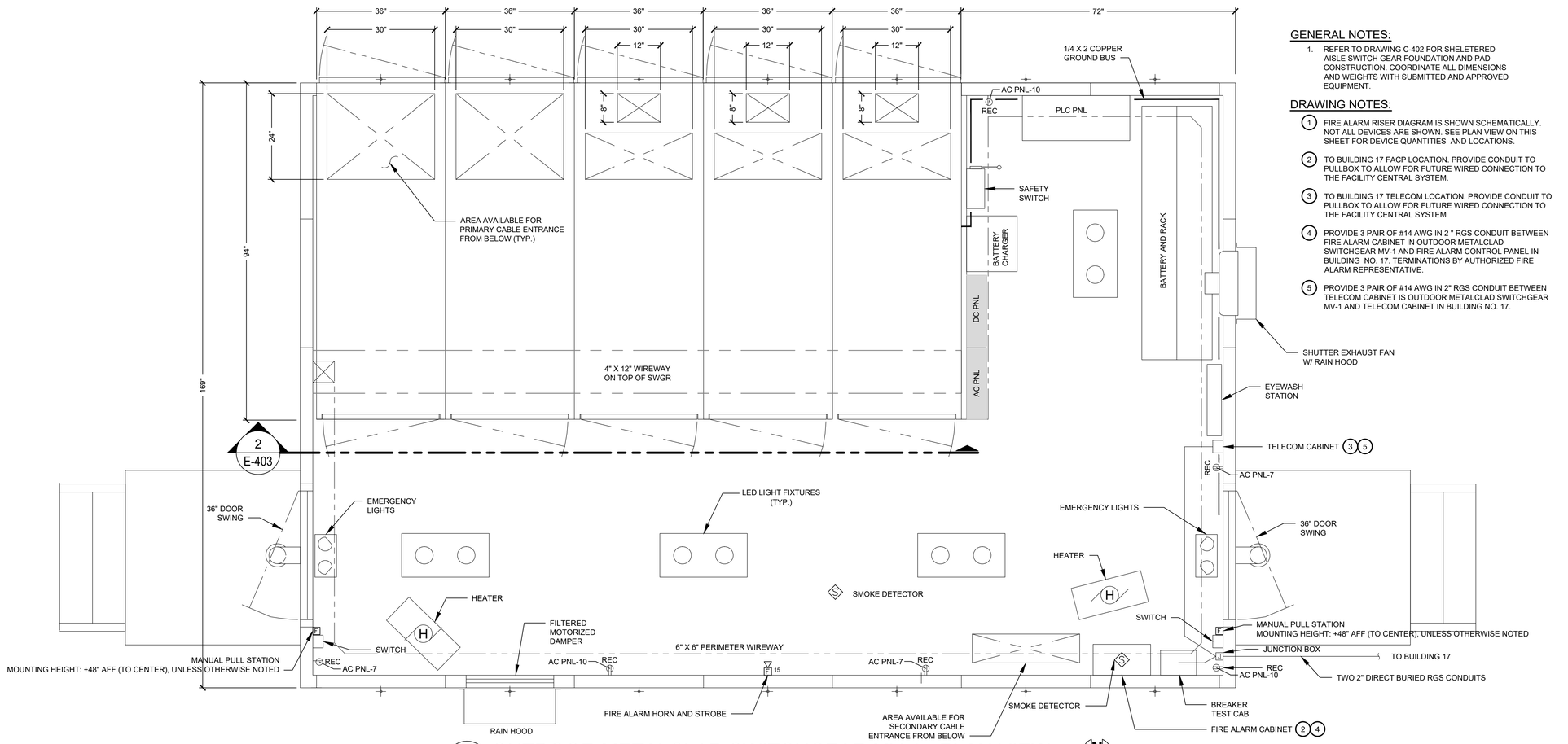
MARK	DATE	DESCRIPTION
1	10/16/2026	ADDENDUM NO. 2
	03/10/2026	BID DOCUMENTS

PROJECT NUMBER:	46151-E
DESIGNED BY:	JDM
DRAWN BY:	JDM
FIELD CHECK:	JTM
APPROVED:	JTM

SHEET TITLE: DETAILS

DRAWING NUMBER: C-402

SHEET 8 OF 48



1 E-403 **OUTDOOR METALCLAD SWITCHGEAR MV-1 - PLAN VIEW**

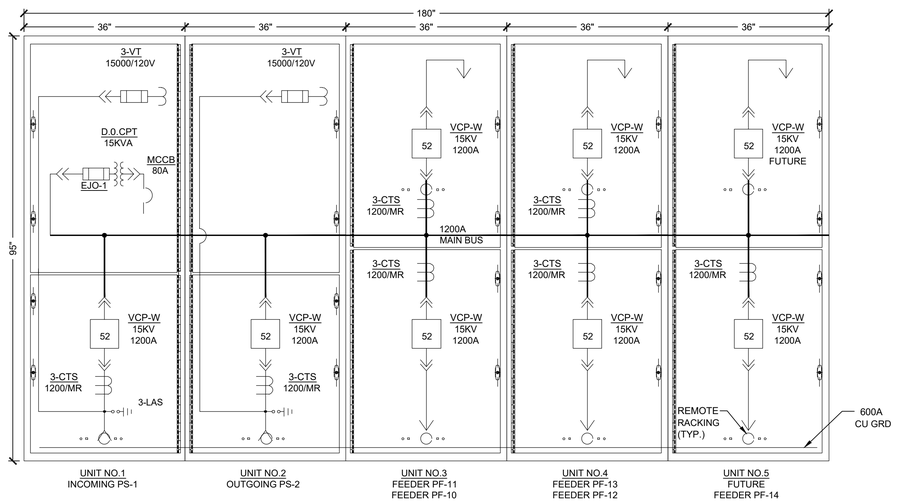
3/4" = 1'-0"

GENERAL NOTES:

1. REFER TO DRAWING C-402 FOR SHELETERED AISLE SWITCH GEAR FOUNDATION AND PAD CONSTRUCTION. COORDINATE ALL DIMENSIONS AND WEIGHTS WITH SUBMITTED AND APPROVED EQUIPMENT.

DRAWING NOTES:

1. FIRE ALARM RISER DIAGRAM IS SHOWN SCHEMATICALLY. NOT ALL DEVICES ARE SHOWN. SEE PLAN VIEW ON THIS SHEET FOR DEVICE QUANTITIES AND LOCATIONS.
2. TO BUILDING 17 FACP LOCATION. PROVIDE CONDUIT TO PULLBOX TO ALLOW FOR FUTURE WIRED CONNECTION TO THE FACILITY CENTRAL SYSTEM.
3. TO BUILDING 17 TELECOM LOCATION. PROVIDE CONDUIT TO PULLBOX TO ALLOW FOR FUTURE WIRED CONNECTION TO THE FACILITY CENTRAL SYSTEM
4. PROVIDE 3 PAIR OF #14 AWG IN 2 " RGS CONDUIT BETWEEN FIRE ALARM CABINET IN OUTDOOR METALCLAD SWITCHGEAR MV-1 AND FIRE ALARM CONTROL PANEL IN BUILDING NO. 17. TERMINATIONS BY AUTHORIZED FIRE ALARM REPRESENTATIVE.
5. PROVIDE 3 PAIR OF #14 AWG IN 2" RGS CONDUIT BETWEEN TELECOM CABINET IS OUTDOOR METALCLAD SWITCHGEAR MV-1 AND TELECOM CABINET IN BUILDING NO. 17.

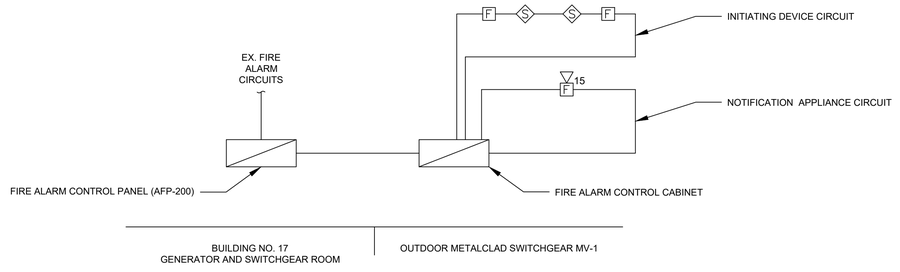


2 E-403 **SWITCHGEAR MV-1 - FRONT ELEVATION**

3/4" = 1'-0"

ELEVATION NOTES:

1. REFER TO DRAWING E-605 FOR CT QUANTITIES.



FIRE ALARM RISER DIAGRAM 1

NO SCALE

6" 0 6" 12" 18"

SCALE: 3/4"= 1'-0"

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DESIGN & CONSTRUCTION

CONSULTANT

RMF ENGINEERING, INC. P.C.

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STATE OF NEW YORK — ANDREW JONATHAN TAN — 090813 — LICENSED PROFESSIONAL ENGINEER

CONTRACT:

ELECTRICAL

TITLE:

PROVIDE SWITCHGEAR & CONTROL SYSTEM MODIFICATION

LOCATION:

FIVE POINTS CORRECTIONAL FACILITY
6600 STATE ROUTE 96, ROMULUS, NY

CLIENT:

NYS DEPARTMENT OF CORRECTIONS AND COMMUNUTY SUPERVISION

MARK	DATE	DESCRIPTION
1	10/16/2026	ADDENDUM NO. 2
	03/10/2026	BID DOCUMENTS

PROJECT NUMBER:	46151-E
DESIGNED BY:	NBK
DRAWN BY:	NBK
FIELD CHECK:	NBK
APPROVED:	JTM

SHEET TITLE:

SHELTERED AISLE SWITCHGEAR - OUTDOOR METALCLAD SWITCHGEAR MV-1 - POWER

DRAWING NUMBER:

E-403

SHEET 27 OF 48

GENERAL NOTES:

1. REFER TO DRAWING 601B FOR KEY INTERLOCK LOCATIONS.

		K1	K2	K3	Keys	NOTE:
Breakers	PF-PS1	XX				1 SPARE OF EACH KEY (K1,K2,K3)
	PF-PS2			XX		
	EX. PF-F1		XX			

NORMAL OPERATING CONDITIONS

		K1	K2	K3	Keys	NOTE:
Breakers	PF-10	X	X	X		ASSUME TWO TEMPORARY GENERATORS ARE BOTH CONNECTED TO QUICK CONNECT
	GQC-LB BRK#1	X	X	X		
	GQC-LB BRK#2	X	X	X		

TEMPORARY POWER CONDITIONS

		K1	K2	K3	Keys	NOTE:
Breakers	PF-10	X	X	X		1 SPARE OF EACH KEY (K1,K2,K3)
	GQC-LB BRK#1	X	X	X		EITHER BREAKER IN THE GQC-LB CAN BE UITILIZED TO LOAD BANK TEST.
	GQC-LB BRK#2					

LOAD BANK TESTING

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STATE OF NEW YORK ANDREW JONATHAN HAY LICENSED PROFESSIONAL ENGINEER No. 089313-1

CONTRACT: ELECTRICAL

TITLE: PROVIDE SWITCHGEAR & CONTROL SYSTEM MODIFICATION

LOCATION: FIVE POINTS CORRECTIONAL FACILITY 6600 STATE ROUTE 96, ROMULUS, NY

CLIENT: NYS DEPARTMENT OF CORRECTIONS AND COMMUNUTY SUPERVISION

MARK	DATE	DESCRIPTION
1	10/16/2026	ADDENDUM NO. 2
	03/10/2026	BID DOCUMENTS

PROJECT NUMBER: 46151-E

DESIGNED BY: NBK

DRAWN BY: NBK

FIELD CHECK: NBK

APPROVED: JTM

SHEET TITLE: KIRK KEY TRUTH TABLE

DRAWING NUMBER: E-601C

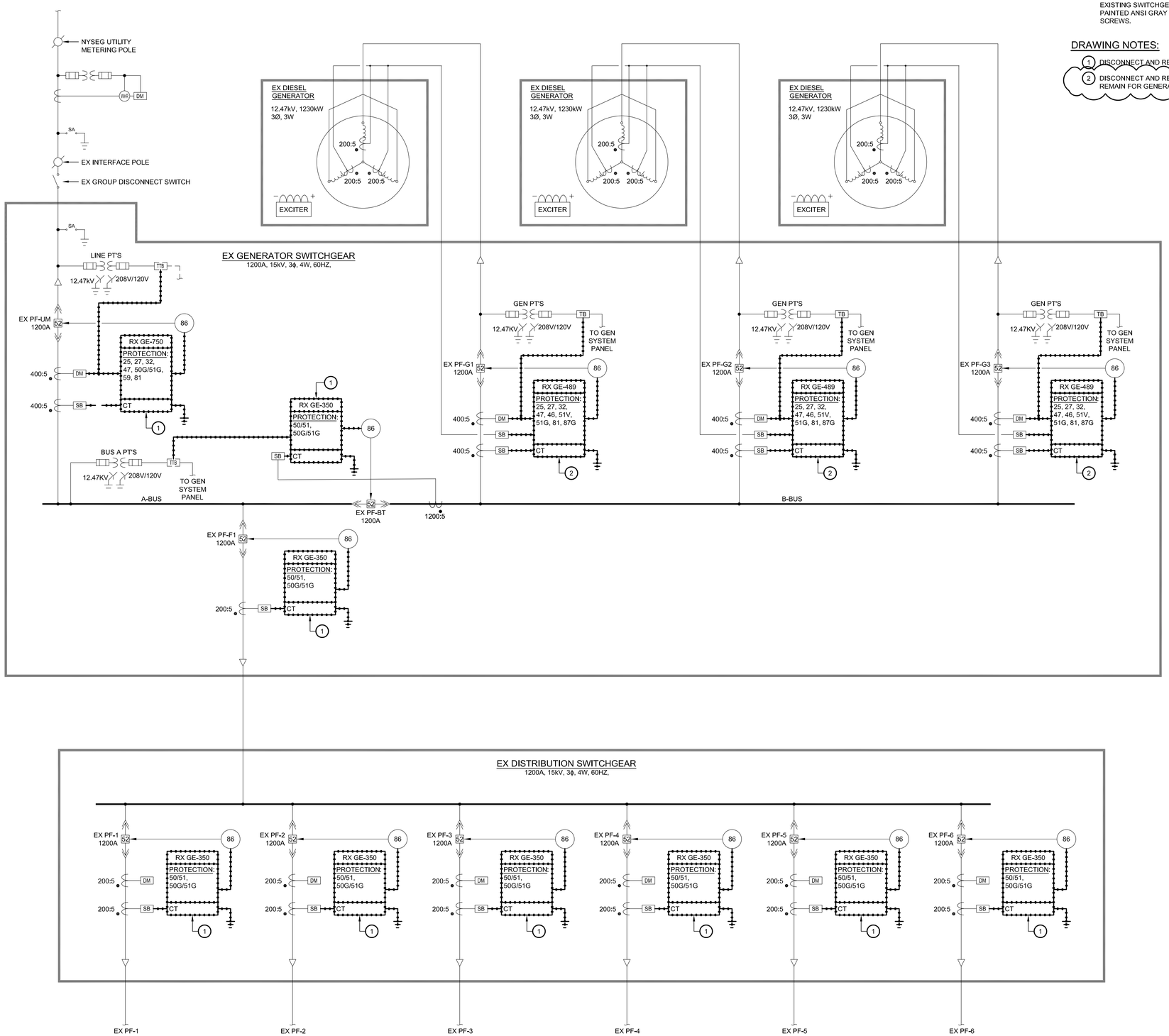
SHEET 30 OF 48

GENERAL NOTES:

1. PROVIDE SHEETMETAL COVER IN PLACE OF ALL REMOVED RELAYS ON EXISTING SWITCHGEAR DOORS. SHEETMETAL SHALL BE 12 GAUGE STEEL PAINTED ANSI GRAY TO MATCH THE SWITCHGEAR. ATTACH WITH MACHINE SCREWS.

DRAWING NOTES:

1. DISCONNECT AND REMOVE FEEDER PROTECTION RELAY.
2. DISCONNECT AND REMOVE GENERATOR MANAGEMENT RELAY. CT'S TO REMAIN FOR GENERATOR DIFFERENTIAL PROTECTION.



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DESIGN & CONSTRUCTION

CONSULTANT

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STATE OF NEW YORK · ANDREW JONATHAN HAY · No. 089313-1 · LICENSED PROFESSIONAL ENGINEER

CONTRACT: ELECTRICAL

TITLE: PROVIDE SWITCHGEAR & CONTROL SYSTEM MODIFICATION

LOCATION: FIVE POINTS CORRECTIONAL FACILITY 6600 STATE ROUTE 96, ROMULUS, NY

CLIENT: NYS DEPARTMENT OF CORRECTIONS AND COMMUNUTY SUPERVISION

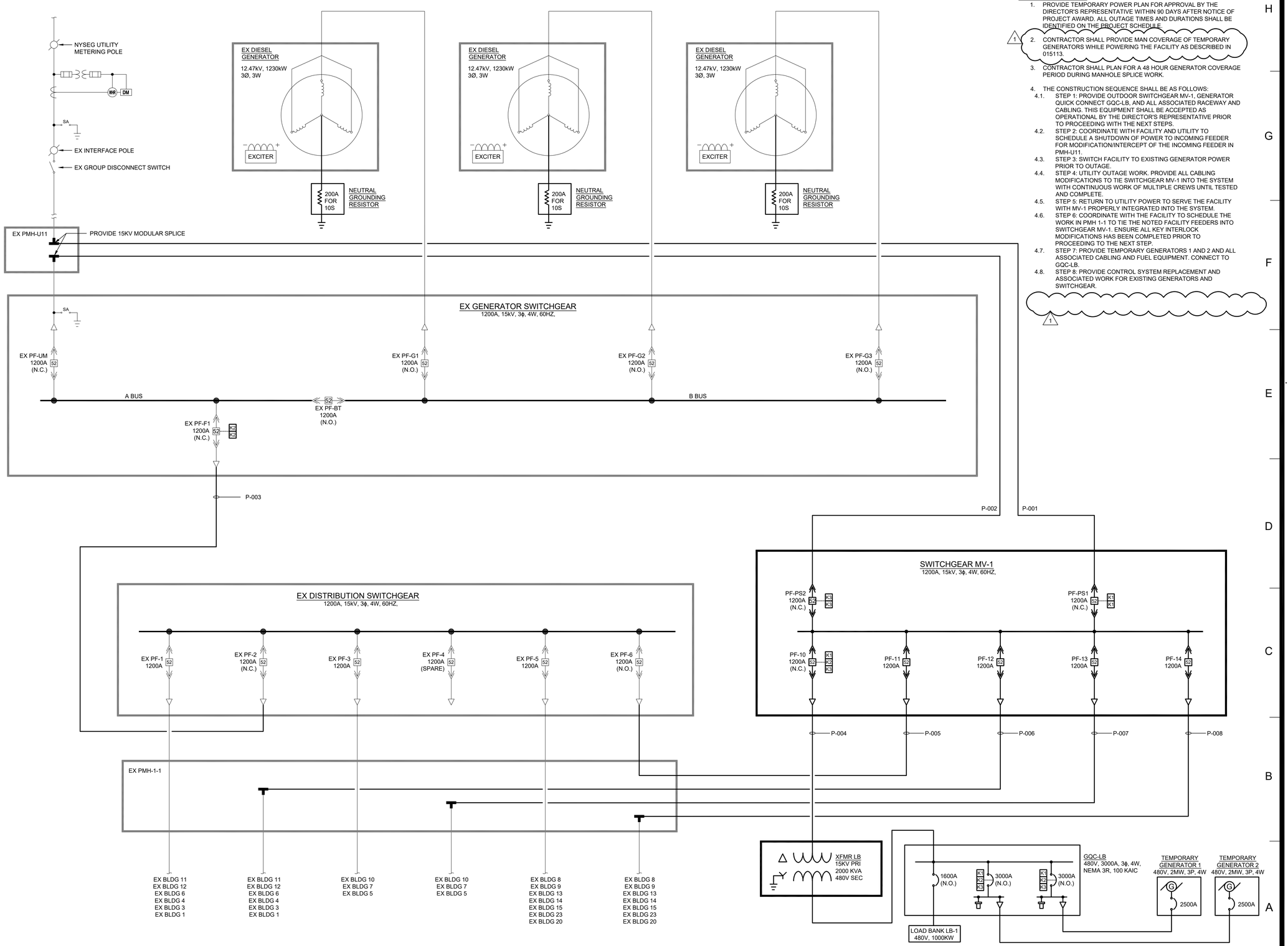
MARK	DATE	DESCRIPTION
1	10/16/2026	ADDENDUM NO. 2
	03/10/2026	BID DOCUMENTS

PROJECT NUMBER:	46151-E
DESIGNED BY:	RH
DRAWN BY:	CG
FIELD CHECK:	NBK
APPROVED:	JTM

SHEET TITLE: RELAY SINGLE LINE DIAGRAM - REMOVALS

DRAWING NUMBER: E-603

SHEET 32 OF 48



GENERAL NOTES:

1. PROVIDE TEMPORARY POWER PLAN FOR APPROVAL BY THE DIRECTOR'S REPRESENTATIVE WITHIN 90 DAYS AFTER NOTICE OF PROJECT AWARD. ALL OUTAGE TIMES AND DURATIONS SHALL BE IDENTIFIED ON THE PROJECT SCHEDULE.
2. CONTRACTOR SHALL PROVIDE MAN COVERAGE OF TEMPORARY GENERATORS WHILE POWERING THE FACILITY AS DESCRIBED IN 015113.
3. CONTRACTOR SHALL PLAN FOR A 48 HOUR GENERATOR COVERAGE PERIOD DURING MANHOLE SPLICE WORK.
4. THE CONSTRUCTION SEQUENCE SHALL BE AS FOLLOWS:
   - 4.1. STEP 1: PROVIDE OUTDOOR SWITCHGEAR MV-1, GENERATOR QUICK CONNECT GQC-LB, AND ALL ASSOCIATED RACEWAY AND CABLING. THIS EQUIPMENT SHALL BE ACCEPTED AS OPERATIONAL BY THE DIRECTOR'S REPRESENTATIVE PRIOR TO PROCEEDING WITH THE NEXT STEPS.
   - 4.2. STEP 2: COORDINATE WITH FACILITY AND UTILITY TO SCHEDULE A SHUTDOWN OF POWER TO INCOMING FEEDER FOR MODIFICATION/INTERCEPT OF THE INCOMING FEEDER IN PMH-U11.
   - 4.3. STEP 3: SWITCH FACILITY TO EXISTING GENERATOR POWER PRIOR TO OUTAGE.
   - 4.4. STEP 4: UTILITY OUTAGE WORK. PROVIDE ALL CABLING MODIFICATIONS TO TIE SWITCHGEAR MV-1 INTO THE SYSTEM WITH CONTINUOUS WORK OF MULTIPLE CREWS UNTIL TESTED AND COMPLETE.
   - 4.5. STEP 5: RETURN TO UTILITY POWER TO SERVE THE FACILITY WITH MV-1 PROPERLY INTEGRATED INTO THE SYSTEM.
   - 4.6. STEP 6: COORDINATE WITH THE FACILITY TO SCHEDULE THE WORK IN PMH 1-1 TO TIE THE NOTED FACILITY FEEDERS INTO SWITCHGEAR MV-1. ENSURE ALL KEY INTERLOCK MODIFICATIONS HAS BEEN COMPLETED PRIOR TO PROCEEDING TO THE NEXT STEP.
   - 4.7. STEP 7: PROVIDE TEMPORARY GENERATORS 1 AND 2 AND ALL ASSOCIATED CABLING AND FUEL EQUIPMENT. CONNECT TO GQC-LB.
   - 4.8. STEP 8: PROVIDE CONTROL SYSTEM REPLACEMENT AND ASSOCIATED WORK FOR EXISTING GENERATORS AND SWITCHGEAR.

1

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STATE OF NEW YORK · ANDREW JONATHAN MAY · LICENSED PROFESSIONAL ENGINEER · No. 089313

CONTRACT:

ELECTRICAL

TITLE:

PROVIDE SWITCHGEAR & CONTROL SYSTEM MODIFICATION

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PROJECT NUMBER:	46151-E
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DRAWN BY:	NBK
FIELD CHECK:	NBK
APPROVED:	JTM

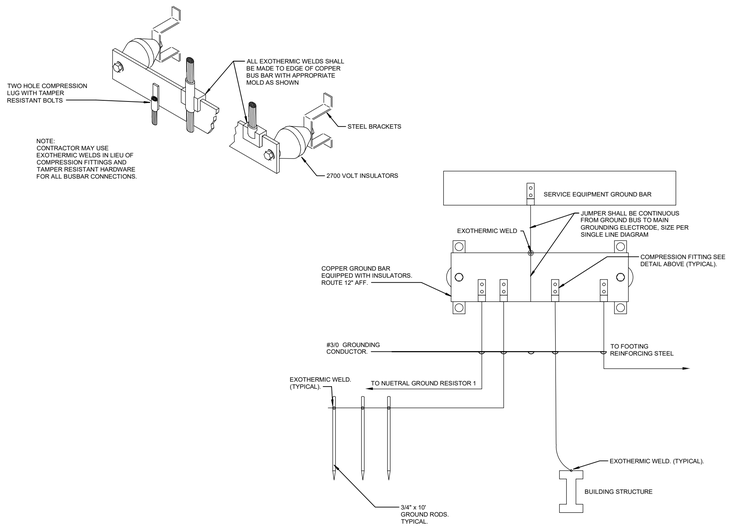
SHEET TITLE:

SINGLE LINE DIAGRAM - TEMPORARY POWER

DRAWING NUMBER:

E-610

SHEET 39 OF 48



7 E-807 GROUND BUS BAR - BUILDING 17

SCALE: NONE

F RATING--2 HR
T RATING--0 HR
L RATING AT AMBIENT--LESS THAN 1 CFM/SQ FT (SEE ITEM 4)
L RATING AT 400 F--LESS THAN 1 CFM/SQ FT (SEE ITEM 4)

1. FLOOR OR WALL ASSEMBLY--MIN 2-1/2 IN. THICK REINFORCED LIGHTWEIGHT OR NORMAL WEIGHT (100-150 PCF) CONCRETE. WALL MAY ALSO BE CONSTRUCTED OF ANY UL CLASSIFIED CONCRETE BLOCKS*. MAX DIAM OF OPENING IS 6 IN. SEE CONCRETE BLOCK (CAZT) CATEGORY IN THE FIRE RESISTANCE DIRECTORY FOR NAMES OF MANUFACTURERS.

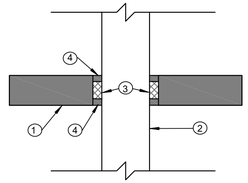
2. THROUGH-PENETRANTS--ONE METALLIC PIPE, CONDUIT OR TUBING TO BE CENTERED WITHIN THE FIRESTOP SYSTEM. A NOM ANNULAR SPACE OF 3/4 IN IS REQUIRED WITHIN THE FIRESTOP SYSTEM. PIPE, CONDUIT OR TUBING TO BE RIGIDLY SUPPORTED ON BOTH SIDES OF FLOOR OR WALL ASSEMBLY. THE FOLLOWING TYPES AND SIZES OF METALLIC PIPE, CONDUIT OR TUBING MAY BE USED:

   A. STEEL PIPE--NOM 4 IN. DIAM (OR SMALLER) SCHEDULE 5 (OR HEAVIER) STEEL PIPE.

   B. CONDUIT--NOM 4 IN. DIAM (OR SMALLER) STEEL ELECTRICAL METALLIC TUBING OR STEEL CONDUIT.

3. PACKING MATERIAL--MIN 1-1/2 IN. THICKNESS OF MIN 4 PCF MINERAL WOOL BATT INSULATION FIRMLY PACKED INTO OPENING AS A PERMANENT FORM. PACKING MATERIAL TO BE RECESSED FROM BOTH SURFACES OF FLOOR OR WALL AS REQUIRED TO ACCOMMODATE THE REQUIRED THICKNESS OF FILL MATERIAL.

4. FILL, VOID OR CAVITY MATERIALS*--SEALANT--MIN 1/2 IN. THICKNESS OF FILL MATERIAL TO BE APPLIED AT BOTH SURFACES OF FLOOR OR WALL ASSEMBLY.



MINNESOTA MINING & MFG. CO --TYPES FB-2000, FB-2000+, FB-2003 (TOP SURFACE OF FLOORS ONLY). (NOTE: L RATINGS APPLY ONLY WHEN FB-2000+ IS USED.)

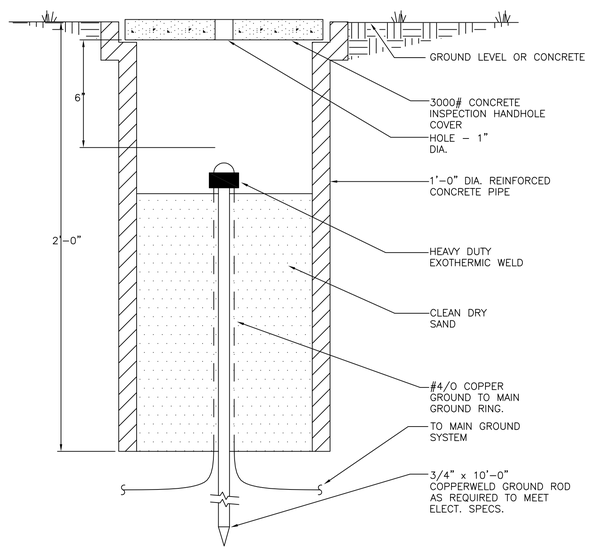
*BEARING THE UL CLASSIFICATION MARKING.

THIS DETAIL SHALL BE USED FOR ALL TWO (2) HOUR RATED CONCRETE/MASONRY WALL OR FLOOR PENETRATIONS AS DESCRIBED ABOVE FOR EMT CONDUITS EXCEPT SLAB ON GRADE.

UL DETAIL CAJ1015

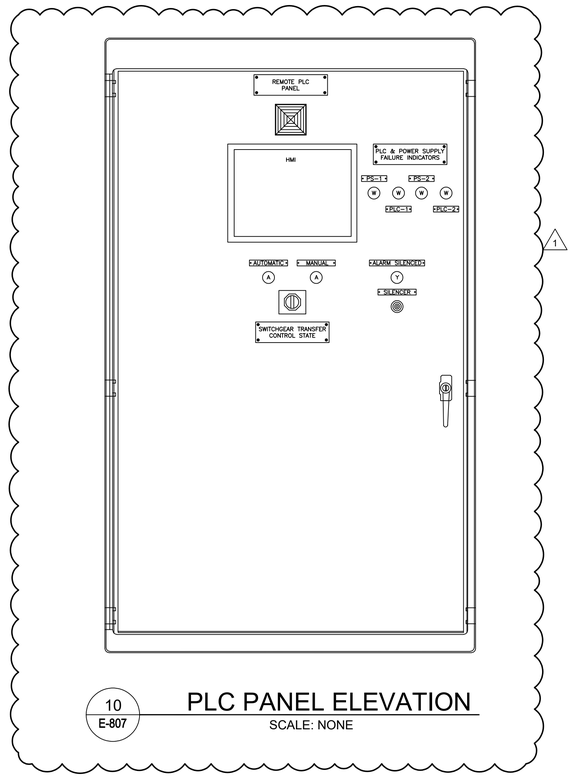
8 E-807 FUEL POLISHER WALL PENETRATION - BUILDING 17

SCALE: NONE



9 E-807 GROUND TEST POINT

SCALE: NONE



10 E-807 PLC PANEL ELEVATION

SCALE: NONE

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DESIGN & CONSTRUCTION

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STATE OF NEW YORK · ANDREW JONATHAN MAY · LICENSED PROFESSIONAL ENGINEER · No. 089313

CONTRACT:

ELECTRICAL

TITLE:

PROVIDE SWITCHGEAR & CONTROL SYSTEM MODIFICATION

LOCATION:

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6600 STATE ROUTE 96, ROMULUS, NY

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DRAWN BY:	NBK
FIELD CHECK:	NBK
APPROVED:	JTM

SHEET TITLE:

ELECTRICAL DETAILS

DRAWING NUMBER:

E-807

SHEET 48 OF 48