# SECTION 26 13 29
# MEDIUM-VOLTAGE, COMPARTMENTALIZED SWITCHGEAR

## 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: Switched and fused, compartmentalized, outdoor switchgear in capacities up to 34 kV, Furnished and Installed by this Contractor.

### 1.3 DEFINITIONS:

A. ATS: Acceptance Testing Specifications.

B. VFI: Vacuum Fault Interrupter or Fault Interrupter.

C. SF6: Sulfur Hexafluoride.

D. SCADA: Supervisory control and data acquisition.

### 1.4 PERFORMANCE REQUIREMENTS:

A. Seismic Performance: Switchgear shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

### 1.5 SUBMITTALS:

A. Provide product data, for all types of materials to be installed. For each type of switchgear and related equipment, provide:

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
2. Include rated capacities, operating characteristics for interrupter switches and circuit breakers.
3. Include time-current characteristic curves for over-current protective devices, including circuit-breaker relay trip devices and fusible devices.

B. Shop Drawings. Provide shop drawings of types of materials to be installed. For each type of switchgear and related equipment, provide:

1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show method of field assembly and location and size of each field connection. Include the following:
   a. Tabulation of installed devices with features and ratings.
   b. Outline and general arrangement drawing showing dimensions, shipping sections, and weights of each assembled section.
   c. Drawing of cable termination compartments showing preferred locations for conduits and indicating space available for cable terminations.
   d. Floor plan drawing showing locations for anchor bolts.
   e. Current ratings of buses.
   f. Short-time and short-circuit ratings of switchgear assembly.
   g. Nameplate legends.
   h. Mimic-bus diagram.
2. Wiring Diagrams: For each type of switchgear and related equipment, 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.

C. Delegated-Design Submittal. Provide types of materials to be installed for switchgear indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Detail fabrication and assembly of switchgear.
   2. Design Calculations: Calculate requirements for selecting seismic restraints and for designing concrete bases.

D. Coordination Drawings, provide types of materials to be installed. Floor/equipment plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Dimensioned layout, required working clearances, and required area above and around switchgear where piping and ducts are prohibited.
2. Switchgear layout and relationships between components and adjacent structural and mechanical elements.
3. Support locations, type of support, and weight on each support.
4. Field measurements.

E. Qualification Data: For qualified testing agency.

F. Seismic Qualification Certificates. Provide for reference of types of materials to be installed. For switchgear, accessories, and components, from manufacturer:
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

G. Source quality-control reports shall be provided by this Contractor for reference of types of materials to be installed.

H. Field quality-control reports.

I. Operation and Maintenance Data. Provide for reference types of materials to be installed. For switchgear and switchgear components to include in emergency, operation, and maintenance manuals. Include the following:
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.

**1.6 QUALITY ASSURANCE**:

A. Testing Agency Qualifications shall be provided by the installation Contractor under this contract. Member company of NETA or an NRTL:
1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and

marked for intended location and application shall be provided by the installation Contractor under this contract.

**1.7 PROJECT CONDITIONS**:

A. Environmental Limitations: Rate equipment for continuous operation at indicated ampere ratings for the following conditions:
   1. Ambient temperature not exceeding 122 deg F (50 deg C).
   2. Altitude of 4500 feet above sea level.

**1.8 COORDINATION**:

A. Layout and Installation shall be provided by this Contractor. Contractor shall coordinate with other construction including conduit, piping, equipment, and adjacent surfaces and shall be required to maintain required clearances for workspace and equipment access doors and panels.

B. Fibercrete Bases shall be furnished by this Contractor, and shall be sized to coordinate with the switch size specified.

**PART 2 - PRODUCTS**

**2.1-GENERAL REQUIREMENTS FOR COMPARTMENTALIZED, MEDIUM-VOLTAGE SWITCHGEAR FURNISHED AND INSTALLED BY THIS CONTRACTOR**

A. Description: Factory assembled and tested.

B. Arc Resistance: Comply with IEC 62271-200, Appendix AA

C. System Voltage: 7.2 kV nominal; 15 kV maximum. Suitable for application in 3-phase, 60-Hz, solidly grounded-neutral system.

D. Switchgear shall have an Open-Close-Ground position for each way.

E. Vacuum Fault Interrupters:
   1. Full-life duty cycle according to IEEE C37.60.

D. Enclosures: Steel, weatherproof construction, with integral structural-steel base frame.

E. Finish: Manufacturer's standard rust-inhibiting primer on phosphatizing-treated metal surfaces and having manufacturer's standard corrosion-resistant finish coating.

F. Instrument Transformers: Comply with IEEE C57.13.
   1. Potential Transformers: Secondary rating shall be 120 V with an accuracy class of 0.3 burdens of W, X, and Y according to NEMA standards.
   2. Current Transformers: Accuracy class and burdens suitable for connected relays, meters, and instruments.

G. Identification:

1. Materials: Comply with requirements in Division 26 Section "IDENTIFICATION FOR ELECTRICAL SYSTEMS" for nameplates, signs, and labels.
2. Mimic Bus: Continuous mimic bus applied to front of switchgear, arranged in single-line diagram format, using symbols and lettered designations, coordinated with the devices in the switchgear, to produce a concise visual presentation of principal switchgear components and connections. The mimic bus shall be black engraving on steel nameplate.
3. Hazard-Alerting Signs:
   a. Mounted on the exterior of the pad-mounted enclosure a sign reading: "WARNING - KEEP OUT - HAZARDOUS VOLTAGE INSIDE - CAN SHOCK, BURN, OR CAUSE DEATH."
   b. Mounted on each switchgear a sign reading: "DANGER - HAZARDOUS VOLTAGE - FAILURE TO FOLLOW THESE INSTRUCTIONS WILL LIKELY CAUSE SHOCK, BURNS, OR DEATH." The text shall further indicate that operating personnel must know and obey the employer's work rules, know the hazards involved, and use proper protective equipment and tools to work on this equipment.
4. Nameplates: Mounted on each switchgear indicating the manufacturer’s name, catalog number, model number, date of manufacture, and serial number.
5. Ratings Label: Mounted on each switchgear indicating the following:
   a. Voltage rating.
   b. Main bus continuous rating.
   c. Short-circuit rating.
   d. Fault-interrupter ratings, including interrupting and duty-cycle fault-closing.
   e. Load-interrupter-switch ratings, including duty-cycle fault-closing and short-time.

H. Viewing Windows: For each switches and interrupters to allow visual verification of the switch-blade position (open, closed, or grounded) while shining a flashlight on the blades.
   1. Viewing windows shall be located on the opposite side of the gear from the bushings and bushing wells so that operating personnel will not be required to perform routine operations in close proximity to high-voltage elbows and cables.

2. Include a cover for each viewing window to shield operating personnel from the flash which may occur during switching operations.

I. Accessories:

1. A shotgun clamp stick 69.5″ to 89.5″ in length with a canvas storage bag.
2. An adapter cable for connecting an overcurrent control to a user-furnished personal computer.
3. An adapter cable for connecting an overcurrent control removed from its enclosure to a user-furnished personal computer.
4. A fuse handling tool as recommended by the fuse manufacturer.

**2.2 PAD MOUNTED INSULATED SWITCHGEAR - FURNISHED AND INSTALLED BY THIS CONTRACTOR**

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. S&C Electric Company.

B. Switch Construction:

1. All switch components and entrances shall be assembled in a totally welded mild steel tank. Entrances shall be internally connected by copper conductors capable of handling momentary and continuous current duty. The switch shall contain no electrically floating metallic parts or components. Construction shall be a dead-front design.
   a. Switch tanks shall be painted Munsell 7.0GY3.29/1.5 green using corrosion-resistant epoxy paint.
2. Comply with IEEE/ANSI C37.20.3.
3. Ratings: Comply with IEEE/ANSI C37.04.

C. Load-break Puffer Switch:

Each switching way is to be equipped with an internally mounted operating mechanism capable of providing quick-make, quick-break operation in either switching direction. The mechanism must be capable of delivering sufficient torque and shall be provided with latches for each position to assure load interrupting, fault closing and momentary ratings. All switch positions are to be clearly identified, padlockable and adaptable to keylock schemes. The operating mechanism shall be actuated from outside the switch tank with an operating handle. The operating shaft shall be made of stainless steel providing

maximum corrosion resistance. A double "O" ring type operating shaft seal shall be used for a leak resistant, long life seal.

1. Switch contacts shall be of a rotary puffer design made with copper alloy contacts with silver plating to assure permanent, low contact resistance. Each rotating contact simultaneously disengages from two fixed contacts, thus providing two break points per phase giving improved interrupting capability compared to single break contact systems. Contact travel shall be 90 degrees to assure efficient arc extinction and a wide open contact gap. Arcing is confined away from the main contact surfaces. The stationary contacts shall be supported independent of the cable entrance bushings, eliminating possible misalignment. Auxiliary blades used for load interruption are not acceptable.
2. Switches shall be designed, tested and built per IEEE C37.74 and IEC 60265 standards. Certified test reports shall be provided. The switch shall be rated:
   a. Maximum design voltage, kV: 15.5.
   b. Impulse level (BIL), kV: 110.
   c. Continuous & load-break current, A: 630.
   d. One minute withstand (dry), AC kV: 35.
   e. One minute withstand (dry), AC kV Production test rating: 34.
   f. 15 minute withstand, DC kV: 53.
   g. Momentary current, kA, ASYM: 20.
   h. Fault close current, kA, ASYM: 20.
   i. One second current, kA, SYM: 25.
   j. Load-break operations at 600 A: 1200.
   k. Mechanical endurance, operations: 2000.
3. Cable entrances shall be tested to ANSI/IEEE 386 and be one or more of the following:
   a. 600 amp Quik-Change disconnectable apparatus bushing. 600 amp Apparatus bushing.
4. The switch shall be provided with an integral ground position that is readily visible through the viewing window to eliminate the need for cable handling and exposure to high voltage to ground the equipment. The ground position shall have a three-time and ten-time duty-cycle fault-closing rating.

D. Vacuum Fault Interrupters (VFI):

1. The vacuum interrupter shall consist of vacuum bottles and a

spring-assisted operating mechanism. The mechanism used shall be designated "Model FI" for three phase operation only. The mechanism shall consist of three vacuum bottles mechanically linked to single spring-assisted operating mechanism

2. The vacuum interrupter operating mechanism shall consist of the support assembly, linkage, spring latch mechanism, and solenoid utilized for electronic tripping. Maximum interrupting time shall be three cycles (50 msec). The movable contact shaft shall be flagged to indicate the contact position, open or closed. This contact position indicator shall be fully visible through viewing windows supplied in the switch tank.
3. The vacuum interrupter shall be a non-reclosing, manual reset device incorporating vacuum bottles. It shall be designed, tested and built per application sections of IEEE C37.60 and C37.74. The vacuum interrupter assembly shall be rated:
   a. Maximum design voltage, kV: 15.5.
   b. Impulse level (BIL), kV: 95.
   c. Continuous & loadbreak current, A: 600 .
   d. One minute withstand (dry), AC kV: 35 .
   e. One minute withstand (dry), AC kV Production test rating: 34.
   f. Symmetrical interrupting rating, kA: 12.
   g. Asym. interrupting rating, kA: 19.2.
4. Cable entrances shall be tested to ANSI/IEEE 386 and be one or more of the following:
   a. 600 amp Quik-Change disconnectable apparatus bushing.
   b. 200 amp Deepwell bushing.
5. The fault interrupter shall be provided with a disconnect with an integral ground position that is readily visible through the viewing window to eliminate the need for cable handling and exposure to high voltage to ground the equipment. The ground position shall have a three-time and ten-time duty-cycle fault-closing rating.

E. Control Power Supply: Current transformer supplies control circuits.
   1. Provide backup battery per manufacturer recommendations.

F. Vacuum Interrupter Electronic Control:
   1. An electronic assembly shall be provided to sense load and Fault current on each phase of the load tap circuits. The electronic control shall be powered from the current

transformers mounted inside the SF6 insulated switch tank. No external power source shall be required for overcurrent protection. The electronic control shall monitor the current on the individual phases of the load tap circuits using input from the internal current transformers. Electronic trip capability shall be selectable for each phase. Temperature range shall be -30C to +50C.

2. Minimum trip selection shall be accomplished with selector knobs or switches inside the electronic enclosure. Trip time current characteristics (TCC) shall be field selectable using a dip switch. Maximum time for power up and ready-to-trip when closing on a circuit shall be ten percent of the trip time or 1/2 cycle, whichever is greater. Trip selection may be made with the load taps energized.
3. The control shall feature time-current characteristic (TCC) curves including standard E-speed, K-speed, coordinating-speed tap, coordinating-speed main curves, and relay curves per IEEE C37.112. Coordinating-speed tap curves shall optimize coordination with load-side weak-link/backup current-limiting fuse combinations, and coordinating-speed main curves shall optimize coordination with tap-interrupter curves.
4. The time-overcurrent relay curves conform to IEEE C37.112 IEEE Standard Inverse-Time Characteristic Equations for Overcurrent Relays for the following curves: U.S. Moderately Inverse Curve U1, U.S. Inverse Curve U2, U.S. Very Inverse Curve U3, U.S. Extremely Inverse Curve U4, U.S. Short-Time Inverse Curve U5, I.E.C. Class A Curve (Standard Inverse) C1, I.E.C. Class B Curve (Very Inverse) C2, I.E.C. Class C Curve (Extremely Inverse) C3, I.E.C. Long-Time Inverse Curve C4, and I.E.C. Short-Time Inverse Curve C5.
5. The control shall have instantaneous-trip (1 kA through 8 kA) and definite-time delay (32 ms through 96 ms) settings to allow tailoring of the coordinating-speed tap and coordinating-speed main curves to the application.

G. Bushings and Bushing Wells:

1. Bushings and bushing wells shall conform to ANSI/IEEE Standard 386.
2. Bushings and bushing wells shall include a semiconductive coating.
3. Bushings and bushing wells shall be mounted in such a way that

the semiconductive coating is solidly grounded to the gas-tight tank.

H. Terminations:

1. Terminals for load-interrupter switches shall have 600-ampere bushings, and terminals for fault interrupters shall have 200-ampere bushing wells.

I. Provisions for Grounding:

1. One ground-connection pad shall be provided on the gas-tight tank of the switchgear. The ground-connection pad shall be constructed of stainless steel and welded to the gas-tight tank, and shall have a short-circuit rating equal to that of the switchgear.
2. If tank is in a pad mounted enclosure, ground connection pads shall be located at each cable entrance.

J. Pad-Mounted Style:

1. The gas-tight tank shall be made of 7-gauge mild steel.
2. Enclosure:
   a. The switchgear shall be provided with a pad-mounted enclosure suitable for installation of the gear on a concrete pad.
   b. The pad-mounted enclosure shall be separable from the switchgear to allow clear access to the bushings and bushing wells for cable termination.
      The enclosure shall be provided with removable front and back panels or doors, and/or hinged lift-up roof sections for access to the operating and termination compartments. Each roof section or door shall have a retainer to hold it in the open position.
   c. Lift-up roof sections or doors shall overlap the panels and shall have provisions for padlocking that incorporate a means to protect the padlock shackle from tampering.
   d. The base shall consist of continuous 90-degree flanges, turned inward and welded at the corners, for bolting to the concrete pad.
   e. For bushings rated 600 amperes continuous, the termination compartment shall be of an adequate depth to accommodate encapsulated surge arresters mounted on 600-ampere elbows having 200-ampere interfaces.

f. For bushing wells rated 200 amperes continuous, the termination compartment shall be of an adequate depth to accommodate 200-ampere elbows mounted on feedthru inserts.

g. An instruction manual holder shall be provided.

h. Non-removable lifting tabs shall be provided.

3. Enclosure Finish:

a. All exterior welded seams shall be filled and sanded smooth for neat appearance.

b. Switch tanks shall be painted in an "outdoor light gray” color, matching existing switches currently on-site, satisfying the requirements of ANSI Standard Z55.1 for No. 70 using corrosion-resistant epoxy paint.

c. Finish shall be applied over rust-inhibiting primer on phosphatizing-treated metal surfaces.

d. Comply with IEEE/ANSI C37.20.3.

e. Ratings: Comply with IEEE/ANSI C37.04.

K. Standard Components:

1. Lifting provisions.
2. Gas pressure gauge and fill valve.
3. Grounding provisions for switch tank and all cable entrances.
4. Stainless steel three line diagram and corrosion-resistant nameplates.
5. Parking stands.
6. Switch operating handle(s) with padlock provision and end stops.
7. Type 1 vacuum interrupter electronics package including a selector switch for single or 3-phase operation and individual phase trip levels.

L. Optional Components:

1. Low pressure warning device.
2. SF6 density switch for SCADA or remote indication of dielectric.
3. 4/0 brass ground lug(s).
4. Keylock provisions as shown on drawings.
5. Analog voltage sensors.
6. Digital voltage sensors.
7. Type 2 electronics package including ground fault trip and time delay selector switches (three phase only).
8. Refill kit consisting of regulator, hose and 10 or 20 lb. SF6 bottle.

9. Voltage indication.
   a. Voltage indication for each load-interrupter switch and fault interrupter by means of capacitive taps on the bushings shall
      be provided to eliminate the need for cable handling and exposure to high voltage to test the cables for voltage. This feature shall include a flashing LCD display to indicate the presence of voltage for each phase, and a solar panel to supply power for testing of the complete voltage-indication circuit.

   The voltage-indication feature shall be mounted on the covers for the viewing windows on the opposite side of the gear from the bushings and bushing wells so that operating personnel shall not be required to perform any routine operations in close proximity to high-voltage elbows and cables.

**2.3 SOURCE QUALITY CONTROL - FURNISHED AND INSTALLED BY THIS CONTRACTOR**

A. Before shipment of equipment, perform the following tests and prepare test reports:
   1. Production tests on circuit breakers according to IEEE C37.09.
   2. Production tests on completed switchgear assembly according to IEEE/ANSI C37.20.2.The bulk SF6 gas supply and each individual switch shall be tested for moisture content. Each individual switch shall undergo a mechanical operation check and a leak test. The switch shall be factory filled with SF6 and AC hi-pot tested one minute phase-to-phase, phase-to-ground and across the open contacts. Circuit resistance shall be checked on all ways.

B. 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.
   3. Tests substantiating the three-time duty-cycle fault-closing ratings shall be performed at maximum voltage with current

applied for at least 10 cycles. Certified test abstracts establishing such ratings shall be furnished upon request

C. 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.

**PART 3 - EXECUTION**

**3.1 SHIPMENT AND DELIVERY:**

A. The Contractor shall arrange to procure, ship and deliver to the project site all equipment specified in this section. The Contractor will unload and install this equipment under this contract.

1. The Contractor will proceed with delivery only after shop drawings have been approved, and delivery released by the Contracting Officer's Technical Representative.

**3.2 INSTALLATION:**

A. Switch Gear will be unloaded and installed by this Contractor, where the Contractor will anchor switchgear assembly to pad as shown on drawings not to be less than 8-inch (203-mm) thick (minimum) concrete pad 12 inches longer on each side than equipment, and attach by bolting.

1. Installing Contractor shall design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint requirements and details.
2. Fibercrete Bases: Shall be designed and furnished so when installed, exposed surface area shall not be less than 8 inches (203 mm) high minimum, reinforced as required. Base shall be sized so that edges extend no less than 12 inches (150 mm) in all directions beyond the maximum dimensions of furnished switchgear, unless otherwise indicated or unless required for seismic anchor support.

B. Temporary Lifting Provisions: Removal of temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchgear units and components shall be by the Contractor under this contract.

**3.3 IDENTIFICATION:**

A. Identification of field-installed conductors, interconnecting wiring, and components shall be furnished and installed by the Contractor under this contract.

**3.4 CONNECTIONS:**

A. All cable connections shall be installed by the Contractor under this contract.

B. The installation Contractor shall provide cable terminations at switchgear are specified in Division 26 Section 26 05 13, "MEDIUM-VOLTAGE CABLES."

C. The Contractor shall tighten bus joints, electrical connectors, and terminals according to manufacturer's published torque-tightening values.

D. The Contractor shall ground equipment according to Division 26 Section 26 05 26, "GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS." The Contractor shall connect wiring according to Division 26 Sections 26 05 21, "LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES" and 26 05 11, "MEDIUM-VOLTAGE CABLES."

**3.5 FIELD QUALITY CONTROL:**

A. The Contractor shall prepare for acceptance tests as follows:

1. Test insulation resistance for each switchgear bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. The Contractor shall engage a testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. The Contractor shall engage manufacturer's Field Services: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

D. The Contractor shall perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

The Contractor shall perform all required tests and Inspections:

2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS. Certify compliance with test

parameters. Perform NETA tests and inspections for each of the following NETA categories:

a. Switchgear.
b. Circuit breakers.
c. Protective relays.
d. Surge arresters.

E. Switchgear will be considered defective if it does not pass tests and inspections.

F. The Contractor shall Prepare all test and inspection reports.

G. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, the Contractor shall perform infrared scan of each switchgear. Remove front and rear panels so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchgear 11 months after date of Substantial Completion.
2. Instrument: Use an infrared-scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies switchgear checked and that describes infrared-scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

**3.6 ADJUSTING:**

A. The Contractor shall set field-adjustable, protective-relay trip characteristics as per Owner provided settings.

**3.7 CLEANING:**

A. On completion of installation, the Contractor shall inspect interior and exterior of switchgear. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair damaged finishes.

**3.8 DEMONSTRATION:**

A. The Contractor shall engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain switchgear. Training shall at a minimum be one 8 hour day of classroom and on-site training in all aspects of operation and maintenance of switchgear.

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