SECTION *[26 13 16] [16341]*
MEDIUM-VOLTAGE FUSIBLE INTERRUPTER SWITCHGEAR

PART 1 - GENERAL

1.1 SCOPE

A. This section includes medium voltage metal-enclosed switchgear assemblies consisting of load interrupter switches, power fuses and associated auxiliary equipment.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:
1. ***[Section [03 06 30] [16xxx] - Schedule for Cast in-Place Concrete***
2. ***Section [26 05 48] [16074] – Vibration and Seismic Controls for Electrical Systems***
3. ***Section [26 09 13] [16290] - Electrical Power Monitoring and Control]***

1.3 SUBMITTALS

A. Submit shop drawings and product data for approval and final documentation in the quantities listed according to the Conditions of the Contract. All transmittals shall be identified by customer name, customer location and customer order number.

B. Documents for Approval: One-line diagrams, dimensioned plans, sections and elevations showing minimum clearances, installed devices, major features, nameplate legends and bills of material.

C. Final Documents: Record documentation to include those in 1.3.B and wiring diagrams, single-line and three-line diagrams of switchgear bus and component connections, product data of accessories or parts not previously described in the drawings, list of recommended spare parts and instruction and installation manuals

D. Product Data: Include features, characteristics and ratings of switches, fuses and other components. Also, time-current characteristic curves for power fuses and any overcurrent devices.

E. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components and location and size of each field connection. Include the following:
1. Enclosure type and details.
2. Nameplate legends.
3. Bus configuration with size and number of conductors in each bus run, including phase, neutral and ground conductors of main and branch buses.
4. Current ratings of buses.
5. Short-time and short-circuit ratings of switchgear assembly.
6. Mimic bus diagram.
7. Wiring Diagrams: Detail wiring for power, signal and control systems and differentiate between manufacturer-installed and field-installed wiring.

1.4 RELATED STANDARDS

A. Comply with requirements of latest revisions of applicable industry standards, specifically including the following:
1. ANSI/IEEE C37.20.3 – Standard for Metal-Enclosed Interrupter Switchgear.
2. ANSI/IEEE C37.20.4 – Standard for Indoor AC Medium Voltage Switches Used in Metal-Enclosed Switchgear.
3. NEMA
4. UL

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage a firm with at least 5 years experience in manufacturing switchgear.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products in factory labeled packages. Shipping groups shall not exceed 15 ft. in length.

B. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from potential damage from weather and construction operations. Store so condensation will not form on or in switchgear and if necessary, apply temporary heat where required to obtain suitable service conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. ***[The metal-enclosed switchgear assembly shall be manufactured by Siemens or pre-approved equal. Approved manufacturers are as follows:***
   1. ***SIEMENS***
   2. ***.]***

2.2 RATINGS

A. System Configuration: Switchgear suitable for application in three-phase, 60-Hz, ***[grounded-neutral] [ungrounded] [high-impedance grounded]*** system.

B. Electrical Ratings:
   1. Nominal System Voltage, kV: ***[4.16] [7.2] [13.8] [34.5]***
   2. Maximum Design Voltage, kV: ***[5] [8.25] [15] [38]***
   3. BIL Impulse Level: ***[60] [95] [150] [200]***
   4. Main-Bus Continuous: ***[600] [1200] [2000]*** A.
   5. Switch Duty Cycle, Fault Closing, symmetrical A: ***[40] [61]***

2.3 GENERAL REQUIREMENTS

A. The switchgear shall be factory assembled and tested and comply with applicable industry standards. If multiple sections, it shall be a coordinated design so that shipping groups are easily connected together at the site into a continuous line-up. Necessary connecting materials shall be furnished.

B. ***[The switchgear assembly shall consist of one or more metal-enclosed ventilated sections in indoor NEMA 1 enclosure(s) [outdoor NEMA 3R enclosure(s)]. Units shall be of individual frames of bolted steel construction with full-side sheets separating adjacent units. Each frame shall be adequately braced to function properly under normal operating and short-circuit conditions. Assembly shall have the following:***
   1. ***Window on door to permit viewing switch-blade positions when door is closed.***
   2. ***Rear removable panels with handles***
   3. ***Danger-warning sign***
   4. ***[Key interlocked doors] [Interlock air-interrupter switch with transformer secondary main circuit breaker, preventing switch from being opened or closed unless secondary main circuit breaker is open.]***

C. The switchgear shall be UL listed with separate doors to the switch and or fuse compartment with the following.
   1. Doors shall be mechanically interlocked with the switch to prevent closing the switch with the door open and to prevent opening the door with the switch closed. Doors shall have provision for pad locks
   2. Protective hinged screen steel barriers, retained with captive thumb screws, to prevent access to the switch when changing fuses.

D. ***[Surge Arresters]: Comply with IEEE C62.11, [distribution] [intermediate] [station] class; metal-oxide-varistor type, with ratings as indicated, connected in each phase of incoming circuit and ahead of any disconnecting device.***

E. ***[Main bus] shall connect vertical sections and between compartments and shall be uniform capacity the entire length of assembly. The main horizontal bus shall be run in a vertical, edge-to-edge arrangement for high short circuit strength. Access to the rear cable termination area shall be possible without reaching over the main and vertical bus.***

1. ***Bus shall be [98% minimum conductivity copper with silver-plated joints] [98 % conductivity copper with tin-plated joints] [aluminum with welded connections***
2. ***Ground Bus shall be copper of 98 percent minimum conductivity, with pressure connector for feeder and branch-circuit ground conductors, minimum size 1/4 by 2 inches.***
3. ***Bus bracing shall be equal to the short circuit interrupting rating of the lowest rated non-fused circuit breaker applied in the assembly.***
4. ***Neutral Bus shall be [50] [100] percent of phase-bus ampacity. Equip bus with pressure-connector terminations for outgoing circuit neutral conductors.***
5. ***[Neutral bus equipped with pressure-connector terminations for outgoing circuit neutral conductors. Neutral-bus extensions for busway feeders are braced.]***
6. ***[Neutral Disconnect Link: Bolted, uninsulated, 1/4-by-2-inch copper bus, arranged to connect neutral bus to ground bus.]***
7. ***Provide for future extensions from either end of main phase, neutral and ground bus by means of predrilled bolt-holes and connecting links.***
8. ***MV clearances shall be maintained in all horizontal and vertical buses such that insulation is not required. [Insulated bus-bar shall consist of bus bars wrapped with factory-applied, flame-retardant tape or spray-applied, flame-retardant insulation. Sprayed insulation thickness of 3 mils minimum. Bolted bus joints shall be insulated with secure joint covers that can easily be removed and reinstalled.]***

F. ***[Fungus Proofing: Permanent fungicidal treatment for switchgear interior, including instruments and instrument transformers.]***

2.4 COMPONENTS

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

1. Potential Transformers: Secondary voltage rating of 120V and NEMA accuracy class of 0.3 with burdens of W, X and Y.
2. Current Transformers: ***[Bar type for utilities] [Donut type for shielded cable]***, ratios as indicated; burden and accuracy class suitable for connected relays, meters and instruments.

B. **Note: Meter may not be desired here if this switch is used for a unit substation.** ***[Multifunction Digital-Metering Monitors shall be UL-listed or -recognized, microprocessor-based unit suitable for three- or four-wire systems. Units shall be mounted in the instrument compartment door and as follows:***

1. ***Incoming monitoring or main switches: Siemens Model PAC3200.]***

C. **Note: If the job is not main-tie-main, delete this section.** ***[Control power transformer, single phase, with primary disconnect fuse 120/240 VAC secondary, internally mounted dry-type transformer with disconnect primary fuses, [5] [10] [15] kVA]***

1. ***[Automatic transfer of load with main-tie-main controls]***

D. ***[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. Mimic-bus segments shall be coordinated with devices in switchgear sections to which applied, to produce a concise visual presentation of principal switchgear components and connections.]***

2.5 INTERRUPTER SWITCH AND FUSE ASSEMBLY

A. Load interrupter switches shall be three-pole, single throw, gang-operated stored energy type with quick-make, quick-break operation.
   1. ***[Manually] [Electrically]*** operated
   2. Non removable switch handle
   3. Separate main and arcing contacts to provide maximum endurance for fault close and load interrupting duty
   4. Arcing contacts shall be spring loaded so that on opening they breaker after the main contacts, on closing they make after the main contacts. Arc interruption to take place in an interruption chute.

B. Fuse Assembly: To be ***[current limiting] [expulsion]*** type.
   1. ***[Current-limiting fuses to be fast replaceable which will operated without explosive noise, expulsion of gas vapor, or foreign matter from the tube.***
      a. ***Fuse contacts be retained by high-pressure locking device to prevent blow-out during operation***
      b. ***Indicator integral with each fuse to show when it has blown.]***
   2. ***[Expulsion fuses controlled and silenced by chambers***
      a. ***Blown fuse indicators***
      b. ***[Non-disconnect] [Disconnect] mounting]***
   3. Spares: Include three fuses in use and three spare fuses in storage clips in each switch.
   4. ***[Phase barriers between fuses]***

2.6 TESTING

A. Perform production tests in compliance with ANSI C37 and NEMA SG 5 requirements. Provide certified test results.

2.7 UNITS REQUIRED

A. ***Incoming Line: Qty [__]***
   1. ***3 - __kV MCOV [station] [intermediate] class surge arrestors***
   2. ***[Set of _ voltage transformers, rated _____V]***
   3. ***[Set of _ current transformers, rated _____A]***
   4. ***[Space heater and thermostat]***
   5. ***Connections shall be made via:***
      a. ***[A set cable lugs [ ] per phase, [Clamp-type] [compression-type] [Cable terminators] [Potheads] for [____] type cable [___] size, [__] kV for [top] [bottom] entry.]***
      b. ***[Metal-enclosed bus rated [___] A]***

B. ***Switches: Qty [__]***
   1. ***Current rating: [600] [1200] A***
   2. ***[Space heater and thermostat]***
   3. ***[Outgoing set of cable lugs] [Close-couple connection to transformer with insulated cable] [Close-couple connection to transformer with rigid bus]***
   4. ***[Zero sequence transformer]***

2.8 ACCESSORIES

A. The following accessories shall be provided:
   1. Fuse-handling tool
   2. Three spare power fuses
   3. Three spare control fuses for potential transformer and control power transformer.
   4. Spare Indicating Lights: One of each type installed.
   5. Touchup Paint: One-half pint of paint matching enclosure finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Electrical contractor to install metal-clad switchgear in accordance with manufacturer's written instructions and the following specifications.

B. Install and anchor switchgear in accordance with manufacturer's instructions.

C. Tighten bus joints, electrical connectors and terminals according to manufacturer's published torque-tightening values. Install equipment grounding conductors for switchgear with ground continuity to main electrical ground bus.

3.2 ADJUSTMENTS AND CLEANING

A. Set field-adjustable, protective-relay trip characteristics.

B. Clean exposed surfaces using manufacturer recommended materials and methods. Touch-up damaged coating and finishes using non-abrasive materials and methods recommended by manufacturer. Eliminate all visible evidence of repair.

3.3 TESTING

A. After installing switchgear and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
   1. Procedures: Perform inspections and tests specified below. Report values that do not meet manufacturer's written recommendations. Certify compliance with test parameters.
   2. Switchgear: Perform inspections and tests stated in NETA ATS, Section 7.1.
   3. Instrument Transformers: Perform inspections and tests stated in NETA ATS, Section 7.10.
   4. Metering and Instrumentation: Perform inspections and tests stated in NETA ATS, Section 7.11.
   5. Ground-Fault Systems: Perform inspections and tests stated in NETA ATS, Section 7.14.
   6. Battery Systems: Perform inspections and tests stated in NETA ATS, Section 7.18.
   7. Surge Arresters: Perform inspections and tests stated in NETA ATS, Section 7.19.

3.4 WARRANTY

A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

3.5 ***[FIELD QUALITY CONTROL***

A. ***Manufacturer's Field Services: Engage a factory-authorized service representative to inspect field-assembled components, installation and connection of switchgear; and to pretest and adjust switchgear components. Report results in writing.***

B. ***Remove and replace malfunctioning units with new units and retest.]***

3.6 ***[STARTUP SERVICES]***

A. ***Engage a factory-authorized service representative to perform startup service.***

B. ***Train Owner's maintenance personnel on procedures and schedules for energizing and de-energizing, troubleshooting, servicing and maintaining equipment and schedules.***

C. ***Verify that switchgear is installed and connected according to the Contract Documents.***

D. ***Verify that electrical control wiring installation complies with manufacturer's submittal by means of point-to-point continuity testing. Verify that wiring installation complies with requirements in Division [26] [16] Sections.***

E. ***Complete installation and startup checks according to manufacturer's written instructions.]***

END OF SECTION