

SECTION 16360 - MEDIUM VOLTAGE SWITCHING CENTER

City of San Diego, CWP Guidelines

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing and testing complete an operable medium voltage switching center with enclosure as indicated.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 09800 Protective Coatings
- 2. Section 16030 Electrical Tests
- 3. Section 16050 Basic Electrical Materials and Methods

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:

- 1. National Electrical Code

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

- 1. NEMA SG6 Metal Enclosed Switchgear
- 2. ANSI/IEEE C37.20 Switchgear Assemblies Including Metal Enclosed Bus

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 and 16050:

- 1. Catalogue cuts of the manufacturer's products.
- 2. Engineering data to include voltage, current, and short-circuit ratings.
- 3. Outline dimensions to include available space for conduits, stress cone type cable terminations, and cable supports.
- 4. Design test reports.
- 5. Certificate of Qualification.

1.6 OWNER'S MANUAL

A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300:

1. Production Test Reports.

1.7 MANUFACTURER'S SERVICES

A. **Inspection, Startup, and Field Adjustment:** An authorized service representative of the manufacturer shall visit the site for not less than [] days and witness the following:

1. Installation of the equipment.

2. Inspection, checking, and adjusting the equipment.

3. Precommissioning checkout, startup and field-testing for proper operation.

4. Performing field adjustments to ensure that the equipment installation and operation comply with the Specifications.

B. **Instruction of OWNER'S Personnel:** The authorized service representative shall also instruct the OWNER'S personnel in the operation and maintenance of the equipment including step-by-step troubleshooting procedures with necessary test equipment for not less than [] days.

1.8 FACTORY TESTING

A. **General:** Products shall be tested at the factory in accordance with Section 16050.

B. **Tests:**

1. Reports of design tests conducted on one medium voltage load break switch assembly having essentially duplicate ratings as indicated herein shall be submitted. The design testing program shall conform to ANSI/IEEE C37.20 and shall include the following tests:

a. Basic impulse level.

b. Momentary withstand.

c. Short time withstand.

d. Fault closing.

e. Load interruption at various loads and power factors.

2. A Certificate of Qualification shall be submitted to verify that the submitted Design Test Reports are completely applicable to all load break switch assemblies furnished hereunder.

3. Production Tests shall be conducted on each medium voltage loadbreak switch assembly, and test reports shall be submitted. The production tests program shall conform to ANSI/IEEE C37.20 and NEMA SG-6, and shall include the following tests:

- a. Visual and Mechanical Inspection
 - b. Dielectric test at power frequency for one minute
 - c. Contact resistance measurement for all the three phases.
- C. **Witnesses:** The OWNER and the CONSTRUCTION MANAGER (at the option of either) reserves the right to witness factory tests.

1.9 FIELD TESTING

- A. **Testing:** Products shall be field-tested for compliance with the indicated requirements in compliance with Section 16050.

1.10 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. **Delivery of Materials:** Products shall be delivered in original, unbroken packages or containers, bearing the name of the manufacturer.
- B. **Storage:** Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from deleterious elements.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. A single responsible manufacturer shall furnish all major components of the switching center and shall be experienced in the design and manufacture of the equipment.
- B. The switching center shall be designed for continuous duty service in the indicated area designations defined in Section 16050.
- C. The switching center shall be an integrated assembly of switches, bus and fuses which are coordinated electrically and mechanically for high voltage circuit switching and protection. The switching center shall be provided in compliance with this Specification and with all applicable NEMA and ANSI standards.
- D. The construction shall be of the universal frame type using die-formed welded and bolted members; enclosing panels shall be 11-gauge steel and shall be bolted in place.
- E. Bus bar shall be copper, fully insulated and shall be silver plated at joints. Bus bar shall be braced for short circuits of [50,000 amperes] minimum. A full-length ground bus bar shall be provided at the bottom of the switching center enclosure.
- F. Multi-section switching center shall be constructed on a self-supporting, continuous beam.

2.2 SERVICE

- A. The switching center shall be suitable for operation at [13.8] nominal kV, 3-phase, 60-Hz directly grounded [ungrounded] system and the whole switching center line up shall have the minimum interrupting capacity of [50,000 amp] RMS symmetrical at [nominal system voltage] or [as indicated].

2.3 ENCLOSURE

- A. The switching center enclosure shall be outdoor, weather-proof [NEMA 3R] non-walk-in type.
- B. Switching center enclosure shall have ventilating louvers top and bottom with dust filters and sloping top. Where full-length doors are required, they shall have continuous hinges with lockable handles and three-point catches; all doors at the same switchgear lineup shall be hinged on the same side. Doors shall have welded corners ground smooth.
- C. The switching center enclosure shall be rodent-and bird-proof. Each section shall be equipped with a switched overhead lighting fixture, one convenience receptacle shall be provided for the entire enclosure.
- D. All covers shall be bolted in place except the front opening doors. Channel bases and lifting arrangements shall be provided. A space heater and a thermostat shall be provided in each section to prevent moisture condensation.
- E. Metal enclosures shall be coated using a system including solvent cleaning, pretreatment with a phosphate coating, application of primer and finishing with a corrosion resistant enamel paint suitable for the environmental conditions of the locality, conforming to the requirements of Section 09800.

Exterior surfaces shall be painted dark gray conforming to ANSI 24. Interior surfaces shall be painted [white] conforming to ANSI [].

The under surfaces shall be coated with an additional coating of corrosion resistant protective coating.

- F. The CONTRACTOR shall provide two one-pint aerosol spray paint cans, of each color per assembly, for use by the OWNER for touching up in the future.
- G. The equipment shall be furnished with a smooth finish, free of all foreign matter such as scales, sand, blisters, weld splatters, metal chips and shavings, oil, grease, organic matter and rust.
- H. Floor-standing switching center shall be shipped fully assembled and tested; if shipping breaks are imperative, the units shall be assembled and tested then disassembled for shipping.

2.4 DESIGN AND CONSTRUCTION FEATURES

- A. The switching center configuration shall be as indicated and shall have two incoming main switches and bus tie switch with two out of three close key interlock.
- B. Incoming and outgoing switch sections shall have ample spaces for 15 kV, 133 percent shielded, jacketed single conductor stress-cone terminations and lightning arresters. All terminals and lugs shall be of the solderless type suitable for copper cables of size indicated.

C. The switches shall be load interrupter type.

1. Each interrupter switch shall be three-pole, single-throw unit, operated by stored energy spring mechanism such that the speed of switch opening or closing shall be independent of the operator. Each switch shall be provided with a means for manually opening or closing if control power is not available or if a motor fails.
2. The interrupter switches shall be air-break type, 3-pole, 2-position with arc chutes, or other suitable method of cooling and quenching an arc quickly, rated [600] [1200] amps continuous, as indicated. The switches shall be for use in a [13.8 kV, 3-phase low resistance grounded system] and shall have the following ratings:

a. Switches with 1200 amps continuous rating:

- o Design voltage [15 kV]
- o Impulse withstanding rating [95 kV]
- o Interrupting ampere rating 1,200 amps
- o Fault closing ampere [61,000 amps]
- o Momentary rating 80,000 amps

b. Switches with 600 amps continuous rating:

- o Design voltage [15 kV]
- o Impulse withstanding rating [95 kV]
- o Interrupting ampere rating 600 amps
- o Fault closing ampere [40,000 amps]
- o Momentary rating [40,000] amps

D. Power fuses shall be furnished for fault protection. Fuse rating shall be as indicated. Provisions shall be made to indicate blown fuses. The fuses shall be one of the types indicated below.

1. Current limiting type, where available in rating, of the self-contained design to provide fast clean interruption with minimum let-through current. Fuses shall operate during the first half cycle on maximum fault condition with no expulsion of gas or vapor.
2. Where ratings of current limiting fuses are not available, expulsion power fuses with fast acting characteristics shall be provided.

E. Access control shall be provided as follows:

1. Doors providing access to interrupter switches with power fuses shall be mechanically or key interlocked to guard against:
 - a. Opening the fuse door if the interrupter switch on the source side of the power fuse is closed.

- b. Closing the interrupter switch if the door is open.
- 2. Fuse compartment door shall be interlocked with the switch mechanism to prevent access when the switch is closed.
- F. A high impact type contact viewing window shall be provided in each door over the switch.
- G. Incoming main switches shall be fused and electrically operated. Each interrupter switch shall be provided with a means for manually opening or closing if control power is not available or if a charging motor fails. Control power transformer shall be provided in each interrupter switch for control of the switch space heaters.
- H. Bus tie switch shall be non-fuse type and manually operated.
- I. Outgoing feeder switches shall be fused and manually operated.

2.5 METERING AND INSTRUMENT SECTION

- A. Metering section shall be provided with all instruments, equipment and accessories as indicated.
- B. **Current Transformer:** Current transformer shall be especially designed for installation in metal-clad switching center. The turns ratio and rating of the current transformers shall be as indicated. The voltage class shall be not less than that of line-up in which they are installed. The current transformer shall be either of the wound, window, or bar type and shall have 5 ampere secondary, with burden and accuracy class suitable for the connected load.
- C. **Potential Transformer:** Potential transformer shall be instrument type, and shall be mounted on a draw-out or "trunion" type frame. The rating of the potential transformer shall be as indicated. The voltage class shall be not less than that of the line-up in which they are installed; volt-ampere rating and accuracy class shall be suitable for the connected load. Potential transformer shall be protected with current limiting fuses on primary and secondary.
- D. **Instruments and Meters:**
 - 1. Meters and instruments shall be of semiflush switchboard type and shall be isolated from high voltage by grounded metal. Barriers shall also be of semi-flush switchboard type.
 - a. Main incoming switch:
 - 1 - voltmeter [0-15 kV], single-phase, one percent accuracy
 - 1 - voltmeter transfer switch with pistol grip handle to permit a single-phase voltmeter to indicate voltage between phase of a three-phase system. Switch shall have an "Off" position
 - 1 - AC indicating ammeter, five amperes full scale, single-phase, 0-XXX amperes dial, one percent accuracy

1 - Ammeter transfer switch with pistol grip handle to permit a single-phase ammeter to indicate current in each phase of a three-phase system. Switch shall have an "Off" position

1 - Watt-hour demand meter with 15-minute demand register, three-phase, two-element

1 - Varmeter, self-contained with 3-phase, three-wire, cross-phase connected three current coils on open-delta potential transformers, coil rating five ampere

b. Distribution feeder switch [breaker]:

1 - AC indicating ammeter, five amperes full scale, single-phase, XXX amperes dial, one percent accuracy

1 - Ammeter transfer switch with pistol grip handle to permit a single-phase ammeter to indicate current in each phase of a 3-phase system. Switch shall have an "Off" position

Where they are shown on the single line diagram, the following shall be provided:

1 - Watt-hour demand meter with 15-minute demand resistor, 3-phase, two-element

1 - Varmeter with three-phase, three-wire, cross phase, three current coils on open-delta potential transformers, coil rating 5-amperes

2.6 NAMEPLATES AND TOOLS

A. **Nameplates:** Nameplates shall be provided for all equipment and components supplied and shall be black and white 1/8-inch thick lamicoide, with lettering engraved through the black surface exposing the white lamination beneath. Letter height shall be 1/8-inch minimum unless otherwise indicated. Nameplate shall be fastened using matching screws; adhesive tape shall not be acceptable. Nameplates shall contain the manufacturer's name, model, serial number, size, characteristics, and appropriate data describing the performance ratings.

B. **Tools:** The WORK includes special tools as necessary for maintenance and repair as recommended by the manufacturer; tools shall be stored in tool boxes, and identified with the equipment number by means of stainless steel or solid plastic name tags attached to the box.

2.7 MANUFACTURERS

A. Products of the type indicated shall be manufactured by one of the following (or equal):

1. Major components

S & C
General Electric
Westinghouse

2. Instruments and meters:

a. Main incoming switch

Voltmeter

Westinghouse Type KA-251
General Electric Type AB-40

Voltmeter transfer switch

Westinghouse Type W
General Electric Type SB-1

AC indicating ammeter

Westinghouse Type KA-241
General Electric Type AB-40

Ammeter transfer switch

Westinghouse Type W
General Electric Type SB-1

Watt-hour demand meter

Westinghouse Type CB
General Electric Type DSM 63

Varmeter

Westinghouse Type KV-261
General Electric Type AB-40

b. Distribution feeder switch

Ammeter transfer switch

Westinghouse Type KA-241
General Electric Type AB-40

Watt-hour demand meter

Westinghouse Type CB
General Electric Type DSM-63

Varmeter

Westinghouse Type KV-261
General Electric Type AB-40

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. The CONTRACTOR shall install the switching center in accordance with the manufacturer's installation instructions and as indicated. The CONTRACTOR shall furnish and install the floor channels and shall secure the switching center to the channels by bolting or tack welding at the front and the rear. Prior to energizing, all equipment shall be cleaned, inspected for loose connections, checked out for electrical and mechanical operations and phase-sequence.

3.2 FIELD TESTING

- A. The equipment shall be field tested in the presence of the manufacturer's representative, and all circuits shall be made free of any shorts or ground connections following testing.

** END OF SECTION **