

Specification Number: 26 13 13.13

Product Name: MEDIUM VOLTAGE METAL-CLAD ARC-RESISTANT SWITCHGEAR (C/B SWITCHGEAR)(long)

SECTION 26 13 13.13

MEDIUM VOLTAGE METAL-CLAD ARC-RESISTANT SWITCHGEAR (C/B SWITCHGEAR)(long)

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Medium voltage (5 kV through 15 kV) freestanding or close-coupled MASTERCLADTM metal-clad arc resistant switchgear with vacuum circuit breakers.
- B. Related Sections
 - 1. 26.09.13 Electrical Power Monitoring.

1.02 REFERENCES

- A. ANSI/IEEE C37.20.7 - Arc-resistance Testing Guide
- B. EEMAC G 14-1 - Arc-resistant switch gear assemblies
- C. CSA 22.2 No. 261 - Evaluation Methods for Arc-resistant Ratings for Enclosed Electrical Equipment
- D. PEMEX Standards

The product shall also conform to the following codes and standards:

- A. NFPA 70, CSA C22.1 - Canadian Electrical Code -part I
- B. CSA C22.2 No. 31-04 - Switchgear assemblies
- C. ANSI/IEEE C37.20.2 - Metal-clad & station type switch gear
- D. ANSI/IEEE C37.100, C37.20, C37.010, C37.04, C37.06, C37.09 37.013A
- E. ANSI/IEEE C37.09, C37.11
- F. ANSI C37.54, C37.55, NEMA SG4
- G. EEMAC G8-3.2 - Switch gear assemblies
- H. ISO 9001:2000 - Quality program requirements
- I. IBC 2003 including CA and HI, Hydro Quebec

1.03 SUBMITTALS

- A. Submit shop drawings indicating outline dimensions, enclosure construction, shipping splits, lifting and supporting points, electrical single line diagram, and equipment electrical ratings.

1.04 OPERATION AND MAINTENANCE DATA

- A. Include circuit breaker recommended spare parts list.

1.05 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in medium voltage metal-clad switchgear with at least five years documented experience. The manufacturer of the switchgear must be the same as the manufacturer of the circuit breaker.

1.06 DELIVERY, STORAGE, AND HANDLING

Note to Specifier: The following paragraphs apply only to the installing contractor

- A. Accept equipment on site and inspect for shipping damage.
- B. Protect equipment from weather and moisture by covering with heavy plastic or canvas and by maintaining heat within enclosure in accordance with manufacturer's instructions.

1.07 EXTRA MATERIALS/ACCESSORIES

- A. Submit [one] [__] racking handle(s) with equipment. Charging handle to be furnished on each breaker mechanism.
- B. Provide [one] [__] sets of spare control fuses for each set installed.
- C. For all switchgear with circuit breakers in upper compartments, provide [one] circuit breaker lifting device - portable, floor-supported with a roller base. Also provide same portable lifting device with each outdoor non-walk-in lineup(s).
- D. [Provide [one] [__] test cabinet.]
- E. [Provide [one] [__] test jumper cable.]
- F. [Provide one Manual Ground and Test Unit (MGTU) with manufacturers standard design.]
- G. [Provide one Automatic Ground and Test Unit (AGTU) with manufacturers standard design.]
- H. [Provide one motorized remote control racking accessory.]
- I. [Provide one lift truck when required for 2 high structure.]

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. The metal-clad switchgear shall be manufactured by Schneider Electric or an approved equal.

2.02 METAL-CLAD SWITCHGEAR ASSEMBLY

- A. The metal-clad switchgear shall consist of a MASTERCLADTM AR [indoor] [outdoor walk-in front aisle] [outdoor common aisle double row] [outdoor POWER-ZONE center*] enclosure containing circuit breakers and the necessary accessory components all factory assembled (except for necessary shipping splits) and operationally checked. The assembly shall be a self-supporting and floor mounted on a level concrete pad. The integrated switchgear assembly shall withstand the effects of closing, carrying and interrupting currents up to the assigned maximum short circuit rating.
* Reference Section 16050-1 - Outdoor Electrical Equipment Housing
- B. System Voltage: ____ kV nominal, three-phase [grounded**][ungrounded], 60 Hz.
- C. Maximum Design Voltage: [4.76] [8.25] [15.0] kV.
- D. Impulse Withstand (Basic Impulse Level): [60] [95] kV.
- E. Power Frequency Withstand: [19] [36] kV, 1 minute test.
- F. Main Bus Ampacity: [1200] [2000] [3000] amps, continuous.
- G. Momentary Current Ratings: Equal to the circuit breaker close and latch rating.
**Specifier to insert description, either "solidly grounded" or a specific type of impedance grounding.
- H. The basic design shall be single and two high indoor arc-resistant Type 2B (one high), Type 2 for two high and EEMAC type B. The arc-resistant ratings shall be tested in accordance with EEMAC G14-1 and ANSI/IEEE C37.20.7. The test levels shall be as follows: 5kV and 15kV - 50kA and meeting the 0.5 second burn-through criteria. The switch gear assembly shall be self-supporting and intended to be floor mounted on a level concrete pad. The concrete pad may include channels or would be specified to be poured within a given tolerance (to be determined by Engineering).
- I. The enclosure shall be designed to allow for a plenum to be mounted on top when the overhead does not meet the 4 meter requirement. The plenum must extend from end to end of the lineup and have flanged ends for easy customer coupling. In accordance with the IEEE and CSA Testing Guides, the recommended plenum shall be tested with the arc-resistant switchgear and shall thus be included in the certified test report from the testing laboratory.
- J. The product shall have UL and CSA certification so that these labels can be applied when required

2.03 COMPONENTS

A. Stationary Structure

1. The switchgear shall consist of ___ sections including ___ breaker compartments and ___ auxiliary compartments assembled to form a rigid self-supporting completely enclosed structure providing steel barriers between sections.
2. All sheet steel used shall be minimum 11 gauge. Cell width shall be 36 inches. Cell depth shall be 91 inches (not including doors) as the base offering. The rear doors shall be bolted as a standard option, with an optional multiple-latch push-to-close design. All non-bolted access doors shall be padlockable as an option. The pressure flaps shall be designed so that a 250 Ib. fully outfitted maintenance worker can step on the flaps without causing permanent deformation. Provisions shall be made so that switch gear lineups can be extended on either end.
3. The sections are divided by metal barriers into the following separate compartments:
 - (a.) Circuit breaker(s), instrument, main bus, auxiliary device and cable. Each feeder section will have one or two circuit breaker compartment(s).

B. Circuit Breaker Compartment

1. The circuit breaker compartment shall be designed to use the Square D VR line of vacuum circuit breakers. The lower circuit breakers shall be horizontal draw-out type and it shall be a maximum of 10 cm (4 in) above floor level. When supplied the upper circuit breaker shall be horizontal draw-out type and installed using a lift truck. The compartment design shall allow the circuit breaker to roll in and out easily (separately removable components such as removable ramps are acceptable). The stationary primary disconnecting contacts shall be silver-plated. The basic design of the racking and safety mechanisms (e.g. shutters) shall be the Masterclad/VR standard. Through-the-door circuit breaker racking shall be provided as the standard offering. One window suitable for viewing the position of the circuit breaker in the cell and the position of the shutters with the circuit breaker out of the cell shall be standard. A medium voltage door mechanical interlock system shall be designed so that the following can be accomplished
2. The medium voltage door cannot be opened once the breaker is fully racked in.
3. The medium voltage door cannot be opened while the breaker is energized.
4. The medium voltage door can be opened once the breaker is in the fully Disconnected or Test position only.
5. A method to allow for maintenance access should be available while the breaker is fully racked in.
6. Entrance to the stationary primary disconnecting contacts shall be automatically covered by metal shutters when the circuit breaker is withdrawn from the connected position to the test or disconnected position or removed from the circuit breaker compartment. Extend a ground bus into the circuit breaker compartment to automatically ground the breaker frame with high-current spring type grounding contacts located on the breaker chassis when in the test and connected positions. Guide rails for positioning the circuit breaker and all other necessary hardware are to be an integral part of the circuit breaker compartment. Blocking devices shall interlock breaker frame sizes to prevent installation of a lower ampere rating or interrupting capacity element into a compartment designed for one of a higher rating. It shall be possible with indoor or outdoor walk-in switchgear to install the lower circuit breaker into its compartment without use of a transport truck or lift device. For 2 high configurations a lift truck shall be used to install the upper breaker into its compartment.

C. Cable Compartment/Ground Bus

1. [Clamp type cable lugs] [Compression type cable lugs] [Cable terminators] [Potheads] shall be furnished as shown on plans. The ground bus shall extend through this compartment for the full length of the switchgear. Auxiliary bus, if needed, and load bus support NEMA Class A-20 standoff insulators shall be epoxy. [Porcelain insulators available on optional basis.]
2. The cable compartment shall be able to accept standard customer requirements for cable terminations, including lugs, potheads and stress cones. Bus supports shall be Schneider Electric standard resin-based standoff insulators. Provision shall be made for adding cable supports as required by customers. Cable entry shall be either from the top or the bottom of the compartment. If a plenum is required cable entry will be restricted to bottom entry. Provision shall be made for the addition of optional grounding switches. Space shall be allowed for the mounting of, at minimum, intermediate class and preferably station class lightning arrestors. Space shall be allowed for the mounting of a zero sequence current sensor around the cables.
3. Cable entry/exit plates shall be stainless steel to (i) withstand the heat of the arc and (ii) to be anti-magnetic. Cell barriers shall also be stainless steel. The cable compartment door shall be either of the hinged and bolted type to suit varied customer requirements.

D. Main Bus Compartment

Note to Specifier: All bus will be silver-plated copper

1. The main bus is to be rated [1200] [2000] [3000] amps and be fully insulated for its entire length with an epoxy coating by the fluidized bed process. The conductors are to be [silver-plated copper] [tin-plated copper] and be of a bolted [not welded] design. Access to this compartment is gained from the front of the structure by removing a steel barrier. Provide standard provisions for future extension, as applicable.
2. Porcelain insulation/insulators shall be available as an option.

E. Doors and Panels

1. Relays, meters, control switches, etc., shall be mounted on a formed front-hinged panel for each Low Voltage compartment. The standard bill of materials shall utilize Schneider Electric control, metering and relaying components wherever possible.

F. Circuit Breakers:

1. The circuit breakers shall be rated [____] nominal volts, [4760] [8250] [15000] maximum volts, 60 Hz, with a continuous current rating of [1200] [2000] [3000] amps and a maximum symmetrical interrupting rating* of [40 kA/250MVA - 4.76 kV system] [50 kA/350MVA - 4.76 kV system] [40kA/500MVA - 8.25 kV system] [25 kA/500MVA - 15 kV system] [40 kA/750MVA - 15 kV system] [50 kA/1000MVA - 15 kV system]. Furnish Type VR circuit breakers with one vacuum interrupter per phase. Breakers of same type and rating shall be completely interchangeable. The circuit breaker shall be operated by means of a stored energy mechanism which is normally charged by a universal motor but can also be charged by the manual handle supplied on each VR breaker for manual emergency closing or testing. The closing speed of the moving contacts is to be independent of both the control voltage and the operator. Provide a full front shield on the breaker. Secondary control circuits shall be connected automatically with a self-aligning, self-engaging plug and receptacle arrangement when the circuit breaker is racked into the connected position. Provision shall be made for secondary control plug to be manually connected in test position. A minimum of 4 auxiliary contacts (2a 2b), shall be provided for external use. Provisions shall be made for [6] [10] additional cell-mounted auxiliary contacts [MOC type] [TOC type] [both MOC and TOC type] for external use. The racking mechanism to move the breaker between positions shall be operable with the front door closed and position indication shall be visible with door closed.

* Maximum symmetrical kA interrupting ratings are based on Table 1 of C37.06-1997. MVA ratings are nominal reference values for comparison only.

2. An interlocking system shall be provided to prevent racking a closed circuit breaker to or from any position. An additional interlock shall automatically discharge the stored-energy operating mechanism springs upon removal of the breaker out of the compartment.
3. The circuit breaker control voltage shall be: [48] [125] [250], volts DC* [120] [230], volts ac - provide one capacitor trip unit for each circuit breaker when ac control power is required.

* Note to specifier: 24VDC tripping only is available, not for closing.

G. Instrument Transformers

1. Current transformers: Each breaker compartment shall have provision for front-accessible mounting of up to four current transformers per phase* (ANSI standard relay accuracy), two on bus side and two on cable side of circuit breaker. The current transformer assembly shall be insulated for the full voltage rating of the switchgear. The current transformers wiring shall be Type SIS #12 AWG. Relaying and metering accuracy shall conform to ANSI Standards.
2. Voltage transformers are drawout mounted with primary current-limiting fuses and shall have ratio as indicated. The transformers shall have mechanical rating equal to the momentary rating of the circuit breakers and shall have metering accuracy per ANSI Standards.

* High accuracy and/or ratios below 150:5, two per phase.

H. Control Wiring

1. The switchgear shall be wired with type SIS #14 AWG, except where larger size wire is specified. The switchgear shall be provided with terminal blocks for outgoing control connections. Wire markers shall be provided for each end of all control wires.

I. Protective Relays: Provide relays as indicated on drawings for each circuit breaker.

Note to Specifier: Add details for protective relays, where possible, including relay types and model numbers for clarity.

- J. With each circuit breaker, provide a PowerLogic ION7650 manufactured by Schneider Electric or equal with the following characteristics: (See specification 26.09.13 Electrical Power Monitoring.)

(a.) Current/Voltage Inputs

- (i) The PMS Instrument shall have no less than 4 voltage inputs and 5 current inputs
- (ii) The PMS Instrument in its standard configuration shall be able to accept 600VAC without using potential transformers.
- (iii) The PMS Instrument shall be able to withstand 1500 VAC RMS continuously.
- (iv) The PMS Instrument shall support nominal current ratings of 1A, 2A, 5A, 10A, and/or 20A.

(b.) PMS Instrument shall provide at minimum the following voltage & current values:

- (i) Voltage L-L Per-Phase, L-L 3-Phase Avg, L-N Per-Phase, 3-Phase Avg, Voltage % unbalanced
- (ii) The PMS Instrument shall provide at minimum the following current values:
Current Per-Phase, Current, Neutral (measured), Current 3-Phase Avg, Current % Unbalanced
- (iii) The PMS Instrument shall provide at minimum the following power & energy values:

Real Power (Per-Phase, 3-Phase Total)
Reactive Power (Per-Phase, 3-Phase Total)
Apparent Power (Per-Phase, 3-Phase Total)
Power Factor – True (Per-Phase, 3-Phase Total)
Power Factor – Displacement (Per-Phase, 3-Phase Total)
Accumulated Energy (Real kWh, Reactive kVARh, Apparent kVAh) (Signed/Absolute)
Incremental Energy (Real kWh, Reactive kVARh, Apparent kVAh) (Signed/Absolute)
Conditional Energy (Real kWh, Reactive kVARh, Apparent kVAh) (Signed/Absolute)
Reactive Energy by Quadrant

2.04 FABRICATION

- A. Construction: Each equipment bay shall be a separately constructed cubicle assembled to form a rigid freestanding unit. Minimum sheet metal thickness shall be 11 gauge steel on all exterior surfaces. Adjacent bays shall be securely bolted together to form an integrated rigid structure. The rear covers shall be removable to assist installation and maintenance of bus and cables. Each individual unit shall be braced to prevent distortion.
- B. Dimensions: Standard dimensions per indoor section are: 36 in W x 95 in H x 92 in D
Outdoor equipment dimensions will vary with enclosure style and circuit breaker selection. Maximum height shall be [115 in for walk-in] style enclosure, measured to peak of the sloped roof.
- C. The metal-clad switchgear shall be fully assembled, inspected and tested at the factory prior to shipment. Large line-ups shall be split to permit normal shipping and handling as well as for ease of rejoining at the job site.

2.05 FACTORY FINISHING

- A. All steel parts, except galvanized (if used), shall be cleaned and a zinc-phosphate (outdoor equipment) or iron phosphate (indoor equipment) pre-treatment applied prior to paint application.
- B. Paint color shall be ANSI-61 [light grey]; TGIC polyester powder, applied electrostatically through air.
Following paint application, parts shall be baked to produce a hard durable finish. The average thickness of the paint film shall be 2.0 mils. Paint film shall be uniform in color and free from blisters, sags, flaking and peeling.
- C. Adequacy of paint finish to inhibit the buildup of rust on ferrous metal materials shall be tested and evaluated per paragraphs 5.2.8.1-7 of ANSI C37.20.2-1987. Salt spray withstand tests in accordance with ASTM #D-1654 and #B-117 shall be performed on a periodic basis to provide conformance with the corrosion resistance standard of at least 2500 hours minimum (outdoor equipment) or 600 hours minimum (indoor equipment).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Visually inspect switchgear for evidence of damage and verify that surfaces are ready to receive work.
- B. Visually inspect to confirm that all items and accessories are in accordance with specifications and drawings.
- C. Verify field measurements are as [shown on drawings] [shown on shop drawings] [instructed by manufacturer].
- D. Verify that required utilities (e.g., control voltage for heater circuits on outdoor switchgear) are available, in proper location, and ready for use.
- E. Beginning of installation means installer accepts existing surface conditions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions, applicable requirements of the NEC and in accordance with recognized industry practices.
- B. [Install cables, as provided by the switchgear manufacturer, to connect the primary surge arresters.]
- C. Bending of high-voltage cables should be avoided or minimized. All necessary bends should meet at least the minimum radii specified by the cable manufacturer.

3.03 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed by [the installing contractor] [a separate contractor furnished by the owner].
- B. Visually inspect for physical damage.
- C. Perform start-up tests in accordance with manufacturer's instruction manual.
- D. Touch-up paint all chips and scratches with manufacturer-supplied paint and leave remaining paint with owner.
- E. Verify key interlock operation.
- F. Perform low frequency withstand (Hi-Pot) tests according to ANSI/IEEE C37.20.2, paragraph 5.5.

END OF SECTION