# GENERAL

## SUMMARY

### This Section includes the following types of switchgear at medium-voltage.

#### Switchgear shall consist of a gas-tight tank containing SF6 gas, load-interrupter switches and resettable fault interrupters with visible open gaps and integral visible grounds, with microprocessor-biased overcurrent control. Load-interrupter switch terminals shall be equipped with bushings rated 600 amps continuous, and fault-interrupter terminals equipped with bushing wells rated 600 amps continuous to provide for elbow connection. Manual operating mechanisms and viewing windows shall be located on the opposite side of the tank from the bushings and bushing wells so that operators shall not be required to perform any routine switch operations in close proximity to high-voltage elbows and cables.

## ACTION SUBMITTALS

### Product Data: For each type and size of switchgear indicated.

### Shop Drawings: Diagrams including power, signal, and control wiring.

### Include complete outline and array event drawings showing plan, elevation, and section views. Include overall dimensions, conduit & cable entrance locations, overall dimensions and weight.

## INFORMATIONAL SUBMITTALS

### Instruction manuals describing orderly assembly, handling, care, inspection, maintenance, and operation for unit and all accessories.

### Include nameplate drawing with connection schematic.

### Time-current characteristic curves for overcurrent protective devices.

## CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

B. Warranty documentation.

C. Field quality-control test reports.

## QUALITY ASSURANCE

### Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

### Comply with IEEE C2 and NFPA 70.

### Comply with the following IEEE standards: C57.12.28, C37.72, C37.74, C37.60 & IEEE 386.

### Manufacturer shall be ISO 9001: 2008 and 14001: 2004 certified and shall have a written quality assurance and inspection program. All documentation available upon request.

### Switchgear shall be UL listed.

## PROJECT CONDITIONS

### Environmental Limitations: Rate equipment for continuous operation at indicated ampere ratings for the following conditions:

#### Ambient temperature not exceeding 122 deg F (50 deg C).

#### Altitude of 1100 feet above sea level.

## PROPOSALS

### Proposals shall be complete and fully describe in detail the switchgear(s) as proposed by the manufacturer.

### Proposals shall state any and all exceptions to these specifications or the standards listed in this document.

### Prices shall be F.O.B. point of shipment with freight prepaid and allowed to the accessible common carrier point nearest the project site, or as specified by the proposal.

### Manufacturer shall warrant the product for a period of not less than eighteen (18) months from the date of shipment or twelve (12) months from the date of initial energization, whichever occurs earliest. Include warranty information with proposal.

# PRODUCTS

## MANUFACTURERS

### Manufacturer shall be regularly engaged in and have minimum of 10 years of experience in the production of pad mounted, SF6 insulated, medium-voltage switchgear.

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

#### Eaton Corporation; Cooper Power Systems Division.

#### G&W Electric.

#### GE Electrical Distribution & Control.

#### S&C Electric Company.

## PAD-MOUNTED, SF6 INSULATED SWITCHGEAR

### Description: Switchgear shall consist of a gas-tight tank containing SF6 gas, load-interrupter switches and resettable fault interrupters. Each switch shall be equipped with 3-phase load break switches and 3-phase fault interrupter switches in quantities called for by the design.

### SF6 Gas Insulation:

#### Switchgear factory filled SF6 gas conforming to ASTM D-2472.

#### The gas-tight tank shall be evacuated prior to filling with SF6 gas to minimize tank moisture.

#### Switchgear shall withstand system voltage at a gas pressure of 0 PSIG at 68-deg F.

### Construction of switchgear shall be of a dead front design. Normal switching operations shall not expose the switch operator to elevated hazardous conditions.

### Switch contacts and cable entrance terminations shall be contained in a single welded mild steel tank with entrances internally connected by copper connecters.

### Switch tanks shall be painted using corrosion–resistant epoxy paint.

### Ratings of the fully assembled switchgear are as follows:

#### Frequency, Hz………………………………………………………………..………….…..60

#### Short-Circuit Rating Amperes, kA, RMS Symmetrical……………………………….….25

#### kV, Maximum……… ……………………………………………………………………..15.5

#### Impulse Level (BIL) voltage, kV………………………………………………………….110

#### Continuous Current, Amperes……………………………………………………………600

#### Load Break Current, Amperes……………………………………………………………600

#### Momentary and Fault-Close Current, kA, Asymmetrical………………………….…….40

#### Fault Interrupting Rating, kA, RMS Symmetrical…………………………………..….12.5

#### Mechanical Entrance, operations……………………………………………………....2000

#### Load Break Switch operations at 600 Amperes………………………………...…...…500

### Load Break Switches:

#### Two position configuration with no integral ground position.

#### Switch contacts shall be clearly visible in the open position through viewing windows. Covers shall be provided for all viewing windows to prevent operators from viewing the flash that may occur during switch operations.

#### Each switch equipped with an internally mounted operating mechanism capable of providing quick-make, quick-break operation in either switching direction.

#### All switch positions are to be clearly and permanently identified and pad lockable in any position.

#### All switches with hookstick operable handles.

### Fault Interrupters:

#### Each fault interrupter to consist of three vacuum bottles and a spring-assisted operating mechanism.

#### Maximum interrupting time shall be three cycles (50 ms).

#### The interrupter shall be provided with an open position readily visible through viewing windows. Open position indication via movable contact shaft position flags supplied in the switch tank.

#### After trip condition, operator handle shall be required to open and then close to re-energize.

#### The mechanical linkage assembly shall provide for a ‘trip-free’ operation which allows fault interrupter to function independent of the operating handle.

### Overcurrent Control:

#### Electronic control shall be provided to monitor load and fault current on all three phases of the fault interrupter.

#### Each phase shall have a current transformer mounted inside the switch tank to provide control power and current sensing.

#### No external power source shall be required for overcurrent protection.

#### The control time current characteristic (TCC) curves shall be field selectable. Selection via manual turn knobs and dip switch positions (standard).

#### The TCC curves shall include standard E-speed, K-speed, coordinating-speed tap, and coordinating-speed main curves.

#### The control shall definite-time delay (32 ms through 96 ms) settings to allow best tailoring of curves for system coordination.

#### Controls shall be mounted in NEMA 4X rated enclosures that shall be removable in the field without taking the gear out of service.

### Options:

#### Voltage sensing bushings on all ways connected to a voltage presence & phasing display panel. Panel provides voltage and phase indication with switch dead front panel installed and includes phasing test pins for use with a 600V rated multi-meter. Voltage panel to mount on inside of switch door or other accessible location and shall be IP68 rated.

## FABRICATION

### Switch enclosure shall be fabricated of 12 gauge galvanized steel and manufactured to ANSI C37.72 and C57.12.28 standards.

### The enclosure shall be provided with permanent lifting provisions.

### Standard green finish (Munsell 7.0GY3.29/1.5).

### The switchgear shall be provided with a pad-mounted enclosure suitable for installation of the gear on a concrete pad and with provisions for anchoring to concrete pad via continuous 90-deg flanges, turned inward and welded at the corners for bolting to the concrete pad.

### The enclosure shall be provided with hinged front and back panels for complete and free access to all operating and termination compartments.

### Access panels shall be pad lockable with rugged, 3-point latching and penta head type bolts.

### Panel openings shall have 90-deg flanges, facing outward, that shall provide strength and rigidity as well as deep overlapping between panels and panel opening to guard against water entry.

### Termination compartments shall be set back sufficiently to allow for workable cable management from below, connection of dead breaks elbows to bushing wells with ample space to the closed panels, and to accommodate surge arresters mounted on the deadbreak elbows.

### Provide instruction manual holder/pocket on door.

### Provide enclosure with hookstick furnished in canvas storage bag.

### Provide switchgear enclosure with parking stands for each bushing. Staggered configuration of bushing wells and corresponding parking stands shall be provided.

## IDENTIFICATION DEVICES & WARNING LABELS

### Nameplates: Engraved, laminated-plastic or metal nameplates for each switchgear, mounted with corrosion-resistant screws. Nameplate shall include: manufacturer’s name, catalog number, model number, date of manufacture, serial number, and all applicable voltage and amp rating information.

### The exterior of the enclosure shall be provided with a warning label reading: “WARNING – KEEP OUT – HAZARDOUS VOLTAGE INSIDE – CAN SHOCK, BURN, OR CAUSE DEATH.”

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

# EXECUTION

## INSTALLATION

### Install and anchor transformers on concrete bases according to manufacturer's written instructions and per University Design Guidelines for switchgear bases. Base requirements can be found at the UNL Design Guidelines website (link: http://facilities.unl.edu/design-guidelines)

#### Construct concrete bases of dimensions indicated, but not less than 6 inches larger in both directions than supported unit and 4 inches high, minimum.

#### Use 3500-psi (24.1-MPa) 28-day compressive-strength concrete.

#### Anchor equipment with epoxy-embedded anchor bolts that extend through concrete base and anchor into structural concrete floor.

### Maintain minimum clearances according to manufacturer's written instructions, NFPA 70, and UNL Design Guideline requirements (linked in above paragraph).

## FIELD QUALITY CONTROL

### Perform electrical test and visual and mechanical inspection stated in NETA ATS. Certify compliance with test parameters.

### Test and adjust controls and safeties.

### Manufacturer’s Field Service: Engage a factory – authorized service representative to perform the following:

#### Inspect switchgear, wiring, components, connections, and equipment installations.

#### Assist in field testing of equipment.

#### Report results in writing.

### Remove and replace malfunctioning units and retest as requires.

## ADJUSTMENTS

### Set field-adjustable, protective-relay trip characteristics in accordance with settings information provided by the University Project Manager.

**END OF SECTION**