# GENERAL

## RELATED DOCUMENTS

### Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 specification sections apply to work of this Section. Division 26 "Basic Materials and Methods" sections apply to work specified in this Section.

### Division 26 “Surge Protection”.

## DESCRIPTION OF WORK

### Extent of switchboard work is indicated by drawings and schedules.

### Types of low voltage, front-accessible, and front/rear-accessible switchboards specified in this Section include the following:

#### Dead Front Distribution

#### Circuit Breaker Switchboards

#### Fusible Switch Switchboards

#### Surge Protection Devices (SPDs)

## QUALITY ASSURANCE

### Manufacturers: Firms regularly engaged in the manufacture of switchboards of types, sizes and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

### Installers Qualifications: Firm with at least 3 years of successful installation experience on projects utilizing switchboards similar to those for this project.

## REFERENCES

### NEC Compliance: Comply with the latest edition of the NEC as applicable to wiring methods, arc energy reduction, construction and installation of switchboards.

### UL Compliance: Comply with applicable requirements of Standard 486A for "Wire Connectors and Soldering Lugs For Use With Copper Conductors", and Standard 891 for "Dead-Front Electrical Switchboards", pertaining to installation of switchboards. Standard 1066 for “Low-Voltage Power Circuit Breakers”, pertaining to switchboard assemblies. Provide switchboards and components which are UL listed and labeled. Standard 489 for “Molded Case Circuit Breakers”, Standard 98 for “Enclosed and Dead Front Switches” and Standard 977 for “Fused Power Circuit Devices.”

### IEEE Compliance: Comply with applicable requirements of IEEE Standard 241, "Recommended Practice for Electrical Power Systems in Commercial Buildings", pertaining to switchboards.

### ANSI Compliance: Comply with applicable requirements of ANSI standards pertaining to switchboard assemblies.

### NEMA Compliance: Comply with applicable portions of NEMA Standards Publication Number PB 2 for "Dead-Front Distribution Switchboards"; PB 2.1 for "Instructions for Safe Handling, Installation, Operation and Maintenance of Switchboards".AB 1 for “Molded Case Circuit Breakers and Molded Case Switches.” And KS 1 for “Fused and Non-fused Switches.”

## SUBMITTALS

### Product Data: Submit manufacturer's data on switchboards including, but not limited to, voltages, number of phases, frequencies, and short-circuit and continuous current ratings. Provide application data for main and branch circuit devices, sections, main buses, and basic insulation levels.

### Shop Drawings: Submit layout drawings of switchboards showing accurately scaled basic equipment sections including auxiliary compartments, section components, and combination sections.

### Wiring Diagrams: Submit wiring diagrams for switchboards showing connections to electrical power feeders and distribution branches. Clearly differentiate between portions of wiring that are manufacturer-installed and portions to be field-installed.

# PRODUCTS

## MANUFACTURERS

### Subject to compliance with requirements, provide switchboards of one of the following (for each type and rating of switchboard):

#### Eaton Corporation

#### Square D Company

#### General Electric Company

#### Siemens

## GENERAL CONSTRUCTION

### Where indicated, furnish and install an indoor dead front type, completely metal enclosed, low voltage, self-supporting switchboard structure independent of wall supports. Voltage rating shall be as indicated on the drawings. It shall consist of the required number of vertical sections bolted together to form one rigid switchboard with a nominal height of 90 inches. The sides and rear shall be covered with removable screw-on plates having formed edges all around.

### Equipment shall comply with the latest applicable standards of NEMA, ANSI and UL.

### Small wiring, necessary fuse blocks and terminal blocks within the switchboard, shall be furnished as required. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips.

### Switchboard shall be provided with adequate lifting means and shall be capable of being rolled or moved into installation position and bolted directly to the floor without the use of floor sills.

### All exterior and interior steel surfaces of the switchboard shall be properly cleaned and finished with gray baked enamel over a rust-inhibiting phosphatized coating. Color shall be ANSI 61 gray.

### Nameplates shall be furnished for all main and feeder circuits including control fuses for all indicating lights and instruments. Nameplates shall give item designation and circuit number as well as frame ampere size and appropriate trip rating. Furnish Master Nameplate giving switchboard designation, voltage and ampere rating, bracing, manufacturer's name, general order number and item number. Switchboard bracing shall meet minimum requirements of the available short circuit current.

### All bus bars shall be copper. The bus work shall be braced at the minimum required for the installation based on calculated available fault current. Minimum typical value expected shall be 65,000 ~~(~~RMS symmetrical amps at rated voltage. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane. Provide full capacity neutral bus where a neutral is indicated on the drawings. A ground bus and lug shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchboard. All hardware used on conductors shall have high-tensile strength zinc plating. All terminals shall be of the anti-turn solderless type suitable for Cu and Al cable of sizes indicated.

### Furnish cable pull sections or cable pull boxes as required complete with cable tie down supports. Where cable pull section or pull boxes contain utility service cables provide utility acceptable sealing means.

### All factory installed devices shall be retorqued prior to energizing.

### Coordination: The equipment dimensions indicated on the drawings are based on General Electric published data. If other acceptable manufacturer's equipment is proposed and exceeds these dimensions, it shall be the responsibility of the Contractor to coordinate the equipment arrangement within the room with all affected trades to provide all code clearances and proper arrangements. Switchboards that grossly exceed the space allocated and would require an increase in room size are not acceptable.

## SWITCHBOARD TYPE

### Switchboards shown mounted against a wall shall be equal to General Electric Evolution, Spectra Series, Gen Tower, AV-3, and PBII, or approved equal. ~~T~~ All sections of the switchboard shall align so that the back of the complete structure may be placed flush against the wall.

### Construction shall allow maintenance of incoming line terminations, main device connections and all main bus bolted connections to be performed without rear access. The feeder branch devices shall be removable from the front and shall be panel mounted with the line and load connections front accessible.

**OR**

## SWITCHBOARD TYPE

### Switchboards shown located off a wall, where access is possible on all sides, shall be equal to Eaton Pow-R-Line C Type. All vertical sections shall align front and rear with uniform depth as shown on the drawings.

### All internal devices, except the main disconnect shall be removable from the front and shall be panel mounted with the line and load connections front accessible. The main device and its connection shall be rear accessible.

## CUSTOMER METERING

### Provide digital power metering integral to all main switchboards. See Utilities Specification 337700 for requirements of this meter.

## ENCASED CIRCUIT BREAKERS

### Main and feeder protective devices shall be encased non-fused circuit breakers, UL listed and labeled. Breakers shall be UL listed at 100 percent of their continuous ampere rating, and shall have uniform dimensions for devices rated through 6000 amps. Breakers shall be manually or electrically operated as required and shall include solid state trip devices with ampere setting, long time, short time, and instantaneous trip functions as standard features. Plug-in ampere rating type breakers shall be provided with plug-in elements as part of their trip assemblies which determine the continuous ampere rating of the devices. Where required, breakers shall be provided with internal ground fault logic components. All units shall have field replaceable contacts. Provide the following optional features and accessories as required for a complete and workable system:

**NOTE TO SPECIFIER: EDIT ITEMS BELOW TO INCLUDE ONLY PROJECT REQUIRED OPTIONS.**

#### Arc energy reduction methods acceptable per the NEC Article 240.87 on circuit breakers adjusted to 1200 amps or higher include the following:

##### Zone selective interlocking on instantaneous per General Electric’s I-ZSI or equal.

##### Differential relaying per General Electric’s Entellysis or equal.

##### Energy-reducing maintenance switch with local status indicator per General Electric’s RELT (Reduced Energy Let Thru) switch or equal.

##### Energy-reducing active arc flash mitigation system per General Electric’s ArcVault or equal.

#### Selective override.

#### Adjustable ground fault pickup and time delay devices.

#### Visual trip indicators.

#### Instantaneous undervoltage release.

#### Time delay undervoltage release.

#### Remote spring release for manually operated breakers.

#### Spring condition auxiliary switch.

#### Remote trip signaling.

#### Remote ground fault test panel.

### All breakers shall be drawout mounted.

### Breakers shall have a minimum UL listed interrupting capacity required for the installation based on calculated available fault current. Minimum typical value expected shall be 65,000 ~~( ( ( ( ( (~~RMS symmetrical amps at system volts.

## MOLDED CASE BREAKERS

### Main and feeder protective devices as shown shall be molded case air circuit breakers, built, tested and UL labeled per UL 489.

### Breakers with 100 ampere through 250 ampere frames shall be thermal-magnetic trip with inverse time current characteristics. Breakers with 250 ampere and above shall have digital electronic trip units continuously adjustable.

#### Protective trip unit shall consist of a solid state microprocessor based programmer; tripping means; current sensors; power supply and other devices as required for proper operation. ~~w~~

### Molded case breakers shall have a minimum UL listed interrupting capacity required for the installation based on calculated available fault current. Minimum typical value expected shall be 65, ~~0 ( ( ( ( ( (~~R.M.S. symmetrical amps at system volts.

### Breakers 1200A thru 6000A frame on the drawings shall be UL listed and labeled for 100 percent application per the latest edition of the N.E.C. Article 240.87 for Arc Energy Reduction Methods on circuit breakers adjusted to 1200 amps or higher:

#### Zone Selective Interlocking on Instantaneous per General Electric’s I-ZSI, or equal.

#### Differential relaying per General Electric’s Entellysis, or equal.

#### Energy-reducing maintenance switch with local status indicator per General Electric’s RELT (Reduced Energy Let Thru) switch, or equal.

#### Energy-reducing active arc flash mitigation system per General Electric’s ArcVault, or equal.

## BOLTED PRESSURE SWITCHES

### Main protective devices rated 800 amperes and above shall be UL-977 / NEMA KS2 listed bolted pressure contact switches as manufactured by Pringle Company or equal. Switches shall be manually or electrically operated as required.

### Main switches shall be provided with blown fuse protection for use with electric trip switch and indicating light.

### Switches shall be fused with Class L fuses; Bussman Type KRP-C, and shall be UL labeled for 200,000 A.I.C.

### Provide switches with ground fault protection system for use with electric trip switch and ground fault trip test panel.

### Provide switch with protection against single phasing.

## FUSIBLE SWITCHES

### Feeder protective devices shall be quick-make quick-break fusible switches as manufactured by Westinghouse, Type FDP or approved equal. Fusible switches 30 ampere through 600 ampere frame shall be furnished with Class R fuse clips and shall be UL labeled for 200,000 A.I.C. Fusible switches 800 amperes through 1600 amperes shall be furnished with Class L fuse clips and UL labeled for 200,000 A.I.C. Switches shall incorporate safety cover interlocks to prevent opening the cover with the switch in the ON position or prevent placing the switch in the ON position with the cover open - provide defeater for authorized personnel. Handles shall have provisions for padlocking and shall clearly indicate the ON or OFF position. Front cover doors shall be padlockable in the closed position.

### Provide fuse coordination and fault current study to determine all adjustable breakers and PPE levels for all electrical equipment.

## SURGE PROTECTION DEVICES (SPD)

### Surge protection devices (SPD) shall be provided at switchboards on most projects. Typically, a minimum of one SPD per distribution ‘level’ or voltage within a given system. SPDs provided for switchboards shall adhere to requirements found within Division 26 “Surge Protection” specification. ~~s (~~

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# EXECUTION

## GENERAL

### Inspection: Installer must examine areas and conditions under which switchboards and components are to be installed and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

### Any and all overcurrent protection device settings or setting adjustments required by the project or project’s coordination study shall be included within the scope of work. Documentation of the settings and settings adjustments shall be provided to the UNL Project Manager.

### Coordinate with other work including electrical cabling and wiring, as necessary to interface installation of switchboards.

### Tighten connections and terminals including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals to comply with tightening torque’s specified in UL Standard 486A.

END OF SECTION 262413