

**SECTION 262413 - SWITCHBOARDS**

**PART 1 - GENERAL**

**RELATED DOCUMENTS**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**QUALITY ASSURANCE**

Manufacturers: Firms regularly engaged in manufacture of switchboards, of types and ratings required in this Section, whose products are Listed and Labeled for the purpose intended. Third party agencies shall be amongst those accredited by the NCBCC (North Carolina Building Code Council) to label electrical and mechanical equipment. Subject to compliance with requirements provide equipment equivalent to that provided by one of the following manufacturers:

- Square D
- Cutler Hammer
- GE/ABB
- Siemens

Codes and Standards:

Electrical Code Compliance: Comply with applicable State code requirements of the authority having jurisdiction, and that portion of the NEC that pertains to installation and construction of switchboards.

Testing Laboratory Compliance: Comply with applicable requirements of UL 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors," UL 489, "Molded-Case Circuit Breakers and Circuit Breaker Enclosures", and UL 891, "Dead-Front Electrical Switchboards", pertaining to installation and construction of switchboards. Provide switchboards and components that are Listed and Labeled. Third party agencies shall be amongst those accredited by the NCBCC (North Carolina Building Code Council) to label electrical and mechanical equipment.

IEEE Compliance: Comply with applicable requirements of IEEE Std. 241, "Recommended Practice for Electric 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 Stds. Pub/No. PB 2, "Dead-front Distribution Switchboards"; PB 2.1, "General Instruction for Proper Handling, Installation, Operation and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less"; and SG 3, "Low-Voltage Power Circuit Breakers"; pertaining to switchboard assemblies.

**SUBMITTALS**

Submittals shall be made in strict accordance with the requirements of Section 019913. Specific submittal requirements are defined in each section of this Division.

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

Submit Time-Current Timing Charts: Provide response curves for all overcurrent protection devices furnished as a part of the project. Provide specific circuit breaker and trip unit model numbers for all specified electronic trip breakers, with available settings for engineer's use in developing system coordination.

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

3  
4 Wiring Diagrams: Submit wiring diagrams for switchboards showing connections to electrical power feeders and  
5 distribution branches. Differentiate between portions of wiring that are manufacturer-installed and portions that are  
6 field-installed.

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8  
9 **PART 2 - PRODUCTS**

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12 **EQUIPMENT SECTIONS AND COMPONENTS**

13  
14 General: Except as otherwise indicated, provide switchboards and ancillary components of types, sizes,  
15 characteristics, and ratings indicated, which comply with manufacturer's standard design, materials, components, and  
16 which are constructed in accordance with published product information, and as required for complete installation.

17  
18 AC Dead-Front Distribution Switchboards: Provide factory-assembled, dead-front, front accessible, 48" maximum  
19 depth metal-enclosed, self-supporting secondary power switchboard, of types, sizes, electrical ratings and  
20 characteristics indicated. Switchboard shall consist of vertical panel units and shall contain circuit-breakers or circuit  
21 breaker assemblies of quantities, ratings and types indicated. Provide copper main bus and connections to switching  
22 devices and circuit-breaker branches of sufficient capacity to limit rated continuous current operating temperature rise  
23 of no greater than 65°C above average ambient temperature of 30°C. Main bus and tap connections shall be silver-  
24 surfaced and bolted tightly according to manufacturer's torquing requirements for maximum conductivity. All bussing  
25 shall be braced for short-circuit stresses up to maximum interrupting capacity. Provide accessibility of line and load  
26 terminations from front of switchboard. Provide mimic bus on front of switchboard to indicate interior connection and  
27 switching arrangement. Switchboard shall be primed and coated with manufacturer's standard finish and color.  
28 Equip units with built-in lifting eyes and yokes; provide vertical individual panel units, suitable for bolting together at  
29 project site.

30  
31 Enclosures:

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33 Construct dead-front switchboard, suitable for floor mounting, with front cabling/wiring accessibility, and  
34 conduit accessibility as indicated or required by the application. Provide welded steel channel framework;  
35 hinge wireway front covers to permit ready access to branch circuit-breaker load side terminals or equivalent  
36 terminal accessibility; circuit breaker nameplates and ratings plates shall be visible when terminal covers are  
37 in place. Coat enclosure with manufacturer's standard corrosive-resistant finish where indicated by the  
38 drawings.

39  
40 Enclosure construction shall be NEMA1 for indoor locations and NEMA 3R for outdoor locations.

41  
42 Paint shall be light gray epoxy paint ANSI 61 for the exterior of enclosure.

43  
44 Main and Vertical Buses:

45  
46 The metal of the buses shall be silver plated copper.

47  
48 Operating temperature, at 40°C ambient, of all buswork and joints shall not exceed prevailing ANSI limits.

49  
50 The end of the main bus shall be arranged such that future extension of the switchgear is possible.

51  
52 Minimum ampacity of main bus shall be as indicated on the Drawings.

53  
54 Vertical bus capacity shall be as indicated on the Drawings.

55  
56 All feeder breaker taps and plug-in connectors shall have an ampacity that is at least as large as the  
57 connected device but in no case shall the connectors have an ampacity less than 800 A capacity.

1 Bus (or "line") connections to circuit breakers shall be as indicated on the Drawings.

2

3 Bus bracing shall be as indicated on the Drawings but in no case shall the RMS symmetrical ampere  
4 interrupting rating be less than 42,000 Amperes.

5

6 Redundant Spaces:

7

8 Compartments designated on the Drawings as "SPACE" shall be completely equipped for future addition of  
9 a circuit breaker of the frame size indicated.

10

11 Ground Bus: A main bolted copper ground bus shall run throughout the length of the switchgear along the bottom.

12

13 Two bolted type connectors, one at each end, shall be provided for #4/0 cables, bolt size shall be 3/8"  
14 diameter.

15

16 All framework, metal enclosures, and non-current carrying parts of equipment shall be securely grounded by  
17 means of this ground bus.

18

19 The ampacity of the ground bus shall equal half the capacity of the phase bus or a minimum of 1,600 A.

20

21 Neutral Bus:

22

23 A neutral bus shall be provided with an ampacity of the main bus and extend the full length of the  
24 switchgear.

25

26 The neutral bus shall be fully insulated from ground except at one point where connection to the ground bus  
27 will be made by a removable conductor supplied with the switchgear and sized equally to the neutral bus.

28

29 Nameplates:

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31 A 1-1/2" x 4" laminated phenolic nameplate engraved to show white letters on a black background shall be  
32 attached to the door of each compartment. Three lines of 3/16" high lettering should be provided.

33

34 Permanent nameplates shall be provided identifying each instrument switch, circuit breaker, meter, relay, or  
35 other item of equipment. Submit all nameplate wording for approval before constructing nameplates.

36

37 Nameplates shall be fastened with self-tapping metal screws and shall be removable. Adhesive shall not be  
38 used.

39

40 Main Feeder Entrance: The main feeder shall enter the equipment as indicated on the Drawings.

41

42 Conduit Exit: Provision shall be made for feeder conduits or armored cables to exit top or bottom of switchboard  
43 housing for field changes.

44

45 Circuit Breakers:

46

47 General: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes,  
48 ratings and electrical characteristics indicated, which comply with manufacturer's standard design, materials,  
49 components, and constructed in accordance with published product information, and as required for a  
50 complete installation.

51

1            Insulated-Case Circuit Breakers:

2  
3            Provide factory-assembled draw-out type, insulated-case circuit breakers of frame sizes and ampere rating  
4 as indicated for main breakers in switchboard. Unless otherwise indicated in the Drawings, all circuit  
5 breakers are to be rated 480 Volts, 60 Hz, 3-poles with a minimum 42,000 RMS symmetrical Ampere  
6 interrupting rating. Provide breakers with solid state trip control units (**L, S, I, G**) responsive to current in  
7 each pole and ampere ratings as indicated. Provide breakers rated at 1,200 Amps and larger with  
8 maintenance switch and associated indicator light to permit the reduction of arc energy at and beyond the  
9 load side terminals for the breaker. Construct circuit breakers with pushbuttons for opening and closing  
10 contacts via mechanical operator. Pushbuttons shall have independently lockable transparent cover blocks.  
11 Provide with locking provisions for off position. Breaker shall also have door interlock to prevent closure of  
12 contracts while door is opened. Draw out mechanism shall be mechanically interlocked with circuit breaker's  
13 trip mechanism so that breaker must be OPEN before it can be moved into or out of the connected position.  
14 The breaker shall automatically trip open if it is withdrawn while in closed position. Breaker shall also trip  
15 open before it is racked into the engaged position. Construct breakers capable of being operated in an  
16 ambient temperature of 40°C.

17  
18            Molded-Case Circuit Breakers:

19  
20            Provide factory-assembled molded-case circuit breakers of frame sizes and ampere rating as indicated.  
21 Unless otherwise indicated in the Drawings, all circuit breakers are to be rated 480 Volts, 60 Hz, 3-poles with  
22 a minimum 42,000 RMS symmetrical Ampere interrupting rating. Provide breakers rated 400 Amps and  
23 larger with solid state trip control units (**L, S, I, G**) or (**L, S, I**) responsive to current in each pole and ampere  
24 ratings as indicated. Provide breakers rated at 1,200 Amps and larger with maintenance switch and  
25 associated indicator light to permit the reduction of arc energy at and beyond the load side terminals for the  
26 breaker. Construct circuit breakers with overcenter, trip-free, toggle-type operating mechanisms with  
27 quick-make, quick-break action and positive handle trip indication. Provide push-to-trip button on enclosure  
28 cover for mechanically tripping circuit breakers. Construct breakers for mounting and operating in any  
29 physical position and capable of being operated in an ambient temperature of 40°C. Provide breakers with  
30 mechanical screw type removable connector lugs, AL/CU rated, and with NEMA Type 1 general purpose  
31 enclosures.

32  
33            Electronic Trip Circuit Breakers: Provide electronic trip units for breakers, where required in this section, with field-  
34 replaceable rating plug and RMS sensing, responsive to current in each pole. Provide following field-adjustable  
35 settings:

- 36  
37            1. Instantaneous trip.  
38            2. Long and short-time pickup levels.  
39            3. Long and short-time delay adjustments.

40  
41            Provide ground fault pickup for breakers rated 1,000 amps and larger, where unit serves as a main disconnecting  
42 means, as required under NEC.

- 43  
44            1. Ground-fault pickup level, time delay and I<sup>2</sup>t response.

45  
46            Fully Rated Circuit Breakers: Unless specifically indicated on the Drawings all circuit breakers shall be fully rated.  
47 The use of 'series ratings' is not permitted.

48  
49            Internal Breaker Accessories: Provide molded-case breaker accessories as indicated in the Drawings or as required  
50 for the operations described in the Drawings.

51  
52            Busing: Provide switchboard busing with sufficient cross-sectional area to fulfill UL 891 pertaining to temperature  
53 rise. Construct through-bus of silver-plated copper with ampacity rating as indicated and with a minimum short-circuit  
54 current rating of 42,000 A RMS symmetrical or as otherwise indicated in the Drawings.

55  
56            Metering: Provide metering compartments for CT's, PT's and instrument transfer switches, and connect meters for  
57 sequence metering. Mount meters recessed in front doors and install meter wiring and lacing with sufficient flexibility  
58 at hinged edge of meter front mounting plates to prevent damage.

1 Ground-Fault Protectors: Provide solid-state ground-fault protection units of types, and ratings indicated, equipped  
2 with static relays, sensors, pilot lights and push-buttons for fault indication and reset, including fuse blocks, fuses,  
3 control power transformers or other accessories necessary for proper operation.  
4

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6 **AUXILIARY EQUIPMENT**

7  
8 Metering, Main Bus:

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10 Main switchboard metering is to be located in the main breaker section as shown on drawings. Metering is  
11 to be of the solid state type and shall provide, as a minimum the metering and remote indicating functions  
12 indicated.  
13

14 Instrument Transformer Fuses: Potential and control power transformers, where used, shall be provided with primary  
15 current-limiting fuses.  
16

17  
18 **ARRANGEMENT**

19  
20 General: Switchboard is to be arranged and mounted as indicated on the Drawings.  
21

22 Data to be Furnished when the Equipment is Shipped: The vendor shall furnish four copies of all shop drawings,  
23 operations and maintenance manuals of this equipment.  
24

25 Inspection: The equipment covered by this specification shall be subject to inspection by Owner or his  
26 Representative prior to shipment from the factory. Deficiencies noted by the Owner or the Owner's Representative  
27 shall be corrected prior to shipment.  
28

29  
30 **END OF SECTION 262413**

