SECTION 16431

SWITCHBOARDS, COMMERCIAL METERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the contract including General and Special Conditions and General Requirements shall apply to all work under this Section.

1.2 DESCRIPTION OF WORK

A. Provide free-standing, dead-front-type low-voltage distribution switchboard(s) utilizing individually mounted tenant metering and group mounted circuit protective devices as specified herein and as shown on the drawings.

1.3 RELATED WORK IN OTHER SECTIONS

A. Related work in other sections:

1.	Electrical General Provisions	Section 16010
2.	Electrical Identification	Section 16195
3.	Grounding	Section 16450
4.	Fuses 600v and Less	Section 16475
5.	Transient Voltage Surge Suppression	Section 16671

1.4 STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:

1. NEMA PB-2
2. UL Standard 891.
3. Standards as published by the serving utility.

1.5 SUBMITTALS -- FOR REVIEW AND APPROVAL

A. The following information shall be submitted to the Engineer:

1. Descriptive bulletins
2. Product sheets.
3. Master drawing index
4. Front view elevation
5. Floor plan
6. Top view
7. Single line
8. Schematic diagram
9. Nameplate schedule
10. Component list
11. Conduit entry/exit locations
12. Assembly ratings including:
    a) Short-circuit rating
    b) Voltage
    c) Continuous current
13. Major component ratings including:
    a) Voltage
    b) Continuous current

c) Interrupting ratings

14. Cable terminal sizes.

B. Where applicable, the following additional information shall be submitted to the Engineer:

1. Busway connection
2. Connection details between close-coupled assemblies
3. Composite floor plan of close-coupled assemblies
4. Key interlock scheme drawing and sequence of operations.

1.6 SUBMITTALS -- FOR CLOSEOUT

A. The following information shall be submitted for record purposes:

1. Final as-built drawings and information for items listed in section 1.04
2. Wiring diagrams
3. Certified production test reports
4. Installation information
5. Seismic certification and equipment anchorage details.

1.7 TRANSPORT, STORAGE AND HANDLING INSTRUCTIONS

A. The manufacturer's transport, storage and handling instructions shall be included with the equipment at time of shipment.

1.8 OPERATION AND MAINTENANCE MANUALS

A. Equipment operation and maintenance manuals shall be provided prior to final payment.

B. Operation and maintenance manuals shall include the following information:

1. Instruction books and/or leaflets
2. Recommended renewal parts list
3. Drawings and information required by submittal sections.

1.9 EXTRA MATERIALS

A. Provide two (2) keys for each cabinet lock.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. All switchboards are to be of the same manufacturer as the panelboards.

B. Subject to compliance with requirements, provide products by one of the following manufacturers:

1. Cutler-Hammer
2. General Electric
3. Siemens ITE
4. Square D

2.2 RATINGS

A. The assembly shall be rated to withstand mechanical forces exerted during short-circuit conditions when connected directly to a power source having available fault current as shown on the drawings.

2.3 CONSTRUCTION

A. The entire assembly shall be front accessible and shall consist of main lugs or main device as shown on the plans.

B. All metering shall be in accordance with the serving utility's requirements.

C. Tenant disconnects shall be molded case breakers, class T fusible pullouts, or fusible switches with class "R" fuse clips as indicated on the drawings.

D. The meter sockets and associated branch protective devices shall be completely prewired and shipped ready for installation of the meters. Meter sockets shall include covers with sealing provisions. Meter blanks shall be provided for all spare tenant meters.

E. Metered tenant circuits above 200 amperes shall incorporate individual tenant disconnects, current transformer compartment, meter socket, and tenant disconnect.

2.4 BUS

A. All bus bars shall be silver-plated copper unless drawings specifically call for tin-plated aluminum. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane. Bus sizing shall be based on NEMA standard temperature rise criteria of 65 degrees C over a 40 degrees C ambient (outside the enclosure).

B. Provide a full capacity neutral bus.

C. A copper ground bus (minimum 1/4 x 2 inch), shall be furnished firmly secured to each vertical section structure, and shall extend the entire length of the switchboard.

D. All hardware used on conductors shall be high-tensile strength and zinc-plated. All bus joints shall be provided with conical spring-type washers.

2.5 WIRING/TERMINATION

A. Small wiring, necessary fuse blocks and terminal blocks within the switchboard shall be furnished as required. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.

B. Mechanical-type terminals shall be provided for all line and load terminations suitable for copper or aluminum cable rated for 75 degrees C of the size as indicated on the drawings.

C. Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.

D. All control wire shall be type SIS, bundled and secured with nylon ties. Insulated locking spade terminals shall be provided for all control connections, except where saddle-type terminals are provided integral to a device. All current transformer secondary leads shall first be connected to conveniently accessible short-circuit terminal blocks before connecting to any other device. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips. Provide wire markers at each end of all control wiring.

2.6 MOLDED CASE CIRCUIT BREAKERS

A. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free.

Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be nonwelding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.

B. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the drawings.

C. Circuit breakers 400-ampere frame and below shall be furnished with thermal-magnetic trip units and inverse time-current characteristics.

D. Circuit breakers 600-ampere through 2500-ampere frame shall be furnished with microprocessor-based RMS sensing trip units, type as indicated on the drawings.

E. Ground fault protection shall be provided where indicated and where required by code.

F. Circuit breakers shall be UL listed for series application where specifically indicated on the drawings. Otherwise, circuit breakers and shall be fully rated.

G. Where indicated circuit breakers shall be current limiting.

H. Where indicated provide UL listed circuit breakers for applications at 100% of their continuous ampere rating in their intended enclosure.

2.7 BOLTED PRESSURE SWITCHES

A. Provide bolted pressure contact-type protective devices where indicated.

B. Fusible switches shall be furnished with class L fuse clips. Switch contact interrupting capacity shall be twelve (12) times the continuous rating of the switch.

C. Fuse access door shall be mechanically interlocked with the operating handle and shall have provisions for padlocking the switch in the open position.

D. The switch shall utilize a stored energy dead-front mechanism compressed and released by the operating handle, to provide quick positive switching action independent of the speed of the operating handle.

E. Switches shall be manually operated unless electrically tripped as shown on the drawings. Electrically tripped switches shall be designed to be closed only after the opening spring has been charged, ready for electrical opening by solenoid or manual opening by the mechanical pushbutton.

F. Provide class L fuses as shown on the drawings.

G. Supply electrically-tripped switch(es) with the following accessories where indicated on the drawing:
   1. Ground fault protection including test panel.
   2. Single-phase protection to open the switch(es) upon loss of any phase from the source.
   3. Blown fuse protection to open the switch upon blowing of one or more of the fuses.

2.8 QUICK-MAKE/QUICK-BREAK FUSIBLE SWITCHES

A. Fusible switches that are not required to be bolted pressure switches shall be quick-make/quick-break fusible switches. Switches 30-amperes through 600 ampere frames shall be furnished with rejection class "R" or "J" type fuse clips unless otherwise scheduled. Fusible switches 800 amperes through 1200 amperes shall be furnished with class L fuse clips. 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.

B. Where indicated provide a UL listed 120-volt AC shunt trip for 400- through 1200-ampere switches.

C. Where indicated, or required by code, provide a zero sequence ground protection system including test panel. Ground fault relay shall include separate time and current pick-up adjustments.

2.9 MISCELLANEOUS DEVICES

1. Key interlocks shall be provided as indicated on the drawings.
2. Provide transient voltage surge suppression as specified in section 16671 when TVSS is indicated on the drawings.

2.10 TENANT UTILITY METERING

A. For EUSERC serviced areas:
   1. Switchboards shall incorporate metering sections with tenant feeder circuits, using ring-type meter sockets to meet local utility or customer requirements.
   2. The self-contained meter sockets shall include a test bypass/disconnect block per EUSERC requirements and be arranged, typically, for hot sequence metering.
   3. Meter Sockets
      a) Ring-type rated 200A
      b) With test bypass/disconnect block to meet EUSERC requirements
      c) Transformer rated sockets available for 400A or larger circuits
      d) Optional internal wireway barriers

B. For non-EUSERC serviced areas:
   1. Switchboards shall incorporate metering sections with tenant feeder circuits using ringless-type meter sockets to meet local utility or customer requirements.
   2. Provide self-contained meter sockets with manual lever bypass and can be arranged for either hot or cold sequence metering.
   3. Meter Sockets
      a) Ringless-type rated 200A or 320A
      b) Manual bypass
      c) Individual compartments with covers and sealing provisions
      d) Transformer rated sockets for 400A and larger circuits
      e) Internal wireway barriers

2.11 ENCLOSURES

A. Provide NEMA 1 enclosures where located indoors in dry locations.

B. Provide NEMA 3R enclosures where located outdoors and locations subject to falling water.
   1. Outdoor enclosure shall be non-walk-in and meet applicable NEMA 3R requirements of UL.
   2. Enclosure shall have flat roof.
   3. Doors shall have provisions for padlocking.
   4. Ventilating openings shall be provided complete with replaceable fiber glass air filters.
   5. Provide thermostatically controlled space heaters for each structure with adequate wattage to prevent the accumulation of moisture.

6. Power for space heaters shall be obtained from a control power transformer within the switchboard unless another source is indicated on the drawings. Supply voltage shall be 120 volts AC.

C. The assembly shall be provided with adequate lifting means and shall be capable of being moved into position and bolted directly to the floor or equipment pad.

2.12 NAMEPLATES

A. Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits. Nameplates shall be laminated plastic, black characters on white background. Characters shall be 3/16-inch high, minimum. 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 ampere rating, short-circuit rating, manufacturer's name, general order number, and item number.

2.13 FINISH

A. All exterior and interior steel surfaces of the switchboard shall be properly cleaned and provided with a rust-inhibiting phosphatized coating. Color and finish of indoor switchboards shall ANSI 61 light gray.

B. Outdoor switchboards shall be painted to match the building with the color as selected by the Architect or Engineer.

PART 3 - EXECUTION

3.1 FACTORY TESTING

A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.

1. The switchboard shall be completely assembled, wired, adjusted, and tested at the factory. After assembly, the complete switchboard will be tested for operation under simulated service conditions to assure the accuracy of the wiring and the functioning of all equipment. The main circuits shall be given a dielectric test of 2200 volts for one (1) minute between live parts and ground and between opposite polarities. The wiring and control circuits shall be given a dielectric test of 1500 volts for one (1) minute between live parts and ground.

B. The manufacturer shall provide three (3) certified copies of factory test reports.

3.2 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Install all equipment per the manufacturer's recommendations and the design drawings.

B. Secure the assembly in place.

3.4 MANUFACTURER'S CERTIFICATION

A. A certified test report of all standard production tests shall be available to the Engineer upon request.

3.5 TRAINING

A. The Contractor shall provide a training session for the owner's representatives.

B. A manufacturer’s qualified representative shall conduct the training session. The training program shall consist of instruction on the operation of the assembly, circuit breakers, fused switches, meters, and major components within the assembly.

-- End of Section --