SECTION 16441
PANELBOARDS

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

A. The general provisions of the Contract, including General and Supplementary General Conditions, and Division 1 General Requirements, apply to work specified in this Section.

B. Requirements of Section 16050, "Basic Electrical Materials and Methods," apply to this Section.

1.02 SUMMARY

A. This Section includes lighting and power panelboards and associated auxiliary equipment rated 600 V or less.

B. Related work specified in other sections:
1. Hangers and Supports: Section 16070.
2. Electrical identification: Section 16075.
3. Grounding: Section 16060.

1.03 REFERENCES

A. National Electrical Code, NFPA-70.

B. National Electrical Manufacturers Association (NEMA):
1. NEMA PB1, Panelboards.
2. NEMA PB1.1, General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
3. NEMA AB1, Molded Case Circuit Breakers and Enclosures.
4. NEMA 250, Enclosures for Electrical Equipment.

C. Underwriters Laboratories (UL):
1. UL 50, Cabinets and Boxes.
2. UL 67, Panelboards.
3. UL 489, Molded Case Circuit Breakers
4. UL 869, Service Equipment.

D. American National Standards Institute, ANSI/IEEE C62.1, Surge Arrestors for alternating Current Power Circuits.

1.04 SUBMITTALS

A. Product data for each type panelboard, accessory item, and component specified.

B. Shop drawings from manufacturers of panelboards including dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features, and voltage rating. Include the following:
   1. Enclosure type with details for types other than NEMA Type 1.
   2. Bus configuration and current ratings.
   3. Short-circuit current rating of panelboard.
   4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.

C. Maintenance data for panelboard components, for inclusion in Operating and Maintenance Manual specified in Division 1 and in Section 16050. Include instructions for testing circuit breakers.

1.05 QUALITY ASSURANCE

A. Installer: Company specializing in performing the work of this section with at least five years of experience.

1.06 EXTRA MATERIALS

A. Keys: Furnish six spares of each type for panelboard cabinet locks.

B. Touch-up Paint for surface-mounted panelboards: One half-pint container.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. General Electric Co.
   2. Siemens Energy & Automation, Inc.
   3. Cutler/Hammer

2.02 PANELBOARDS, GENERAL REQUIREMENTS

A. Panelboards: Dead-front type with automatic short-circuit and overcurrent protective devices, assembled into a single interior unit mounted in a sheet-steel enclosure, consisting of a box and front, and designed to be placed in/against a wall or partition.

B. Overcurrent Protective Devices (OCPDs): Molded case circuit breakers with thermal-magnetic trip. Provide type, rating, and features as indicated on the drawings. Circuit breakers with trip ratings larger than 100 amperes shall have interchangeable trips. Tandem circuit breakers shall not be used. Multipole breakers shall have common trip. Panelboards shall be a minimum of 100 ampere frame. Breakers rated from 15 amperes to 100 amperes trip size shall take up the same pole spacing.

C. Enclosures: Cabinets, fabricated from code gauge galvanized sheet steel, flush or surface mounted as indicated. NEMA Type 1 enclosure, except where the following enclosure

requirements are indicated. Surface mounted cabinets shall be furnished without pre-punched knockouts.

1. NEMA 12: Dust tight, dripproof, and resistant to oil and coolant seepage.

D. Directory Frame: Metal with clear plastic cover. Mount inside each panel door.

E. Equipment Ground Bus: Copper, adequate for feeder and branch-circuit equipment ground conductors. Bonded to box.

F. Provision for Future Devices: Where "SPACE" is indicated in the panelboard schedule, equip with mounting brackets, bus connections, and necessary appurtenances for the OCPD ampere ratings indicated for future installation of devices.

G. Bus: Plated aluminum

H. Special Features: Provide the following features for panelboards :

1. Isolated Equipment Ground Bus: Where it is indicated in the panelboard schedule. Adequate for branch-circuit equipment ground conductors; insulated from box.

2. Hinged Front Cover: Entire front trim hinged to box with standard door within hinged trim cover.

3. Subfeed: OCPD or lug provision as indicated.

I. Feed-Through Lugs: Sized to accommodate feeders indicated.

J. Short circuit rating: As shown on the drawings, but not less than 10,000 amperes RMS for panelboards rated 120/240 volt AC and 14,000 amperes RMS for panelboards rated 277/480 volt AC.

1. Series short circuit rating is not acceptable.

2.03 LIGHTING AND APPLIANCE BRANCH CIRCUIT PANELBOARDS

A. Branch OCPDs: Bolt-on circuit breakers, replaceable without disturbing adjacent units, bus structure or insulation.

B. Double-Width Panels: Where more than 42 poles are indicated or where otherwise indicated, provide two panelboards under separate trims.

C. Doors: In panel front, with concealed hinges. Secure with flush catch and tumbler lock, all keyed alike.

2.04 DISTRIBUTION PANELBOARDS

A. Doors: In panel front, with a cylinder tumbler-type lock. On the doors more than 48 inches high, provide a combination three point catch and lock.

B. Branch-Circuit Breakers: Where OCPDs are indicated to be circuit breakers, use bolt-on breakers except circuit breakers 225-ampere frame size and greater may be plug-in type where individual positive locking device requires mechanical release for removal.

2.05 TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS)

A. Type and Listing/Labeling: Furnish where indicated on the drawings, parallel connected type TVSS devices, which will suppress voltage surges and transients as listed under UL 1449 and ANSI/IEEE C62.41. The unit shall be attached directly to the panelboard bus, that eliminates the need for any line and load wiring.

B. Maximum Continuous Operating Voltage (MCOV): At least 125% of nominal operating voltage for 120/208 Volt system.

C. Protection Modes: Bi-directional, line-line, line-neutral, line-ground, and neutral-ground.

D. Maximum Peak Surge Current: For medium-to-low exposure level, 80,000 Amps per phase for all protection modes.

E. Suppression voltage rating for 120/208 Volt System: 400 Volt for L-N, L-G and N-G protection modes, and 800 Volt for L-L Mode.

F. Noise filtering: 60dB minimum.

G. Monitoring Features: LED display, system status, alarm contact for remote monitoring.

2.06 IDENTIFICATION

A. General: Refer to Section 16075 "Electrical Identification."

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install panelboards and accessory items in accordance with NEMA PB 1.1 and manufacturers' written installation instructions.

B. Branch circuit numbering: Shown on the drawings for identification and convenience only, and is not intended to designate connecting sequence. The contractor is responsible for proper load balance at each panel.

C. Mounting Heights: Top of trim 6'-2" above finished floor, except as indicated. If size of the panelboard is taller, the highest circuit breaker shall not exceed 6'-6" above finished floor to comply with referenced Electrical Code.

D. Mounting: Plumb and rigid without distortion of box. Mount flush panels uniformly flush with wall finish. Install panels securely mounted to building structure or to steel channel framing fastened to the building structure. For seismic requirements refer to Section 16050.

E. Circuit Directory: Typed and reflective of final circuit changes required to balance panel loads.

F. Install filler plates in unused spaces.

G. Provision for Future Circuits at Flush Panelboards: Stub four 1-inch empty conduits from panel into accessible ceiling space or space designated to be ceiling space in future. Stub four 1-inch empty conduits into raised floor space or below slab other than slabs on grade.

H. Wiring in Panel Gutters: Train conductors neatly in groups, bundle, and wrap with wire ties after completion of load balancing.

3.02 IDENTIFICATION

A. Identify field-installed wiring and components and provide warning signs in accordance with Division 16 Section "Electrical Identification."

3.03 GROUNDING

A. Connections: Make equipment grounding connections for panelboards as indicated.

B. Provide ground continuity to main service ground bus in the switchboard.

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals, including grounding connections, in accordance with manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A.

3.05 FIELD QUALITY CONTROL

A. Visual and Mechanical Inspection: Include the following inspections and related work:

1. Inspect for defects and physical damage, labeling, and nameplate compliance with requirements of up-to-date drawings and panelboard schedules.

2. Exercise and perform of operational tests of all mechanical components and other operable devices in accordance with manufacturer's instruction manual.

3. Check panelboard mounting, area clearances, and alignment and fit of components.

4. Check tightness of bolted electrical connections with calibrated torque wrench. Refer to manufacturer's instructions for proper torque values.

B. Electrical tests: Include the following items performed in accordance with manufacturer's instruction:

1. Insulation resistance test of buses and portions of control wiring that disconnected from solid-state devices. Insulation resistance less than 100 megohms is not acceptable.

2. Ground resistance test on system and equipment ground connections.

3. Measure steady-state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multiwire branch circuits.

C. Upon request of the Architect, the Contractor shall remove random samples of installed work sufficient to establish the quality of materials and workmanship. If such samples indicate the materials and/or workmanship do not meet the contract specifications, the Contractor will be required to replace and/or clean installed work as deemed necessary by the Architect.

D. Testing shall be witnessed by and final acceptance shall be made by the Architect.

E. Retest: Correct deficiencies identified by tests and observations and provide retesting of panelboards.

3.06 CLEANING

A. Upon completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION 16441