

## SECTION 16470

### PANELBOARDS

#### PART 1 - GENERAL

##### 1.01 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.

##### 1.02 DESCRIPTION OF WORK

- A. Provide complete panelboards.

##### 1.03 RELATED WORK IN OTHER SECTIONS

- A. Related work in other sections:
  - 1. Electrical General Provisions                      Section 16010
  - 2. Raceways and Boxes                                Section 16110
  - 3. Wire and Cable                                        Section 16120
  - 4. Support Devices                                      Section 16190
  - 5. Electrical Identification                            Section 16195
  - 6. Grounding     Section 16450

##### 1.04 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. Panelboards
    - a) U.L. Standards #50 & #67
    - b) Federal Standard W-P-115C
    - c) NEMA Standard PB-1
  - 2. Circuit Breakers
    - a) U.L. Standard #489
    - b) Federal Standard W-C-375A Amendment No.4
    - c) NEMA Standard AB-1-1969

##### 1.05 SUBMITTALS

- A. Submit complete shop drawings and catalog data. With each panelboard drawing the following is required:
  - 1. Show main devices and lug sizes
  - 2. Branch circuit device sizes and arrangement. Identify available spaces
  - 3. Dimensions and construction
  - 4. Gutter and backbox dimensions, conduit entry/exit locations.
  - 5. Nameplate and legend
  - 6. Protective coating
  - 7. All pertinent details of panel, enclosure, cover, and method of securing cover and lock
  - 8. Assembly ratings including:
    - a) Short-circuit rating
    - b) Voltage

- c) Continuous current
- 9. Major component ratings including:
  - a) Voltage
  - b) Continuous current
  - c) Interrupting ratings
- 10. Cable terminal sizes.
- B. The following information shall be submitted for record purposes:
  - 1. Final as-built drawings and information for items listed in section A.
  - 2. Installation information
  - 3. Seismic certification and equipment anchorage details.

#### 1.06 QUALITY ASSURANCE

- A. Each panelboard as a complete and finished product shall receive a single integrated equipment rating by the manufacturer. The integrated equipment manufacturer shall certify that all equipment is capable of withstanding the thermal and magnetic stress of a fault equal to the value specified on the Drawings. Such rating shall be established by actual tests by the manufacturer on similar equipment. This certification shall be permanently affixed to each panelboard.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. These instructions shall be included with the equipment at time of shipment.

#### 1.08 EXTRA MATERIALS

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

### **PART 2 - PRODUCTS**

#### 2.01 APPROVED MANUFACTURERS

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

#### 2.02 PANELBOARDS IN GENERAL

- A. Provide panelboards consisting of an assembly of branch circuits switching and protective devices (circuit breakers, switch and fuse units, or combination thereof) mounted inside a dead front enclosure. Provide the number and size of these branch circuit devices as indicated by the circuiting, on the drawings, and in the schedules. Locations of circuit breakers shall be as indicated in the schedules.
- B. Provide the following modifications and additional equipment as shown on the Drawings:
  - 1. Main circuit breakers
  - 2. Shunt trip circuit breakers

3. Integral remote control switches
  4. Subfeed switches
  5. Feed through lugs and/or bus
  6. Feed through cabling arrangement
  7. Double lugs for multiple cables or for future provisions
  8. Circumferential compression lugs where aluminum conductors are employed
  9. Ground fault interrupting circuit breakers
  10. Oversized gutters
  11. Door in door construction for power panels
- C. Interiors
1. Rigid removable assembly of copper bus bars and interchangeable bolted branch circuit devices.
  2. Bus bars sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum.
  3. Bus bars drilled to permit branch circuit devices of all sizes and number of poles to be interchangeable and installed in any spare space of sufficient size, without disturbing adjacent units; without removing main bus or branch circuit connectors and without machining, drilling, or tapping in the field.
  4. Arrange bus in sequence or distributed phasing so that multipole circuit breaker can replace any group of single circuit breakers of the same size.
  5. Full-size (100%-rated) insulated neutral bars shall be included for panelboards shown with neutral. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection. 200%-rated neutrals shall be supplied for panels designated on drawings with oversized neutral conductors and panels served from K-rated transformers.
  6. Provide ground bus in each panelboard. On 120/208 volt panelboards provide an additional isolated ground bus where required.
- D. Enclosure
1. Code gauge steel box galvanized.
  2. Provide a bolt-on ground connector to inside of enclosure.
  3. Flush mounted in finished areas and where indicated. Surface mount elsewhere.
- E. Front
1. Doors must be provided on all lighting and power panels. On switch and fuse panelboards doors over overcurrent devices are not to be provided unless rated for same.
  2. Heavy code gauge steel as required to maintain panel face flat.
  3. Hold front closed with trim clamps.
  4. Factory finished in medium gray enamel or two coats of air-drying lacquer over a rust inhibitor.
  5. Provide cylinder lock . All panels keyed alike.
  6. Welded angle rest at the bottom of the door to facilitate cover installation.
  7. Doors over 48" in height shall have auxiliary fasteners at top and bottom of door in addition to lock and catch.
- F. Multiple Section Panelboards
1. Each section of multiple section panelboards shall be the same height.
  2. Multiple sections shall each contain the same number of poles (e.g. 72 poles equals 2-36 pole panels).
- G. Terminal Lugs
1. Bolted type, labeled for either copper or aluminum conductors.

2. Locate main lugs properly at top or bottom, depending where main feeder enters.
- H. Electrical Ratings
1. Short circuit withstand ratings shall be as indicated on the Drawings. Panelboards shall be labeled with a UL short-circuit rating. All circuit breakers shall be fully-rated unless the drawings specifically indicate series rated. When series ratings are applied with integral or remote upstream devices, a label or manual shall be provided. It shall state the conditions of the UL series ratings including:
    - a) Size and type of upstream device
    - b) Branch devices that can be used
    - c) UL series short-circuit rating.
  2. Where indicated, provide panelboards having a "service entrance" Type UL label with neutrals factory bonded to frame or enclosure.
- I. Circuit Breaker Devices
1. Plastic molded case. Completely sealed enclosure. Toggle type operating handle. Trip ampere rating and ON/OFF indication clearly visible.
  2. Thermal-magnetic trip-free, trip-indicating, quick-make, quick-break, with inverse time delay characteristics. Single-handle and common tripping multipole breakers.
  3. Silver alloy contacts with auxiliary arc-quenching devices.
  4. Panelboard must be of the type which will accept the field installation of shunt trip devices of 60 amperes or less on the branch devices.
  5. Interrupting capacities shall be as indicated on the Drawings. As a minimum, 240 volt devices shall be not less than 10,000 AIC and 480 volt devices not less than 14,000 AIC.
  6. For lighting circuits provide devices labeled "SWD" for switching purposes.
  7. Bolted type terminals U.L. listed for either aluminum or copper 75 degrees C cables.
  8. Provide main breakers in panels served from transformers unless separate transformer secondary protection is provided.
  9. Locate next to each breaker or space unit an individual number.
  10. Circuit breakers serving computer equipment and those serving kitchen equipment beneath cooking hoods shall include a shunt trip coil.
  11. Shunt trip breakers shall be supplied with 120 volt coils. Provide 120 volt circuit from nearest 120 volt panel to coil. Where shunt trip breakers are in emergency panels provide emergency 120 volt source for same from nearest 120 volt emergency panel.
  12. Provide locking device for designated breakers.
  13. For HVAC equipment provide UL listed "HACR" type devices.
- J. Ground Fault Interrupters
1. Ground fault interrupter branch circuit breakers shall be as indicated on the Drawings. Circuit breakers shall be circuit interrupting which will operate manually for normal switching functions and automatically under overload, short circuit, and 0.005 amp line-to-ground fault conditions. The operating mechanism shall be entirely trip-free so that contact cannot be held closed against an abnormal overcurrent, short circuit, or ground fault condition. The device shall be bolt-on type with case construction and shall be interchangeable with standard 1P breakers utilized in the panelboard.

K. Switch and Fuse Devices

1. Quick-make/quick-break, horsepower rated, dead-front type. Each switch a self-contained unit, externally operable from the front. Provision for padlocking handle in OFF position.
2. Fuse and switch compartment interlocked to prevent access to the fuse compartment until switch is thrown to "OFF" position. Interlock intentionally releasable by externally applied tool to permit checking switch and fuses under load.
3. Switch units interchangeable for replacement, without disturbing balance of distribution panelboard's operation.
4. Provide with rejection-type clips for Class R type fuses.
5. Provide Class R rejection type fuses as specified elsewhere.
6. Provide spare fuses as specified elsewhere.

## **PART 3 - EXECUTION**

### 3.01 INSTALLATION

- A. Mount all panels at a maximum height of 6 feet 6 inches to top unless otherwise noted.
- B. Where flushed mounted, the fire integrity of the wall in which it is installed must be maintained.
- C. Neatly arrange branch circuit wires and tie together in each gutter with Thomas & Betts nylon "Ty-Raps", or approved equal at minimum 4 inch intervals.
- D. Plug all knockouts removed and not utilized.
- E. Provide nameplate and fill out panel directory. For remodel work or changes, trace circuits to determine loads and provide new updated directory.
- F. Provide grounding and bonding jumpers per Section 16450 and as indicated on the Drawings.

### 3.02 TOUCH UP AND CLEANING

- A. Vacuum all backboxes clean of debris after installation and prior to contract closeout.
- B. Touch up scratch marks, etc. with matching paint.

### 3.03 OBSERVATIONS

- A. All panel fronts shall be removed by the Contractor for observation of the panel interiors by the Engineers.
- B. Panel fronts shall be removed when directed by the Engineer/Architect for observation and reinstalled immediately after the observations.

-- End of Section --