

**SECTION 26 24 16**  
**PANELBOARDS**

**PART 1 GENERAL**

**1.01 The Contractor is referred to the “special notice to contractors”; special conditions, the “form of proposal”; the “form of bid bond”; “division 01 - general requirements” of the contract specifications”; the “contract drawings” and all amendments and addenda thereto; all of which govern the work of this section. these specifications complement and supplement the contract drawings. any variations, discrepancy or conflicting information found by the contractor shall be brought to the attention of nycha for resolution.**

**1.02 SECTION INCLUDES**

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

**1.03 RELATED REQUIREMENTS**

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 28 13 - Fuses: Fuses for fusible switches and spare fuse cabinets.
- E. Section 26 43 00 - Surge Protective Devices.

**1.04 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision D, 2013.
- B. NEMA AB 1 - Molded Case Circuit Breakers
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- D. NECA 407 - Standard for Installing and Maintaining Panelboards; National Electrical Contractors Association; 2009.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- F. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2013
- G. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association; 2011.
- H. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association; 2007.
- I. NEMA PB 1.2 - Application Guide for Ground-fault Protective Devices for Equipment
- J. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; International Electrical Testing Association; 2013 (ANSI/NETA ATS).
- K. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

- L. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- M. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- N. UL 67 - Panelboards; Current Edition, Including All Revisions.
- O. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- P. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- Q. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

#### 1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
  4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

#### 1.06 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
- B. **Submission shall be reviewed and signed-off by NYC Licensed Electrician. Submission will be disapproved without sign off.**
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
  2. Include wiring diagrams showing all factory and field connections.
  3. Show Code required clearances on drawings
  4. Show panel schedule indicating circuit arrangement, ampacity and loads.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Panelboard Keys: Two of each different key.
  3. Fuse Pullers: Furnish one fuse puller to Owner
  4. See Section 26 28 13 for requirements for spare fuses and spare fuse cabinets.

### **1.07 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.
- D. Panel boards and cabinets shall be delivered to the construction site complete. All electrical devices, including but not limited to circuit breakers, shall be in place and wired. Components shall be packaged to prevent damage due to vibration, jarring and the like during transportation and handling.
- E. Electrical devices shipped loose shall be delivered in the manufacturer's original, unopened, protective packaging and shall be identified with suitable non-corrosive tag.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Siemens Industry, Inc: [www.usa.siemens.com](http://www.usa.siemens.com).
- B. Eaton Corporation; Cutler-Hammer Products: [www.eaton.com](http://www.eaton.com).
- C. General Electric Company: [www.geindustrial.com](http://www.geindustrial.com).
- D. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).
- E. Each Panel shall be marked with the name of the Manufacturer
- F. Source Limitations: Furnish panelboards and associated components produced by a single manufacturer and obtained from a single supplier.

### **2.02 ALL PANELBOARDS**

- A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- B. Panel boards and cabinets shall be designed in accordance with the applicable standards of ANSI NEMA and NFPA
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
    - b. Panelboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.
- D. Short Circuit Current Rating:
  - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

- E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
  - 1. Provide fully rated neutral bus, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
  - 3. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
  - 2. Boxes: Galvanized steel unless otherwise indicated.
    - a. Provide wiring gutters sized to accommodate the conductors to be installed.
    - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
    - c. Provide removable end walls for NEMA Type 1 enclosures.
  - 3. Fronts:
    - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
    - c. Finish for Painted Steel Fronts: Manufacturer's standard grey enamel unless otherwise indicated.
  - 4. Lockable Doors: All locks keyed alike unless otherwise indicated. Each locked cabinet shall be furnished with a combination catch and flat Panel doors shall have a latching type 511s lock approved for use in N.Y. City with Yale 47 key. Provide 2 keys for each panel and maximum 20 keys per system. Provide metal directory frame with 1/16" clear acrylic plastic with numbered circuits and typewritten panel directory.
  - 5. All doors shall close against a rabbet placed all around the inside edge of the frame with a close-fitting joint between door and frame. Doors shall be fitted with concealed, continuous, flush piano hinges. Fastening screws on fronts shall be of the captive type and shall be set no more than 24 inches apart. Doors more than 48 inches high shall be provided with a combination three-point catch.
- J. Panel board interiors shall be factory-assembled, complete with circuit breakers, and shall be so designed and assembled that any individual breaker may be replaced without disturbing adjacent units or without removing main bus or branch circuit connectors. Main buses and back pans of panel boards shall be of such a design that branch circuits may be changed without additional machining, drilling or tapping. Main and branch circuit bus shall be copper, based on 1,000 amperes per square inch current density, and contact surfaces shall be based on not more than 200 amperes per square inch current density.
- K. Panel boards shall be so designed and constructed that the branch circuit connections to the main bus provide sequence phasing throughout, that is, adjacent poles shall be of unlike polarity and rotated in sequence.
- L. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- M. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list and label panelboards as a complete assembly including surge protective device.
- N. Load centers are not acceptable.

### **2.03 POWER DISTRIBUTION PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker or fusible switch type as indicated, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Products:
  - 1. Square 'D' NEMB Bolt-on Type.
  - 2. As indicated on drawings..
- C. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
  - 2. Main and Neutral Lug Type: Mechanical.
- D. Bussing:
  - 1. Phase and Neutral Bus Material: Copper.
  - 2. Ground Bus Material: Copper.
- E. Circuit Breakers:
  - 1. Provide bolt-on type.
  - 2. Provide thermal magnetic circuit breakers unless otherwise indicated.
- F. Enclosures:
  - 1. Provide surface-mounted or flush-mounted enclosures.
  - 2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  - 3. Provide clear plastic circuit directory holder mounted on inside of door.

### **2.04 LIGHTING AND APPLIANCE PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  - 2. Phase and Neutral Bus Material: Copper.
  - 3. Ground Bus Material: Copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type.
- E. Enclosures:
  - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
  - 2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  - 3. Provide clear plastic circuit directory holder mounted on inside of door.

### **2.05 OVERCURRENT PROTECTIVE DEVICES**

- A. Fusible Switches:
  - 1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA KS 1, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
  - 2. Fuse Clips: As required to accept indicated fuses.

- a. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- 3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- 4. Conductor Terminations:
  - a. Provide mechanical lugs.
  - b. Lug Material: Copper, suitable for terminating copper conductors only.
- B. Molded Case Circuit Breakers:
  - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
  - 2. Circuit breaker shall be 1" wide industry – standard format for 1 pole circuit protection. Circuit breaker shall be designed to plug into the wide range of load centers. Breaker shall be 15A and 20A quick open type with trip reaction within one cycle, with three handle positions to indicate when the breaker is "on", "off", or "tripped". Breaker shall be ground fault, arc fault, surge and equipment protection type as indicated on drawings. Tandem and miniature/half size breakers are acceptable subject to authority approval if necessary due to space limitations.
  - 3. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
    - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  - 4. Conductor Terminations:
    - a. Provide mechanical lugs.
    - b. Lug Material: Copper, suitable for terminating copper conductors only.
  - 5. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
    - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
  - 6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
  - 7. Provide the following circuit breaker types where indicated:
    - a. HACR type for motor loads, pumps, hvac equipment. Coordinate with mechanical equipment.
    - b. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
  - 8. **Provide listed switching duty rated circuit breakers with SWD marking where indicated.**
  - 9. Do not use tandem circuit breakers.
  - 10. Do not use handle ties in lieu of multi-pole circuit breakers.

## 2.06 SOURCE QUALITY CONTROL

- A. Factory test panelboards according to NEMA PB 1.

## PART 3 EXECUTIONS

### 3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. **Contractor is advised that the sub-meter room has limited space. Code clearance for electrical equipment shall be the responsibility of the Contractor. Where equipment does not meet Code required clearances, Contractor shall relocation to new location without additional cost to NYCHA.**
- C. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- D. Verify that mounting surfaces are ready to receive panelboards.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.
- C. The installation shall be done in complete compliance with the latest valid New York City Electrical Code 2011 and shall meet all the requirements of other agencies having jurisdiction.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70. **Where clearances are not complied per Code, Contractor shall relocate at no additional expense to NYCHA.**
- E. Provide required supports in accordance with Section 26 05 29.
- F. Install panelboards plumb.
- G. On wet surfaces, panels shall be installed 1/2" off wall. Furnish and install stainless steel spacers or stainless steel metal strut channels.
- H. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- I. Mount panelboards such that the highest position of any operating handles for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- J. Provide typed circuit directory for each branch circuit apartment panel board.
- K. Provide grounding and bonding in accordance with Section 26 05 26.
  - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
  - 2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.
- L. Install all field-installed branch devices, components, and accessories.
- M. Provide fuses complying with Section 26 28 13 for fusible switches as indicated. Fuse size shall meet equipment manufacturer's recommendation for overload and short circuit protection.
- N. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- O. Provide filler plates to cover unused spaces in panelboards.
- P. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads. Also provide for the following:
  - 1. Fire detection and alarm circuits.
- Q. Identify panelboards in accordance with Section 26 05 53.

### **3.03 FIELD QUALITY CONTROL**

- A. Perform inspection, testing, and adjusting in accordance with Section 01 40 00.
- B. Inspect and test in accordance with NETA STD ATS, except Section 4.
- C. Fusible Switches: Perform inspections and tests listed in NETA STD ATS, Section 7.5.1.1.
- D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA STD ATS, Section 7.6.1.1. Tests listed as optional are not required.
- E. Test GFCI circuit breakers to verify proper operation.
- F. Test shunt trips to verify proper operation.
- G. All testing shall be witnessed by NYCHA Field Personnel.
- H. Correct deficiencies and replace damaged or defective panelboards or associated components.

### **3.04 ADJUSTING**

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.
- D. In the event the physical size of the new panel is different from the old panel, the contractor shall do all the required work to retrofit the new panel at the old location.
- E. After the installation of the panel the contractor shall do the necessary painting like the original finish.

### **3.05 CLEANING**

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**