SECTION [26 24 16.23][16447]

PANELBOARDS – POWER

Square D I-Line (600vac or 250vdc maximum) Power Distribution Panelboards by Schneider Electric

Schneider Electric Editor's Note:

This guide specification is written in accordance with the Construction Specifications Institute (CSI) Master Format. This section must be carefully reviewed and edited by the architect or the engineer to meet the requirements of the project. Coordinate this section with other specification sections within the Contract Documents and Drawings.

In order to properly use / edit this document, show formatting and hidden text by selecting ¶ on the menu or by typing (Ctrl+*) simultaneously. Except for these introductory paragraphs, green hidden text will not print. Text in red is optional. Red text in [brackets] denotes multiple options where one or more should be chosen. All red text should be edited and changed to black for final project conformation. In addition, these introductory paragraphs should be deleted or changed to hidden text.

PART 1 - GENERAL

1.1 SUMMARY

A. Scope: Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, configuration and installation for lighting and appliance panelboards (also identified as panelboard, PP) as required for the complete performance of the Work, as shown on the Drawings, as specified herein, and as specified elsewhere for the assemblies or systems comprised of the components specified herein.

B. Related Sections: Related sections include, but shall not be limited to, the following:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
2. Applicable general requirements for electrical Work specified within Division 26 Specification Sections apply to this Section.
3. Specification Section 26 28 11.11 Molded Case Circuit Breakers
4. Specification Section 26 43 13 Surge Protective Devices for Power Circuits
5. Specification Section 26 27 13.13 Power and Energy Meters
6. Specification Section 26 09 43.11 Lighting Control System

1.2 REFERENCES

A. General, Publications: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

1. American Society of Civil Engineers (ASCE):
   a. ASCE 7, "Minimum Design Loads for Buildings and Other Structures."
2. California Office of Statewide Health Planning and Development (OSHPD)
3. Canadian Standards Association (CSA):
   a. C22.2 No. 5, "Molded Case Circuit Breakers, Molded Case Switches and Circuit Breaker Enclosures."
   b. C22.2 No. 29, "Panelboards and Enclosed Panelboards."
   c. C22.1, "Canadian Electrical Code, Part I" (CEC)
4. USA Federal Specifications (FS):
   a. FS W-C-375, "Circuit Breakers, Molded Case, Branch Circuit and Service."
   b. FS W-P-115, "Panel, Power Distribution."

5. International Code Council (ICC):
   a. ICC IBC, "International Building Code."
   b. ICC IBC Section 1621, “Architectural, Mechanical, and Electrical Component Seismic Design Requirements.”
   c. ICC ES AC156, “International Code Council Evaluation Services Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems”
6. National Electrical Manufacturers Association (NEMA):
   a. NEMA AB 1, "Molded Case Circuit Breakers and Molded Case Switches."
   b. NEMA PB 1, "Panelboards."
   c. NEMA PB 1.1, "General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less."
7. National Fire Protection Agency (NFPA)
   a. NFPA 70, "National Electrical Code," hereinafter referred to as NEC.
   b. NFPA 5000, “Building Construction and Safety Code.”
8. Underwriter Laboratories (UL):
   a. UL 50, "Enclosures for Electrical Equipment, Non-Environmental Considerations.”
   b. UL 67, "Standard for Panelboards."
   c. UL 489, "Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.”

1.3 DEFINITIONS

A. Unless specifically defined within the Contract Documents, the words or acronyms contained within this specification shall be as defined within, or by the references listed within this specification, the Contract Documents, or, if not listed by either, by common industry practice.
   1. GFEP: Ground fault equipment protection
   2. PP: Power Panelboard
   3. MCB: Miniature circuit breaker
   4. MCCB: Molded-case circuit breaker
   5. MVP: Measurement and Verification Panels
   6. NRTL: Nationally Recognized Testing Laboratory
   7. OCPD: Overcurrent protective device
   8. SPD: Surge Protective Device

1.4 SUBMITTALS

A. General: Submittals shall be in accordance with the requirements of Section [01 33 00][01300] Submittals and Section [26 00 10][16010] Electrical, in addition to those specified herein.
   1. Submit sufficient information to determine compliance with the Contract Documents. Identify submittal data with the specific equipment tags and/or service descriptions to which they pertain. Submittal data shall be clearly marked to identify the specific model numbers, options, and features of equipment and work proposed.
   2. Deviations from the Contract Documents shall be indicated within the submittal. Each deviation shall reference the corresponding drawing or specification number, show the Contract Document requirement text and/or illustration, and shall be accompanied by a detailed written justification for the deviation.
   3. Product Data: For each type of panelboard:
      a. Bus Materials, OCPDs, SPDs, and accessories indicated.
      b. Dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

c. Installation instructions complying with NEMA PB 1.1.

4. Shop Drawings: Submit the following additional shop drawing information for each product and accessory required. Include information not fully detailed in manufacturer's standard product data.

a. Drawings shall include, but shall not be limited to: environmental protection; interior mounting dimensions; and wiring gutter dimensions.

b. The location of the main shall be clearly shown.

c. The location of the branches and solid neutral shall be clearly shown.

d. Shop drawings shall illustrate one-line diagrams with applicable voltage systems.

e. Evidence of NRTL listing for series rating on OCPDs.

B. Operation & Maintenance (O&M) manuals shall be provided in accordance with the minimum requirements specified in Section [01 78 23][1780] Operation and Maintenance Data, Section [26 00 10][16010] Electrical Requirements and additional requirements specified herein.

1. Submit required Operations & Maintenance data specific to each product and accessory proposed. In addition, include the following information:

a. Installation instructions and NEMA Standards Publication PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 50 years.

1. The manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system that is regularly reviewed and audited by a third-party registrar. Manufacturing, inspection, and testing procedures shall be developed and controlled under the guidelines of the quality assurance system.

2. The manufacturer or their representative shall have service, repair, and technical support services available 24 hours 7 days a week basis.

B. All work performed and all materials used shall be in accordance with the National Electrical Code, and with applicable local regulations and ordinances. Process controllers, assemblies, materials, and equipment shall be listed and labeled by Underwriter's Laboratories or by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 DELIVERY, STORAGE AND HANDLING

A. Prior to delivery to the Project site, ensure that suitable storage space is available to store materials in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres. Materials shall be protected during delivery and storage and shall not exceed the manufacturer stated storage requirements. As a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. In addition, protect electronics from all forms of electrical and magnetic energy that could reasonably cause damage.

B. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified within the Contract Documents.

C. Inspect and report any concealed damage or violation of delivery storage, and handling requirements to the Engineer.

1.7 WARRANTY

A. General: Refer to [Section 01 77 00 - Closeout Procedures] [Section 01770 - Closeout Procedures].

B. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1.8 SPECIAL TOOLS AND SPARE PARTS [- NOT USED]

A. The Contractor shall provide a recommended spare parts list with the following information provided as a minimum:

1. Contact information for the closest parts stocking location to the Owner.
2. Critical spare parts shall be identified as those parts being associated with long lead times and/or those being critical to the unit's operation.
3. Maintenance spares shall be identified as being those parts required to regularly perform scheduled maintenance on the furnished equipment. These spares shall include, but shall not be limited to, consumable spares that are required to be exchanged during scheduled maintenance periods.

B. Spare parts shall be provided for each type and size of unit furnished. At a minimum, the following shall be provided:

1. Provide the minimum spare parts recommended by the manufacturer.

C. Any manufacturer specific special tool, not normally found in an electrician’s toolbox, required to remove and install recommended or furnished spare parts shall be furnished. At a minimum the following shall be provided:

1. If available from manufacture, provide PC-based configuration software tool and a minimum of [one] communication interface cable for each type of cable required to connect a PC-based computer to the devices specified herein for configuration and programming.
2. Electronic configuration files, in a media format acceptable by the Owner (e.g. CD, USB stick, etc.), updated to an as-installed and commissioned state.

D. Spare parts shall be properly marked and packaged for long term storage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. [Basis-of-Design Product: Subject to compliance with requirements, provide Square D by Schneider Electric I-Line Panelboard.

B. Acceptable Products: Panelboards specified herein shall be the product of a single manufacturer. Products and manufacturers specified are to establish a standard of quality for design, function, materials, and appearance. Products shall be modified as necessary by the manufacturer for compliance with requirements. Provide the following specified product and manufacturer without exception, unless approved as a substitute by addendum to the Contract Documents prior to the bid date:

1. Square D I-Line Panelboard by Schneider Electric
2. [2nd manufacturer and model]
3. [3rd manufacturer and model]

2.2 GENERAL REQUIREMENTS

A. Panelboards shall be manufactured in accordance with standards listed within the Article 1.2 REFERENCES.

2.3 PANELBOARD INTERIOR

A. Shall be rated [240vac][208y/120vac][480vac][480y/277vac][600vac][600y/347vac][250vdc] maximum. Continuous main current ratings as indicated on associated [schedules] [drawings] not to exceed 1200 amperes maximum main lugs or main circuit breaker. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67.

B. Provide UL Listed short circuit current ratings (SCCR) as indicated on the associated [schedules] [drawings] not to exceed the lowest interrupting capacity rating of any circuit breaker installed with a maximum of 200,000 RMS symmetrical amperes. Main lug and main breaker panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NFPA70 National Electric Code.

C. The panelboard interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.

D. The bussing shall be fully rated with sequentially phased branch distribution. Panelboard bussing rated 100 through 600 amperes shall be plated [copper] [aluminum]. Bussing rated 800 amperes and above shall be plated copper. Bus bar plating shall run the entire length of the bus bar. The entire interleaved assembly shall be contained between two (2) U-shaped steel channels, permanently secured to a galvanized steel-mounting pan by fasteners.

E. Interior trim shall be of dead-front construction to shield user from all energized parts. Main circuit breaker and main lug interiors shall be field convertible for top or bottom incoming feed.

F. A solidly bonded [aluminum] [copper] equipment ground bar shall be provided. [An additional [aluminum] [copper] isolated/insulated ground bar shall also be provided.]

G. Solid neutral shall be equipped with a full capacity bonding strap for service entrance applications. [UL Listed panelboards with 200% rated solid neutrals shall have plated copper neutral bus for non-linear load applications.] Gutter-mounted neutral will not be acceptable.

H. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label, and Short Circuit Current Rating shall be displayed on the interior or in a booklet format. Leveling provisions shall be provided for flush mounted applications.

I. Group mounted circuit breakers through 1200A

1. Circuit breaker(s) shall be group mounted with plug-on electrical connection, bolted to common pan or rail assembly.
2. The interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
3. Circuit breakers equipped with line terminal jaws shall not require additional external mounting hardware. Circuit breakers shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Circuit breakers of different frame sizes shall be capable of being mounted across from each other.
4. Line-side circuit breaker connections are to be jaw type.
5. All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate breaker connectors and mounting hardware.

J. Molded Case Circuit Breaker Characteristics - General

1. Circuit breakers shall be I-LINE - up to 1200 Amp maximum construction with factory installed mechanical lugs. [All circuit breakers shall be UL Listed to accept field installable/removable mechanical type lugs][Circuit breakers connecting to oversized field wiring shall be UL Listed to accept field installable/removable mechanical type lugs]. All lugs shall be UL Listed to accept solid (not larger than #8 AWG) and/or stranded [copper and aluminum conductors], [copper conductors only]. Lugs shall be suitable for [60° C rated wire - on 125 A circuit breakers and below], [75° C rated wire] or [90° C rated wire, sized according to the 75° C temperature rating in the National Electrical Code].

2. [Circuit breaker/circuit breaker] [Fuse/circuit breaker] combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end use equipment along with the statement "Caution - Series Rated System. [__] Amps Available. Identical Replacement Component Required".

3. All circuit breakers with permanent trip units shall be UL Listed for reverse connection without restrictive line and load markings and be suitable for mounting in any position.

K. Surge Protective Device

1. Surge protection devices shall comply with [Section 26 43 13 Surge Protective Devices for Power Circuits][Section 16280 – Surge Protective Devices].

2. Surge protective devices shall be electrically connected to each phase bus of the panelboard, and should be installed close to the main incoming lugs or circuit breaker.

2.4 PANELBOARD ENCLOSURES

A. Type 1 Boxes

1. Boxes shall be hot zinc dipped galvanized steel constructed in accordance with UL 50 requirements. Unpainted galvannealed steel is not acceptable.

2. Boxes shall have removable blank end walls and interior mounting studs. Interior support bracket shall be provided for ease of interior installation.

3. Standard enclosure widths shall be [26”][32”][42”][44”].

B. Type 1 Trim Fronts

1. Trim front steel shall meet strength and rigidity requirements per UL 50 standards. Shall have an ANSI 49 medium gray enamel electrodeposited over cleaned phosphatized steel.

2. Trim front shall be [4-piece surface] [4-piece with door] [hinged 1-piece with door] available in [flush] [surface] mount. Trim front door shall have rounded corners and edges free of burrs. A clear plastic directory cardholder shall be mounted on the inside of the door.

3. Locks shall be cylindrical tumbler type with larger enclosures requiring sliding vault locks with 3-point latching. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock.

C. Type 3R, 5, and 12

1. Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.

2.5 INTERNAL SMART CELL [- NOT USED]

A. Metering

1. Meter shall be made available within the panelboard, buss connected and without the use of any box extension.

2. Meter shall be able to connect externally with a data connection to monitoring software or be utilized as a stand-alone meter.

3. Meter shall be able to communicate over all the following, Modbus RTU, Modbus TCP/IP, BACnet MS/TP, BACnet/IP, HTTP (Web access)

B. Circuit Breaker Communications

1. A smart cell data connection shall be provided to each breaker for monitoring breaker status and metering information. Data protocol shall be Modbus RTU or Modbus TCP/IP.

2. When using Modbus TCP/IP breaker data shall be accessible via a Web browser. Historical information, breaker status, breaker metering and maintenance data shall be made available on the Web browser. Device shall have the capability to email breaker alarms and send breaker alarms to smart phone application.

C. Circuit Breaker Control

1. The smart cell shall be provided input/output modules to connect to a breaker motor operator provided as shown on the Panel Schedule or Drawings for remote circuit breaker control. Remote control shall be possible through connection to data communications port of the smart cell.

D. Energy Reduction Maintenance Setting Switch (ERMS)

1. An ERMS switch shall be made available mounted internally to the panelboard for breakers requiring ERMS per NFPA70 National Electric Code.

2. Shall provide a Modbus TCP/IP connection to the ERMS breaker. Breaker data connection shall be available for connection to external monitoring software. Shall also provide a web page providing historical information, breaker status, breaker metering and maintenance data. Device shall be capable of sending breaker alarms via email and smart phone application.

2.6 ELECTRICAL POWER MANAGEMENT SYSTEM [- NOT USED]

A. The equipment specified herein shall provide the necessary communications connectivity and functionality required to support the functionality of an Electrical Power Management System (EPMS). This shall include, but not be limited, to the following:

1. Communications connectivity using the specified Ethernet network and protocols of the EPMS and related EPMS connected equipment necessary to provide functionality. Equipment may be connected through a communications gateway as shown or specified; otherwise Ethernet and protocol connectivity shall be provided within the equipment.

2. Compliance with Cyber security requirements.

3. Remote EPMS application functionality for equipment configuration[and operational control]; electrical power monitoring; power quality monitoring, compliance and correction; and alarm monitoring with event log.

4. Refer to the Electrical Power Management System specification section for additional requirements.

B. Native EPMS software compatibility shall be fully factory-tested, and shall include the following characteristics.

1. Capability for pre-engineered, interactive graphical display screens to view and analyze real-time device data.

2. Pre-mapping of registers to standard measurement names without the need for additional configuration or internal device registers.

3. Automatic collection and logging of device data by EPMS software without additional configuration.

PART 3 - EXECUTION

3.1 GENERAL

A. In addition to the requirements specified herein, execution shall be in accordance with the requirements of Specification Section [26 00 10][16010] and Drawings.

B. Examine equipment exterior and interior prior to installation. Report any damage and do not install any equipment that is structurally, moisture, or mildew damaged.

C. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

D. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

E. Install equipment in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the Drawings.

F. Functional testing, commissioning, and first parameter adjusting shall be carried out by a factory trained manufacturer's representative field service engineer. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment. Report to the Engineer any discrepancies or issues with the installation.

G. Provide final protection and maintain conditions in a manner acceptable to the manufacturer that shall help ensure that the equipment is without damage at time of Substantial Completion.

3.2 INSTALLATION

A. Install panelboards in accordance with manufacture's written instructions, NEMA PB 1.1 and NEC Standards.

B. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.

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

D. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

END OF SECTION [26 24 16.23][16447]

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