

SECTION 26 24 16 PANELBOARDS

PART 1 - GENERAL

1.1 SCOPE

- A. The requirements of the Contract, Division 26 applies to work in this section. Panelboards as Specified and as shown on the contract drawings shall be furnished and installed by the Contractor.

1.2 RELATED DOCUMENTS

- A. ***[Related Sections include the following:***
 - 1. ***Section 26 28 16 01 - Enclosed Switches and Circuit Breakers***
 - 2. ***Section 26 43 13 – Surge Protection Devices***
 - 3. ***Section 26 08 00 - Commissioning of Electrical Systems]***

1.3 SUBMITTALS

- A. The manufacturer shall provide the following information for review and evaluation by the Engineer:
 - 1. Shop Drawings showing circuit breaker or fusible switch layout, dimensions, voltage, phasing, continuous current capacity, and short circuit rating.
- B. Manufacturer shall provide final, as- built drawings, recording the actual circuiting of panels. Installation, Operation and Maintenance manuals shall be supplied.

1.4 RELATED STANDARDS

- A. The panelboards and circuit protection devices shall be manufactured and tested according to the latest applicable standards of the following agencies:
 - 1. UL 50 and UL50E, Enclosures and Electrical Equipment
 - 2. UL 67, Panelboards
 - 3. UL 489, Molded Case Circuit Breakers and Circuit Breaker Enclosures
 - 4. UL 943, Ground Fault Circuit Interrupters
 - 5. NEMA PB1, Panelboards
 - 6. ANSI/NEMA PB1.1, General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or less.
 - 7. NEMA AB1, Molded Case Circuit Breakers and Molded Case Switches
 - 8. Federal Spec W-P 115, Rev. C, Panel, Power Distribution
 - 9. NEMA KS1, Enclosed and Miscellaneous Distribution Equipment Switches (600V)
- B. ***[Manufacturer Seismic Qualification: The low voltage panelboard(s) shall meet and be certified to seismic requirements specified in the [IBC 2015 International Building Code] [CBC 2013 California Building Code] [ASCE American Society of Civil Engineers 7-10].***
 - 1. ***The low voltage panelboard(s) shall be compliant with IBC 2012 parameters:***
 - a. ***Building Occupancy Category (as defined in Table 1.1 from ASCE 7-10): [I] [II] [III] [IV]***
 - b. ***Seismic Design Category: [A] [B] [C] [D] [E] [F]***
 - c. ***Site Class: [A – Hard Rock] [B - Rock] [C – Very dense soil and soft rock] [D – Stiff soil profile] [E – Soft Soil Profile] [F – Soil vulnerable to potential failure or collapse under seismic loading] as defined in IBC 2015 Table 1613.5.2 Site Class Definitions***
 - d. ***Ip – Importance Factor: [1.5 – Components must function after an earthquake for life safety purposes (Building Occupancy Code IV)] [1.25 - Buildings and structures that represent a substantial hazard to human life in the event of failure or that can cause substantial economic impact or mass disruption of***

day-to-day civilian life (Building Occupancy Code III)] [1.0 – Non-essential buildings. Function not life critical. (Building Occupancy Code I and II)]

- e. *Ss – Mapped Spectral Accelerations for Short Periods at 0.2 seconds – 270%g.*
 - f. *Sds – 5% Damped Design Spectral Response Accelerations for Short Periods at 0.2 seconds – 1.80.*
 - g. *z/h – Height factor ratio: [] Note: Ratio is a calculated value equal to the floor the gear is installed on divided by 12. A 6th floor installation is a 0.5 value. A basement or ground floor installation is a 0.0 value.*
2. *Equipment shall be designed to be located in a concrete and steel, moment-resisting frame building not exceeding 12 stories in height with a minimum story height of 10 feet.]*

1.5 QUALITY ASSURANCE

- A. The panelboard shall be produced by a company that also manufactures circuit breakers and fusible switches.
- B. Manufacturer shall have produced similar electrical equipment for a minimum period of 10 years.
- C. Products shall be listed by Underwriters Laboratories, Inc.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Handle and store equipment in accordance with manufacturer's Installation and Maintenance Manuals. One (1) copy of this document to be provided with the equipment at time of shipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The panelboards shall be P-Series panelboards manufactured by Siemens or pre-approved equal. Approved manufacturers are as follows:
 - 1. SIEMENS
 - 2. []

2.2 COMPONENTS

- A. Panelboards shall be as shown on the drawings. Refer to drawings for details regarding location of components, voltage and current rating of devices and other required details. *[Panels suitable for use as Service Entrance given compliance with NEC shall be marked accordingly. Barriers shall be included in service entrance panels on line side lugs to prevent inadvertent contact to live circuit parts.]*
- B. Lighting And Power Distribution Panels (Standard)
 - 1. Furnish Siemens Industry Lighting Panelboards, Type P1.
 - 2. NEMA PB 1, circuit breaker type.
 - a. Standard Lighting and Power Distribution
 - 1.) Main Lug Panels to be rated *[125A] [250A] [400A] [as indicated on the drawings]*. Main lugs shall be either removable or lay-in style construction for panels up to 250 amps to facilitate connections.
 - 2.) Main circuit breaker panels to be rated *[100A] [125A] [225A] [250A] [400A] [as indicated on the drawings]*.
 - 3. *[Standard lighting and power distribution panels (P1) shall be field convertible from Main Lug to Main Breaker with no increase in panel height. Field- addable mains, bus connected sub-feed breaker or feed-thru lug kits shall also be available, without utilizing any branch circuit space.]*

4. ***[Interior shall be changeable from top to bottom feed and vice-versa, while maintaining readability of dead- front labeling on standard lighting and power distribution panels.]***
- C. Lighting and Power Distribution (Custom) for applications requiring bus connected RC switches, split bus, special bussing size or material, special wire connectors and other than standard size enclosures or voltages or systems.
1. Furnish Siemens Industry Series Lighting Panelboards, Type P2.
 2. NEMA PB 1, circuit breaker type.
 - a. Custom Lighting and Power Distribution
 - 1.) Main Lug Panels to be rated ***[125A] [250A] [400A] [600A] [as indicated on the drawings].***
 - 2.) Main Circuit Breaker panels to be rated ***[100A] [125A] [225A] [250A] [400A] [600A] [as indicated on the drawings].***
- D. Distribution Panels
1. Furnish Siemens Industry Series Distribution Panelboards, Type P3, P4 and P5.
 2. NEMA PB 1, circuit breaker or fusible switch type.
 - a. Distribution Panels
 - 1.) Main lug panels shall be rated ***[250A] [400A] [600A] [800A] [1000A] [1200A] [as indicated on the drawings].***
 - 2.) Main breaker panels shall be rated ***[250A] [400A] [600A] [800A] [1200A] [as indicated on the drawings].***
 - 3.) Main switch shall be rated ***[200A] [400A] [600A] [800A] [1200A] [as indicated on the drawings]*** with branch breakers less than or equal to 1200 amps, fusible switches less than or equal to 1200A.
- E. Bussing
1. ***[Aluminum] [Copper]*** sized in accordance with UL 67 standards for temperature rise.
- F. Ground Bars
1. ***[A non-insulated] [An insulated] [An aluminum] [A copper]*** equipment ground bar shall be provided.
- G. Neutrals
1. ***[Neutral bussing shall have a lug for each outgoing branch requiring a neutral connection; P1, P3, P4 and P5 load side neutral connection lugs to be split with each side taking 50% of load neutral connections. [200 % neutrals shall be field upgradeable up to 400 amps on standard lighting and power distribution panels (P1) and provided for panels designated on drawings.]]***
- H. Enclosure
1. Boxes shall be fabricated from galvanized, galvaneal steel or protected against corrosion per the requirements of NEMA 250, UL 50 and UL50E. Box or panel interior shall have adjustable screws to provide easy alignment for flush mounted applications. Removable end walls to be ***[blank] [with KO's on boxes 20"W by 5.75"D].***
 2. Surfaces of the trim shall be properly cleaned and painted gray ANSI 61.
- I. Trims
1. Trims for Lighting and Power distribution shall be ***[surface] [flush] [as indicated on the drawings].*** It shall be fabricated from steel, painted with an ANSI-61 light gray finish and equipped with concealed hinges, flush lock and circuit directory cardholder. P1, P2 and P3 trim shall have two separate supports designed to engage the box flange to stabilize and secure the trim during installation. ***[Trim screws to be located behind the lockable door for tamper resistance.] [The trim shall be hinged to the box.] [The trim shall be door in door].***
 2. Trims for Distribution Panels shall be ***[surface] [flush] [as indicated on the drawings].*** It shall be fabricated from steel, painted with an ANSI-61 light gray finish. ***[Trim screws***

to be located behind the lockable door for tamper resistance.] [The trim shall be hinged to the box.] [The trim shall be door in door].

J. Circuit Breakers

1. Molded case circuit breakers shall be bolt-on devices. Short circuit rating shall be amperes symmetrical based on *[the lowest rating on any circuit breaker installed in the panel] [an integrated equipment short circuit rating]* and as shown on the drawings, but not less than 10kaic at 240 VAC or 14kaic at 480 VAC. Molded case circuit breaker shall be of the quick-make, quick-break, trip-free, *[thermal magnetic] [solid state]* type. Breakers shall be Siemens 3VA, Sentron or other Siemens approved designs. *[Solid state breaker trip functions shall include adjustments for continuous amperage, long time pickup and delay, instantaneous, [short time pickup and delay,] [ground fault pickup and delay,] [zone selective interlocking for short time and ground fault].]* Breaker ratings shall be as shown on the drawings.
2. Molded case circuit breakers shall be thermal-magnetic, quick-make, quick-break, trip free. Multi-pole breakers shall be common trip.
3. Provide circuit breaker accessories as indicated on the drawings or panel schedules.
4. Provide SWD rated breakers for all lighting branch circuits and UL Listed Type HACR for all air conditioning equipment branch breakers.
5. *[Install a bolt-on, listed combination type arc-fault circuit interrupter (AFCI) where shown on the drawings. The AFCI shall be installed on 120-volt, single phase, 15- and 20-ampere branch circuits to provide protection to the branch circuit supplying outlets installed in [dwelling units per NEC 2008] [dwelling unit bedrooms per NEC 2005] [as noted on the drawings]. The AFCI shall have two indicating lights, for Arc Fault and Ground. The breaker shall keep, in non-volatile memory, the last trip for up to 30 days. The memory shall be able to be reset. The breaker shall have a Test button.]*
6. *[Siemens Molded case, solid state circuit breakers shall utilize a micro-processor solid-state trip unit. Ampere ratings shall cover a continuous current range from 40 through 1200 amps.] [All breakers shall have an interrupting rating of not less than [] amperes RMS symmetrical at the system voltage, or as indicated on the drawings.]*
7. *[Sentron Current Limiting circuit breakers shall provide inverse time delay, instantaneous circuit protection and also limit the I2t to a value less than the I2t of the one-half cycle wave of the symmetrical prospective current without fusible elements.] [All breakers shall have an interrupting rating of not less than [] amperes RMS symmetrical at the system voltage, or as indicated on the drawings.]*
8. *[Fusible switches shall be quick-make, quick-break units utilizing the double-break principle of circuit interruption to minimize arcing and pitting and shall conform to the ratings shown on the plans. Each switch shall have an individual door over the front, equipped with a voidable interlock that prevents the door from being opened when the switch is in the "ON" position, unless the interlock is purposely defeated by activation of the voiding mechanism.]*
9. *[All switches have externally operated handles. Switches shall be equipped with NEC standard, Class R rejection type fuse holder[] H, [] K1, [] K5, [] RK1, [] RK5, [] T fuses of ampere rating and type as indicated on the plans suitable for application on a system with [] ampere symmetrical available fault current.]*
10. *[The circuit breaker shall have a Dynamic Arc Flash Sentry. The main breaker will allow the installer to set two different short time and instantaneous settings into one breaker. One set of settings will be set for standard operating mode and the second settings, with instantaneous protection shall be set for arc flash mode.] [The switchboard shall be outfitted with a 24 VDC power supply, Sm@rt DAS controller, annunciator panel with flashing light. The arc flash mode shall be actuated by a [keyed switch] [The breakers with frames rated 1200 amps or larger*

shall be equipped with Sm@rt Dynamic Arc Flash Sentry to comply with NEC 2014 240.87.]]

- K. **[Metering Equipment NOTE: P1 panels do not have a meter option. PAC 3100 and PAC 3200 are available in P2 – P5 panels. SEM3 is available in P2, P4 and P5 only. PAC 4200, 9410 are available in P4 and P5 only.**
1. **[Provide a multi-function, high accuracy digital power metering instrumentation module equipped with LCD display. NOTE: This is standard all meters except SEM3. For SEM3 a display is optional.] The power metering module shall provide simultaneous measurements for current, voltage and power parameters. Power meter shall be Siemens type [PAC 3100] [PAC 3200] [SEM3] [PAC4200] [9410] equipped with a communications port for standard RS-485 connection. The panel shall be extended at the [top] [bottom] to accommodate the meter.]**
- L. **[Surge Protection Device**
1. **Where indicated on drawings, a SPD - Surge Protection Device shall be installed with a [P1, P2, P3 direct bus connection] [P4, P5 external connection factory wired to the main bus] for low clamping and without utilizing any circuit breaker positions. It shall be listed or recognized in accordance with UL 1283 and 1449. Designed and tested in accordance with ANSI/IEEE C62.45 and C62.41.**
 - a. **Surge capacity shall be [100kA] [150kA] [200kA] [250kA] [300kA] per phase Lighting Panelboards, Type [P1] [P2]. Surge Capacity shall be 100kA [150kA] [200kA] [250kA] [300kA] per phase for Distribution Panelboards, Type [P3] [P4] [P5]. EMI/RFI filtering shall be Active Tracking up to –50 db from 100 kHz to 100 MHz. Less than ½ nanosecond response time. Operating Frequency 47-63 Hz. Operating Temperature –40C to +65C.**
 - b. **Field-addable, bolt-on connection, into existing P1 lighting panels.**
 - c. **Factory installed SPD units shall be available for mounting in unit space in distribution panels type P4 and P5.**
 - d. **5 year warranty**
 - e. **LED indicators for immediate status monitoring.**
 - f. **Audible alarm with silencing switch and test button.]**
- M. **[ARC FLASH [DELETE ONE OR BOTH OF THE FOLLOWING SENTENCES ON ARC FLASH]**
1. **[Apply in the field, the factory supplied arc flash warning label to all panelboards that are in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized to warn qualified persons of potential electrical arc flash hazards.]**
 2. **[Provide a complete arc flash study of the entire electrical system from the point of incoming service to all panelboards. Labels shall be applied that include the arc flash boundary in feet, hazard category and a list of appropriate PPE.]]**

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install per manufacturer's recommendations and contract documents.
- B. Install units plumb, level and rigid without distortion

3.2 ADJUSTMENTS AND CLEANING

- A. Remove debris from panelboards and wipe dust and dirt from all components.
- B. Repaint marred and scratched surfaces with touch up paint to match original finish.

3.3 TESTING

- A. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacture's recommendations.
- B. Check all installed panels for proper grounding, fastening and alignment.

3.4 WARRANTY

- A. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

END OF SECTION