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In an effort to minimize the cost of process industry facilities, this Practice has been prepared from the technical requirements in the existing standards of major industrial users, contractors, or standards organizations. By harmonizing these technical requirements into a single set of Practices, administrative, application, and engineering costs to both the purchaser and the manufacturer should be reduced. While this Practice is expected to incorporate the majority of requirements of most users, individual applications may involve requirements that will be appended to and take precedence over this Practice. Determinations concerning fitness for purpose and particular matters or application of the Practice to particular project or engineering situations should not be made solely on information contained in these materials. The use of trade names from time to time should not be viewed as an expression of preference but rather recognized as normal usage in the trade. Other brands having the same specifications are equally correct and may be substituted for those named. All Practices or guidelines are intended to be consistent with applicable laws and regulations including OSHA requirements. To the extent these Practices or guidelines should conflict with OSHA or other applicable laws or regulations, such laws or regulations must be followed. Consult an appropriate professional before applying or acting on any material contained in or suggested by the Practice.

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Data Form
ELSSG11-D – Data Sheet for Electrical Power Center
1. **Scope**

This Practice describes the requirements for the design, materials fabrication, inspection, testing, and shipping of power centers for housing electrical equipment.

2. **References**

Applicable parts of the following Practices, industry codes and standards, and references shall be considered an integral part of this Practice. The edition in effect on the date of contract award shall be used, except as otherwise noted. Short titles are used herein where appropriate.

2.1 **Process Industry Practices (PIP)**
- PIP ELSSG11-D - *Data Sheet for Electrical Power Center*
- PIP STC01015 - *Structural Design Criteria*

2.2 **Industry Codes and Standards**
- **American Society for Testing Materials (ASTM)**
  - ASTM A36/A36M - *Standard Specification for Carbon Structural Steel*
  - ASTM A90/A90M - *Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings*
  - ASTM A653/A653M - *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*
  - ASTM B117 - *Standard Practice for Operating Salt Spray (Fog) Apparatus*
  - ASTM D714 - *Standard Test Method for Evaluating Degree of Blistering of Paints*
  - ASTM D1654 - *Standard Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments*
  - ASTM D2244 - *Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates*
  - ASTM E84 - *Standard Test Method for Surface Burning Characteristics of Building Materials*
- **Institute of Electrical and Electronics Engineers (IEEE)**
  - IEEE C37.100.1 - *IEEE Standard of Common Requirements for High Voltage Power Switchgear Rated Above 1000V*
- **National Fire Protection Association (NFPA)**
  - NFPA 1 - *Fire Code*
  - NFPA 70 - *National Electrical Code (NEC)*
  - NFPA 101 - *Life Safety Code*
  - NFPA 220 - *Standard on Type of Building Construction*
  - NFPA 255 - *Standard Method of Test of Surface Burning Characteristics of Building Materials*
  - NFPA 496 - *Standard for Purged and Pressurized Enclosures for Electrical Equipment*
2.3 Government Regulations

Federal Standards and Instructions of the Occupational Safety and Health Administration (OSHA), including any additional requirements by state or local agencies that have jurisdiction where the electrical work is to occur, shall apply.

- OSHA 1910, Subpart D - Walking-Working Surfaces

3. Definitions

owner: The party who owns the facility wherein the Electrical Power Center will be used.

purchaser: The party who awards the contract to the supplier. The purchaser may be the owner or the owner’s authorized agent.

supplier: The party responsible for furnishing and/or installing the electrical power center.

4. Requirements

4.1 Design and Fabrication

4.1.1 General

4.1.1.1 The power center shall include installed lighting, receptacles, switches, transformers, power panels, HVAC system, doors, hardware, wiring, and other components required for a complete unit.

4.1.1.2 The power center shall be capable of accommodating the specified electrical equipment, which may include any of the following:
   a. Medium- and low-voltage switchgear
   b. Medium- and low-voltage motor control centers
   c. Medium- and low-voltage adjustable speed drives
   d. UPS systems, transfer switches
   e. Other electrical distribution and control equipment

4.1.1.3 The specific requirements of electrical equipment installed within the power center (such as switchgear, motor control centers, etc.) shall be covered by separate practices.

4.1.1.4 If specified on purchaser’s PIP ELSSG11-D Data Sheet, the building shall be constructed in accordance with NFPA 220.

4.1.1.5 The building shall be constructed to withstand blast if specified on purchaser’s PIP ELSSG11-D Data Sheet.

4.1.2 Design Criteria

4.1.2.1 All interior power center materials, including finish, insulation, and acoustical treatments, shall have a maximum flame spread index of 25 or less in accordance with NFPA 255. The materials shall be tested in accordance with ASTM E84.
4.1.2.2 The power center shall be designed to comply with the minimum wind, snow, and seismic loading requirements of *PIP ELSSG11-D Data Sheet*.

### 4.1.3 Fabrication Criteria

4.1.3.1 Unless otherwise specified on the purchaser’s *PIP ELSSG11-D Data Sheet*, all structural bolts and fasteners shall be corrosion resistant and suitable for harsh environments such as Grade 8 electroplated or stainless steel.

4.1.3.2 All external nonstructural bolts, fasteners, and power center hardware shall be Type 300 series stainless steel.

4.1.3.3 All equipment shall be securely bolted or welded to the power center.

4.1.3.4 Equipment mounted on the power center walls or ceiling shall typically be installed on strut or other supports that have been securely attached to the structure by bolting or welding.

4.1.3.5 The enclosure shall be in accordance with the rain test performance requirements of *IEEE C37.100.1*. Documentation shall be provided that shows that the enclosure design is in accordance with the rain test performance requirements.

4.1.3.6 Supports for conduit, tray, and duct shall be provided as part of the power center design.

4.1.3.7 All openings into the power center shall be sealed to provide a weather-tight seal from outside elements.

4.1.3.8 Holes in the floor or in the exterior walls used for device or fixture mounting shall be adequately sealed to prevent corrosion from moisture intrusion. Wall/ceiling penetration(s) should be kept to a minimum.

### 4.1.4 Layout

4.1.4.1 Unless otherwise indicated on the purchaser’s *PIP ELSSG11-D Data Sheet*, a layout drawing showing equipment layout and dimensions, door locations, 120-volt power receptacles, telephone outlets, and power center size will be provided by the purchaser.

4.1.4.2 Maximum dimensions (length, width, height) of shipping splits of power center shall be in accordance with local transportation codes for the mode of transportation.

4.1.4.3 Inside height of ceiling to finished floor shall be a minimum of 9 ft, 6 inches (2.9 m) or as indicated on the layout drawing.

4.1.4.4 Working and egress space around equipment shall be in accordance with the equipment manufacturer’s recommendations but shall not be less than required by the *NEC*.

4.1.4.5 Sufficient aisle space shall be provided to allow for removal of equipment.
4.1.4.6 Requirements of *NFPA 101* shall be used when laying out equipment and doors.

4.1.4.7 Provision for future extension shall be as indicated on the layout drawing.

## 4.1.5 Structural Loading

4.1.5.1 The design shall meet all load combinations.

4.1.5.2 As a minimum, the structural steel base shall be designed to support an equally distributed load of 250 psf plus the building superstructure load.

4.1.5.3 The structural steel base shall be designed to withstand all shipping and erection loads in addition to normal dead and live loads.

4.1.5.4 Structural steel for the base of the power center shall be in accordance with *ASTM A36*.

4.1.5.5 Structural steel members shall be rigidly braced with structural steel cross-members for installation on a concrete slab or piers by others in accordance with the purchaser’s PIP ELSSG11-D Data Sheet. If indicated on the purchaser’s PIP ELSSG11-D Data Sheet, the base shall be fabricated of hot dipped galvanized structural steel beams, with welds to be cold galvanized during final base fabrication.

4.1.5.6 Maximum base deflection shall be L/240.

4.1.5.7 The floor shall be designed for a 1/4-inch (6.4 mm) maximum deflection on a 10-ft (3 m) span if moving removable equipment elements.

4.1.5.8 Assembled power center or each shipping assembly with all equipment installed shall be designed for a maximum four-point bottom lift for assemblies shorter than 40 ft (12.2 m). For assemblies 40 to 75 ft (12.2 to 22.9 m) long, design shall be for a maximum six-point lift. For assemblies longer than 75 ft (22.9 m), design shall be for a maximum eight-point lift.

4.1.5.9 Lifting eyes shall be removable.

4.1.5.10 Spreader bar for lifting the complete power center shall be provided along with sketch and calculations if specified on the purchaser’s PIP ELSSG11-D Data Sheet.

4.1.5.11 The bearing surfaces of the lifting eyes, spreader bar, and other required lifting means shall be free from sharp edges.

4.1.5.12 The base shall have provisions for anchoring the building. Anchor bolt pattern, size, and projection with support loading and locations shall be provided on drawings.

4.1.5.13 The building shall be designed to withstand, without damage, deformation, or leakage, wind and seismic loads in accordance with *PIP STC01015* and *ASCE/SEI 7* for location of installation.
4.1.5.14 The building shall be dust-tight and weatherproof, and shall not leak during exposure to wind or driven rain.

4.1.5.15 Supplier shall be responsible for building design and equipment installation in accordance with building loads and seismic conditions for location of installation.

4.1.6 Roof

4.1.6.1 Unless otherwise specified on the purchaser’s *PIP ELSSG11-D* Data Sheet, roof panels shall be minimum 18-gauge steel in accordance with *ASTM A653/A653M* with the galvanized coating in accordance with *ASTM A90/A90M*.

4.1.6.2 Minimum yield strength of roof panel material shall be 36,000 psi (248,211 kPa).

4.1.6.3 Roof joints (if present) shall be of standing seam construction with a cap over the seam or interlocking panel design.

4.1.6.4 Roof panels shall be supplied in a single continuous length from eave line to ridge line and shall be designed to tightly interlock so that fasteners are not required at intermediate points along the panel side laps.

4.1.6.5 Unless otherwise specified on the purchaser’s *PIP ELSSG11-D* Data Sheet, the power center roof shall be sloped 1/4 inch per ft (21 mm per m) nominal and shall be designed to carry a load of 50 lb per square ft (244.25 kg per square m), and the point load weight of a 250 pound (113.4 kg) person who may be anywhere on the roof during construction and maintenance periods.

4.1.6.6 The roof shall not drain on any side that has a personnel entry doorway. If it drains over an entry, gutters or a canopy shall be provided.

4.1.6.7 If specified on the purchaser’s *PIP ELSSG11-D* Data Sheet, gutters and down spouts shall be provided.

4.1.7 Doors, Rain Canopy, and Exit Signs

4.1.7.1 A minimum of two 36-inch (914 mm) wide gasketed doors, one at each end of the power center, shall be provided and located to facilitate egress and to prevent entrapment of personnel. Alternate door layouts are permissible as shown on the building layout drawing (see section 4.1.4), if minimum criteria mentioned above is met.

4.1.7.2 All doors shall open outward with a minimum swing of 105 degrees.

4.1.7.3 Doors shall be made from 14-gauge steel at a minimum. Each door shall be pre-assembled into a welded steel frame. Hinges shall be type 304 or 316 stainless steel, 10 gauge minimum, with 0.25 inch (6.4 mm) diameter fixed pin. A minimum of three 4 inch (10.2 mm) by 4 inch (10.2 mm) ball bearing type hinges shall be used and the hinge leaves shall be mounted such that they are perpendicular to the face of the door when it is closed.
4.1.7.4 Doors shall be insulated and made of double-wall construction with integral frame.

4.1.7.5 All doors shall be flush at the top to prevent water entry.

4.1.7.6 Inside panic hardware designed to override all locks, key lock, door closer, and stay hinge shall be provided.

4.1.7.7 If indicated on the purchaser’s PIP ELSSG11-D Data Sheet, common keyed locks shall be provided on all doors. A minimum of five keys shall be provided with each power center. If indicated on the purchaser’s PIP ELSSG11-D Data Sheet, the power center door locks shall be keyed to match other locks on the site.

4.1.7.8 Door closer hardware shall be pneumatic or hydraulic and shall be capable of holding the door in the fully open position and capable of closing the door for pressurized space.

4.1.7.9 All equipment-loading door openings shall be a minimum of 36 inches (914 mm) wide by 96 inches (2.44 m) high. The 96-inch (2.44 m) height can include removable transom panel and standard height door.

4.1.7.10 Equipment-loading doors shall be of adequate size to remove or install largest equipment section in the power center.

4.1.7.11 If specified on the purchaser’s PIP ELSSG11-D Data Sheet, doors shall be provided with fire-rated glazing or wire-glass vision panel in the top half of the door.

4.1.7.12 Weather shields, with a minimum of 2.5 inches (64 mm) overhang, shall be provided over all equipment access doors.

4.1.7.13 If specified on the purchaser’s PIP ELSSG11-D Data Sheet, a rain canopy shall be provided over each personnel entry door. The rain canopy shall extend a minimum of 36 inches (914 mm) from the structure and extend 6 inches (152 mm) on each side of the door opening.

4.1.7.14 Weather shields and rain canopies shall be compatible with building exterior material.

4.1.7.15 Engraved or lighted exit signs shall be provided on or on top of each door at a conspicuous location.

4.1.7.16 Any opening likely to be confused with a door, such as equipment access panels for future equipment, shall be clearly marked with a sign reading, “Not an Exit.”

4.1.8 Access Panels and Cable Entry

4.1.8.1 Outside equipment access panels behind equipment shall be provided if shown on the layout drawing.

a. Panels shall be capable of being opened with equipment in place.

b. Panels shall be insulated, weatherproof and gasketed, full-height and hinged.
c. Panels shall have a three-point latching mechanism with padlockable handle.

d. Panels shall be 11-gauge steel at a minimum.

4.1.8.2 If indicated on the layout drawing, side entrance metal framed bulkhead openings or other purchaser-approved methods shall be provided by the supplier. Entry plates shall be removable and minimum 3/16-inch (4.8 mm) galvanized steel plate. Threaded bolts shall be the means of attachment of the plates to the structural framing.

4.1.8.3 If bottom entrance is indicated on the layout drawing for cable entry, removable nonferrous metal plates shall be provided to facilitate drilling for conduit and cable openings. Conduit entry plates to cover the openings shall be provided and constructed of 3/16-inch (4.8 mm) thick aluminum plate bolted to the floor by means of threaded bolt holes in the floor plate. Neoprene gaskets shall be attached to the removable plates.

4.1.9 Stairs and Platforms

4.1.9.1 Access stairs and platforms with integral handrails for each exterior door shall be provided if specified on the purchaser’s PIP ELSSG11-D Data Sheet.

4.1.9.2 Treads shall be minimum No. 11-gauge galvanized steel with open grip grating.

4.1.9.3 The step unit shall have an 8-inch (203 mm) maximum rise and 11-inch (279 mm) minimum depth treads and a 36-inch (914 mm) minimum width.

4.1.9.4 Removable handrails shall be provided on platforms and on both sides of the stairs and shall be in accordance with all OSHA 1910, Subpart D requirements.

4.1.9.5 Platform at each door shall be of sufficient dimensions to allow full opening of doors and a minimum 28-inch-wide (711 mm-wide) clearance between door and handrails with door open.

4.1.10 Ceiling

Unless otherwise specified on the purchaser’s PIP ELSSG11-D Data Sheet, the metal ceiling system shall consist of panels of 16-gauge minimum, interlocked formed galvanized steel in accordance with ASTM A653/A653M, and the galvanized coating shall be in accordance with ASTM A90/M90.

4.1.11 Walls

4.1.11.1 Unless otherwise specified on the purchaser’s PIP ELSSG11-D Data Sheet, outer wall panels shall be minimum 18-gauge galvanized steel in accordance with ASTM A653/A653M and the galvanized coating (1-1/4 ounces) in accordance with ASTM A90/M90.

4.1.11.2 Unless otherwise specified on the purchaser’s PIP ELSSG11-D Data Sheet, inner wall panels shall be fabricated of 16-gauge minimum, interlocked or overlapped, formed galvanized steel.
4.1.13.1 Power center shall be insulated for the climatic conditions shown on the purchaser’s PIP ELSSG11-D Data Sheet.

4.1.13.2 Unless otherwise specified on the purchaser’s PIP ELSSG11-D Data Sheet, roof and sides shall have a minimum insulation effective R value of 11.

4.1.13.3 Insulation shall have minimum flame spread as noted in Section 4.1.2.1.

4.1.13.4 Roof insulation shall be secured between the roof and ceiling panels.

4.1.14 Heating, Ventilation, and Air-Conditioning (HVAC)

4.1.14.1 HVAC system shall be heavy-duty industrial grade suitable for installation according to the electrical area classification.

4.1.14.2 If the purchaser’s PIP ELSSG11-D Data Sheet indicates power center installation in an electrically classified area, the power center shall be pressurized in accordance with NFPA 496 to result in a nonclassified inside environment. If specified on purchaser’s PIP ELSSG11-D Data Sheet, owner requirements for special hydrocarbon detectors, pressure switches with alarm contacts, power supply to the pressurization system, and other special requirements shall be specified under other requirements. If specified on purchaser’s PIP ELSSG11-D Data Sheet, a chemical filtration system shall be installed on the air intake as additional protection against H2S or other identified contaminants that are capable of attacking copper and electrical components.

4.1.14.3 Unless otherwise specified on the purchaser’s PIP ELSSG11-D Data Sheet, the HVAC system shall consist of a wall-mounted unit design thermostatically controlled from within the power center.

4.1.14.4 Redundancy of HVAC units shall be in accordance with the purchaser’s PIP ELSSG11-D Data Sheet.

4.1.14.5 The power center shall be essentially airtight design, and the HVAC system shall provide a 0.1 inch (2.5 mm) of water inside pressure to prevent entry of dust-laden air and contaminants. A separate pressurization system shall be considered to meet this requirement.
4.1.14.6 Supporting calculations to determine heating and air-conditioning loads shall be furnished by the supplier.

4.1.14.7 The HVAC system shall be capable of maintaining a temperature of 80°F (27°C) at the maximum ambient temperature in accordance with the purchaser’s PIP ELSSG11-D Data Sheet.

4.1.14.8 The heater shall be able to maintain a temperature of 65°F (18°C) (or 70°F [21°C] if batteries are installed) at the minimum ambient temperature in accordance with the purchaser’s PIP ELSSG11-D Data Sheet.

4.1.14.9 The basis for calculating heat load shall take into consideration all equipment load losses, equipment by supplier, and all defined spare and future space(s).

4.1.14.10 An enclosed safety disconnect switch with provisions for padlock in “OFF” position, approved for the area classification, shall be provided on or mounted adjacent to outdoor unit(s). For nonclassified areas, a NEMA 3R enclosure shall be used. Source of power shall be identified on the disconnect switch.

4.1.14.11 If specified on the purchaser’s PIP ELSSG11-D Data Sheet, one form C contact shall be provided to activate an alarm if interior temperature exceeds 90°F (32°C).

4.1.14.12 The ventilation system shall maintain hydrogen concentration from batteries to less than 1% by volume with one unit operating in accordance with NFPA 1.

4.1.14.13 The hydrogen emission from batteries shall be calculated on the basis of equalizing charge into fully charged batteries at the maximum ambient temperature specified in the purchaser’s PIP ELSSG11-D Data Sheet. All calculations shall be supplied to the purchaser.

4.1.14.14 Replaceable filters shall be accessible from within the power center.

4.1.14.15 Alarm contacts for loss of pressurization and HVAC common trouble shall be provided. Building pressurization alarm shall be provided with an adjustable time delay.

4.1.14.16 If specified on the purchaser’s PIP ELSSG11-D Data Sheet, HVAC coils shall have a corrosion protection coating applied.

4.1.15 Electrical Accessories

4.1.15.1 General

1. Supply voltage for lighting, receptacles, and equipment accessories shall be in accordance with the purchaser’s PIP ELSSG11-D Data Sheet.

2. Lighting panelboards shall be constructed as follows:

   a. A minimum of one lighting panelboard shall be provided with integral main breaker, bolt-on, industrial-type branch circuit breakers, neutral bus, and ground bus.
b. Branch circuit breaker sizes shall be determined by the power center loads. All branch circuit breakers shall be a minimum 20 amp with provision for padlocking in “OFF” position.

c. A minimum of one circuit shall be provided for lighting, one for receptacles and one each for equipment space heaters and motor space heaters; one for HVAC if required from each panelboard; and a minimum of four spare circuits on each panelboard for purchaser’s use.

d. Lighting, receptacles, and HVAC units shall be split between two panelboards if multiple panelboards are provided.

e. A typed circuit directory shall be provided on the inside of the panelboard door.

f. If specified on the purchaser’s PIP ELSSG11-D Data Sheet, additional lighting panelboards shall be provided.

3. If specified on the purchaser’s PIP ELSSG11-D Data Sheet, dry-type transformer(s) shall be provided to supply the lighting panelboard(s).

a. The transformer shall be solidly grounded, dry-type with two 2-1/2% taps above and below normal primary voltage.

b. The transformer shall be grounded in accordance with the NEC.

c. Dry-type transformers shall be rated based on 80°C (176°F) rise above ambient at full load and 220°C (428°F) rated insulation.

4. Wiring shall be installed as follows:

a. The power center shall be furnished completely, and all interconnecting wiring shall be installed and connected before shipping.

b. Wiring shall be 600 volt, stranded copper, minimum 12 AWG.

c. All wiring shall be installed in surface-mounted metal conduit or cable trays.

d. Each interconnecting wire shall be identified by sleeve-type wire markers at each end.

e. Wire identification shall match the supplier’s interconnection drawings.

f. Interconnecting wiring across shipping splits shall not be allowed to be spliced at terminal blocks at the shipping split unless otherwise specified on the purchaser’s PIP ELSSG11-D Data Sheet.

5. Unless otherwise specified on the purchaser’s PIP ELSSG11-D Data Sheet, cable tray, if used, shall be ladder type with 9-inch (229 mm) rung spacing, aluminum. Cable tray shall be bonded to building ground. Unless otherwise specified on the purchaser’s PIP ELSSG11-D Data Sheet, all cable trays and other raceway
inside the building shall include space for the identified future loads plus 20% additional space.

6. All wiring methods, raceways, and cable systems shall be in accordance with the NEC.

4.1.15.2 Convenience Receptacles, 120 Volt

1. All exterior convenience receptacles shall be UL Class A GFCI receptacles. Interior receptacles shall be general purpose unless otherwise specified on the purchaser’s PIP ELSSG11-D Data Sheet.

2. A minimum of two receptacles shall be provided inside and two receptacles outside the electrical power center.

3. Receptacles shall be wired to the power center lighting panelboard.

4. Inside the power center, the receptacles shall be spaced every 10 ft (3 m) if possible.

5. Outside receptacles shall be provided with weatherproof covers and shall be near each door.

6. Exterior receptacles shall be approved for the area electrical classification specified on the purchaser’s PIP ELSSG11-D Data Sheet.

4.1.15.3 Lighting

1. Interior Lighting

   a. The power center shall be furnished complete with integrally protected, industrial-type lighting fixtures, and an industrial grade three-way switch at each personnel door on the nonhinged side of the door as specified on purchaser’s PIP ELSSG11-D Data Sheet.

   b. The illumination level, minimum maintained foot-candles, shall be 30 foot-candles (fc) at the floor level with 50 fc on the vertical face of each equipment line-up.

2. Egress Lighting

   a. Unless otherwise specified on the purchaser’s PIP ELSSG11-D Data Sheet, the power center shall be furnished complete with self-contained, battery-operated lighting.

   b. The lighting system shall provide immediate light (for at least 90 minutes) upon failure of the normal power source and shall switch off automatically when power is restored. Fixtures shall be of the self diagnostic type.

   c. Lamps shall be used as specified on the purchaser’s PIP ELSSG11-D Data Sheet.

   d. The lighting system shall be connected to a dedicated non-GFCI receptacle adjacent to the fixture and supplied from the lighting circuit for that area.
3. Exterior Lighting
   a. The power center shall be furnished completely with factory-installed, light fixtures in accordance with the purchaser’s PIP ELSSG11-D Data Sheet.
   b. Fixtures shall be provided with integral photo control and shall be adjacent to each doorway and connected to the power center lighting panelboards.
   c. Exterior lighting shall be enclosed and gasketed with globe and guard and shall be suitable for the area electrical classification specified in the purchaser’s PIP ELSSG11-D Data Sheet.

4.1.15.4 Grounding and Bonding
   1. System and equipment grounding and bonding shall be in accordance with NEC Article 250.
   2. An interior grounding loop as specified in the purchaser’s PIP ELSSG11-D Data Sheet shall be provided and connected to the exterior ground pads.
   3. All exposed noncurrent-carrying metal parts including power center additions, such as steps, etc., shall be electrically bonded to the power center grounding loop.
   4. The grounding system shall provide system and equipment grounding for all electrical equipment and the power center frame.
   5. Each equipment assembly ground bus shall be connected at each end to the power center grounding loop.
   6. As specified on the purchaser’s PIP ELSSG11-D Data Sheet, NEMA standard copper or stainless steel four-hole ground pads shall be at each corner or opposite corners of the exterior of the power center.

4.1.16 Safety Accessories
   4.1.16.1 A minimum of two fire extinguishers (one by each exit door), carbon dioxide Type C for energized electrical equipment, 10-lb (4.54-kg) capacity, hand-carry, with hanging bracket, hose, hose nozzle, and hand-squeeze valve control shall be provided in accordance with the purchaser’s PIP ELSSG11-D Data Sheet.
   4.1.16.2 A smoke alarm with a dry contact output for remote alarm indication shall be provided.

4.1.17 Coatings
   4.1.17.1 All structural framing members shall be cleaned to nearly white metal. The use of chemical or solvent cleaning of structural steel shall not be permitted by the power center manufacturer.
   4.1.17.2 After cleaning, one shop coat of epoxy primer (3.0 mils minimum dry thickness) shall be applied.
4.1.17.3 Floor surface shall be finished with a durable, scuff-resistant, non-skid epoxy or enamel coating.

4.1.17.4 All power center seams outside the power center shall be sealed with 25-year silicon sealant to preclude crevice corrosion and to ensure the environmental integrity of the power center against blowing rain, dust/dirt, or sand.

4.1.17.5 All interior and exterior exposed metal surfaces shall receive factory paint coats to meet or exceed 2,000 hours of salt spray testing in accordance with ASTM B117 and evaluated in accordance with ASTM D1654 and ASTM D714.

4.1.17.6 Interior and exterior color coating design shall meet the following performance standards after 10 years continuous exposure in normal atmospheric conditions:

1. Panels shall show no evidence of blistering, peeling, or chipping.
2. Panels shall show no surface chalking.
3. Panels, after cleaning, shall show no color change in excess of seven units when measured in accordance with the ASTM D2244 standard.

4.1.17.7 Unless otherwise specified on the purchaser’s PIP ELSSG11-D Data Sheet, exterior wall panels and trim shall be painted white.

4.1.17.8 All structural members under the flooring shall be coated with an additional 20 to 25 mils of bitumastic or equivalent undercoating to eliminate base rusting and subsequent potential corrosion.

4.1.17.9 Two 1-quart (0.94-L) cans of touch-up paint shall be supplied per equipment assembly for each color used.

4.1.18 Labeling and Tagging

4.1.18.1 The power center and all equipment shall be tagged.

1. Power center tag shall be made of laminated plastic, with black lettering, ¼ inch (6.4 mm) minimum height, on white background and permanently attached to each piece of equipment.

2. Equipment labels shall be installed with stainless steel hardware.

3. Device markers and shrink sleeve wire markers shall be provided at both ends to identify all circuits and equipment.

4.1.18.2 Nameplates shall be provided for panelboards, annunciator panels, dry-type transformers, specialty equipment, all other equipment and accessories, and exterior access panels not otherwise covered by the equipment specifications. The power center manufacturer shall create a nameplate schedule for review and approval of the Owner’s Engineer. Nameplate schedule shall show nameplate background and letter color, physical size, font size and engraving.

4.1.18.3 Lighting fixtures, receptacles, HVAC, and other electrical equipment shall be identified with power source (panel name and circuit number).
4.1.19 Battery Installation

4.1.19.1 If flooded-cell batteries are installed in the power center, a stainless steel drip pan shall be installed under the battery rack.

4.1.19.2 Floor, walls, and any metal work within 3 ft (914 mm) of the battery rack shall be stainless steel or coated with acid resistant paint.

4.1.19.3 Battery rack shall be secured to the wall or floor.

4.1.19.4 A self-contained eyewash station shall be provided for flooded-cell installations.

4.1.19.5 A clear plastic safety cover shall be provided for exposed battery installations. The cover shall be easy to remove to allow for battery testing.

4.2 Inspection and Testing

4.2.1 All tests and inspections shall be conducted that are necessary to determine that all equipment and wiring is installed in accordance with this Practice and is in satisfactory condition to be energized. All test results shall be documented and submitted to the purchaser for record.

4.2.2 All equipment shall be inspected for compliance with all parts of this Practice.

4.2.2.1 The supplier’s inspection and testing guide shall be used to test the entire assembly (wired power center).

4.2.2.2 The supplier’s inspection and testing guide shall be submitted to the purchaser for approval.

4.2.2.3 In addition to testing required by individual equipment specifications, a functional test shall be performed to ensure proper operation of all auxiliaries, devices and components.

4.2.3 Unless otherwise specified on the purchaser’s PIP ELSSG11-D Data Sheet, the purchaser shall witness all production and functional tests. A 2-week notice shall be given to the purchaser for required inspection and testing date to meet shipment deadlines.

4.2.4 If specified on the purchaser’s PIP ELSSG11-D Data Sheet, a water spray test shall be performed for 24 hours.

4.3 Shipping

4.3.1 Preparation for shipment shall be in accordance with supplier’s standards unless otherwise noted in the job specifications.

4.3.2 The supplier shall be solely responsible for the preparation for shipment.

4.3.3 Loose equipment, such as auxiliary test devices, charts, replacement parts, manual operating handles, packing devices, etc., shall be appropriately packaged, tagged for easy identification, and secured for shipment inside the power center.

4.3.4 Moving parts shall be securely blocked and braced in relays, contactors, and other components in which these moving parts might be damaged during shipment. Blocking shall be identified (tagged) for removal.
4.3.5 Additional shipping and handling requirements that appear in the individual equipment specifications shall be strictly followed, if applicable.

4.3.6 If the power center is shipped in more than one section, each open shipping split shall be protected with plywood or other purchaser approved method.

4.4 Documentation

4.4.1 Documentation Content

4.4.1.1 Documentation of the type and quantity shown in Table 1 and the purchaser’s PIP ELSSG11-D Data Sheet shall be provided.

4.4.1.2 One reproducible set of drawings and the specified number of copies of all documentation and operating manuals as indicated on the purchaser’s PIP ELSSG11-D Data Sheet shall be provided.

4.4.1.3 Unless otherwise specified on the purchaser’s PIP ELSSG11-D Data Sheet format for reproducible drawings shall be CAD convertible .dwg electronic format.

4.4.1.4 All engineering data provided for the equipment shall represent the actual equipment specified and ordered.

4.4.1.5 Generic drawings shall not be acceptable unless the drawings are revised to show only the equipment being furnished.

4.4.1.6 Approval drawings (documents listed in column B of Table 1) shall be provided and approved by purchaser before start of manufacturing.

4.4.1.7 Final factory drawings and data (as listed in column D of Table 1), completed to purchaser’s satisfaction, shall be provided no later than 2 weeks after shipment of equipment.

4.4.1.8 The following drawings and details for building and support facilities shall be provided:

   a. Structural drawings shall include the following:

      1. Complete dimensions
      2. Arrangement
      3. Plan and elevation views
      4. Support locations and weight on each support
      5. Other details as required for civil/structural design for installation of the power center
      6. Conduit and bus duct entrance locations
      7. Lifting and jacking provisions
      8. Grounding connections
      9. Estimated weight of each piece of equipment
     10. Total weight of power center, including layout of floor beams
11. If specified on the purchaser’s PIP ELSSG11-D Data Sheet, stamped, certified structural and seismic calculations for the electrical power center.

12. Cutout, bulk heads and access panels drawings as required.

b. HVAC drawings shall include the following:
   1. If specified on the purchaser’s PIP ELSSG11-D Data Sheet, heat loss and gain calculations, pressurization calculations, and equipment selection calculations.
   2. Arrangement and plan.
   3. Elevation views.
   4. Purchased HVAC equipment cut sheets showing capacities and physical data.
   5. All maintenance, testing, and operations manuals.

c. Electrical drawings shall include schematics for lighting and power circuits.

Table 1. Documentation Requirements

<table>
<thead>
<tr>
<th>A With Bid</th>
<th>B For Review</th>
<th>C Final Certified</th>
<th>D As Built</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Detailed bill of materials</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>General layout of equipment, showing all dimensions, weights, locations, and outline drawings, showing the final assembled configuration</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Connection wiring diagrams, support locations, and weight on each support; and final assembled configuration and instructions for assembly of equipment and power center</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>Assembly, inspection, and testing guide</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Three-line and control schematic diagrams</td>
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<td>X</td>
<td></td>
<td></td>
<td></td>
<td>Certified test reports</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>Final as-built drawings</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>Recommended priced spare parts list</td>
</tr>
</tbody>
</table>

Notes:
A. These documents shall be provided with proposal.
B. These documents shall be provided for purchaser’s review and authorization to proceed before fabrication.
C. These documents shall be provided as part of the final certified document submittal.
   (1) Equipment shall be shipped with one set of installation, operation, and maintenance manuals.
   (2) Equipment shall be shipped with one complete set of drawings.
D. Final as-built drawings shall be provided within 2 weeks after shipment.
4.4.2 Conflict Resolution

Any conflicts between the following documents shall be identified to the purchaser in writing for resolution. If resolving conflicts, the following order of precedence shall apply:

a. One-line diagram(s)
b. *PIP ELSSG11-D* Data Sheet
c. This Practice, *PIP ELSSG11*
d. Referenced standards
**ASSOC. PIP ELSSG11**

**DATA SHEET**

**ELSSG11D-D**

**ELECTRICAL POWER CENTER**

**PAGE 1 OF 5**

**AUGUST 2017**

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**DOCUMENT NO.**

**ALTERNATE DOCUMENT NO.**

**ISSUED FOR:**

- [ ] PROPOSAL
- [ ] PURCHASE
- [ ] AS BUILT

**FACILITY NAME/LOCATION:**

**ITEM NAME:**

**PURCHASER/LOCATION:**

**ITEM TAG NO.:**

**JOB NO.:**

**SERVICE:**

**PURCHASER ORDER NO.:**

**UNIT:**

**SUPPLIER/LOCATION:**

**DWG. NO.:**

**SUPPLIER ORDER/SERIAL NOS.:**

**DATA PROVIDED BY:**

- [ ] PURCHASER
- [ ] SUPPLIER
- [ ] SUPPLIER IF NOT BY PURCHASER

**REFER TO PIP ELSSG11 FOR GENERAL REQUIREMENTS**

**APPLICABLE STATE AND LOCAL CODES:**

- [ ]

**SERVICE CONDITIONS:**

- **AMBIENT TEMPERATURE:**
  - MAX: ______ °C
  - MIN: ______ °C
  - HUMIDITY: ______ %

- **ALTITUDE:** ______ M
  - [ ] OTHER:

- **AREA CLASSIFICATION:**
  - [ ] NON-CLASSIFIED
  - [ ] CLASSIFIED

- **CLASS:** __________
  - **DIVISION:** __________
  - **GROUP:** __________
  - **AUTO IGNITION TEMP:** ______ °C

  - [ ] EXPOSED TO A MOIST/MODERATE CORROSIVE ENVIRONMENT
  - [ ] SITE ENVIRONMENTAL DATA SHEET ATTACHED
  - [ ] OTHER:

**DESIGN AND FABRICATION - GENERAL (4.1.1):**

- **FIRE RESISTANCE RATING (4.1.1.4):**
  - [ ] NONE
  - [ ] NFPA 220 TYPE I
  - [ ] NFPA 220 TYPE II
  - [ ] NFPA 220 TYPE III
  - [ ] OTHER:

- **BLAST RESISTANCE RATING (4.1.1.5):**
  - [ ] NONE
  - [ ] 20 PSF
  - [ ] 40 PSF
  - [ ] 80 PSF
  - [ ] OTHER:

**DESIGN CRITERIA (4.1.2):**

- **WIND, SNOW, & SEISMIC LOADING REQUIREMENTS (4.1.2.2):**
  - [ ] REQUIRED PER PIP STC01015, CVC01017, & CVC01018
  - [ ] NOT REQUIRED

  - **SITE LOCATION:** __________
  - **LATITUDE:** __________
  - **LONGITUDE:** __________

  - **SEISMIC CERTIFICATE:**
    - [ ] REQUIRED
    - [ ] NOT REQUIRED

  - [ ] OTHER:

---

**NO.**

**DATE**

**REVISION DESCRIPTION**

**BY**

**APPROVED**

---
BOLTS & FASTENERS (4.1.3.1): ☐ GRADE 8 ELECTROPLATED ☐ STAINLESS STEEL
☐ OTHER: 

LAYOUT DRAWING (4.1.4.1): ☒ FURNISHED BY PURCHASER ☐ FURNISHED BY SUPPLIER
☐ OTHER: 

STRUCTURAL STEEL MEMBERS (4.1.5.5)
☐ INSTALLED ON CONCRETE SLAB ☐ INSTALLED ON PIERS ☐ GALVANIZED BASE REQUIRED
☐ OTHER: 

SPREADER BAR FOR LIFTING (4.1.5.10): ☐ FURNISHED BY SUPPLIER ☐ FURNISHED BY OTHERS
☐ OTHER: 

ROOF PANELS (4.1.6.1): ☒ 18ga GALVANIZED STEEL ☐ 18ga ALUMINUM ☐ 18ga STAINLESS STEEL
☐ OTHER: 

ROOF SLOPE & LOADING (4.1.6.5): 
SLOPE: ☒ ¼' PER FOOT ☐ OTHER: 
LOADING: ☒ 50 PSF & 250 POINT LOAD ☐ OTHER: 

GUTTERS & DOWNSPOUTS (4.1.6.7): ☐ REQUIRED ☐ NOT REQUIRED
☐ MATERIAL: 

COMMON KEYED LOCKS (4.1.7.7): ☐ REQUIRED ☐ NOT REQUIRED
KEYED TO MATCH EXISTING SITE LOCKS: ☐ REQUIRED ☐ NOT REQUIRED
KEYED AS: 
☐ OTHER: 

DOORS (4.1.7.11): ☐ SOLID DOOR ☐ TOP HALF FIRE RATED GLAZING ☐ TOP HALF WIRE GLASS
☐ OTHER: 

RAIN CANOPY (4.1.7.13): ☐ REQUIRED ☐ NOT REQUIRED
☐ OTHER: 

EQUIPMENT ACCESS PANELS (4.1.5.1): ☐ REQUIRED ☐ NOT REQUIRED
☐ PER LAYOUT DRAWING ☐ OTHER: 

CABLE ENTRY (4.1.8.2 & 4.1.8.3): ☐ SIDE ENTRY ☐ BOTTOM ENTRY
☐ PER LAYOUT DRAWING ☐ OTHER: 

ACCESS PANELS & CABLE ENTRY (4.1.8):

STAIRS & PLATFORMS (4.1.9):
STAIRS & PLATFORMS: ☐ BY SUPPLIER ☐ BY OTHERS
☐ OTHER: 

ASSOC. PIP ELSSG11 DATA SHEET ELSSG11D-D ELECTRICAL POWER CENTER PAGE 2 OF 5 AUGUST 2017
<table>
<thead>
<tr>
<th>Section</th>
<th>Material Options</th>
<th>Required</th>
<th>Not Required</th>
<th>Other</th>
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<tr>
<td><strong>Ceiling (4.1.10):</strong></td>
<td>16ga Galvanized Steel</td>
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<tr>
<td></td>
<td>16ga Stainless Steel</td>
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<td></td>
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<tr>
<td></td>
<td>16ga Aluminum</td>
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<td><strong>Walls (4.1.11):</strong></td>
<td>Outer Wall (4.1.11.1):</td>
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<td>18ga Galvanized Steel</td>
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<td>18ga Aluminum</td>
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<td>Inner Wall (4.1.11.2):</td>
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<td>16ga Galvanized Steel</td>
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<td>16ga Aluminum</td>
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<td>Floor: R11</td>
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<td>Wall: R11</td>
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<td>Roof: R11</td>
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<td><strong>Heating, Ventilation, &amp; Air Conditioning (4.1.14):</strong></td>
<td>Pressurized to NFPA 496 (4.1.14.2):</td>
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<td>Chemical Filtration (4.1.14.2):</td>
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<td>HVAC Mounting (4.1.14.3):</td>
<td>X WALL</td>
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<td>HVAC Redundancy (4.1.14.4):</td>
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<td>Interior Temp Alarm (4.1.14.11):</td>
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<td>HVAC Coil Corrosion Protection (4.1.14.16):</td>
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<td><strong>Electrical Accessories (4.1.15):</strong></td>
<td>Power Supply by Supplier</td>
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<td>Power Supply by Purchaser</td>
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<td>120/240 Vac, 1PH, 3 W</td>
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<td>208Y/120 Vac, 3 PH, 4 W</td>
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<td>Additional Lighting Panel Boards (4.1.15.1.2.f):</td>
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<td>Dry Type Transformer(S) (4.1.15.1.3):</td>
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<td>Control Wiring</td>
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<td>Utility Wiring (Receptacles &amp; Lighting):</td>
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<tr>
<td></td>
<td>Other</td>
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</table>
**ELECTRICAL ACCESSORIES (4.1.15) (CONTINUED):**

- **CABLE TRAY (4.1.15.1.5):**
  - **X** ALUMINUM LADDER TYPE, 9 INCH RUNG SPACING
  - **OTHER:**

- **ADDITIONAL FUTURE SPACE:**
  - **X** 20%
  - **OTHER:**

- **INTERIOR RECEPTACLES (4.1.15.2.1):**
  - **X** GENERAL PURPOSE
  - **OTHER:**

- **INTERIOR LIGHTING (4.1.15.3.1):**
  - **LED**
  - **OTHER:**

- **EGRESS LIGHTING (4.1.15.3.2):**
  - **X** REQUIRED
  - **NOT REQUIRED**
  - **SELF CONTAINED BATTERY OPERATED**

- **EXTERIOR LIGHTING (4.1.15.3.3):**
  - **LED**
  - **OTHER:**

- **LOCATIONS REQUIRED:**
  - **AT EACH DOOR**
  - **OTHER:**

- **GROUNDING & BONDING (4.1.15.4):**
  - **MATERIAL:**
  - **SIZE:**

  - **GROUND PADS:**
    - **COPPER**
    - **STAINLESS STEEL**
    - **FOUR HOLE**
    - **TWO HOLE**

**SAFETY ACCESSORIES (4.1.16):**

- **FIRE EXTINGUISHER:**
  - **FURNISHED BY SUPPLIER**
  - **NOT FURNISHED BY SUPPLIER**

- **QUANTITY:**
- **TYPE:**
- **LOCATION:**

**COATINGS (4.1.17):**

- **EXTERIOR WALL COLOR:**
  - **X** WHITE
  - **OTHER:**

- **TRIM COLOR:**
  - **X** WHITE
  - **OTHER:**

- **INTERIOR WALL COLOR:**
  - **X** WHITE
  - **OTHER:**

- **TRIM COLOR:**
  - **X** WHITE
  - **OTHER:**

**BATTERY INSTALLATION (4.1.19):**

- **NOT FURNISHED BY SUPPLIER**
- **FURNISHED BY SUPPLIER**

- **TYPE:**
- **QUANTITY:**
- **SIZE:**

- **OTHER:**

**INSPECTION & TESTING (4.2):**

- **PURCHASER:**
  - **X** WITNESSED
  - **NOT WITNESSED**

- **SUPPLIER'S STANDARD TESTS:**
- **OTHER TESTS:**

- **PRE-SHIPMENT SHOP WITNESS INSPECTION:**
  - **REQUIRED**
  - **NOT REQUIRED**

- **WATER SPRAY TEST (4.2.4):**
  - **REQUIRED**
  - **NOT REQUIRED**

- **OTHER:**
DOCUMENTATION (4.4):

- Electronic Document Format: [ ] DWG  [x] PDF  [ ] OTHER: 
- Supplier to provide: 1 reproducible plus copies of all documents plus copies of operating manuals
- [ ] HVAC calculations
- [ ] Stamped structural calculations
- [ ] Stamped seismic calculations

OTHER REQUIREMENTS: