PROCESS INDUSTRY PRACTICES

COMPLETE REVISION
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Electrical

PIP ELSPS01
Electrical Requirements for Packaged Equipment

PURPOSE AND USE OF PROCESS INDUSTRY PRACTICES

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.

This Practice is subject to revision at any time.

PUBLISHING HISTORY

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ELSPS01-D - Electrical Requirements for Packaged Equipment

ELSPS01-V - Electrical Requirements for Packaged Equipment – Preferred Vendors and Components

1. Scope

This Practice describes the electrical requirements for design, manufacture, inspection, testing, and shipping of packaged equipment (also referred to as skid mounted equipment). Electrical systems for packaged equipment can include components such as electrical enclosures, motors, motor controllers, heaters, relays, controls and control panels, control stations, pilot devices, indicating lights, transformers, wires, and conduits.

This Practice does not address requirements for medium-voltage motor controllers, DC motors and controllers, substations, power control centers or instrumentation.

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 ELSPS01-D – *Purchaser's PIP ELSPS01-D Data Sheet for Electrical Requirements for Packaged Equipment*
- PIP ELSPS01-V – *Electrical Requirements for Packaged Equipment - Preferred Vendors and Components*

Unless otherwise specified on the *PIP ELSPS01-D* Data Sheet, the following referenced Practices apply.

- PIP ELEMT01 – *Guidelines for Selecting IEEE and API Standards for AC Motors 250 HP (185 kW) and Larger"*
- PIP ELSMT01 – *AC Squirrel Cage Induction Motors (4000 Volts and Below) Specification*
- PIP ELTFT01 – *New Electrical and Systems Field Inspection and Testing*
- PIP PCSPS001 – *Packaged Equipment Instrumentation Specification*
- PIP PCSPS010 – *Small, General Purpose Packaged Equipment Instrumentation Specification*
- PIP STC01015 – *Structural Design Criteria*

2.2 Industry Codes and Standards

- National Electrical Manufacturers Association (NEMA)
  - NEMA ICS 2 – *Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts*
  - NEMA 250 – *Enclosures for Electrical Equipment (1000 Volts Maximum)*
- National Fire Protection Association (NFPA)
  - NFPA 70 - *National Electrical Code* (NEC)
  - NFPA 496 - *Standard for Purged and Pressurized Enclosures for Electrical Equipment*

3. Definitions

owner: The party who owns the facility wherein the packaged equipment will be used

packaged equipment: An item or items of equipment, including ancillary and auxiliary devices, that normally requires engineering, assembly, piping, and interconnecting wiring. *Packaged equipment* can further be defined as having the following characteristics:

a. Can be stand-alone but is typically designed and built to enable or support a primary process

b. Is generally shop-built, structurally integrated, and transportable as a unit

c. Is capable of operation once integrated with the main process piping and utilities

d. Has a degree of operational complexity that may require a basic regulatory control system and an alarm/shutdown system that monitors and protects its own performance and safety

e. Employs a control system of sufficient complexity to require an engineered design

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

NRTL: Nationally Recognized Testing Laboratory

service conditions: Ambient and other conditions directly associated with the physical location of the packaged equipment

supplier: The party responsible for providing the completely assembled packaged equipment unit

4. Requirements

4.1 Service Conditions

4.1.1 Unless otherwise specified on the purchaser's *PIP ELSPS01-D* Data Sheet, equipment shall be designed to perform satisfactorily under the following ambient conditions:

a. Ambient condition within the limits of -30°C (-22°F) and 40°C (104°F)

b. Altitude of installation does not exceed 3300 feet (1000 m)

4.1.2 When specified on the purchaser's *PIP ELSPS01-D* Data Sheet, electrical components and their support to the site's structure shall meet the seismic design requirements of ASCE/SEI 7 for nonstructural components. Unless specified otherwise on the purchaser's *PIP ELSPS01-D* Data Sheet the following shall apply when seismic design is required:

a. Risk Category IV

b. Component Importance Factor (I_P) of 1.5

c. Site Class D

4.1.3 All equipment and enclosures shall be approved for installation in the area classification and in the environment specified on the purchaser's *PIP ELSPS01-D* Data Sheet.

4.2 General

4.2.1 All electrical components shall be labeled as suitable for use in the area classification specified on the purchaser's *PIP ELSPS01-D* Data Sheet.

4.2.2 All electrical equipment and installations shall be in accordance with applicable sections of the NFPA 70 (*NEC)*.

4.2.3 Component manufacturer shall be in accordance with the purchaser's preferred list *PIP ELSPS01-V* or owner Approved Manufacturer List (AML).

4.2.4 The supplier shall install and test all necessary interconnecting wiring between packaged unit devices before shipment. If shipping breaks are necessary, interconnecting wiring across such breaks shall be provided with identically marked terminal strips on both ends, coiled back on one side, clearly identified, and protected for shipment.

4.2.5 All equipment shall be rated for heavy-duty industrial service and manufactured to NEMA standards.

4.2.6 All electrical devices requiring external purchaser connections (except motor power leads and heater leads) shall be wired by supplier to terminal or junction boxes located near the periphery of the packaged equipment. All terminal and junction boxes shall be readily accessible.

4.2.7 Terminal blocks shall be permanently identified for purchaser's external connections and shall be fully rated for the voltage and ampere service involved.

4.2.8 The purchaser will furnish and install feeders directly to medium-voltage motors on the packaged equipment skid. The supplier shall provide an equipment layout that allows access to medium voltage motor feeders to motor terminal boxes. Medium-voltage power supply attributes, such as voltage, frequency, and fault current, are indicated on the purchaser's *PIP ELSPS01-D* Data Sheet.

4.2.9 The low voltage power supply attributes are indicated on the purchaser's *PIP ELSPS01-D* Data Sheet. One of the two options described below shall apply as indicated on the purchaser's *PIP ELSPS01-D* Data Sheet:

a. The purchaser supplies all motor controllers and heater contactors. The purchaser will furnish and install feeders directly to loads on the packaged equipment. The purchaser will also supply a single feeder to a power junction box provided by supplier and mounted near the periphery of the packaged equipment skid, from which the supplier shall derive all other single- and three-phase voltages required for other equipment on the skid.

b. All low voltage power distribution equipment provided by the supplier shall be rated for 600 V. The supplier supplies all motor controllers and heater contactors. The purchaser supplies a single, three-phase feeder to a power junction box provided by the supplier and mounted near the periphery of the packaged equipment skid. The supplier distributes power as necessary from