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.

© Process Industry Practices (PIP), Construction Industry Institute, The University of Texas at Austin, 3925 West Braker Lane (R4500), Austin, Texas 78759. PIP Member Companies and Subscribers may copy this Practice for their internal use. Changes or modifications of any kind are not permitted within any PIP Practice without the express written authorization of PIP. Authorized Users may attach addenda or overlays to clearly indicate modifications or exceptions to specific sections of PIP Practices. Authorized Users may provide their clients, suppliers and contractors with copies of the Practice solely for Authorized Users’ purposes. These purposes include but are not limited to the procurement process (e.g., as attachments to requests for quotation/purchase orders or requests for proposals/contracts) and preparation and issue of design engineering deliverables for use on a specific project by Authorized User’s client. PIP’s copyright notices must be clearly indicated and unequivocally incorporated in documents where an Authorized User desires to provide any third party with copies of the Practice.

PUBLISHING HISTORY

March 2000 Issued
October 2006 Complete Revision
October 2007 Editorial Revision
April 2013 Complete Revision
May 2018 Complete Revision

Not printed with State funds
Table of Contents

1. Scope .............................................. 2

2. References ...................................... 2
   2.1 Process Industry Practices .......... 2
   2.2 Industry Codes and Standards ...... 2

3. Definitions ..................................... 2

4. Requirements ................................. 3
   4.1 General ...................................... 3
   4.2 Enclosures .................................. 4
   4.3 Wireways .................................... 5
   4.4 Power Buses ................................ 6
   4.5 Grounding ................................... 7
   4.6 Incoming Line Section ............... 7
   4.7 Units ........................................ 8
   4.8 Combination Starters and
       Contactors .................................. 10
   4.9 Feeder Units ............................... 13
   4.10 Space Heaters ......................... 13
   4.11 Painting .................................... 14
   4.12 Nameplates ............................... 14
   4.13 Inspection and Testing ............ 15
   4.14 Shipping .................................... 15
   4.15 Documentation ......................... 15
   4.16 Conflict Resolution ................... 16
1. **Scope**

This Practice describes the requirements for the design, fabrication, inspection, testing, and shipping of factory-assembled 600 V motor control centers. It includes requirements for buses, enclosures, motor starters, fused switches, and circuit breakers. All equipment described in this Practice is suitable for use in dry, non-classified areas or in outdoor enclosures. Panelboards and adjustable speed drives are outside the scope of this Practice.

2. **References**

Applicable parts of the following Practices and industry codes and standards 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 ELSSG12 - *Design and Fabrication of Outdoor Enclosures for Motor Controllers and Switchgear*

2.2 **Industry Codes and Standards**

- American Society of Civil Engineers
  - ASCE/SEI 7 - *Minimum Design Loads for Building and Other Structures*
- Institute of Electrical and Electronics Engineers (IEEE)
  - IEEE C37.20.7 - *IEEE Guide for Testing Metal-Enclosed Switchgear Rated up to 38kV for Internal Arcing Faults*
- National Electrical Manufacturers Association (NEMA)
  - NEMA ICS 18 - *Motor Control Centers*
  - NEMA ICS 2 - *Industrial Control and System Controllers, Contactors and Overload Relays Rated 600 Volts*
- National Fire Protection Association (NFPA)
  - NFPA 70 - *National Electrical Code* (NEC)
- Underwriters Laboratories (UL)
  - UL 845 - *Motor Control Centers*

3. **Definitions**

- **arc resistant**: Equipment designed to withstand the effects of an internal arcing fault, as indicated by meeting test requirements of IEEE C37.20.7
- **spare**: Space occupied by a unused starter, feeder, or other device
- **space**: A space specified and equipped to accept a future unit
- **intelligent motor control center**: A motor control center (MCC) with digital communication and control capability
internal arcing fault: An unintentional discharge of electrical energy in air within the confines of an electrical equipment enclosure

motor control center (MCC): An assembly of one or more enclosed sections having common power buses and principally containing motor control units

owner: The party that owns the facility where the equipment will be used or installed

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 providing the equipment

unit: A single combination motor-controller, feeder-tap assembly, or similar removable plug-in or bolt-in assembly (bucket)

unusable unit space: A space not suitable to accept a future unit

4. Requirements

4.1 General

4.1.1 MCCs shall be in accordance with NEMA ICS 18 and UL 845.

4.1.2 Equipment shall be designed to perform satisfactorily under the following conditions unless otherwise indicated on the purchaser’s PIP ELSMC13D Data Sheet:

   a. Ambient conditions within the limits of 0°C (32°F) and 40°C (104°F)
   b. Altitude of installation not greater than 3300 ft (1000 m)
   c. Humidity up to 95% non-condensing

4.1.3 Supplier shall clearly state during proposal any derating factors required to meet the service conditions of Section 4.1.2 or as indicated on the purchaser’s PIP ELSMC13D Data Sheet.

4.1.4 If specified on the purchaser’s PIP ELSMC13D 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 otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet the following shall apply if seismic design is required:

   a. Risk Category IV
   b. Component Importance Factor (IP) of 1.5
   c. Site Class D

4.1.5 The unit wiring shall be Class I, Type B, in accordance with NEMA ICS 18, unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet. Wiring shall be stranded copper with 600 V, flame retardant insulation rated 90°C. Control wiring shall be #14 AWG minimum. Power wiring shall be #12 AWG minimum.
4.1.6 The temperature rise of bus joints and splices shall not exceed a 65°C rise above a 40°C ambient temperature.

4.1.7 The complete assembly and its components shall be suitable for continuous rated load current and available fault current.

4.1.8 Unless otherwise specified on purchaser’s PIP ELSMC13D Data Sheet, each compartment shall be a minimum of 6 inches high. Load wiring to each device shall be directly from the wireway, not from an adjacent compartment.

4.1.9 Purchaser shall indicate the quantity and type of MCC units along with the number of spaces and spares on purchaser’s one line or load summary. Supplier shall indicate any unusable unit spaces on general layout drawings submitted with proposal.

4.1.10 Purchaser shall furnish supplier with requirements for auxiliary control and metering devices such as incoming metering, pilot lights, controls, push buttons, etc., if required.

4.1.11 All unpainted parts and hardware shall be plated for corrosion resistance or shall be stainless steel.

4.1.12 The MCC shall be Nationally Recognized Testing Laboratory (NRTL) listed and labeled as specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.1.13 Units that contain multiple starters, switches, or breakers with a single access door are not permitted.

4.1.14 If specified on purchaser’s PIP ELSMC13D Data Sheet, the MCC shall be arc resistant by meeting the testing requirements of IEEE C37.20.7. Arc resistant rating shall not be dependent on including an instantaneous trip on incoming circuit breaker.

4.2 Enclosures

4.2.1 Main Enclosure

4.2.1.1 The enclosure shall be NEMA 1A gasketed, unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet. If outdoor weatherproof enclosures are specified on the purchaser’s PIP ELSMC13D Data Sheet, outdoor enclosures shall be in accordance with PIP ELSSG12.

4.2.1.2 The enclosure shall be constructed of minimum 14 gauge metal thickness reinforced with formed structural members to resist warping.

4.2.1.3 The assembly shall be furnished with a removable lifting support.

4.2.1.4 Provisions shall be made for adding future sections as specified on the purchaser’s PIP ELSMC13D Data Sheet. Removable cover plates shall be provided for future bus extension without interfering with cables or conduits entering wireway.

4.2.1.5 Integral base support angles (sills) shall be provided on the front and rear of the vertical section(s) and shall have holes to allow bolting to the floor.
4.2.1.6 Unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet, the MCC shall contain only front-mounted units with rear-bolted cover.

4.2.1.7 If back-to-back configuration is specified on the purchaser’s PIP ELSMC13D Data Sheet, double vertical buses shall be required, with the same phase configuration for the front and back sections.

4.2.1.8 All components and wiring connections shall be accessible in the front of the unit.

4.2.1.9 If specified on the purchaser’s PIP ELSMC13D Data Sheet, enclosure and/or equipment doors shall include approved “viewer ports” to allow infrared scanning of the equipment without opening the equipment. If required, purchaser shall provide a detailed description of viewer port locations and quantities.

4.2.2 Doors and Covers

All doors and covers shall be flanged or otherwise constructed to form a sturdy, rigid construction for operation of circuit breaker or motor protection device handle and latch fastening.

4.3 Wireways

4.3.1 General

4.3.1.1 All metal edges in wireways shall be constructed to prevent damage to wire insulation.

4.3.1.2 Wireways shall be suitable for wiring from top or bottom entry.

4.3.1.3 Vertical and horizontal wireways shall have separate access.

4.3.1.4 Construction of the horizontal and vertical wireways shall provide isolation from energized parts.

4.3.1.5 No accessories such as terminal strips shall be installed in wireways except for ports necessary for network communication.

4.3.2 Vertical Wireways

4.3.2.1 Unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet, vertical wireways shall be a minimum of 4 inches (150 mm) wide and full depth of the units.

4.3.2.2 Where main circuit breaker, main fused switch, large starters, or special large units are installed without vertical wireways, all smaller load units in the same vertical section shall be provided with vertical wireways to interconnect with the horizontal wireways.

4.3.2.3 Means for supporting cables every 12 inches (300 mm) shall be provided.

4.3.2.4 Vertical wireway shall run the complete height of the units and shall consist of no more than two individual doors for each vertical section.

4.3.2.5 All vertical wireways shall have a fixed metal barrier with openings for wire passage between the wireway and the unit. The wire passageway
shall protect the wiring from damage by grommeting or other equivalent means.

4.3.3 Horizontal Wireways

4.3.3.1 Unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet, continuous, 6-inch minimum height horizontal top and bottom wireways shall be provided.

4.3.3.2 Top wireway top cover shall be removable for drilling for conduit and other access.

4.3.4 Wire and Cable Bending Space

4.3.4.1 All wire-bending space for manufacturer-installed wiring shall be in accordance with the requirements of UL 845.

4.3.4.2 Space available for installation of field wiring sized up to the larger of the maximum current rating of the unit or the cable size shown on the One Line Diagram(s) shall be in accordance with minimum cable bending radius requirements of the NFPA 70.

4.4 Power Buses

4.4.1 General

4.4.1.1 Power bus bracing shall be as specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.4.1.2 Holes for all bolted electrical connections shall be no larger than necessary for proper insertion of bolts.

4.4.1.3 Bus shall have enough exposure to permit the insertion of a plug-in unit.

4.4.1.4 Barriers shall be provided to separate the bus compartment from wiring space at top, bottom, and sides of each section.

4.4.1.5 Barriers shall be adequate to prevent accidental contact and to restrict propagation of unit-originated arc into the bus compartment.

4.4.1.6 Vertical and horizontal bus material shall be copper, unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.4.1.7 Bus plating, whether joints only or entire bus, shall be as specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.4.1.8 All bolted splice connections shall be easily accessible for installation and inspections.

4.4.1.9 Labels indicating bolt torque requirements shall be attached to the inside of bus covers.

4.4.2 Horizontal Power Bus

4.4.2.1 Horizontal power bus and splice bars ampacity shall be as specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.4.2.2 Bus shall be pre-drilled for extension on each end, without the need for additional bus supports or bracing.
4.4.2.3 Unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet, horizontal power bus shall be continuously covered with fluidized bed epoxy insulating material.

4.4.3 Vertical Power Bus

4.4.3.1 Vertical power bus and splice bars ampacity shall be as specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.4.3.2 The plug-in unit stabs and the vertical power bus at the stab location shall be lubricated with an anti-seizing compound. Lubricant shall be kept off insulating surfaces.

4.4.3.3 Vertical power bus shall be isolated.

4.4.3.4 Automatic shutters shall be provided to cover plug-in stab openings when units are removed.

4.5 Grounding

4.5.1 General

4.5.1.1 Units shall be individually grounded.

4.5.1.2 Resistance between the unit enclosure and the equipment grounding bus shall not be greater than 0.005 ohm.

4.5.1.3 Compartment doors shall also be bonded to the enclosure with a bonding jumper.

4.5.2 Horizontal Ground Bus

4.5.2.1 Horizontal ground bus shall be copper and shall have provisions for future extension.

4.5.2.2 Ground bus shall be uniform and continuous across the entire length of the MCC.

4.5.2.3 Ground bus shall be sized and located in top and/or bottom of the MCC as specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.5.3 Vertical Ground Bus

4.5.3.1 A bare copper vertical ground bus shall be provided, unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.5.3.2 Vertical ground bus shall be bolted to the horizontal ground bus in each section.

4.5.3.3 If the MCC has a vertical ground bus, each withdrawable unit shall make a wiping-action slide connection to the vertical bus. The ground connection shall “make” before the line stabs are engaged and shall “break” after the line stabs are disengaged.

4.6 Incoming Line Section

4.6.1 Provision shall be made for connecting incoming lines from above or below to the main bus or main disconnect device as specified on the purchaser’s PIP ELSMC13D Data Sheet.
4.6.2 Rigid bus shall be used to connect the incoming lugs or main disconnect device to the main horizontal bus in an incoming section.

4.6.3 Supplier shall provide NEMA drilling and hole spacing (9/16-inch hole by 1-3/4-inch spacing) for two-hole lugs purchaser-supplied or provide full ring compression two-hole lugs if specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.6.4 If supplier is required to provide termination lugs, supplier shall provide purchaser with the lug type and installation specifications.

4.6.5 No horizontal wireway shall be permitted to pass through an incoming line compartment.

4.6.6 Attachment points for lugs shall be braced to withstand, without distortion, any torque imposed by the incoming line cables.

4.6.7 If a main circuit breaker or fused disconnect is specified on the purchaser’s PIP ELSMC13D Data Sheet, it shall conform to the one-line diagram.

4.6.8 If specified on the purchaser’s PIP ELSMC13D Data Sheet, provisions shall be made for metering as specified.

4.7 Units

4.7.1 General

4.7.1.1 External control power and wiring shall enter the units from the side.

4.7.1.2 Fixed-connection units shall be connected to the bus with cable and shall have two-hole compression connectors and lock-washers. Connection shall be suitable for bus thermal properties.

4.7.1.3 The conductor between the incoming line stab and the unit disconnect device shall be fully rated based on the disconnect or starter maximum current rating, without exceeding the allowable temperature rise of the conductor or components.

4.7.1.4 Line side conducting parts that remain energized if the unit disconnect is “Off” shall be covered with a barrier or otherwise protected from accidental contact with fingers or tools.

4.7.1.5 Internal assembly fastening methods shall be as specified by the device manufacturer (torque on screws, bolts, etc.).

4.7.1.6 All wiring shall be marked on each end with permanently embossed wire markers of the heat-shrinkable or slip-on type. Wrap-around, adhesive, and rigid snap-on markers are not acceptable.

4.7.2 Arrangement

4.7.2.1 Terminal strips and fuse holders shall be located for safe and unobstructed access.

4.7.2.2 Load and control wiring from unit to raceway shall be removable without de-energizing units above or below.
4.7.3 Plug-In
4.7.3.1 Self-aligning plug-in unit stab construction shall be provided to ensure positive electrical and mechanical contact to the bus under all load and rated fault conditions. All stabs shall be tin plated unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.7.3.2 If specified on the purchaser’s PIP ELSMC13D Data Sheet, provision for removal of the unit stabs from the power bus with the unit door closed shall be provided with positive indication of position.

4.7.3.3 Installation or removal of plug-in units shall not expose personnel to energized components.

4.7.4 Termination
4.7.4.1 Terminals shall not encroach on the vertical wireway.

4.7.4.2 Terminals accessible to wireways shall be protected or isolated to prevent accidental contact while altering wiring to other compartments.

4.7.4.3 Manufacturer’s manuals shall include torque requirements for connections.

4.7.4.4 Units rated over 100 amperes shall be supplied with load terminations that consist of flat drilled tabs or bus ends suitable for connection of standard two hole compression lugs. If specified on the purchaser’s PIP ELSMC13D Data Sheet, the supplier shall provide termination lugs and the supplier shall provide purchaser with the lug type and installation specifications.

4.7.4.5 NEMA standard drilling and hole spacing shall be provided for terminations.

4.7.4.6 If specified on the purchaser’s PIP ELSMC13D Data Sheet, terminals shall be finger-safe (IP20 or equivalent).

4.7.5 Safety Interlocks
4.7.5.1 The safety interlock provided shall allow the compartment door to be opened with the unit disconnect handle in the “On” position. The safety interlock shall be designed to allow access with a tool without interrupting power.

4.7.5.2 Each plug-in unit shall be equipped with a mechanical safety interlock that prevents connecting or disconnecting to the vertical bus with the unit’s disconnect handle in the “On” position.

4.7.6 Unit Disconnect Operating Handles
4.7.6.1 The operating handle shall clearly indicate whether the disconnect is in the “On” or “Off” position.

4.7.6.2 Operating handles for breakers used as a disconnect shall be:
   a. Self-indicating in the “Tripped” position
   b. Predominantly up or left (if side mounted) for “On”
   c. Predominantly down or right (if side mounted) for “Off”
   d. In accordance with the height requirements of NFPA 70-2017, Article 404.8(A)
4.7.6.3 Operating handles shall accept a minimum of three standard padlocks, any one of which can lock the handle in the “Off” position only.

4.8 Combination Starters and Contactors

4.8.1 General

4.8.1.1 The motor starters shall be designed and rated in accordance with NEMA ICS 2, full voltage, combination type, using a thermal magnetic circuit breaker, magnetic-only circuit breaker, or current-limiting fused switch combined with a magnetic air or vacuum contactor as specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.8.1.2 If specified on the purchaser’s PIP ELSMC13D Data Sheet, starters NEMA Size 4 and above shall be vacuum-break contactors.

4.8.1.3 Unless otherwise stated on the purchaser’s PIP ELSMC13D Data Sheet, starter units size 5 and up shall be the bolt-in type.

4.8.1.4 Line side wiring shall be protected from mechanical or electrical damage.

4.8.1.5 Thermal-magnetic circuit breakers, magnetic-only breakers, and fused switch assemblies shall be capable of interrupting fault current equivalent to the bus bracing specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.8.1.6 The minimum size starter shall be NEMA Size 1.

4.8.1.7 The continuous current rating of each starter or contactor assembly shall be based on the maximum NEMA horsepower or breaker rating or switch rating.

4.8.2 Control Power Transformer or Control Power Supply

4.8.2.1 Each individual combination starter shall include a 480 V to 120 V control power transformer, unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.8.2.2 Control power transformer continuous rating shall be supplier’s standard, unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.8.2.3 All ungrounded primary and secondary leads shall be fused in accordance with NFPA 70 - 2017, Table 450.3(B).

4.8.2.4 Primary fuses shall be current-limiting type with a current interrupting rating not less than 100,000 amperes.

4.8.2.5 The control power transformer (CPT) shall have one secondary terminal grounded to the unit frame.

4.8.2.6 If specified on the purchaser’s PIP ELSMC13D Data Sheet, 24 volt DC control power shall be used. If redundant power supplies are specified they shall be wired in parallel with blocking diodes connected to DC output circuit.
4.8.3 Control Circuit

4.8.3.1 Starters requiring control power at line voltage shall be provided with a fuse block and a 600 V, Class “CC” current-limiting fuse in each control circuit conductor connected to an ungrounded phase conductor.

4.8.3.2 Control power terminal blocks shall be “pull-apart” type located within the starter unit unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.8.3.3 If specified on the purchaser’s PIP ELSMC13D Data Sheet, each contactor coil shall be equipped with a surge suppression device for interface with sensitive electronic equipment.

4.8.3.4 If specified on the purchaser’s PIP ELSMC13D Data Sheet, under voltage ride-through and/or restart devices shall be provided. The purchaser shall supply details of the under voltage and restart program in a separate document.

Comment: Caution shall be used to make sure motor does not close in out of phase between motor back EMF and power system.

4.8.4 Contactor Unit

4.8.4.1 Contactor unit parts shall be corrosion resistant.

4.8.4.2 Contactor shall be provided with self-cleaning contacts.

4.8.4.3 Contactor disassembly and assembly of moving and fixed contacts and operating coil shall not require special tools.

4.8.4.4 Voltage and frequency of operating coils shall be easily identifiable from the front of the unit.

4.8.4.5 Contacts and coil shall be removable without removing unit from the MCC.

4.8.4.6 Contactors with coils operating at line voltage shall be provided with interposing 120 V control relay located in the same starter unit.

4.8.4.7 Contactors shall be equipped with spare auxiliary contacts as shown on the purchaser’s PIP ELSMC13D Data Sheet.

4.8.5 Overload Relays

4.8.5.1 If specified on the purchaser’s PIP ELSMC13D Data Sheet, overload relays shall be standard electro-mechanical three-pole Class 20 without ambient compensation.

4.8.5.2 If electronic solid state overload relays are specified on the purchaser’s PIP ELSMC13D Data Sheet, they shall be three-pole, current-sensing, solid state selectable trip of NEMA Class 5-30. Unless otherwise specified, the trip class shall be set for NEMA Class 20 operation. If specified on the purchaser’s PIP ELSMC13D Data Sheet, include single-phasing protection and/or ground fault detection. The overload trip range shall permit setting at 125% of the motor full load current in accordance with NFPA 70 - 2017 Table 430.250. Overload trip setting range shall be marked on the overload relay.
4.8.5.3 Overload relay shall be equipped with externally operable, nonmetallic manual reset.

4.8.5.4 If specified on the purchaser’s PIP ELSMC13D Data Sheet, Automatic reset overloads shall be provided.

4.8.5.5 If an overload relay conversion table is required, it shall be permanently attached to the inside of each compartment enclosure door.

4.8.5.6 Unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet, overload relays shall be supplied in accordance with the purchaser’s attached documentation.

4.8.5.7 If specified on the purchaser’s PIP ELSMC13D Data Sheet, intelligent overload relays shall be provided. The purchaser shall provide the functionality and communication protocols and architecture to the supplier.

4.8.6 Single Phase Protection

If specified on the purchaser’s PIP ELSMC13D Data Sheet, phase loss protection shall be provided.

4.8.7 Motor Overcurrent Protective Devices

4.8.7.1 Motor protection device assemblies shall be rated to withstand the available fault current and shall be capable of operating continuously at rated current.

4.8.7.2 The adjustment range for the motor protection devices shall be suitable for the NFPA 70 - 2017, Table 430.251(B), motor-locked rotor current, unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.8.8 Intelligent Motor Control Center

4.8.8.1 If an intelligent motor control center is specified on the purchaser’s PIP ELSMC13D Data Sheet, the minimum requirements are outlined below.

   a. Overload relay protection functionality shall include protection functions as specified in Section 4.8.5.2, metering functions as described in a separate document supplied by the purchaser, and diagnostic capabilities.

   b. Overload relay I/O count as described in a separate document supplied by the purchaser

   c. Communication protocol as described in a separate document supplied by the purchaser

   d. Communication system general architecture as described in a separate document supplied by the purchaser.

   e. Interface requirements for programming and diagnostics (e.g. starter level HMI, communication port, etc.) as described in a separate document supplied by the purchaser

4.8.8.2 Communication Cabling

   a. Communication cables shall be rated for 600 Volts.

   b. Communication cabling shall be appropriate for the communication protocol specified including shielding as required.
4.9 Feeder Units

4.9.1 Circuit Breaker Units

4.9.1.1 Circuit breakers shall be of the molded case, thermal magnetic type, and shall provide inverse-time overcurrent protection and instantaneous short circuit protection. The breaker shall be rated to interrupt the available fault current as specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.9.1.2 Unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet, circuit breaker units with a frame size of 250 amperes and smaller shall be plug-in.

4.9.1.3 Minimum circuit breaker frame size shall be 100 amperes.

4.9.2 Fused Switch Units

4.9.2.1 Fused switches shall be heavy-duty continuous service type (with full locked rotor interrupting capacity) and shall have a current rating no less than that of the fuse clips.

4.9.2.2 Internal assembly fastening methods shall be as specified by the fused switch manufacturer (torque on screws, bolts, etc.).

4.9.2.3 Fused switch contacts shall be visible with the switch and compartment door open.

4.9.2.4 Unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet, disconnects 250 amperes and smaller shall be plug-in.

4.9.2.5 Units shall be rated to withstand maximum available rated fault current as specified on the purchaser’s PIP ELSMC13D Data Sheet or the purchaser’s attached documentation.

4.9.2.6 If specified on the purchaser’s PIP ELSMC13D Data Sheet, the supplier has the option to provide high set magnetic trip type molded-case switches in lieu of visible blade switches greater than the ampacity specified.

4.9.2.7 Fuse clips shall have momentary current capacity in excess of possible short-circuit current let through of the fuses specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.9.2.8 Fuse clips shall be tin plated unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.9.2.9 Fuse holder shall be compatible with the fuse class specified on the purchaser’s PIP ELSMC13D Data Sheet or on the purchaser’s attached documentation.

4.9.2.10 Fuses shall be UL, 600 V class specified on the purchaser’s attached one line diagram, with a minimum interrupting rating of 200,000 amperes.

4.10 Space Heaters

4.10.1 If specified on the purchaser’s PIP ELSMC13D Data Sheet, space heaters shall be provided.

4.10.2 Space heaters shall be provided to eliminate condensation within the section.

4.10.3 Heaters shall be located uniformly at the bottom rear of the vertical sections.
4.10.4 Space heaters shall be 120 VAC low sheath temperature operating at 160°C or less.

4.10.5 A metal cage or barrier shall be provided around the heaters to guard against accidental contact. Caution signs with black engraving on yellow background shall be provided on each vertical section stating: “Caution: Space Heaters May Be Energized Inside.”

4.10.6 All heaters shall be wired to terminal blocks in a single junction box accessible from the front of the MCC. Wiring with a temperature rating suitable for connection to the heater element shall be used.

4.10.7 The power source for space heater shall be provided by purchaser. The supplier shall provide space heater electrical load requirements during the review stage.

4.10.8 If specified on the purchaser’s PIP ELSMC13D Data Sheet, a molded case circuit breaker shall be installed on each heater circuit.

4.10.9 If specified on the purchaser’s PIP ELSMC13D Data Sheet, an adjustable thermostat control, or humidistat, shall be provided.

4.10.10 If specified on the purchaser’s PIP ELSMC13D Data Sheet, a normally closed, momentary test push button and analog ammeter shall be provided.

4.11 Painting

Finish shall be supplier’s standard unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet.

4.12 Nameplates

4.12.1 Unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet, engraved, laminated plastic nameplates shall be 1 inch by 2.5 inch.

4.12.2 Unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet, characters shall be 3/16 inch (4.8 mm) high or larger shall and be provided for each unit to identify the motor it serves.

4.12.3 Unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet, nameplates shall be mounted on the front of the cubicle with stainless steel pins or screws.

4.12.4 Engraving shall be as indicated on the one-line diagram, load summary, or nameplate schedule.

4.12.5 Unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet, nameplates shall have black letters on a white background.

4.12.6 Separate nameplates, suitably located, shall be provided to indicate the following:
   a. Identification of meters, relays, switches, and other devices within the unit
   b. Identifying symbols that shall be the same as those appearing on the schematic diagrams

4.12.7 Warning nameplates with distinguishing background color, suitably located, shall be provided to indicate the following:
   a. Warning or operational instructions as required
   b. External voltages if external sources are used within the unit
4.12.8 An MCC nameplate with 2-inch (50 mm) letters shall be located near the top of the MCC, above the main disconnect device. Nameplate shall be engraved in accordance with purchaser’s nameplate schedule. Nameplates shall be mounted on the front of the cubicle with stainless steel pins or screws. Engraving shall be as indicated on the one-line diagram or nameplate schedule. Unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet, nameplates shall have black letters on a white background.

4.13 **Inspection and Testing**

4.13.1 Suppliers providing controllers to this Practice shall have subjected identical units to the interruption, current withstand, and dielectric withstand tests specified by NEMA ICS 18 and its internal references.

4.13.2 After completion of the assembly and wiring of each controller, all the electrical and mechanical interlocks, control devices, protective relays, indicator lights, meters, and optional equipment provided shall be thoroughly tested to the extent required to guarantee a completely workable controller assembly before shipping.

4.13.3 If specified on the purchaser’s PIP ELSMC13D Data Sheet, witness of function testing and production tests or other inspections shall be required.

4.14 **Shipping**

4.14.1 Supplier shall identify the following on each shipping group:
   a. Purchase order number
   b. Requisition number
   c. MCC and section number(s)
   d. Equipment number
   e. Project number

4.14.2 Shipping assemblies shall be mounted on rigid skids for handling with a crane or forklift truck.

4.14.3 Protection by water resistant wrapper shall be provided.

4.14.4 Provided that the shipping split does not expose the MCC to the elements, the water resistant wrapper shall not be required for weatherproof enclosures.

4.14.5 Shipping bolts, supports, braces, etc., to be removed upon installation shall be painted red or yellow.

4.14.6 If the MCC is split for shipment, supplier shall provide detailed directions for re-assembly.

4.15 **Documentation**

4.15.1 **Documentation Content**

4.15.1.1 Unless otherwise specified on the purchaser’s PIP ELSMC13D Data Sheet, documentation shall be furnished in approved electronic format.

4.15.1.2 Drawings shall have a space on the right-hand bottom corner for the purchaser’s title block.
4.15.1.3 Schematic drawings shall be provided for each starter size, type, and unique control wiring configuration.

4.15.2 Supplier Drawing and Data Requirements

Supplier shall provide one (1) reproducible set of drawings plus the specified number of copies of all documentation and operating manuals as specified on the purchaser’s PIP ELSMC13D Data Sheet. Reproducible drawings shall be in DWG electronic format.

### 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 Material</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>General layout of equipment, showing all dimensions, weights, location; outline drawings showing the final assembled configuration</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Schematic and connection wiring diagrams for all electrical equipment</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>List of accessories</td>
</tr>
<tr>
<td>X</td>
<td>X(1)</td>
<td></td>
<td></td>
<td>Installation, operation, and maintenance manual</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>Copies of certified test reports</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>Final as-built drawings</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>Recommended spare parts list with pricing</td>
</tr>
</tbody>
</table>

**Notes:**

A. These documents shall be provided with the proposal.

B. These documents shall be provided for the 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.

D. The final as-built documents shall be provided within 2 weeks following shipment.

4.16 Conflict Resolution

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

a. Purchase Order
b. Purchaser’s one line or load summary
c. PIP ELSMC13D Data Sheet
d. This Practice, PIP ELSMC13
e. Referenced Standards
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 ELSMC13 FOR GENERAL REQUIREMENTS

APPLICABLE STATE AND LOCAL CODES:

**SERVICE CONDITIONS (4.1.2):**

AMBIENT TEMPERATURE: MAX: 40 °C MIN: 0 °C HUMIDITY: 95%

ALTITUDE: 1000 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:

**SEISMIC REQUIREMENT (4.1.4):**

SEISMIC DESIGN: ☑ REQUIRED ☑ NOT REQUIRED

SITE LOCATION: ☐ REQUIRED ☐ NOT REQUIRED

LATITUDE ☐ LONGITUDE ☐ OTHER:

RISK CATEGORY: ☑ X ☑ IV ☑ III ☐ OTHER:

COMPONENT IMPORTANCE FACTOR (Ip): ☑ X 1.5 ☐ OTHER:

SITE CLASS: ☑ X ☑ D ☐ OTHER:

SEISMIC CERTIFICATE: ☑ REQUIRED ☑ NOT REQUIRED

☐ OTHER:

**ELECTRICAL SYSTEM PARAMETERS:**

VOLTS: ☐ kV PHASE: ☑ 3 HERTZ: ☑ 60 ☐ THREE WIRE ☐ FOUR WIRE

☐ WYE ☐ DELTA ☐ OTHER:

SYSTEM GROUNDING: ☐ SOLID ☐ UNGROUNDED ☐ HIGH RESISTANCE ☐ LOW RESISTANCE

GROUND FAULT CURRENT: ☐ AMPS

AVAILABLE FAULT CURRENT: ☐ kA ASYMMETRICAL ☐ X/R RATIO: ☐

☐ ONE LINE DIAGRAM ☐ OTHER:

<table>
<thead>
<tr>
<th>NO.</th>
<th>DATE</th>
<th>REVISION DESCRIPTION</th>
<th>BY</th>
<th>APPROVED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### GENERAL (4.1):

- **NEMA WIRING (4.1.5):**
  - [X] CLASS I, TYPE B
  - [ ] OTHER:

- **UNIT SPACE HEIGHT (4.1.8):**
  - [X] 6 INCHES MIN.
  - [ ] OTHER:

- **NRTL LISTED LABELED (4.1.12):**
  - [ ] REQUIRED
  - [ ] NOT REQUIRED
  - [ ] UL
  - [ ] OTHER:

- **ARC RESISTANT CONSTRUCTION (4.1.14):**
  - [ ] REQUIRED
  - [ ] NOT REQUIRED
  - [ ] TYPE 2
  - [ ] OTHER:

- [ ] OTHER:

### MCC ENCLOSURE (4.2.1):

- [ ] NEMA 1 STANDARD
- [ ] NEMA 1A GASKET
- [ ] NEMA 3R DRIP-PROOF
- [ ] NEMA 12 DUST-TIGHT

- **OUTDOOR ENCLOSURE**
  - [ ] OTHER:

- [X] FRONT ONLY
- [ ] BACK TO BACK

- **15 INCH DEEP**
- [ ] 20 INCH DEEP
- [ ] OTHER:

- **FUTURE EXPANSION (4.2.1.4):**
  - [ ] REQUIRED
  - [ ] NOT REQUIRED

- **IR VIEWING PORTS (4.2.1.9):**
  - [ ] REQUIRED
  - [ ] NOT REQUIRED

- [ ] LEFT
- [ ] RIGHT

- [ ] OTHER:

### WIREWAYS:

- **VERTICAL WIREWAYS (4.3.2.1):**
  - [X] 4 INCH MIN.
  - [ ] OTHER:

- **HORIZONTAL WIREWAYS (4.3.3.1):**
  - [X] 6 INCH MIN.
  - [ ] OTHER:

- [ ] OTHER:

### POWER BUSES (4.4):

- **BUS BRACING (4.4.1.1):**
  - [42 kA]
  - [50 kA]
  - [65 kA]
  - [100 kA]

- [ ] OTHER:

- **BUS MATERIAL (4.4.1.6):**
  - [X] COPPER
  - [ ] ALUMINUM

- **BUS PLATING (4.4.1.7):**
  - [MFG. STD.]
  - [ ] TIN PLATED
  - [ ] SILVER PLATED

- [ ] JOINTS ONLY
- [ ] ENTIRE BUS

- [ ] OTHER:

- **HORIZONTAL POWER BUS (4.4.2):**

- **BUS RATING (4.4.2.1):**
  - [600 A]
  - [800 A]
  - [1000 A]
  - [1200 A]
  - [1600 A]

- [2000 A]
- [2500 A]
- [ ] OTHER:

- **BUS INSULATION (4.4.2.3):**
  - [X] FLUIDIZED BED EPOXY
  - [ ] OTHER:

- **VERTICAL POWER BUS (4.4.3):**

- **BUS RATING (4.4.3.1):**
  - [300 A]
  - [450 A]
  - [600 A]
  - [800 A]

- [ ] OTHER:
### Grounding (4.5):

- **Horizontal Ground Bus (4.5.2):**
  - Size (4.5.2.3):
    - [ ] MFG. STD.
    - [ ] 1/4 INCH X 1 INCH
    - [ ] OTHER: ____________
  - Location (4.5.2.3):
    - [ ] TOP
    - [ ] BOTTOM
    - [ ] OTHER: ____________

- **Vertical Ground Bus (4.5.2):**
  - REQUIRED [X]
  - NOT REQUIRED [ ]
  - OTHER: ____________

### Incoming Line Section (4.6):

- **Line Entry (4.6.1):**
  - [ ] TOP
  - [ ] BOTTOM
  - [ ] LEFT
  - [ ] RIGHT
  - [ ] OTHER: ____________

- **Line Connection (4.6.7):**
  - [ ] LUGS ONLY
  - MAIN CIRCUIT BREAKER AMP RATING: ______ AMPS
  - MAIN FUSED DISCONNECT AMP RATING: ______ AMPS
  - [ ] OTHER: ____________

- **Lugs (4.6.3):**
  - [ ] BY PURCHASER
  - [ ] BY SUPPLIER
  - COPPER [ ]
  - ALUMINUM [ ]
  - RING COMPRESS. [ ]
  - [ ] OTHER: ____________
  - Conductors per phase: ______
  - CONDUCTOR SIZE: ______ AWG
  - [ ] OTHER: ____________

- **Incoming Metering Provisions (4.6.8):**
  - [ ] REQUIRED
  - [ ] NOT REQUIRED
  - DIGITAL [ ]
  - ANALOG [ ]
  - VOLTMETER [ ]
  - AMMETER [ ]
  - WATTHOUR METER [ ]
  - WATTMETER [ ]
  - [ ] OTHER: ____________
  - REQUIRED SUPPLIER/MODEL: ____________
  - [ ] OTHER: ____________

### Units (4.7):

- **Self-Aligning Unit Stabs (4.7.3.1):**
  - [X] TIN PLATED
  - [ ] SILVER PLATED
  - [ ] OTHER: ____________

- **Removal of Unit Stabs from Bus with Door Closed (4.7.3.2):**
  - [ ] REQUIRED
  - [ ] NOT REQUIRED

- **Termination Lugs (4.7.4.4):**
  - [ ] BY PURCHASER
  - [ ] BY SUPPLIER

- **Space for Future Unit Internal Devices:**
  - [ ] REQUIRED
  - [ ] NOT REQUIRED

- **Finger Safe Terminals (4.7.4.6):**
  - [ ] REQUIRED
  - [ ] NOT REQUIRED

- **Door Mounted Devices:**
  - [ ] REQUIRED
  - [ ] NOT REQUIRED
  - [ ] OTHER: ____________
## Combination Starters and Contactors (4.8):

<table>
<thead>
<tr>
<th>Combination Motor Starters (4.8.1.1):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Magnetic C/B</td>
</tr>
<tr>
<td>Magnetic Only C/B</td>
</tr>
<tr>
<td>Current Limiting Fused Switch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contactors:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size 1</td>
</tr>
<tr>
<td>Size 2</td>
</tr>
<tr>
<td>Size 3</td>
</tr>
<tr>
<td>Size 4</td>
</tr>
<tr>
<td>Size 5</td>
</tr>
<tr>
<td>Size _____</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size 4 and Larger (4.8.1.2):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum</td>
</tr>
<tr>
<td>Air</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size 5 and Larger (4.8.1.3):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolt In</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

### Control Power (4.8.2):

<table>
<thead>
<tr>
<th>Control Power Transformer (4.8.2.1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>480/120 VAC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual CPTs</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>CPT Rating (4.8.2.2):</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFG. STD.</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>24 Volt DC Control Power Supply (4.8.2.6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redundant DC Control Power</td>
</tr>
<tr>
<td>Required</td>
</tr>
<tr>
<td>Not Required</td>
</tr>
</tbody>
</table>

### Control Circuit (4.8.3):

<table>
<thead>
<tr>
<th>Pull-Apart Terminal Blocks (4.8.3.2):</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Surge Suppression (4.8.3.3):</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Under Voltage Ride-Through (4.8.3.4):</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Under Voltage Restart (4.8.3.4):</th>
</tr>
</thead>
</table>

### Spare Auxiliary Contacts (4.8.4.7):

<table>
<thead>
<tr>
<th>Number of Normally Open:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Number of Normally Closed:</th>
</tr>
</thead>
</table>

### Overload Relays (4.8.5):

<table>
<thead>
<tr>
<th>Electro-Mechanical (4.8.5.1):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 20</td>
</tr>
<tr>
<td>Other Class:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ambient Compensation:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Automatic Reset:</th>
</tr>
</thead>
</table>

### Electronic - Solid State (4.8.5.2):

<table>
<thead>
<tr>
<th>Class Selected:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 5</td>
</tr>
<tr>
<td>Class 10</td>
</tr>
<tr>
<td>Class 20</td>
</tr>
<tr>
<td>Class 30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ambient Compensation:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Automatic Reset:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Single Phase Protection:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Ground Fault Protection:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Other:</th>
</tr>
</thead>
</table>

### Combination Starters and Contactors (4.8) (continued):

<table>
<thead>
<tr>
<th>Item</th>
<th>Required</th>
<th>Not Required</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overload Relays (4.8.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overload Relays Supplied Per Purchaser’s Attachment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overload Relays Not Required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single Phase Protection (4.8.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor Overcurrent Protection (4.8.7.2)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per NFPA 70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intelligent Motor Control Center (4.8.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Refer to Purchaser’s Attachment for Requirements</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Feeder Units (4.9):

<table>
<thead>
<tr>
<th>Item</th>
<th>Required</th>
<th>Not Required</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit Breaker Units (4.9.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>250 Amp or Less Frame Size (4.9.1.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plug In</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolt In</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fused Switch Units (4.9.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>250 Amp or Less Frame Size (4.9.2.4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plug In</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolt In</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Molded Case Switch (4.9.2.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allowed at Ampacities Above</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amps</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuse Clips (4.9.2.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tinned</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silver Plated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuse Holder (4.9.2.9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without Fuse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class J</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class RK1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class RK5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Space Heaters (4.10):

<table>
<thead>
<tr>
<th>Item</th>
<th>Required</th>
<th>Not Required</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space Heater (4.10.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control per Heater Circuit (4.10.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermostat Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humidistat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitoring (4.10.10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test PB and Ammeter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Other:

- **Manufacturer's Standard Finish**: X
- **Other**: |
### NAMEPLATES (4.12):
- **NAMEPLATE SIZE:** X 1 INCH BY 2.5 INCH
- **CHARACTER SIZE:** X 3/16 MINIMUM
- **NAMEPLATE MOUNTING:** SELF-TAPPING SCREWS
- **COLOR:** X BLACK LETTERING / WHITE BACKGROUND
- **NAMEPLATE ENGRAVING:**

### INSPECTION & TESTING (4.13):
- **MANUFACTURES STD.**
- **WITNESSED**
- **CERTIFIED TEST REPORTS:** REQUIRED

### SHIPPING (4.14):
- **SUPPLIERS STD PREPARATION**
- **PRE-SHIPMENT SHOP INSPECTION:** REQUIRED

### DOCUMENTATION (4.15):
- **ELECTRONIC DOCUMENT FORMAT:** DWG, PDF
- **SUPPLIER TO PROVIDE:** REPRODUCIBLE PLUS
- **COPIES OF ALL DOCUMENTS PLUS**
- **COPIES OF OPERATING MANUALS**

### OTHER REQUIREMENTS:

---

---

---

---

---

---

---