USask Master Specification Directions: The master specifications are intended to be incorporated into the Consultant's final, project specific specification package. The project specific specifications are expected to include any and all sections or portions of sections (Part 1, Part 2, Part 3) that are required to create a fully executable project specification. USask Master Specs only provide information that USask **requires** be a part of the final specification package. Components or sections not included in the Master USask Specifications may still be required for a complete, well-designed project. **It is the consultant's responsibility to ensure all specifications match USask requirements. Any deviations or revisions to any section included in the master specifications requires written consent from the USask Engineering department. The consultant is liable for any omissions, errors, or incorrect equipment or components supplied to site.**
The Master Specifications shall be used in conjunction with USask's Design Guidelines. Any conflicts shall be brought to the attention of USask Engineering staff for clarification.

Part 1 General

Part 2 Products

.1 Manufacturers

.1 Shall be Square D Company, Allen-Bradley, Eaton Cutler-Hammer or equal. Other manufacturers must be approved by USask Engineering prior to purchase or installation.
.2 Additions to existing MCCs shall be the same as the original manufacturer.

.2 Materials

.1 Steel material shall comply with UL 845 and CSA requirements.
.2 Each MCC shall consist of one (1) or more vertical sections of heavy gauge steel bolted together to form a rigid, free-standing assembly. A removable 7 gauge structural steel lifting angle shall be mounted full width of the MCC lineup at the top. Removable 7-gauge bottom channel sills shall be mounted underneath front and rear of the vertical sections extending the full width of the lineup. Vertical sections made of welded side-frame assembly formed from a minimum of 12 gauge steel. Internal reinforcement structural parts shall be of 12 and 14 gauge steel to provide a strong, rigid assembly. The entire assembly shall be constructed and packaged to withstand normal stresses included in transit and during installation.

.3 MCC Finish

1. All steel parts shall be provided with UL and CSA listed acrylic/alkyd baked enamel paint finish, except plated parts used for ground connections. All painted parts shall undergo a multi-stage treatment process, followed by the finishing paint coat.
.2 Pre-treatment shall include:
    .1 Hot alkaline cleaner to remove grease and oil.
    .2 Iron phosphate treatment to improve adhesion and corrosion resistance.
.3 The paint shall be applied using an electro-deposition process to ensure a uniform paint coat with high adhesion.
.4 The standard paint finish shall be tested to UL 50 per ASTM B117 (5% ASTM Salt Spray) with no greater than 0.125 in (3 mm) loss of paint from a scribed line.

.5 Paint color shall be #49 medium light gray per ANSI standard Z55.1-967 (60-70 gloss) on all surfaces unless specified otherwise. Control station plates and escutcheon plates shall be a contrasting gray.

.4 Structures

.1 Structures shall be totally enclosed, dead-front, free-standing assemblies. Structures shall be capable of being bolted together to form a single assembly.

.2 The overall height of the MCC shall not exceed 90 in (2286 mm) (not including base channel or lifting angle). Base channels, of 1.5 in (38 mm) in height, and lifting angles, of 3 in (76 mm) in height, shall be removable. The total width of one (1) section shall be 20 in (508 mm); (widths of 25 in (630 mm), 30 in (760 mm), and 35 in (890 mm) can be used for larger devices).

.3 Structures shall be NEMA type 1 for indoor, dry location, NEMA 4 for indoor/outdoor wet location. MCC's mounted in sprinkler areas to be sprinkler proof.

.4 Each 20 in wide standard section shall have all the necessary hardware and bussing for modular plug-in units to be added and moved around. All unused space shall be covered by hinged blank doors and equipped to accept future units. Vertical bus openings shall be covered by manual bus shutters.

.5 Each section shall include a top plate (single piece or two-piece) Top and bottom plates shall be removable for ease in cutting conduit entry openings.

.5 Wireways

.1 Structures shall contain a minimum 12 in (305 mm) high horizontal wireway at the top of each section and a minimum 6 in (152 mm) high horizontal wireway at the bottom of each section. These wireways shall run the full length of MCC to allow room for power and control cable to connect between units in different sections.

.2 A full-depth vertical wireway shall be provided in each MCC section that accepts modular plug-in units. The vertical wireway shall connect with both the top and bottom horizontal wireway. The vertical wireway shall be 4 in (102 mm) wide minimum with a separate hinged door. There should be a minimum of 4,000 in3 (65,548 cm3) of cabling space available. Access to the wireways shall not require opening control unit doors. Structures that house a single, full section control unit are not required to have vertical wireways. Those control units must open directly into the MCC horizontal wireways.

.6 Barriers

.1 All power bussing and splice connections shall be isolated from the unit compartments and the wireways. The horizontal bus shall be mounted onto a glass filled polyester support assembly that braces the bus against the forces generated during a short circuit. The horizontal bus shall be isolated from the top horizontal wireway by a two-piece rigid non-conductive barrier. The barrier design shall allow qualified personnel to slide the barriers both left and right, to allow access to the bus and connections for maintenance without having to remove the barrier. Barrier sliding shall occur via an upper and lower track system.

.2 The vertical bus shall be housed in a molded glass-filled polyester support that provides bus insulation and braces the bus against the forces generated during a short circuit. These supports shall have openings every 3 in (75 mm) for unit stab-on connections. Each opening shall be provided with a manual shutter to close off the stab opening. These

shutters shall be attached to the structure so that when they are removed (to allow a stab connection) they are retained in the structure and are readily accessible for use should a plug-in unit be removed from the MCC.

.3 Barriers shall be provided in the vertical structure and unit designs to prevent the contact of any energized bus or terminal by a fishtape inserted through the conduit or wireway areas.

.7 Bussing

.1 All bussing and connectors shall be tin-plated copper.

.2 The main horizontal bus shall be rated at 600 A continuous and shall extend the full length of the MCC. Bus ratings shall be based on 65° C maximum temperature rise in a 40° C ambient. Provisions shall be provided for splicing additional sections onto either end of the MCC.

.3 The horizontal bus splice bars shall be pre-assembled into a captive bus stack. This bus stack is installed into the end of the MCC power bus to allow the installation of additional sections.

.4 Each section that accepts plug-in units shall be provided with a vertical bus for distributing power from the main bus to the individual plug-in starter units. This bus shall be of the same material and plating as the main bus, and shall be rated at 300A continuous. The vertical bus shall be connected directly to the horizontal bus stack without the use of risers or other intervening connectors.

.5 A tin-plated copper ground bus shall be provided that runs the entire length of the MCC. The ground bus shall be 0.25 in (6.0 mm) x 1.0 in (25 mm) and be rated for 300 amps. A compression lug shall be provided in the MCC for a 4/0-250 kcmil ground cable. The ground bus shall be provided with (6) 0.38 in (10 mm) holes for each vertical section to accept customer-supplied ground lugs for any loads requiring a ground conductor.

.6 Each vertical section shall have a steel vertical ground bus that is connected to the horizontal ground bus. This vertical ground bus shall be installed so that the plug-in units engage the ground bus prior to engagement of the power stabs and shall disengage only after the power stabs are disconnected upon removal of the plug-in unit.

.7 The system shall be rated for minimum available short circuit capacity subject to the result of power system study.

.8 Typical Unit Construction

.1 Units with circuit breaker disconnects through 400 A frame, and fusible switch disconnects through 400 A, shall connect to the vertical bus through a spring reinforced stab-on connector. Units with larger disconnects shall be connected directly to the main horizontal bus with appropriately sized cable or riser bus. Stabs on all plug-on units shall be solidly bussed to the unit disconnect. Cabled stab assemblies are not permitted.

.2 All conducting parts on the line side of the unit disconnect shall be shrouded by a suitable insulating material to prevent accidental contact with those parts.

.3 Unit mounting shelves shall include hanger brackets to support the unit weight during installation and removal. All plug-on units shall use a twin-handle camming lever located at the top of the bucket to rack in and out the plug-on unit. The cam lever shall work in conjunction with the hanger brackets to ensure positive stab alignment.

.4 A cast metal handle operator must be provided on each disconnect. With the unit stabs engaged onto the vertical phase bus and the unit door closed, the handle mechanism shall allow complete ON/OFF control of the unit. All circuit breaker operators shall include a separate TRIPPED position to clearly indicate a circuit breaker trip condition. It shall be possible to reset a tripped circuit breaker without opening the control unit door. Clear indication of disconnect status shall be provided.

.5 A mechanical interlock shall prevent the operator from opening the unit door when the disconnect is in the ON position. Another mechanical interlock shall prevent the operator from placing the disconnect in the ON position while the unit door is open. It shall be possible for authorized personnel to defeat these interlocks.

.6 A non-defeatable interlock shall be provided between the handle operator and the cam lever to prevent installing or removing a plug-on unit unless the disconnect is in the OFF position.

.7 The plug-in unit shall have a grounded stab-on connector which engages the vertical ground bus prior to, and releases after, the power bus stab-on connectors.

.8 Provisions shall be provided for locking all disconnects in the OFF position with up to three (3) padlocks.

.9 Handle mechanisms shall be located on the left side to encourage operators to stand to the left of the unit being switched.

.10 Unit construction shall combine with the vertical wireway isolation barrier to provide a fully compartmentalized design.

.9 Components for Typical Units

.1 Metering – provide ION 8000 series meter on the incoming section of the MCC.

.2 Control Bay

.3 Inspection Windows. Provide infrared (IR) windows that allow for safe and efficient thermal imaging inspections.

.1 Refer to section 26 24 15.

.4 Main Circuit Breaker. Provide 100% rated circuit breaker.

.5 Arc Flash Mitigation. Use of shutters to isolate the vertical bus and the stabs when a unit is removed and allowing units to be disconnected from the vertical bus while the door remains closed. Apply arc flash relays to rapidly detects and clears arc flash events

.6 Integrate TVSS units in new MCC’s.

.7 Combination Starters

1. All combination starters shall utilize a unit disconnect as specified in the previous article. Magnetic starters shall be furnished in all combination starter units. All starters shall utilize NEMA rated contactors. Starters shall be provided with a three-pole, external manual reset, and overload relay for eutectic melting alloy thermal overload units.
2. When provided, control circuit transformers shall include two (2) primary protection fuses and one (1) secondary fuse (in the non-ground secondary conductor). The transformer shall be sized to accommodate the contactor(s) and all connected control circuit loads. The transformer rating shall be fully visible from the front when the unit door is opened.
3. When a unit control circuit transformer is not provided, the disconnect shall include an electrical interlock for disconnection of externally powered control circuits.
4. Auxiliary control circuit interlocks shall be provided where indicated. Auxiliary interlocks shall be field convertible to normally open or normally closed

operation.

5. NEMA Size 1-4 starters shall be mounted directly adjacent to the wireway so that power wiring (motor leads) shall connect directly to the starter terminals without the use of interposing terminals. Larger starters shall be arranged so that power wiring may exit through the bottom of the starter cubical without entering the vertical wireway.
6. Provide H-O-A selector switch, 'on','off','overload' pilot lights, overload reset, elapsed time meter all in starter covers.

.8 Terminal Blocks

.1 When Type B-Class 2 wiring is specified, all starter units shall be provided with unit control terminal blocks with controls wired to the control bay. (See drawings)

.2 Terminal blocks shall be the pull-apart type 600 volt and rated at 25 amps. All current carrying parts shall be tin plated. Terminals shall be accessible from inside the unit when the unit door is opened. Terminal blocks shall be DIN rail mounted.

.3 Nameplates

.1 When provided, shall be engraved phenolic nameplates with a gray background and white letters. Total outside dimensions will be a minimum of 1.5 in (38 mm) H x 6.25 in (159 mm) W total outside dimensions.

Part 3 Execution

.1 Inspection

.1 Verify that the location is ready to receive work and the dimensions are as indicated.

.2 Do not install the MCC until the building environment can be maintained within the service conditions required by the manufacturer.

.2 Protection

.1 Before and during the installation, the MCC unit shall be protected from site contaminants.

.3 Commissioning

.1 Provide enough days on site to work with the U of S controls commissioning personnel to ensure that all of the motor starter relocation power and controls are working. Provide a report on each motor starter operation including load tests, functional control operation, field control device verification, run command verification, record control schematic updates.

END OF SECTION