SECTION 13 1609 – WATER FEATURE DISCONNECTS, MCC, AND STARTERS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Disconnect Switches
2. Motor Control Centers (MCC)
3. MCC Components, including Motor Starters, SSVR, and VFD Controllers

B. Related Sections:

1. SECTION 13 1502 – WATER FEATURE PUMPS AND MOTORS
2. SECTION 13 1504 – WATER FEATURE CHEMICAL FEED SYSTEMS
3. SECTION 13 1505 – WATER FEATURE OZONE GENERATION AND INJECTION
4. SECTION 13 1506 – WATER FEATURE UV STERILIZERS
5. SECTION 13 1507 – WATER FEATURE HEATERS
6. SECTION 13 1508 – WATER FEATURE HYDRONIC SYSTEMS
7. SECTION 13 1509 – WATER FEATURE CHILLERS
8. SECTION 13 1510 – WATER FEATURE HEAT EXCHANGERS
9. SECTION 13 1511 – WATER FEATURE VALVES, GAUGES, AND METERS
10. SECTION 13 1602 – WATER FEATURE CONTROLS
11. SECTION 13 1605 – WATER FEATURE CONTROL PANELS
12. SECTION 13 1607 – WATER FEATURE PROGRAMMABLE LOGIC CONTROLLERS
13. SECTION 13 1608 – WATER FEATURE UNDERWATER LIGHTING CONTROLS
14. SECTION 13 1610 – WATER FEATURE ELECTRICAL ACCESSORIES
15. SECTION 26 0000 – ELECTRICAL

C. References:

1. NEMA 250 – Enclosures for Electrical Equipment
2. NEMA ICS 18 – Industrial Control and Systems: Motor Control Centers
3. NEMA KS 1 – Enclosed Switches
4. NFPA 70 – National Electrical Code (NEC)
5. Underwriters Laboratories (UL) 98 – Enclosed and Dead Front Switches
6. UL 845 – UL Standard for Safety of Motor Control Centers

1.2 SUBMITTALS FOR REVIEW

A. SECTION 01 3300 – SUBMITTAL PROCEDURES

B. Product Data: Submit Manufacturer's literature for all major components including but not limited to the following: Motor starters, overload relays, circuit breaker and fuse information, control power transformers, pilot devices, relays, and etc.

C. Shop Drawings: Submit Manufacturer drawing showing the following:

1. Layout and configuration of the MCC, including height, width, depth, and location of shipping splits.
2. Structure descriptions showing: Bus rating, enclosure rating, short-circuit withstand rating, and other information requiring approval.
3. Conduit Locations.
4. Required Bus Splices.
5. Unit Descriptions including starter sizes, circuit breaker frame sizes, circuit breaker continuous amperage rating, pilot devices, etc.
6. Nameplate information.
7. Schematic Wiring Diagrams.

D. Provide a copy of the Manufacturer's installation instructions that include the following: Delivery and storage instructions, general description for reading nameplate data and other markings, installation procedures, conduit and cable installation, installing and removing plug-in units, operation of operator handles and unit interlocks, checklist before energizing, procedure for energizing equipment, and maintenance procedures.

E. Warranty: Submit manufacturer's warranty and ensure forms have been completed in the owner's name and registered with the manufacturer.

1.3 DESIGN REQUIREMENTS

A. Provide MCC base upon applicable NEMA and UL Standards and in accordance with the details Contract Documents.

B. The Manufacturer of the MCC shall also be the Manufacturer of the across-the-line motor starters, across-the-line contactors, solid-state reduced voltage starters, and variable frequency drives.

C. The Contractor shall confirm the motor full-load amperage ratings and provide those to the MCC Manufacturer to ensure proper sizing of the motor branch circuit and overload protection.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be handled and stored in accordance with the Manufacturer's instructions.

B. One (1) copy of the Manufacturer's instructions shall be included with the equipment at time of shipment.

1.5 REGULATORY REQUIREMENTS

A. The MCC shall bear a UL Label and shall conform to the requirements of the latest edition of the NEC and/or other applicable installation standards.

B. The Manufacturer shall provide certified copies of production test reports demonstrating compliance when requested by the Engineer.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

A. Approved Manufacturers

1. Schneider Electric – Square D Company
2. Eaton
3. Approved Equal

B. Switch Interior

1. All switches shall have switch blades that are visible when the switch is OFF, and the cover is open.
2. Lugs shall be UL Listed and sized for the temperature and amperage ratings as recommended by the Manufacturer, aluminum, or copper.
3. All current carrying parts shall be plated to resist corrosion.

C. Switch Mechanism

1. The Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.
2. The operating handle shall be an integral part of the box, on the cover.
3. Provisions shall be provided for padlocking the switch in the OFF position.

D. Switch Enclosures

1. The enclosure shall be NEMA Type 1 for dry indoor use and NEMA Type 3R for outdoor or high humidity environments.
2. Tangential knockouts shall be provided to facilitate ease of conduit entry on switches through 200-ampere.
3. Enclosures for Type 3R switches through 200-ampere shall have provisions for interchangeable bolt-on hubs in the top endwall. Hubs shall be provided by a common manufacturer.

E. Switch Ratings

1. Switches shall be horsepower rated for 240-VAC as indicated on the Contract Documents.
2. The UL Listed short circuit rating shall be as per the Manufacturer's recommendation and specification.

2.2 MOTOR CONTROL CENTERS (MCC)

A. Approved Manufacturers

1. Allen-Bradley
2. Siemens Energy and Automation
3. Eaton / Cutler Hammer
4. Approved Equal

B. Ratings

1. The MCC shall be 600-volt class suitable for operation on a three-phase, 50/60 Hz system.
2. The MCC shall be rated for the system voltage as indicated on the Contract Documents.
3. The MCC horizontal and vertical power bus bracing shall be rated to meet or exceed the available fault current as shown on the Contract Documents.
4. All MCC units shall have a full rated short-circuit rating that meets or exceeds the available fault current as shown on the Contract Documents.
5. All circuit breakers used in the MCC shall have full rated short-circuit interrupt ratings based on the applied MCC voltage.

C. Enclosure

1. The MCC enclosure shall be NEMA Type 2 for indoor installation and NEMA Type 3R for outdoor installations.
2. Each section shall be equipped with two (2) full metal side sheets to isolate each vertical section and to help reduce the likelihood of fault propagation between sections.
3. All interior and exterior surfaces shall be painted ANSI 49 medium light gray. The vertical wireways and unit back plates shall be painted high visibility gloss white
4. All unpainted parts shall be plated for corrosion resistance.
5. Removable closing plates on each end of the MCC shall cover all horizontal bus and horizontal wireway openings.
6. Insulating sheets shall be provided on the inside of the end closing plates for horizontal openings to help prevent burn-through of the end closing plate if the internal arcing fault occurs in the horizontal bus compartment.

D. Structure

1. The MCC shall be of dead front construction and shall consist of one or more vertical sections bolted together to form a rigid, free-standing assembly. The systems shall be designed to allow for the addition of future sections at either end, and to permit the interchanging of units.
2. Vertical Sections shall be rigid, free-standing structures.
    a. Vertical sections shall have internal mounting angles running continuously within the shipping block. An external mounting channel that is required to maintain structure integrity is not acceptable.

b. Vertical sections shall be 90-inches (2.3m) high, 20-inch (500mm) wide, and either 15-inch (380mm) or 20-inches (500mm) deep as required. Custom widths shall be available.
c. Vertical sections shall be provided with a removable steel lifting angle on all shipping blocks. The angle shall run the length of the shipping block. Lifting eyes are not acceptable.
d. Each standard section shall be capable of being subdivided into 12 usable, unit spaces.
e. Two (2) unit spaces shall constitute one (1) space factor and shall be 13 inches (325mm) in height.
f. One (1) unit space shall constitute one-half space factor and shall be 6.5 (165mm) in height.

3. Horizontal Wireways

a. Horizontal wireways shall be located at the top and bottom of the MCC.
b. Horizontal wireways shall be 6-inches (150mm) in height and extend the full depth of the vertical section to allow maximum flexibility in locating conduit for MCC feeds and loads.

i. Pull boxes to extend the height of the top horizontal wireway by 12-inches (300mm) shall be provided, if specified.

c. Horizontal wireways shall be continuous across the length of the MCC, except where access needs to be denied due to electrical isolation requirements.
d. The horizontal wireways shall be isolated from the power bus.
e. The horizontal wireways shall have removable covers held in place by captive screws.

4. Provide a full height vertical wireway, independent of the plug-in units, in each standard vertical section.

a. The vertical wireway shall be isolated from the vertical and horizontal buses.
b. The vertical wireway shall be covered with a hinged and secure door.
c. Wireway tie bars shall be provided.
d. Isolation between the wireway and the units shall be provided with arc resistant latches to help keep the door latched if the internal arcing fault occurs.

5. All full voltage starter units through NEMA Size 5 and all feeder breakers through 400-amperes shall be of the draw-out type. Draw-out provisions shall include a positive guide rail system and stab shrouds to absolutely ensure alignment of stabs with the vertical bus. Draw-out units shall have a tin-plated stab assembly for connection to the vertical bus. No wiring to these stabs shall extend outside of the draw-out unit. Units equipped with side-mounted, positive latch pull-apart type control terminal blocks rated 600 volts. Knockouts shall be provided for the addition of future terminal blocks. In addition, a master terminal block, when Type C wiring is specified, shall be draw-out and shall be located in the top wireway, readily accessible through a hinged cover. All control wire to be 14 AWG minimum.
6. All draw-out units shall be secured by a spring-loaded, quarter turn, indicating type fastening device located at the top front of the unit. Except for the dual-mounted units, each unit compartment shall be provided with an individual front door.
7. An operating mechanism shall be mounted on the primary disconnect of each starter unit. It shall be mechanically interlocked with the unit door to prevent access, unless the disconnect switch is in the OFF position. A defeater shall be provided to bypass this interlock. With the door open, an interlock shall be provided to prevent inadvertent closing of the disconnect switch. A second interlock shall be provided to prevent removal or reinsertion of the unit while in the ON position. Padlocking facilities shall be provided to positively lock the disconnect switch in the OFF position with up to three (3) padlocks with the door open or closed. In addition, means shall be provided to padlock the unit in a partially withdrawn position with the stabs free of the vertical bus.
8. Doors are to be hinged in a manner that allows for the removal of the individual doors without the removal of any door above or below. Unit doors shall be hinged on the left and vertical wireway doors on the right for unobstructed access to the units and associated vertical wireway.

All doors shall be mounted on removable pin-type hinges and secured with steel quarter turn, indicating type fasteners.

9. MCC's shall be assembled in such a manner that it is not necessary to have rear accessibility to remove any internal device or components.

E. BUS BAR

1. Horizontal Power Bus

a. The horizontal bus shall be rated as shown on the Contract Documents.
b. The horizontal bus material shall be copper with tin plating.
c. The horizontal bus shall be supported, braced, and isolated from the vertical bus with a high strength, non-conductive, non-tracking, glass polyester material.
d. For standard sections, the horizontal bus shall be continuous within each shipping block and shall be braced within each section.
e. Horizontal bus splices shall have at least two (2) bolts on each side.

2. Vertical Bus

a. The vertical power bus shall have an effective rating of 600-amperes. If a center horizontal bus construction is utilized, then the rating shall be 300-amperes above and below the horizontal bus for an effective rating of 600-amperes.
b. The vertical bus material shall be copper with tin plating.
c. The vertical bus shall attach to the horizontal bus with at least two (2) bolts.
d. The vertical bus shall be continuously braced by a high strength, non-conductive, non-tracking, glass-filled polyester material and isolated from the unit spaces by a non-conductive, polycarbonate molded cover.
e. Automatic shutters shall cover plug-in stab openings when the units are removed.

3. Ground Bus

a. Provide a ground bus system consisting of a horizontal ground bus connected to vertical ground buses mounted in each section.
b. Provide a tin-plated copper, 1/4- x 1-inch (6 x 25mm) or 1/4- x 2-inch (6 x 50mm) horizontal ground bus mounted in the bottom of the MCC unless otherwise specified in the Contract Documents.
c. Provide a pressure-type mechanical lug mounted on the ground bus in the incoming line section.
d. Provide a unit ground stab on all unit inserts. The ground stab shall establish unit insert grounding to the vertical ground bus before the plug-in power stags engage the power bus. The grounding shall be maintained until after the plug-in power stabs are disengaged.

4. Neutral Bus

a. In a 4-wire system with a main incoming device rated at 400-amperes or less, if there are not neutral loads in the MCC, an incoming neutral termination plate in the MCC main device unit is acceptable in lieu of a horizontal neutral bus.
b. In a 4-wire system with a main incoming device rated at more than 400-amperes, if there are no neutral loads in the MCC, and incoming neutral termination plate in the MMC main device unit connected to a horizontal neutral bus in the section with the main is acceptable.
c. If neutral loads area specified within the MCC, provide neutral connection plates in sections with horizontal neutral bus as indicated on the Contract Documents.
d. Horizontal neutral bus shall be provided in the main incoming and adjacent sections as specified in the Contract Documents.
e. Neutral bus rating shall be the same as the horizontal power bus rating.

F. MCC Communications Options

1. MCC shall be able to provide at least one (1) of the following methods of communication:
    a. FIELDBUS Devices
    b. DEVICENET Devices
    c. PROFIBUS Devices
    d. MODBUS TCP Devices
    e. MODBUS Serial Devices
    f. ETHERNET/IP Devices
2. Provide communications option when specified in the Contract Documents.

2.3 MCC COMPONENTS

A. Unit Information

1. The minimum compartment height shall be 6.5-inches (165mm) and this shall be considered one-half space factor.
2. NEMA Size 5 FVNR starters and below shall be provided as plug-in units.
3. Plug-in Units
    a. Plug-in Units shall consist of a unit assembly, unit support pan, and unit door assembly.
    b. Units shall be supplied with removable doors. The unit doors shall be fastened to the structure so that the doors can be closed when the unit is removed.
    c. A unit support pan shall be provided for support and guiding units. Unit support pans shall remain in the structure when units are removed to provide isolation between units.
    d. A service position shall be provided for plug-in units that allows for the unit to be supported but disengaged from the bus. The unit shall be capable of being padlocked in the service position. This position is to be used to isolate a unit from the bus to allow service to be performed on the connected load equipment.
4. Power Stabs
    a. Unit stabs for engaging the power bus shall be tin-plated copper and provided with stainless back-up springs to provide and maintain a high pressure 4-point connection to the vertical bus.
    b. Wiring from the unit disconnecting means to the plug-in stabs shall not be exposed on the rear of the unit. A separate isolated pathway shall be provided for each phase to minimize the possibility of unit fault conditions reaching the power bus system.
    c. The power cable termination at the plug-in stab shall be maintenance-free crimp type connection.
5. Withdrawable Power Stabs
    a. Plug-in units shall have the capacity of withdrawing the power stabs, allowing the primary voltage to be disconnected with the unit door closed.
    b. The Withdrawable assembly shall accept a standard 1/4-inch (6mm) hex-style drive socket.
    c. The Withdrawable stabs design shall include a set of stab assembly-mounted shutters.
    d. The Withdrawable stabs design shall include interlock mechanisms.
    e. The Withdrawable stabs design shall include feedback mechanisms that are verifiable with the unit door closed.
    f. The Withdrawable power stabs with the door closed mechanism shall not increase the original height design so total space in the MMC is optimized.
    g. A remote operating device shall be supplied to allow the connection and disconnection of the power stabs with the doors closed.
6. Disconnect Handle

a. Plug-in units shall be provided with a heavy-duty, non-conductive, industrial-duty, flange mounted handle mechanism for control of each disconnect switch or circuit breaker.
b. Use of rotary operators is not acceptable.
c. The disconnect handle may pivot in the vertical or horizontal plane.
d. The ON-OFF condition shall be indicated by the handle position, red and green color indicator with the words ON and OFF, and the international symbols 1 and 0 along with a pictorial indication of the handle position.
e. Handles shall be capable of being locked in the OFF position with up to three (3) padlocks.
f. Plug-in units shall be provided with interlocks per NEMA and UL requirements.

7. Pilot Devices

a. Where specified, units shall be furnished with pushbutton, selector switches, or pilot lights as shown on the Contract Documents.
b. Pilot devices shall be rated NEMA Type 4/13 watertight/oil tight.

8. Terminal Blocks

a. Control Terminal blocks shall be provided on all contactor and starter units. They shall be a pull-apart design on all plug-in units for easy removal of the unit from the structure.
b. Control terminal blocks on non-plug-in contactor and starter units shall be fixed type.
c. Power terminal blocks shall be provided on all contactor and starter units, rated NEMA Size 3 (100 amperes) and below that utilize vertically operated disconnects.
d. Terminal blocks shall not be located adjacent to or inside the vertical wireway.

9. Doors

a. Each unit shall be provided with a removable door mounted on removable pin-type hinges.
b. The unit doors shall be capable of being opened at least 110-degrees.
c. The unit doors shall be removable from any location in the MCC without disturbing any other unit doors.
d. The unit doors shall be fastened to the structure so it can be closed to cover the unit space when the unit is removed.
e. The unit doors shall be held closed with quarter-turn latches.
f. Unit door latches shall be provided with arc resistant latches to help keep the door latched in the event that an internal arcing fault occurs.

B. Metering Compartment

1. The MCC shall include a plug-in metering unit.
2. The unit shall include the following.

a. Fusible disconnect with fuses. The disconnect must be operable with the unit door closed.
b. Fused control circuit transformer.
c. Current transformers shipped loose to be installed by the Contractor onto incoming power conductors.
d. Solid-state power monitor with door mounted display.

3. Power Monitor

a. The power monitor shall be capable of displaying the following:

i. Line current for all three phases with plus or minus 0.2-percent full-scale accuracy.
ii. Average three phase current with plus or minus 0.2-percent full-scale accuracy.
iii. Line-to-neutral and line-to-line voltage with plus or minus 0.2-percent full-scale accuracy.
iv. Current and voltage unbalance.

v. Real, reactive, apparent and true power with plus or minus 0.4 percent full-scale accuracy.
vi. kWh, kVARh, and kVAHnet.
vii. True RMS to the 45th harmonic.
viii. Frequency at plus or minus 0.5-percent.
ix. Power factor at plus or minus 0.4-percent.

b. The power monitor shall include min/max logs and trend logs with up to 45,867 data points.
c. The power monitor shall be capable of performing distortion analysis with THD, Crest Factor (I, V) and Distortion power factor.
d. The power monitor shall include a communication port compatible with specified communication option.
e. The power monitor shall include two (2) form-C relays.

C. Disconnects

1. Main Disconnect

a. If no overcurrent protection is indicated, provide a main incoming-line lug compartment. Lugs to accommodate the incoming power conductors as indicated on the Contract Documents.
b. Main Fusible Disconnect Switch (if specified in the Contract Documents) provide as per Manufacturer specification.
c. Main Circuit Breaker Disconnect (if specified in the Contract Documents) provide as per Manufacturer specification.

2. Feeder Disconnects and Transformer Disconnects

a. The disconnecting means for feeders and transformers shall be circuit breakers with thermal-magnetic trip units for 400-amps and smaller frames; provide an electronic trip unit for 600-amps and larger frames.
b. The interrupting capacity rating shall meet or exceed the available fault current as shown in the Contract Documents.
c. The minimum frame sizes shall be 150-amps.
d. Provide one (1) normally open and one (1) normally closed-circuit breaker auxiliary contact which follows the position of the circuit breaker main contacts for indication of ON or OFF/Tripped.

3. Motor Starter Disconnect

a. Electro-mechanical NEMA Starters

i. The disconnecting means for the across the line starters shall be motor circuit protectors.
ii. The unit short circuit rating shall be greater than or equal to the available fault current as shown on the Contract Documents.
iii. Units shall be supplied based upon the rules/requirements set for in the UL 845, NEMA ICS-18, and NFPA 70.
iv. Units shall be shipped as the motor circuit protector set as lowest setting per UL Standards. The Contractor shall field adjust the units based upon the particular motor application.
v. The minimum frame size shall be 150-amps.
vi. Provide one (1) normally open and one (1) normally closed-circuit breaker auxiliary contact which follows the position of the circuit breaker main contacts for indication of ON or OFF/Tripped.

b. Solid State Controllers (solid-state reduced voltage motor controllers (SSRV) and variable frequency drives (VFD)).

i. The disconnecting means for solid-state controllers shall be fusible disconnect with current limiting fuses.
ii. The short circuit rating shall be 100,000 amps (RMS symmetrical).

D. Automatic Transfer Switch

1. Provide if specified in the Contract Documents.

E. Combination NEMA Rated Across the Line Starters.

1. Starters shall meet applicable NEMA and UL requirements.
2. Starters shall be minimum NEMA 1. Fractional NEMA sizes are not acceptable.
3. Starters shall be provided with a 3-pole solid state overload relay that includes the following features:

a. Communication capability, which takes precedence over this overload requirement.
b. Selectable trip classes of 10, 15, 20, or 30.
c. Set for class 20 unless otherwise indicated on the Contract Documents.
d. Overload Protection.
e. Phase Loss Protection.
f. Trip Current adjustment range of 5:1.
g. Test/Reset Button.
h. Bipolar latching relay with one (1) normally open and one (1) normally closed contact, rated NEMA B600 for use in motor contactor control circuits.
i. Thermal memory circuit to model the heating and cooling effects of motor ON and OFF periods.
j. If ground fault protection is required, it shall have selectable trip value between 20-mA and 5-Amperes

4. The starter shall be capable of accommodating up to six (6) contacts in addition to the hold-in contact.
5. Provide a control power transformer with a rated secondary voltage of 120-VAC. The control power transformer shall be provided with primary and secondary fusing.
6. Overload relays shall have a reset button located on the outside of the unit door.
7. Provide a door mounted selector switch for HAND-OFF-AUTO operation. The HAND mode shall provide local control at the MCC unit door. The AUTO mode shall provide control through a remote contact.
8. Provide door mounted 120-VAC push-to-test pilot lights with LED lamps for ON (RED) and OFF (GREEN) status indication.

F. SSRV Motor Controllers

1. Provide a control power transformer with a rated secondary voltage of 120-VAC. The control power transformer shall be provided with primary and secondary fusing.
2. Type 1 SSRV Controller

a. Integrated bypass contactor that is closed once the motor is up to full speed.
b. Electronic overload protection with adjustable trip class.
c. Four (4) programmable auxiliary contacts.
d. Selectable control capabilities: soft start, kick start, current limit start, dual ramp, full voltage, linear speed, preset slow speed, soft stop.
e. Additional control capabilities, as available from specific Manufacturer
f. LCD display.
g. Keypad programming for configuration.

h. Built-in, selectable protective functions for: overload, jam, stall, excessive starts per hour, underload, over/under voltage, voltage unbalance.
i. Metering capabilities for: Current, voltage, kW, kWH, power factor, motor thermal capacity utilized, elapse time.
j. Ground Fault protection (1 A to 5 A).

3. Type 2 SSRV Controller

a. Integrated bypass contactor that is closed once the motor is up to full speed.
b. Electronic overload protection with adjustable trip class.
c. Selectable control capabilities: soft start, kick start, current limit start, soft stop.
d. Built-in, selectable protective functions for: overload, phase reversal, phase Loss/Open Load, Phase imbalance, shorted SCR, SCR Over temperature.

4. Provide an input isolation contactor.
5. The Type 2 Unit shall be provided with line side protective modules. The modules shall contain capacitors and metal oxide varistors (MOVs) that protect the internal power circuitry from severe electrical transients and/or high electrical noise.
6. Provide door-mounted pilot devices as shown on the Contract Documents.
7. Provide door mounted 120-VAC push-to-test pilot lights with LED lamps for ON (RED) and OFF (GREEN) status indication.
8. Emergency run bypass contractor is required. Bypass shall be fully rated for the motor load and be capable of starting the motor at full voltage. The emergency run bypass shall be provided with the same type of solid-state overload relay protection as for the electromechanical starter units.

G. VFD Motor Controller

1. Provide a control power transformer with a rated secondary voltage of 120-VAC. The control power transformer shall be provided with primary and secondary fusing.
2. Provide door-mounted pilot devices as shown on the Contract Documents.
3. Provide door mounted 120-VAC push-to-test pilot lights with LED lamps for ON (RED) and OFF (GREEN) status indication.
4. Provide a door-mounted human interface module for programming, display, and control.
5. Provide on isolated, configurable analog input and output.
6. Provide additional Manufacturer recommended options for the application specified.

PART 3 - EXECUTION

3.1 DISCONNECT SWITCH INSTALLATION

A. Clearly label Disconnects with the equipment served. Use 1/16-inch (2mm) thick laminated plastic composition material with contrasting color core. Engraved lettering shall be 1/4-inch (6mm) high. Attach tags with screws.

B. Install Disconnect Switch when motors are not in sight of the MCC.

3.2 MCC INSTALLATION

A. The Contractor shall install the MCC in accordance with the Manufacturer’s instructions.

B. The Contractor shall tighten all accessible bus connections and mechanical fasteners to the Manufacturer’s torque requirements.

C. The Contractor shall select and install all fuses in fusible switches based upon field requirements.

D. The Contractor shall adjust circuit breaker settings based upon field requirements.

E. The Contractor shall adjust solid state overloads to match the installed motor characteristics.

F. The Contractor shall provide field reports on tests performed, test values experienced, etc. and make the report available to the Owner upon request.

G. The Contractor shall perform field adjustment of the short circuit and overload devices as required to place the equipment in final operating condition. The settings shall be in accordance with the approved short circuit study, protective device evaluation study, protective device coordination study, manufacturer's instruction leaflet, and the Contract Documents.

H. The Manufacturer of the MCC shall be capable of providing the programming for the PLC and the operator interface, if provided with the MCC.

I. The Manufacturer shall be capable of providing start-up services as part of the supply of the MCC.

J. The Manufacturer shall provide training for the Operator, which covers concepts and knowledge to install, troubleshoot the MCC and associated programming.

K. Clearly label MCC units with the equipment being served. Use 1/16-inch (2mm) thick laminated plastic composition material with contrasting color core. Engraved lettering shall be 1/4-inch (6mm) high. Attach tags with screws.

END OF SECTION