Section 16425- MOTOR CONTROLLERS AND CONTACTORS

Introduction

Part 1 – General

- Related Work
  - Section 16195- Electrical Identification.
  - Section 16440- Enclosed Disconnect Switches and Circuit Breakers.
  - Section 16475- Overcurrent Protective Devices.
- Reference
  - The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 1 General Requirements.
- Description of Work
  - All motors will be provided ready for connections.
  - This Contractor responsible for proper phase relationships, and correct motor rotation.
  - Provide power circuit wiring for each motor from source of supply to terminal box on motor including required intermediate connections at devices such as motor starter, disconnect switches, etc.
  - Provide power circuit disconnects devices unless shown or specified to be furnished by other divisions or the owner.
  - Provide connecting lugs for equipment specified in this Section as well as for equipment furnished by other divisions or the owner.
  - Provide motor starters as specified for motors unless shown or specified to be furnished by other divisions or the owner. VDF drives shall be provided under division 15.
  - Provide control devices shown on motor schedule or as otherwise indicated.
  - Provide control wiring (except temperature control wiring) for operation, control and supervision of motorized equipment including wiring between motor starters and control devices specified and as shown on drawings.
  - Motor control wiring shall be installed in accordance with control wiring diagrams.
  - Motors ½ HP and smaller shall be served with 120 volts, single phase.
  - Motors ¾ HP and larger shall be served with 480 volt, 3 phase.
  - Starters for NEMA rated 460- volt motors 60 HP and above shall be reduced voltage starting type.
  - Reduced voltage starters shall be auto transformer type, closed transition.
- Reference Standards
  - ASME/ANSI A17.1 Safety Code for Elevators and Escalators.
  - NEMA ICS 1 Industrial Control and Systems: General Requirements.
  - NEMA ICS 2 Industrial Control and System: Controllers, Contactors and Overload Relays, rated not more than 200 Volts AC or 750 Volts DC.
  - NEMA AB- 1 Molded Case Circuit Breakers and Molded Case Switches.
  - NEMA KS- 1 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volt Max.)
  - NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)
  - UL 580 Electric Industrial Control Equipment.
  - UL 845 Electric Motor Control Centers.

- Submittals
    - The design shown in the contract documents is based on the first listed manufacturer. If any of the other listed manufacturers are provided the performance of the equipment shall be equal to or exceed the first listed manufacturer and result in clean coordination and an uncompromised distribution system.
    - Shop drawings for equipment provided under this Section.

Part 2 - Products

- Manufacturers
    - Cutler Hammer, Allen Bradley, General Electric, Siemens.
- Motor Control Equipment
    - Motor Starters:
        - Starters to be equipped with temperature compensated bi-metal overload relays with manual reset.
        - Manual starter to have melting alloy thermal overload relay.
        - Thermal units shall be selected on basis of nameplate horsepower, service factor and full load amps for particular motor.
        - Thermal units shall be selected on basis of measured actual full load amps of particular motor. Sizing shall be done with motor and driven device in its final and normal operating condition. Provide temporary heaters for each starter until motor is in proper operating condition, and replace with heaters sized to actual full load amps.
        - Each starter operating at other than 120 volts single phase shall have control transformer providing 120- volt control power to supply connected load plus 100% spare capacity.
            - Transformer shall have fused primary and secondary circuits.
        - Coils and pilot lights to be 120 volt. Provide surge suppressor across coil.
        - Manual starters shall be equipped with pilot light.
        - Starters shall be equipped with the following:
            - “Hand-Off-Auto” (H-O-A) selector switch.
            - 4 NO and 4 NC set of auxiliary contacts.
            - Red pilot light to indicate motor operation.
            - Green pilot light to indicate motor stopped.
            - Amber pilot light to indicate H-O-A switch in auto position.
        - Pilot lights shall be “Push-To-Test” type.
        - NEMA 3R enclosures shall also be gasketed.
    - Multi speed Starters:
        - Multi speed starters shall be equipped same as single-speed starters with addition of:
            - Speed selector switch.
            - “Auto-Off-Low-High” selector switch.
            - Compelling relay.
            - Accelerating relay/timer.
            - Decelerating relay/timer.
        - Reduced Voltage Motor Starters:
            - Autotransformer starter:
                - Closed transition.

- Magnetic Contactors:
  - Magnetic contactors shall be same as magnetic starters, except without overload protection.
- Motor Disconnect Devices:
  - Refer to Section 16440 –Disconnect Switches for disconnect switches not located in motor control centers.
  - Provide disconnect device with type FRN rejection full size fuses rated minimum of 600 volts Connected in line side of each starter.
  - Provide non-fused disconnect device at all motors.
  - Provide non-fused disconnect device at motors located on roof or located on floor different from overcurrent protective device.
  - Disconnect device shall be capable of being locked in open position.
  - Disconnect devices shall be:
    - Heavy-duty safety switch, quick-make, quick-break, horsepower rated.
      - Fused disconnect switches shall be equipped with Class RK-5 time delay fuses.

- Individual Starters and Disconnect Devices
  - Starter and disconnect device shall be installed in common enclosure, combination type, with accessories mounted in enclosure front except as scheduled.
  - Provide padlocking facility for one to three padlocks to lock disconnect in either ON or OFF position with door open or closed.
  - Provide mechanical interlock to prevent opening of door unless disconnect is in OFF position. Provide defeater to by-pass this interlock.
  - Remote disconnect switches for motors supplied from variable frequency drives (VFD) shall be equipped with pivot arm electrical interlock kit consisting of 4 NO and 4 NC contacts. Contacts to break control circuits before main switchblades open and close control circuits after main switchblades close.
  - Enclosures shall be: NEMA 1, NEMA 4X SS or NEMA 3R/12 by the spaces they are installed. NEMA 4X SS enclosures shall be required in, mechanical rooms, the main electrical equipment room, generator room, main emergency electrical room and for enclosures located exposed to the weather.

- Motor Control Centers
  - Motor Control Centers:
    - Install starters and disconnects in motor control centers, except where shown to be remote mounted at motor location.
    - Provide main breaker in the MCC, fully electronic type LSI/LSIG.
  - Motor Control Centers Shall Be:
    - 480Y/277 Volts, 3 phase 4 wire.
    - NEMA 1 enclosure indoors and NEMA 3R gasketed enclosure outdoors.
    - NEMA Class II.
    - NEMA Type B wiring.
    - Structure shall:
      - Consist of one or more vertical sections joined together to form a freestanding assembly.
      - Be minimum of 90” high, 20” wide and 15” deep for front mounted units or 20” deep for back-to-back units.
      - Have base channels with holes for bolting to floor.
      - Be designed to add matching sections on either end at future date.
    - Bus:
      - Bracing at 65,000 amps symmetrical.

- Shall be copper-tin plated.
- Horizontal Bus amp as shown on plans.
- Vertical bus size shall be same size a horizontal bus size.
- 50% Ground Bus size per NEMA standard.
- 400 AMP MCC's shall have each section rated 400 AMP.
- 300 AMP sections are not permitted.

- Wire ways:
  - Horizontal wire ways at top and bottom of structure.
  - Vertical wire way full height of each section.

- Lifting Eyes

  - Provide permanent mounted lifting eyes on all equipments shipped to the site for installation by the Contractor. Lifting eyes shall be heavy duty forged steel, located to facilitate equipment installation and removal and shall not be removed after construction is complete.

Part 3 – Execution

- Installation

  - Provide 120 volts to each temperature control panel.
  - Install disconnects and motor control equipment as indicated. Final location of devices shall be determined in field.
  - Provide NEMA 4 disconnect switches at exterior mounted equipment.
  - Each motor terminal box shall be connected to rigid conduit system with maximum 18" of flexible liquid-tight metal conduit.
  - Provide green wire ground through flexible conduit to interconnect motor frame and rigid conduit system.
  - Check for proper rotation of each motor.
  - Install fuses per manufacturer's instructions.

- Elevator Connections

  - Provide power wiring from source through circuit breaker disconnect to elevator controller to motor.
  - Coordinate entire installation with elevator equipment supplier prior to rough in.
    - Installation shall comply with ASME/ANSI A17.1: Safety Code for Elevators and Escalators.

End of Appendix Section 16425