SECTION 16420

ENCLOSED CONTROLLERS

PART 1 GENERAL

A SUMMARY

1 This Section includes ac general-purpose controllers rated 600 V and less that are supplied as enclosed units (see section 16443 for MCC mounted controllers).

B QUALITY ASSURANCE

1 Source Limitations: Obtain enclosed controllers of a single type through one source from a single manufacturer. The same manufacturer shall provide controllers and switchgear.

2 Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

3 Comply with NFPA 70.

C DELIVERY, STORAGE, AND HANDLING

1 Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

D COORDINATION

1 Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

2 Coordinate features of enclosed controllers and accessory devices with pilot devices and control circuits to which they connect.

3 Coordinate features, accessories, and functions of each enclosed controller with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load. Coordinate all control requirements with the Mechanical Contractor and Temperature Control Contractor.

PART 2 PRODUCTS

A MANUFACTURERS

1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a Magnetic controllers and Variable-Frequency Controllers:

i General Electrical Distribution & Control.

ii Siemens/Furnas Controls.

iii Square D Co.

iv Cutler Hammer

B MAGNETIC ENCLOSED CONTROLLERS

1 Description: NEMA ICS 2, Class A, full voltage, nonreversing, across the line, unless otherwise indicated.

2 Control Circuit: 120 V; obtained from integral control power transformer of sufficient capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity. Verify with mechanical contractor's equipment prior to ordering controller.

3 Combination Controller: Factory-assembled combination controller and disconnect switch.

a Fusible Disconnecting Means: NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 947-4-1, as certified by a nationally recognized testing laboratory.

4 Adjustable Overload Relay: Solid State, Dip switch selectable for motor running overload protection with NEMA ICS 2, Class 20 tripping characteristic, and selected to protect motor against voltage and current unbalance and single phasing. Provide relay with Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.

C ENCLOSURES

1 Description: Flush- or surface-mounted cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated to comply with environmental conditions at installed location.

D ACCESSORIES

1 Devices shall be factory installed in controller enclosure, unless otherwise indicated.

2 Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type. Provide H-O-A selector switch w/pilot lights in each enclosure.

3 Control Relays: Auxiliary and adjustable time-delay relays.

a Selectable start/stop control, switching between either the start and stop buttons on the keypad or a remote maintained contact closure.

b Selectable speed control, switching between either the faster and slower buttons on the keypad or a remote analog (0-10 VDC, 4-20 MA, etc.) input.

c Analog outputs proportional to speed, motor amps, and KW.

d Digital outputs to monitor drive run and fault status remotely.

4 Phase-Failure and Undervoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection. Provide adjustable undervoltage setting.

5 Current-Sensing, Phase-Failure Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection; arranged to operate on phase failure, phase reversal, current unbalance of from 30 to 40 percent, or loss of supply voltage; with adjustable response delay.

6 Soft-start / Soft-stop modules for all pump motor controllers 3h.p. or greater. Soft-start modules for all fan motor controllers 3h.p. or greater

E FACTORY FINISHES

1 Manufacturer's standard prime-coat finish ready for field painting.

PART 3 EXECUTION

A EXAMINATION

1 Examine areas to receive enclosed controllers for compliance with requirements, installation tolerances, and other conditions affecting performance.

2 Proceed with installation only after unsatisfactory conditions have been corrected.

B APPLICATIONS

1 Select features of each enclosed controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, drive, and load; and configuration of pilot device and control circuit affecting controller functions.

2 Select horsepower rating of controllers to suit motor controlled.

C INSTALLATION

1 See Division 16 Section "Basic Electrical Materials and Methods" for general installation requirements.

2 For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Division 16 Section "Basic Electrical Materials and Methods."

3 Enclosed Controller Fuses: Install fuses in each fusible switch. Comply with requirements in Division 16 Section "Fuses."

D IDENTIFICATION

1 Identify enclosed controller components and control wiring according to Division 16 Section “Electrical Identification."

E CONTROL WIRING INSTALLATION

1 Install wiring between enclosed controllers according to Division 16 Section "Conductors and Cables."

2 Bundle, train, and support wiring in enclosures.

3 Connect hand-off-automatic switch and other automatic-control devices where applicable.

a Connect selector switches to bypass only manual- and automatic-control devices that have no safety functions when switch is in hand position.

b Connect selector switches with enclosed controller circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

F FIELD QUALITY CONTROL

1 Prepare for acceptance tests as follows:

a Test insulation resistance for each enclosed controller bus, component, connecting supply, feeder, and control circuit.

b Test continuity of each circuit.

2 Testing: Perform the following field quality-control testing:

a Perform each electrical test and visual and mechanical inspection indicated in NETA ATS, Sections 7.5, 7.6, and 7.16.

b Certify compliance with test parameters.

c Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3 Test Reports: Prepare a written report to record the following:

a Test procedures used.

b Test results that comply with requirements.

c Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

G ADJUSTING

1 Set field-adjustable switches and/or circuit-breaker trip ranges according to each respective motor horsepower ratings and manufacturers recommended setting.

H CLEANING

1 Clean enclosed controllers internally, on completion of installation, according to manufacturer's written instructions. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 16420