**SECTION 213900**

**CONTROLLERS FOR FIRE PUMP DRIVERS**

## PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Controllers for electric-drive fire pumps.
2. Controllers for pressure-maintenance pumps.

1.3 DEFINITIONS

A. ATS: Automatic transfer switch(es).
B. ECM: Electronic control module.
C. MCCB: Molded-case circuit breaker.
D. NO: Normally open.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories**.**

B. Shop Drawings: For each type of product indicated. Include dimensioned plans, elevations, sections, details, and attachments to other work, including required clearances and service spaces around controller enclosures.

1. Show tabulations of the following:

a. Each installed unit's type and details.
b. Enclosure types and details for types other than NEMA 250, Type 2.
c. Factory-installed devices.
d. Nameplate legends.
e. Short-circuit current (withstand) rating of integrated unit.
f. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices.
g. Specified modifications.

2. Detail equipment assemblies and indicate dimensions, weights, loads, method of field assembly, components, and location and size of each field connections

3. Schematic and Connection Diagrams: For power, signal, alarm, and control wiring and for pressure-sensing tubing.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For each type of product indicated, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Product Certificates: For each type of product indicated, from manufacturer.

C. Source quality-control reports.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Record Drawings: Complete Shop Drawing re-submittal updated to reflect actual final system installation integral to Division 21 for water-based fire suppression systems record drawing submittal.

B. Operation and Maintenance Data: For fire pumps to include in operation and maintenance manuals

C. Operation and Maintenance Data: For each type of product indicated to include in emergency, operation, and maintenance manuals. Include the following:

1. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.

2. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor-based logic controls.

3. Project Specific Summary of NFPA Required Inspections, testing and maintenance

4. Project Specific Summary of Controller Start and Stop set points, and all other controller settings.

1.7 QUALITY ASSURANCE

A. Factory Testing: Controllers tested. Inspected, and rated according to UL 218 requirements for "Operation Test" and "Manufacturing and Production Tests."

B. Source Limitations: Obtain products for each product category from a single manufacturer.

C. Product Standards: Listed in the "Fire Protection Equipment Directory" published by UL or the "Approval Guide" published by FM Global.

1. Subject to compliance with requirements, indication of a UL product requirement within Part 2 shall be construed to be inclusive of a corresponding FM Global approved product, with or without UL listing.

D. NFPA Compliance: Comply with NFPA 20 NFPA 70 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store 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.

B. If stored in areas subject to weather, protect controllers from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers.

1.9 FIELD CONDITIONS

A. Environmental Limitations:

1. Ambient Temperature Rating: Not less than 40 deg F and not exceeding 122 deg F unless otherwise indicated.

2. Altitude Rating: Not exceeding 6600 feet unless otherwise indicated.

1.10 COORDINATION

A. Definition, “Coordinate”: Where Sections of the Work interact, the Contractor responsible for this Section of the Work initiates verbal and/ or written communication with one or more different Contractors responsible for other interacting Sections of the Work for the purposes of establishing a coordinated approach of product selections and installation sequencing that satisfies the individual requirements of the interacting Sections of the Work as well as the requirements of the Work as a whole.

B. Coordinate construction operations with those of other Sections of the Work and other entities to ensure efficient and orderly installation of each part of the Work.

1. Coordinate sizes and locations of concrete bases with actual equipment provided.

2. Coordinate electrical connections for the fire pump and controller, including control wiring between the controller and emergency generator with Division 26.

C. Coordinate operations and product selections of this Section with operations and product selections included in different Sections that depend on each other for proper installation, connection, and operation.

D. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

E. Coordinate installation of different components with other Sections of the Work to ensure maximum performance and accessibility for required maintenance, service, and repair.

F. Make adequate provisions to accommodate items scheduled for later installation.

## PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Division 26 for seismic controls for electrical systems.

B. Seismic Performance: Fire-pump controllers and alarm panels shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 CONTROLLERS FOR ELECTRIC-DRIVE FIRE PUMPS

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

1. ASCO Power Technologies, LP; Firetrol Products.
2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Joslyn Clark Corporation.
4. Master Control Systems, Inc.

B. General Requirements for Full-Service Controllers:

1. Comply with NFPA 20 and UL 218.
2. Combined automatic and nonautomatic operation.
3. Factory assembled, wired, and tested; continuous-duty rated.

C. Method of Starting:

1. Pressure transducer actuated.

a. Water- pressure transducer with independent high- and low-calibrated adjustments responsive to water pressure in fire-suppression piping.

b. Programmable minimum-run-time relay to prevent short cycling.

c. Programmable timer for weekly tests.

2. Controller: Solid-state reduced-voltage, soft-start type.
3. Emergency Start: Mechanically operated start handle that closes and retains the motor RUN contactor independent of all electric or pressure actuators.
4. Provide remote start capability upon signal from fire alarm system.

D. Method of Stopping: Nonautomatic or via signal from fire alarm system.

E. Capacity: Rated for fire-pump-driver horsepower and short-circuit-current (withstand) rating equal to or greater than short-circuit current available at controller location.

F. Method of Isolation and Overcurrent Protection: Interlocked isolating switch and nonthermal MCCB; with a common, externally mounted operating handle, and providing locked-rotor protection.

G. Door-Mounted Operator Interface and Controls:

1. Monitor, display, and control the devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used.

2. System shall have an event log retaining a minimum 3000 operational and alarm events with index number, time and date stamp.

3. Method of Control and Indication:

    a. Microprocessor-based logic controller, with multi-line digital readout.

    b. Membrane or touchscreen keypad.

    c. LED alarm and status indicating lights.

4. Local Alarm and Status Indications:

    a. Controller power on.

    b. Controller is in the automatic position.

    c. Motor running condition.

    d. Loss-of-line power.

    e. Line-power phase reversal.

    f. Line-power single-phase condition.

5. Audible alarm, with silence push button.

6. Nonautomatic START and STOP push buttons or switches.

7. Exterior door-mounted USB communication port.

8. Paperless digital pressure recorder.

H. Communications Ports: USB, Ethernet, and RS485 for local and remote status monitoring and programing.

I. Output Contacts for Fire Alarm System Supervision:

1. Motor running condition.

2. Loss-of-line power.

3. Line-power phase reversal or single-phase condition.

J. Integral Automatic Transfer Switch (ATS):

1. Complies with NFPA 20, UL 218, and UL 1008.

2. Integral with controller as a listed combination fire-pump controller and power transfer switch.

3. Automatically transfers fire-pump controller from normal power supply to alternate power supply in event of power failure.

4. Allows manual transfer from one source to the other.

5. Alternate-Source Isolating and Disconnecting Means: Integral molded-case switch, with an externally mounted operating handle.

6. Alternate-Source Isolating and Disconnecting Means: Mechanically interlocked isolation switch and circuit breaker rated at a minimum of 115 percent of rated motor full-load current, with an externally mounted operating handle; circuit breaker shall be provided with nonthermal sensing, instantaneous-only short-circuit overcurrent protection to comply with available fault currents.

7. Local Alarm and Status Indications:

    a. Normal source available.

b. Alternate source available.

c. In normal position.

d. In alternate position.

e. Isolating means open.

8. Audible alarm, with silence push button.

9. Nonautomatic (manual, nonelectric) means of transfer.

10. Engine test push button.

11. Start generator output contacts.

12. Timer for weekly generator tests.

13. Output Contacts for Fire Alarm System Supervision:

a. In alternate position.

## 2.3 CONTROLLERS FOR PRESSURE-MAINTENANCE PUMPS

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

1. ASCO Power Technologies, LP; Firetrol Products.

2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.

3. Joslyn Clark Corporation.

4. Master Control Systems, Inc.

B. General Requirements for Pressure-Maintenance-Pump Controllers:

1. Type: UL 508 factory assembled, -wired, and tested, across-the-line; for combined automatic and manual operation.

2. Method of Starting: Water pressure transducer with independent high- and low-calibrated adjustments responsive to water pressure in fire-suppression piping.

3. Enclosure: UL 508 and NEMA 250, Type 12 for wall-mounting.

4. Factory assembled, wired, and tested.

5. Finish: Manufacturer's standard color paint.

C. Rate controller for scheduled horsepower and include the following:

1. Fusible disconnect switch.

2. Pressure transducer.

3. Hand-off-auto selector switch.

4. Pilot light.

5. Running period timer.

## 2.4 ENCLOSURES

A. Fire-Pump Controllers, and Automatic Transfer Switches: NEMA 250, to comply with environmental conditions at installed locations and NFPA 20.

1. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12 (IEC IP12).

B. Enclosure Color: Manufacturer's standard "fire-pump-controller red".

C. Nameplates: Comply with NFPA 20; complete with capacity, characteristics, approvals, listings, and other pertinent data.

D. Floor stands, 12 inches high, for floor-mounted controllers.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine areas and surfaces to receive equipment, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine equipment before installation. Reject equipment that is wet or damaged by moisture or mold.

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

### 3.2 CONTROLLER INSTALLATION

A. Coordinate installation of controllers with other construction including conduit, piping, fire-pump equipment, and adjacent surfaces. Maintain required clearances for workspace and equipment access doors and panels. Ensure that controllers are within sight of fire-pump drivers.

B. Install controllers within sight of their respective drivers.

C. Connect controllers to their dedicated pressure-sensing lines.

D. Wall-Mounting Controllers: Install controllers on walls with disconnect operating handles not higher than 79 inches above finished floor, and bottom of enclosure not less than 12 inches above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Division 26.

E. Floor-Mounting Controllers: Install controllers on 4-inch nominal-thickness concrete bases, using floor stands high enough so that the bottom of enclosure cabinet is not less than 12 inches above finished floor. Comply with requirements for concrete bases specified in Division 03.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. Install anchor bolts to elevations required for proper attachment to supported equipment.

F. Seismic Bracing: Comply with requirements specified in Division 26.

G. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

H. Comply with NEMA ICS 15.

3.3 POWER WIRING INSTALLATION

A. Install power wiring between controllers and their services or sources, and between controllers and their drivers. Comply with requirements in NFPA 20, NFPA 70, and Division 26.

B. Locations of all penetrations in controller enclosure shall be in accordance with manufacturer’s installation guidelines and listing requirements.

C. Penetrations of controller enclosure shall maintain NEMA classification of enclosure, and be in accordance with manufacturer’s installation guidelines and listing requirements.

3.4 CONTROL AND ALARM WIRING INSTALLATION

A. Install wiring between controllers and facility's central monitoring system. Comply with requirements in NFPA 20, NFPA 70, and Division 26.

B. Install wiring between controllers and the building's fire-alarm system. Comply with requirements specified in Division 28.

C. Bundle, train, and support wiring in enclosures.

D. Connect remote manual and automatic activation devices where applicable.

E. Locations of all penetrations in controller enclosure shall be in accordance with manufacturer’s installation guidelines and listing requirements.

F. Penetrations of controller enclosure shall maintain NEMA classification of enclosure, and be in accordance with manufacturer’s installation guidelines and listing requirements.

3.5 IDENTIFICATION

A. Comply with requirements in NFPA 20 for marking fire-pump controllers.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification in NFPA 20 and as specified in Division 26.

3.6 FIELD QUALITY CONTROL

A. Test each fire controller with its pump as a unit. Comply with requirements for fire-pump drivers specified in Division 21.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Prior to final acceptance test with Owner and authority having jurisdiction (AHJ) perform preliminary testing to adjust system and correct deficiencies prior to final acceptance testing.

D. Acceptance Testing Preparation:

1. Inspect and Test Each Component:

a. Inspect wiring, components, connections, and equipment installations. Test and adjust components and equipment.

b. Test insulation resistance for each element, component, connecting supply, feeder, and control circuits.

c. Test continuity of each circuit.

2. Verify and Test Each Electric-Drive Controller:

   a. Verify that voltages at controller locations are within plus 10 or minus 1 percent of motor nameplate rated voltages, with motors off. If outside this range for any motor, notify Construction Manager before starting the motor(s).

   b. Test each motor for proper phase rotation.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Field Acceptance Tests:

1. Do not begin field acceptance testing until suction piping has been flushed and hydrostatically tested and the certificate for flushing and testing has been submitted to Construction Manager and authorities having jurisdiction.

2. Prior to starting, notify authorities having jurisdiction of the time and place of the acceptance testing.

3. Engage manufacturer's factory-authorized service representative to be present during the testing.

4. Perform field acceptance tests as outlined in NFPA 20.

F. Controllers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports.

## 3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

## 3.8 ADJUSTING

A. Adjust controllers to function smoothly and as recommended by manufacturer.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, and timers.

C. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

D. Set field-adjustable pressure switches.

## 3.9 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.

B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain controllers, and to use and reprogram microprocessor-based controls within this equipment.

END OF SECTION