

**SECTION 21 2400**  
**DRY-CHEMICAL FIRE-EXTINGUISHING SYSTEM**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fire suppression system.
- B. Cylinder and valve assembly.
- C. Manual release station.
- D. Control equipment.
- E. Distribution system.
- F. Pipe and piping specialties.
- G. Miscellaneous equipment.
- H. System maintenance after closeout.

**1.02 RELATED REQUIREMENTS**

- A. Section 07 8400 - Firestopping.
- B. Section 08 7100 - Door Hardware.
- C. Section 09 9123 - Interior Painting.
- D. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.
- E. Section 21 1300 - Fire Suppression Sprinkler Systems.
- F. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- G. Section 23 0913 - Instrumentation and Control Devices for HVAC.
- H. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections.
- I. Section 28 3100 - Fire Detection and Alarm.

**1.03 REFERENCE STANDARDS**

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.
- B. ASME B31.1 - Power Piping; 2014.
- C. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.
- D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- E. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service; 2014.
- F. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2009 (Reapproved 2014).
- G. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.
- H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
- I. ITS (DIR) - Directory of Listed Products; current edition.
- J. NFPA 17 - Standard for Dry Chemical Extinguishing Systems; 2013.
- K. NFPA 33 - Standard for Spray Application Using Flammable or Combustible Materials; 2011.
- L. NFPA 34 - Standard for Dipping, Coating, and Printing Processes Using Flammable or Combustible Liquids; 2015.
- M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. NFPA 72 - National Fire Alarm and Signaling Code; 2016.

- O. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.
- P. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.
- Q. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service; Current Edition, Including All Revisions.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

#### **1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: To bear stamp of approval of Authority Having Jurisdiction. Provide for each piece of equipment comprising the system including valves, pressure gages, detectors, release devices, actuators, thermostats, discharge nozzles, manual controls, alarm devices, annunciators, extinguishing agent containers, manifolds, and control panel.
- C. Shop Drawings: To bear stamp of approval of Authority Having Jurisdiction. Indicate detailed layout of system, including piping and location of each component. Include control diagrams, wiring diagrams, and written sequence of operation.
  - 1. Drawing Scale: 1/8 inch to 1 foot, minimum; use larger scale for details.
- D. Design Data: Submit design calculations bearing stamp of approval of Authority Having Jurisdiction, Fire Marshal, Owner's fire insurance underwriter, and \_\_\_\_\_. Include calculations that verify system pressures, nozzle flow rate, orifice code numbers, piping pressure losses, component flow data, and pipe sizes. Base design approach on NFPA 17.
- E. Installer's Qualification Statement.
- F. Certificates: Certify that products meet or exceed specified requirements.
  - 1. Manufacturer: Certify that system meets or exceeds specified requirements.
- G. Manufacturer's Instructions: Include recommended equipment installation and system components.
- H. Test Reports: Indicate successful completion of tests; include certification of extinguishing agent container pressure and extinguishing agent quantity.
- I. Code Authority Approval: Submit copy of inspection approval of fire protection system by Authority Having Jurisdiction.
- J. Project Record Documents: Record actual locations of components and equipment, equipment identification markings, conduit and piping routing details, and agent container positions.
- K. Operation and Maintenance Data:
  - 1. Include electrical schematic written description of system design, drawings illustrating control logic and equipment locations, and technical brochures describing equipment.
  - 2. Include list of recommended spare parts.
  - 3. Include checklists and procedures for emergency situations, trouble shooting techniques, abort functions, system control panel operation, trouble procedures, and safety requirements.
- L. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### **1.06 QUALITY ASSURANCE**

- A. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this Work and licensed at Michigan.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

- C. Provide products listed, classified, and labeled by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for the purpose indicated.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store equipment in shipping containers with labeling in place. Deliver fire extinguishing agent in approved containers.

#### **1.08 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a six year period after Date of Substantial Completion.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. System Components Other Than Pipe, Piping Specialties, Conduit, Wiring, and Wiring Devices:
  - 1. Kidde Fire Systems, a UTC Company; Model IND: [www.kiddefiresystems.com](http://www.kiddefiresystems.com).
  - 2. Tyco Fire Protection Products, a Tyco Business; \_\_\_\_: [www.tyco-fire.com](http://www.tyco-fire.com).
- B. Controls and Control Panels:
  - 1. Kidde Fire Systems, a UTC Company; ARIES NETLink: [www.kiddefiresystems.com](http://www.kiddefiresystems.com).
  - 2. Tyco Fire Protection Products, a Tyco Business; \_\_\_\_: [www.tyco-fire.com](http://www.tyco-fire.com).
- C. Alarm and Detection Systems:
  - 1. Kidde Fire Systems, a UTC Company; AIR-Intelligence: [www.kiddefiresystems.com](http://www.kiddefiresystems.com).
  - 2. Tyco Fire Protection Products, a Tyco Business; \_\_\_\_: [www.tyco-fire.com](http://www.tyco-fire.com).

#### **2.02 FIRE SUPPRESSION SYSTEM**

- A. Provide a pre-engineered modular type, fixed pipe, automatic dry chemical fire suppression system for the hazard including work area, plenums, all exhaust ventilation pits, all associated ductwork, and \_\_\_\_\_ requiring protection.
- B. System to consist of manufacturer's dry chemical storage cylinders, actuation hardware, distribution nozzles attached to the pipe network, and \_\_\_\_\_.
- C. System to comply with NFPA 17, NFPA 33, NFPA 34, and \_\_\_\_\_ including extinguishing agent.

#### **2.03 CYLINDER AND VALVE ASSEMBLY**

- A. Provide steel cylinder and valve assemblies of the type and size required by the manufacturer for dry chemical storage.
- B. Specialties to consist of valves and pressure gages, including reliable and safe means of minimizing accidental discharge.
- C. Furnish pressurized assembly with the capability of being stored and operated at the following temperature ranges:
- D. Provide listed bracketing for the mounting of the cylinder securely to the intended mounting surface.
- E. Furnish manufacturer's high-pressure nitrogen tubing when control system is mounted to a dry cylinder and in all cases where actuation delay is employed.

#### **2.04 MANUAL RELEASE STATION**

- A. Provide as a means of manually actuating the system from a remote location.
- B. Surface housing fitted with un-tensioned pull-to-trip that locks in position after allowing the control system to activate the cylinder and valve assembly, for mounting on electrical outlet box; addressable using manufacturer's standard monitor module.
- C. Functions:
  - 1. Activate all audible and visual alarms.
  - 2. Override any abort station or time delay function.

3. Activate all release and shutdown functions normally triggered by detectors or alarm system.
- D. Identification:
1. Provide engraved label for each manual release station indicating area protected and that actuation will cause discharge of fire extinguishing agent.
  2. Provide manufacturer's label directly on faceplate.

## **2.05 CONTROL EQUIPMENT**

- A. Provide control equipment capable of automatic and manual discharge of the dry chemical agent from all extinguishing valve assemblies, including automatic shutdown of the heat source or fuel and electrical power to all protected areas upon system activation.
- B. Furnish fully enclosed, integral control head and actuator for each cylinder valve assembly without exposed means for actuation.
1. Control Head: Equip with micro-switch contacts for audible alarm and equipment shutdown.
- C. All cylinders protecting one hazard area must be connected for simultaneous discharge by all methods of alarm actuation.
- D. Activate control head automatically by electrical and mechanical means.
1. Provide listed, rate-compensated thermostat fire detectors conforming to NFPA 17, with rating suitable to their expected exposure temperature, capable of detecting and indicating heat, flame, smoke, combustible vapors, or an abnormal condition in the hazard that is likely to produce a fire.
  2. Electrical Activation:
    - a. Activate electric solenoid by tested and listed system control panel.
    - b. Provide supervision for all detection and releasing circuits.
    - c. Furnish listed, rate-compensated thermostat fire detectors conforming to NFPA 17, with rating suitable to their expected exposure temperature, capable of detecting and indicating heat, flame, smoke, combustible vapors, or an abnormal condition in the hazard that is likely to produce a fire.
    - d. Provide secondary, reserve power supply in accordance with NFPA 17, Chapter 9.6.1
  3. Mechanical Activation:
    - a. Activate system control head by manufacturer supplied fire detectors incorporating mechanical thermo-bulb link systems requiring no outside power source for operation.
    - b. Provide thermo-bulb links with rating suitable to their expected exposure temperature.

## **2.06 DISTRIBUTION SYSTEM**

- A. Discharge Nozzles:
1. Total-flooding type for enclosed spaces.
  2. Duct/plenum type for exhaust ducts or plenums.
  3. Identification: Permanently marked with manufacturer's identification system identifying nozzle type and listing.
- B. Discharge Nozzles for Local Application:
1. High overhead type for discharge of solid cone of dry chemical on to protected area from above.
  2. Identification: Permanently marked with manufacturer's identification system identifying nozzle type and listing.
- C. Flow Restrictors: Designed and supplied by the extinguishing system manufacturer to restrict flow of dry chemical through the in-line distribution piping to ensure the appropriate quantity of agent is delivered to each nozzle in the distribution system.

## **2.07 PIPE AND PIPING SPECIALTIES**

- A. Steel Pipe: ASTM A53/A53M or ASTM A106/A106M Schedule 40, or ASTM A135/A135M Schedule 10, hot dipped galvanized.

1. Fittings: ASME B16.3 malleable iron class 300 for sizes 2 inch and smaller, or ASTM A234/A234M, wrought steel welding type fittings.
  2. Joints: Threaded, AWS D1.1/D1.1M welded, or grooved and shouldered pipe end couplings.
- B. Pipe Hangers: ASME B31.1, listed, split clamp up to 2-1/2 inch size, riser clamps over 2-1/2 inch size, adequate to offset discharge thrust.
- C. Escutcheons: Chrome plated pressed or stamped brass, one-piece or split pattern, minimum 2 inches larger than opening.
- D. Gages:
1. ASME B40.100, UL 393, UL 404, or \_\_\_\_\_ 3-1/2 inch diameter cast aluminum case, phosphor bronze bourdon tube, rotary brass movement, brass socket, front re-calibration adjustment, black figures on white background, 1 percent mid-scale accuracy, scale calibrated in psi.

## **2.08 MISCELLANEOUS EQUIPMENT**

- A. Alarm Bells: 24 volts, with supervision of circuit wiring, of modular design, red baked enamel finish, with minimum sound level of 84 dba at 10 feet, for mounting on 4 inch electrical outlet box.
- B. Alarm Horns: 24 volts, with supervision of circuit wiring, with minimum sound level of 90 dba at 10 feet, for mounting on 4 inch electrical outlet box.
- C. Strobe Beacon: Manufacturer's standard design, 24 volts, with system identification on strobe lens.
- D. Signage:
1. Entrance Sign: One warning sign at each entrance to protected area.
  2. Exit Warning Signs: One lighted, flashing warning sign at each exit from protected area.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that open, enclosed, and protected areas requiring total dry chemical flooding enable required application and concentration to be built up and maintained for the required time to ensure fire is extinguished.

### **3.02 INSTALLATION**

- A. Install in accordance with the Authority Having Jurisdiction, Fire Marshal, Owner's fire insurance underwriter, manufacturer's instructions, and \_\_\_\_\_ including the following NFPA Standards:
1. NFPA 17 and NFPA 33 for the extinguishing system.
  2. NFPA 72 for the detection and alarm control units (other than links).
  3. NFPA 70 for electrical connections.
- B. Agent Distribution Piping:
1. Ream pipe and tube ends, remove burrs and bevel plain end ferrous pipe.
  2. Remove scale and dirt on inside and outside before assembly.
  3. Blow out pipe before nozzles or discharge devices are installed.
  4. Route piping in orderly manner, concealed, plumb and parallel to building structure, and maintain gradient.
  5. Install piping to conserve building space and not interfere with use of space and other work.
  6. Securely support piping in accordance with ASME B31.1 with allowance for fire extinguishing agent thrust forces, and thermal expansion and contraction.
  7. Use grooved mechanical couplings and fasteners only in accessible locations with roll grooved piping only.
  8. Install unions downstream of valves and at equipment or apparatus connections.
  9. Prepare pipe, fittings, supports, and accessories for finish painting, in accordance with Section 09 9123.

10. Identify in accordance with requirements of referenced standard.
  - a. Place directional arrows and system labels wherever piping changes direction and minimum every 20 feet on straight runs.
  - b. Install engraved plastic instruction plate, detailing emergency procedures, at control panel and at each manual discharge and abort switch location.
  - c. At control panel identify control logic units, contacts, and major circuits with permanent nameplates.
  - d. Refer to Section 22 0553 for identification.
- C. Manufactured Equipment for Field Installation:
  1. Cylinder and valve assembly with listed mounting bracket.
  2. Discharge adapter kit.
  3. Pressure switches where applicable.
  4. Discharge nozzles.
  5. Actuation System Installation:
    - a. Mount the housed control system where indicated on the drawings.
    - b. Install the system valve actuators, cylinders, and nitrogen actuation tubing.
    - c. Mechanical/Electrical Actuation:
      - 1) Install fusible links, cabling, heat detectors, and UL (DIR) listed fire control panel.
      - 2) Locate thermo-bulb links in accordance with manufacturer's instructions and as acceptable to the authority having jurisdiction.
    - d. Install remote manual release pull station.
    - e. Mount electrical actuator within control system housing.
    - f. Attach, mount, and wire all micro-switches.
- D. Install wiring in accordance with Section 26 2717 requirements.
- E. Make final connections between equipment and system wiring under direct supervision of factory trained representative of manufacturer.
- F. Penetrations:
  1. At hazard area walls pack space between pipe, pipe sleeve or surface penetration with mineral fiber with elastomer calk to depth of 1/2 inch.
  2. Provide escutcheons where exposed piping passes through walls, floors, and ceilings.
  3. Seal pipe penetrations of fire separations.
  4. Refer to Section 07 8400.
- G. Locate remote manual releases and abort switches at one or more doors to protected area.
- H. Locate strobe units at all points of entrance to protected area.

### **3.03 INTERFACE WITH OTHER PRODUCTS**

- A. Provide interlock with automatic closing door releases. Refer to Section 08 7100.
- B. Integrate system with pre-action sprinkler system. Refer to Section 21 1300.
- C. Provide signal to building fire alarm system. Refer to Section 28 3100.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Perform field inspection and testing in accordance with Section 01 4000 - Quality Requirements.
- C. Pressure Testing:
  1. Test distribution piping and valving, prior to nozzle installation, with air pressure test at levels recommended by the manufacturer.
  2. Inspect joints using soap water solution or halide torch or lamp.
  3. Repair leaks and retest.
  4. Maintain test pressure for four hours.
- D. Upon completion of installation provide final checkout inspection by factory trained representative of manufacturer to ascertain proper system operation.

- E. Leave system in a fully commissioned and automatic readiness state with circuitry energized and supervised.
- F. Test circuits including automatic discharge, manual discharge, equipment shut-down, alarm devices, storage container pressure, and supervision of each circuit.
- G. Check each detector in accordance with manufacturer's instructions, perform any required adjustments, and include record of work in test report.
- H. Submit original copies of tests, indicating that factory trained technical representatives of the manufacturer have inspected and tested systems and are satisfied with methods of installation, connections and operation.
- I. Where applicable, pressure test enclosed, protected space with test fan, pressurizing protected area both under positive and negative conditions. Confirm that leakage is within system design allowance.

### **3.05 CLOSEOUT ACTIVITIES**

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. See Section 01 7900 - Demonstration and Training, for additional requirements.
- C. Demonstration and Instructions:
  - 1. Demonstrate that components, except discharge assemblies, are functioning properly and in conjunction with controls system.
  - 2. Submit integrated step-by-step test procedure for approval 30 days prior to start of demonstration.
    - a. Arrange meeting prior to demonstration with representatives of Owner, Owner's underwriter, and the installer.
    - b. Perform visual inspection and overall review of system installed.
    - c. Place minimum of three UL-listed recording analyzers in space.
    - d. Provide certification that testing devices have been checked by a recognized testing authority within two weeks of date of demonstration.
    - e. When applicable, certify that replacement charge can be provided within 24 hours of demonstration.
- D. Training: Train Owner's personnel on operation and maintenance of system.
  - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
  - 2. Provide minimum of two hours of training.

### **3.06 MAINTENANCE**

- A. Conduct inspections at six months and 12 months from Date of Substantial Completion to verify proper operation of system, check agent container weight and pressure, and a thorough check of controls, detection and alarm systems.
- B. Remedy of all deficiencies shall be included at no extra cost to Owner except for replacement of agent due to discharge under normal use or damage due to abuse.
- C. Submit documents certifying satisfactory system conditions and include manufacturer's certificate of acceptance of inspector's qualifications.

**END OF SECTION 21 2400**

