

FIRE DETECTION AND FM-200 SUPPRESSION SYSTEM

A. SCOPE: This specification outlines the requirements for a cross-zoned detection and total flooding FM-200 fire suppression system. The work described in the specification consists of all labor, materials, equipment, and services necessary and required to complete and test the system.

B. APPLICABLE PUBLICATIONS:

1. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto (latest edition):

a) National Fire Protection Association (NFPA) Standards:

No. 2001 Clean Agent Fire Extinguishing Systems

No. 70 National Electric Code

No. 72 National Fire Alarm Code

b) Factory Mutual Systems (FM) Publication
Factory Mutual Approval Guide

c) Underwriters Laboratories, Inc. (UL) Publication
Fire Protection Equipment Directory with quarterly supplements

d) Department of Transportation (DOT)
Title 49 Code of Federal Regulations Parts 100 to 199
Transportation of Hazardous Materials, DOT3AAZ300 or 3AAZ15T

e) National Electrical Manufacturers Association (NEMA) Publication
Enclosures for Industrial Controls and Systems

f) Industrial Risk Insurers Interpretive Guide (Detection & Controls)

g) Requirements of the Authority Having Jurisdiction (AHJ)

C. REQUIREMENTS: This installation shall be made in accordance with the drawings, specifications, and applicable standards. Should a conflict occur between the drawings and specifications, the specifications shall prevail.

D. EXCLUSION: The work listed below shall be provided under other sections of the specifications.

1. 120 VAC power to the FM-200 panel, graphic annunciators and maintenance panel.
2. Interlock conduit and wiring to ventilation equipment, dampers, and shunt-trip breakers
3. Tie-in of FM-200 panel to house fire alarm and/or security system.

E. GENERAL:

1. The system and components shall be a Kidde Fire Suppression System as manufactured by KIDDE FIRE SYSTEMS, INC., 400 Main Street, Ashland, MA.
2. The equipment shall be supplied and installed by INTERSTATE FIRE PROTECTION, North Conway, NH or Gardiner, ME
3. Qualifications of installer/contractor:
 - a) The system shall be installed by an experienced firm regularly engaged in the installation of automatic FM-200 fire extinguishing systems in strict accordance with NFPA standards.
 - b) The contractor's firm must have a minimum ten (10) years experience in design, installation, and testing FM-200 or similar fire suppression systems. A list of systems of similar nature and scope shall be provided at the time of proposal.
 - c) The installation Contractor shall be an authorized stocking distributor of the manufacturer for the equipment included in the system so that immediate replacement parts can be made from inventory. He shall show proof of available telephone communications on a twenty-four hour, seven-days-a-week basis; his service personnel shall be available for emergency service at all times.
4. Insurance Requirements:
 - a) The FM-200 systems contractor shall show evidence that he carries a minimum \$2,000,000.00 liability and completed operations insurance policy.
 - b) These limits shall supersede limits required in the general conditions of the specifications.

F. SUBMITTALS

1. The following shall be submitted for approval prior to the start of installation:
 - a) Shop drawings and component details:
 - 1) Manufacturer's certificate of acceptance of the qualifications of the installing contractor to install, test, maintain, and recharge the manufacturer's equipment.
 - 2) Shop drawing shall indicate locations, installation details, and operation details of all equipment associated with the FM-200 system. Floor plans showing equipment locations, piping, conduit runs, and other details, as required, be provided. Elevations, cross section, and other details shall be drawn.
 - 3) Sequences of operation, electrical schematics, and connection diagrams shall be provided to completely describe the operation of the FM-200 system controls.
 - 4) The contractor shall illustrate the agent distribution system, and provide calculations to demonstrate the volumetric concentrations.

G. SYSTEM DESCRIPTION AND OPERATION

1. The system shall be total flooding FM-200 extinguishing system designed to provide a uniform concentration of 7%, at normal average ambient temperature, minimum of FM-200.
 - a) The amount of FM-200 to be provided shall be the amount required to obtain and hold the minimum uniform concentration for ten (10) minutes. The contractor shall take into consideration such factors as unclosable openings (if any), run-down time of fans, time required for dampers to close (and requirements for any additional dampers), and any other feature of the facility that could affect concentration.
2. The system shall be actuated by a combination of ionization and photoelectric smoke detectors. Automatic operation in each separate protected area shall be as follows:
 - a) Actuation of one (1) detector in either loop shall:

- 1) Illuminate the respective zone (circuit) lamp on the control unit.
 - 2) Energize a pre-alarm audible or audible/visual signal associated with that area in which the detector was operated.
 - 3) Actuate door closer/holders on access doors to the protected area.
 - 4) Transmit a signal to the building's fire alarm system.
- b) Actuation of a second detector in the same area, but on the second detection loop, shall:
- 1) Illuminate the respective zone (circuit) lamp on the control unit.
 - 2) Energize an evacuation audible and visual signal associated with the area in which the detector was operated.
 - 3) Start time-delay sequence.
 - 4) Shut down ventilation system and/or close dampers.
- c) Discharge of the FM-200 shall occur at the end of time-delay period.
3. The system shall be capable of being actuated by manual discharge stations located at each fire exit. Operation of manual discharge station shall duplicate the cross-zones sequence description above, except that time-delay shall be bypassed. The manual discharge station shall be of the electrical actuation type and be supervised at the control panel. Local, manual, mechanical release shall be installed on each pilot cylinder. Systems that do not allow for this type of releasing shall not be permitted.

H. MATERIALS AND EQUIPMENT

1. General Requirements: Materials and equipment shall be standard products of the manufacturer's latest design and suitable to perform the functions intended. When one or more pieces of equipment must perform the same functions, they shall be duplicates produced by one manufacturer. The name of the manufacturer and the serial numbers shall appear on all major components.
2. All devices and equipment shall be UL listed and/or FM approved.

3. All devices, equipment and components shall be products of the same manufacturer.
4. The FM-200 control panel shall be a Kidde, Aegis Control Panel, and shall perform the functions necessary to operate the detection, control and release of the FM-200 Suppression System. The panel shall accept input from the following types of equipment used to make up the system: smoke detectors, thermal detectors, and manual pull stations. The control unit shall be approved by Underwriters' Laboratories, Inc., and/or Factory Mutual as an FM-200 system control unit. This control unit shall be located as shown on plans.
 - a) The control unit shall be housed in a wall mounted, sheet metal enclosure suitable for protecting electrical circuits. It shall be a NEMA Type 1 metal cabinet with hinged, locked doors.
 - b) The control unit shall operate on 120 volts AC, 50/60 Hz.
 - c) In the event of a loss of rectified power, visual and audible trouble signs shall be activated.
 - d) The control unit shall contain a self-contained, 24 volts DC emergency power supply. The units shall have built-in, rechargeable standby batteries to provide a minimum 24-hour emergency power. A trouble signal will be initiated if battery leads are disconnected or the battery is in an abnormally low state of charge.
5. Manual discharge stations shall be of the dual-action type, which will require that an outer door be lifted to expose the actuation door. The concealed release switch shall be double action SPST. The front shall be suitably labeled. Push button type manual discharge stations shall not be permitted.
 - a) Manual actuation shall bypass the delay and abort functions and shall cause all alarm and shutdown devices to operate the same as if the system had operated automatically.
6. The detectors shall be spaced, located, etc., in accordance with the manufacturer's specifications and within the guidelines of NFPA standard 72E.
7. Each detector shall have a LED to indicate the status of the detector.

8. The Ionization products-of-combustion smoke detectors shall be Kidde Model CPD-7054 Detectors.
9. The Photoelectric products-of-combustion smoke detectors shall be Kidde Model PSD-7157 Detectors.
10. Alarm signals shall be operated from Agent Release Modules installed in the control unit.
 - a) The alarm bells shall be Kidde Model MB-G6-24-R, Kidde P/N 75-000030-001.
 - b) The alarm horn/strobe devices shall be Kidde Model NS-2415W-AR, Kidde P/N 75-000086-002.
 - c) Visual alarm unit shall be vertical strobe unit, Kidde Model RSS-24MCW-AR, Kidde P/N 75-000005-002.
11. All wiring shall be furnished and installed by the contractor.
 - a) Unless a written variance is obtained, all wiring shall be installed in electrical metallic tubing (EMT) or conduit.
 - b) All system components shall be securely fastened to their support independent of the wiring. Runs of conduit and wiring shall be straight, neatly arranged, properly supported, and parallel and perpendicular to walls and partitions.
 - c) The sizes of the conductors shall be those specified by the manufacturer. Color code shall be used where specified. All wires shall be tagged at all junction points and shall be free from grounds or crosses between conductors. Final connections between equipment and the system wiring shall be made under direct supervision of a factory trained representative.
 - d) All wiring shall be installed to conform to the requirements of the National Electrical Code, Article 725 for Class 1 Signal Systems, except as otherwise permitted for limited energy circuits, as described in NFPA 72E. All wiring shall also meet State and local codes.
 - e) The complete electrical installation of the system and all components shall be grounded in accordance with the National Electrical Code.

12. Abort Stations shall be of the "Dead Man" type and located next to each manual station. The abort stations shall be supervised and shall indicate a trouble condition at the FM-200 control unit if depressed. "Locking" or "keyed" abort stations shall not be permitted.

I. FM-200 STORAGE AND DISTRIBUTION

1. Each protected area shall have its own separate supply of FM-200. The system shall be of central storage design.
 - a) Each supply shall be located within the hazard area or as near to it as possible so that a minimum of distribution piping is used.
 - b) The FM-200 shall be stored in floor mounted cylindrical containers. Containers should be super-pressurized with dry nitrogen to 360 PSIG at 70 degrees F. Containers shall be of high-strength alloy steel construction that complies with the Department of Transportation regulation for refillable pressure vessels and conforms to NFPA 2001. Containers valves shall be actuated by solenoid operation only. Parallel or Series wired initiators shall not be permitted.
 - 1) Each agent storage container shall also have a pressure gauge and pressure switch to facilitate visual and electrical supervision of the container pressure. The pressure switch shall be isolated from the container assembly by check valves such that it may be replaced without having to remove the agent from the container.
 - 2) Each container shall have a pressure relief device that automatically operates when internal pressure exceeds 805 PSIG.
 - 3) It shall be possible to determine the agent liquid level within each container without removing the storage container from its mounting bracket, disconnecting the distribution piping, or shutting down the FM-200 system.
 - c) Each agent storage container shall be securely mounted to a rigid surface. The bracket anchors and mounting surface shall withstand a thrust at 1000 lbs for 5 seconds.
2. Discharge nozzles shall distribute the FM-200 throughout the protected area.

- a) The nozzles shall be manufactured by Kidde and designed to provide proper distribution and weight of the agent. Ceiling penetrations shall be finished with chrome plated escutcheons.
- 3. All distribution piping shall be in accordance with the latest requirements listed in NFPA Standard 2001.
 - a) All pipe length must be reamed, blown clear, and swabbed with suitable solvents to remove burrs, mill varnish, and cutting oil before assembly.
 - b) For threaded fittings, Teflon tape only shall be used and applied to male pipe threads only.

J. SYSTEM INSPECTION AND CHECKOUT

- 1. After the installation is complete, the system shall be inspected by factory-trained personnel in accordance with the manufacturer's recommended procedures.
- 2. All wiring shall be tested for proper connection, continuity, and resistance to ground.
- 3. The complete system shall be functionally tested in the presence of the Owners, and all functions, including system and equipment interlocks, must be operational at least ten (10) days prior to the final acceptance test.
 - a) Each detector shall be tested in accordance with the manufacturer's recommended procedures. The system and equipment interlocks, such as door releases, audible and visual alarms, and equipment shut-downs shall function at that time.
 - b) Each circuit shall be tested for trouble by inducing a trouble condition to the system.

K. TRAINING REQUIREMENTS

1. Prior to final acceptance, the contractor shall provide operation training to each shift of the Owner's personnel. Each training session shall include emergency procedures, abort functions, system control panel operation, trouble procedures, and safety requirements. Each session shall include a complete demonstration of the system. Dates and times of the training period shall be coordinated through the Owner not less than two weeks prior to session.

L. OPERATION AND MAINTENANCE

1. Prior to final acceptance, the contractor shall provide complete operation and maintenance instruction manuals (three copies for each system) to the owner. All aspects of system operation and maintenance shall be detailed, including electrical schematics of all circuits, a written description of the system design, drawing illustrating control logic and equipment used in the system. Checklists and procedures for emergency situations, troubleshooting techniques, and maintenance operations shall be included.

M. AS-BUILT DRAWINGS

1. Upon completion of each system, the contractor shall provide two copies of as-built drawings showing actual installation details, all equipment locations (manual stations, abort switches, alarms, detectors, control panels) shall be shown, as well as exact conduit and piping routing details and agent storage positions. All facilities modifications, including door and damper installations, and modifications to insure required soak times, shall be illustrated. One copy of reproducible engineering drawings will be provided reflecting all actual installation details.

N. ACCEPTANCE TESTS

1. At the time "as-built" drawings and maintenance/operation manuals are submitted, the contractor shall submit a "Test Plan" which shall describe how the system will be tested. This shall include a step-by-step description of all tests and shall indicate type and location of test apparatus to be employed. The tests shall demonstrate that the operating and installation requirements of this specification have been met. All tests shall be conducted in the presence of the owner and shall not be conducted until the "Test Plan" is approved.
2. Tests shall demonstrate the entire control system functions as intended. All circuits shall be tested: Automatic actuation, manual actuation, equipment shut-down, alarm devices, and storage container pressure. In addition, supervision of each circuit shall be tested.

3. A room pressurization test shall be conducted in each room to determine the presence of openings which could effect the FM-200 system concentration levels. This test will be conducted using Retrotec Corp. Door-Fan system, or equivalent, with integrated computer program. All testing shall be in accordance with NFPA 2001. The manufacturer of the test equipment shall provide a specification for the room pressurization test.
4. An inspection shall be made by the FM-200 distributor to ensure that all required dampers, door bottom seals, weather-stripping, caulking, and foam sealant have been installed and that the areas protected will, in fact, contain the FM-200 for the full ten minutes required. While the responsibility for this work may lie with other contractors or the owner, the responsibility for determining the corrective action required is that of the FM-200 system distributor/installer and shall not relieve him of his obligation to conduct any required re-tests of the system at no cost to the owner should the test fail due to inadequate room tightness, faulty design, installation, or equipment failure.
5. Upon acceptance by owners, the complete system shall be placed in operation within a nominal twenty-four (24) hour period. The contractor shall provide written certification that all containers are filled as required.

O. FM-200 SYSTEM INSPECTIONS

1. The contractor shall provide two (2) inspections of each system under this contract during the one-year warranty period. The first inspection shall be at the six month interval after system acceptance, and the second at the 12 month interval. Inspections shall include determination of agent container weight and pressure and that the system is in proper working order.
2. Inspection shall also include a complete checkout of the control and alarm system. All inspections shall be done in accordance with NFPA 2001.

P. WARRANTY

1. All FM-200 system components furnished under this contract shall be guaranteed against defective design, materials, and workmanship for the full warranty time which is standard with the manufacturer, but in no case less than ONE (1) YEAR from the date of system acceptance.
2. The FM-200 contractor shall warrant refill of the system should there be any accidental discharge of the system during the 1-year warranty period contingent on the following:

- a) System shall be under service contract by the installing FM-200 contractor during the entire warranty period.
- b) Tampering of the system or servicing by any others shall void this warranty.
- c) Discharge will not have been caused by operator negligence, sabotage, or release of contaminating media into the detection system.