

Engineering Specification for a Total Flooding Fire Suppression System utilizing FM200 Fire Suppression System

SECTION 1 : GENERAL

1 Scope

This specification outlines the requirements for total flooding Fire Suppression System designed for use with FM200 Fire Protection with automatic detection and control. The work described in this specification includes all engineering, labor, materials, equipment and services necessary and required for a complete and tested suppression system.

2 Applicable Standards and Publications

The design, equipment, installation, testing and maintenance of the suppression system designed for use with FM200 shall be in accordance with, but not necessarily limited to the applicable requirements set forth in the latest edition of the following:

- NFPA 2001 – Clean Agent Fire Extinguishing Systems
- NFPA 70 – National Electrical Code
- NFPA 72 – National Fire Alarm Code
- Factory Mutual Approval Guide
- Underwriters Laboratories Fire Protection Equipment List

The standards and requirements listed, as well as all other applicable codes and standards shall be used as “minimum” design standards. Also compliance with the Authority Having Jurisdiction (AHJ) shall be required and good engineering practices must be implemented.

3 Requirements

The Suppression System designed and approved for use with FM200 Fire Protection 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 take precedence.

4 Exclusions

The work listed below shall be provided by others or under other sections of this specification:

- Power supply to the panel
- Interlock wiring and conduit for shutdown of HVAC, dampers and/or electric power supplies, relays or shunt trip breakers
- Connection to local or remote fire alarm systems or listed central station(s)

5 Quality Assurance

5.1 Equipment Manufacturer

- 5.1.1 The manufacturer of the Suppression System designed for use with FM200 Fire Protection hardware and direction components shall be experienced in the design and manufacture of these types of suppression systems.
- 5.1.2 The name of the manufacturer, part numbers and serial numbers shall appear on all data sheets.
- 5.1.3 All devices, components and equipment shall be new and standard products of the manufacturer's latest design, suitable to perform the intended functions and BSI/LPCB approved.

5.2 Agent Manufacturer

- 5.2.1 Europe

5.3 Installer

- 5.3.1 The installing contractor shall be a specialist Fire Engineering company and trained by the equipment manufacturer to design, install, test and maintain suppression systems designed for use with FM200 Fire Protection.
- 5.3.2 The installing contractor shall be an experienced firm regularly engaged in the installation of automatic Fire Suppression System using FM200 Fire Protection Fluid, or similar other clean agents, in strict accordance with applicable standards.
- 5.3.3 The installing contractor shall be experienced in the design, installation and maintain of Fire Suppression Systems using FM200, or similar such systems. A list of suppression systems of a similar nature and scope shall be provided upon request.
- 5.3.4 The installing contractor shall be an authorized distributor of the manufacturer for the suppression system designed for use with FM200 Fire Protection so that the immediate replacement parts are readily available from inventory.

6 Submittals

- 6.1 The installing contractor shall submit the following design information and drawings for approval prior to starting work on this project:

- 6.1.1 Field installation layout drawings shall be provided detailing the location of all agent storage cylinders, pipe runs, including sizes and lengths, control panel(s), detectors, manual pull stations, abort stations, audible and visual alarms, etc.
 - 6.1.2 Auxiliary details and information shall be provided such as maintenance panels, door holders, special sealing requirements and equipment shutdowns.
 - 6.1.3 Separate layout drawings shall be provided for each level, such as the main room, sub floor and above ceiling spaces as applicable. Also, include necessary details for mechanical and electrical work.
 - 6.1.4 A separate drawing shall be provided showing isometric details of agent storage containers, mounting details and pipe runs and sizes.
 - 6.1.5 Electrical layout drawings shall show the location of all devices and include point-to-point conduit runs.
 - 6.1.6 A complete sequence of operation shall be submitted detailing all alarm devices, shutdown functions, remote signaling, damper operation, time delay and agent discharge for each zone or system.
- 6.2 The contractor shall submit drawings, calculations and suppression system component data sheets for approval to the local fire department, owner's insurance underwriter and/or all other AHJs before starting installation.

SECTION 2 : SYSTEM REQUIREMENTS

I System Description and Operation

- A. The system shall be a Total Flood Fire Suppression System.
- B. The System shall provide a FM200 minimum design concentration of 6.9% by volume for Class A hazards, a minimum of 9 % by volume for Class B hazards in all areas and/or protected spaces, and a minimum of 7 % by volume for Class C hazards at the minimum anticipated temperature within the protected area. System design shall not exceed 10% for normally occupied spaces, adjusted for maximum space temperature anticipated, with provisions for room evacuation before agent release.
- C. The System shall be complete in all ways. It shall include a mechanical and electrical installation, all detection and control equipment, agent storage containers, FM200 agent, discharge nozzles, pipe and fittings, manual release and abort stations, audible and visual alarm devices, auxiliary devices and controls, shutdowns, alarm interface, advisory signs, functional checkout, training and any other operations necessary for a functional Clean Agent Suppression System.
- D. The system(s) shall be actuated by photoelectric detectors installed as per manufacturer recommended/listed spacing, in both the room, under floor and above ceiling protected spaces.
- E. Detectors shall be Cross-Zoned detection requiring two (2) detectors to be in alarm before release.
- F. Automatic operation of each protected area shall be as follows :
 - 1. Actuation of one (1) detector, within the System, shall :
 - a) Illuminate the "ALARM" lamp on the control panel face.
 - b) Energize an alarm bell.

- c) Transfer auxiliary contacts, which can perform auxiliary system functions such as: Operate door holder/closures on access doors; Transmit a signal to a Fire Alarm System; Shutdown HVAC equipment.
- d) Light an individual lamp on an optional annunciator.
- 2. Actuation of a 2nd detector, within the system, shall :
 - a) Illuminate the "PRE-DISCHARGE" lamp on the control panel face.
 - b) Energize a pre-discharge horn/strobe device.
 - c) Shut down the HVAC system and/or close dampers.
 - d) Start time-delay sequence .
 - e) System abort sequence is enabled at this time.
 - f) Light an individual lamp on an optional annunciator.
- 3. After completion of the time-delay sequence, the Clean Agent System shall discharge and the following shall occur :
 - a) Illuminate a "DISCHARGED" lamp on the control panel face.
 - b) Shutdown of all power to high-voltage equipment.
 - c) Energize a visual indicator(s) outside the hazard in which the discharge occurred.
 - d) Energize a "DISCHARGED" audible device. (Optional)
- 4. The operation shall be capable of being actuated by manual discharge devices located at each hazard exit. Operation of a manual device shall duplicate the sequence description above except that the time delay and abort functions shall be bypassed. The manual discharge station shall be of the electrical actuation type and shall be supervised at the main control panel.

II. Material and Equipment

A. General Requirements

- 1. The Clean Agent System materials and equipment shall be standard products of the supplier's latest design and suitable to perform all functions intended. All devices and equipment shall be UL listed and FM approved.
- 2. If a room has more than one enclosure, all enclosures shall be covered by one downstream pipework simultaneously.
- 3. Only system seamless cylinders with working pressure 42 bars "610 psi" and above can be used
- 4. Seamless cylinders with working pressure less than 50 bars "725 psi" (but not less than 42 bar) shall be accepted in the case of protecting single zones, but not for multizone application.
- 5. Systems shall be designed in accordance with the manufacturer's guidelines.
- 6. The clean agent shall be stored in Clean Agent storage cylinders. Cylinders shall be super-pressurized with 100% dry nitrogen
- 7. The maximum size of system cylinders used shall be 180l, the maximum weight shall be 400kg w/o protection cap. In case the floor load is less than 400kg/m² cylinder banks shall be released with a pilot line of 1500mm and distance between the cylinders of minimum 1000mm. Cylinder shall be manufactured and approved according to TPED or DOT standard.

8. The cylinder storage temperature range shall be -18° to 50°C
9. Cylinder valves shall be equipped with internal spring to close the valve after agent discharge and at maintain dry nitrogen pressure of 1 bar inside the cylinder.
10. Each Cylinder shall have a pressure gauge with embedded low pressure switch to provide visual and electric supervision of the container pressure. The low-pressure switch shall be wired to the control panel to provide audible and visual "Trouble" alarms in the event at 10% loss of the container pressure. The pressure gauge shall be color coded to provide an easy, visual indication of container pressure. The construction of the dip tube shall be in that way that only nitrogen will leak until the alarm level of the gauge is reached.
11. Cylinder valve shall have two ports equipped with Schrader valves for the pressure gauge. Further the valve should be closed by a spring when working pressure is 1bar in order to ensure no moisture can enter the cylinder.
12. Cylinders shall have a pressure relief provision that automatically operates before the internal nominal pressure exceeds 90bar.
13. Only seamless steel cylinders shall be accepted. Cylinders shall be either TPED or DOT approved.
14. Engineered discharge nozzles shall be provided within the manufacturer's guidelines to distribute the FM200 agent throughout the protected spaces. The nozzles shall be designed to provide proper agent quantity and distribution. Nozzles shall be available in $\frac{1}{2}$ in. through 2 in. sizes. Each size shall be available in 180° and 360° distribution patterns. The nozzle shall have two stages of evaporation, with individual drilled orifice plate and fixed diameters for the 7 bores of a 180° nozzle respectively 16 bores of the 360° nozzle.
15. Nozzles shall be installed so as to be free of obstructions that could interfere with the proper distribution of the discharged agent. Evaporation distance per nozzle shall be confirmed by the hydraulic calculation program or by the system manufacturer..

III. Detection and Extinguishing Release System

A. CONTROL PANEL

1. The control panel shall be a Release Control Panel KITE MARK approved with the release units of the Extinguishing system & built in Abort switch .
2. The detection control system and its components shall be LPCB approved for use as a local fire alarm system with releasing device service.
3. The control system shall perform all functions necessary to operate the system detection, actuation, and auxiliary functions.
4. The control system shall include battery standby power to support 24 hours in standby and 5 minutes in alarm.

5. The control system shall be microprocessor based, utilizing a distributed processing concept. A single microprocessor failure shall not impact operation of additional modules in the system.
6. The control system shall be capable of supporting Cross Zoned Detection.

B. DETECTORS

1. The Fire Detectors shall be LPCB APPROVED.

C. MANUAL RELEASE (Electric)

1. The manual release shall be LPCB APPROVED.
2. Manual release shall be located at each exit from the protected hazard.

E. AUDIBLE and VISUAL ALARMS

1. Alarm audible and visual signal devices shall operate from the control panel.
2. The alarm horn, and horn strobe devices shall be LPCB APPROVED.
3. The visual alarm unit shall be LPCB APPROVED.
4. A strobe device shall be placed outside, and above, each exit door from the protected space. Provide an advisory sign at each light location.

G. SYSTEM and CONTROL WIRING

1. All system wiring shall be furnished and installed by the contractor.
2. The complete system electrical installation and all auxiliary components shall be connected to earth ground in accordance with the National Electrical Code.

SECTION 4 : TESTING and DOCUMENTATION

I. System Inspection and Checkout

After the system installation has been completed, the entire system shall be checked out, inspected, and functionally tested by qualified, trained personnel, in accordance with the manufacturer's recommended procedures and actual standards.

- A. All containers and distribution piping shall be checked for proper mounting and installation.
- B. All electrical wiring shall be tested for proper connection, continuity, and resistance to earth.
- C. Each detector shall be tested in accordance with the manufacturer's recommended procedures and test values recorded.

- D. All system and equipment interlocks, such as door release devices, audible and visual devices, equipment shutdowns, local and remote alarms, etc. shall function as desired and designed.
- E. Each control panel circuit shall be tested for trouble by inducing a trouble condition into the system.

IV. As-Built Drawings

Upon completion of each system, the installing contractor shall provide copies of system "As-Built" drawings to the owner. The drawings shall show actual installation details including all equipment locations (i.e., control panel(s), agent container(s), detectors, alarms, manual pull station(s) and abort switch(es), etc.), as well as piping and conduit routing details. Show all room or facilities modifications, including door and/or damper installations completed. One (1) copy of reproducible engineering drawings shall be provided reflecting all actual installation details.

SECTION 5: Site Visit

Site visit for the site shall be done by the contractor for (Room 1 & Room 2)

SECTION 6: Training

On-site Training shall be conducted for two sessions for a period of one day for each session after the commissioning .

SECTION 7: Warranty :

- The System warranty shall be for two years starting after the commissioning.
- The tenderer shall describe in detail their support service policy during and after the warranty period .
- During the warranty period the contractor shall be responsible for the faulty unit and replacement and/or maintenance in case of the fault occurring under normal operating conditions and with no equipment mishandling .
- Maintenance contract shall be provided after warrantee period

TERMS AND CONDITIONS:

Scope of Work:	Supply, Install, Testing & Commissioning, Training
Delivery time:	Two months after Purchase permission
Warranty:	24 Months after commissioning