

1. GENERAL

1.1 INTENT OF SPECIFICATIONS

- A. This specification details the requirements for an engineered fire suppression system Model Kidde Natura. These requirements combined with good engineering practices must be followed in order to produce a safe and effective fire protection and suppression system.
- B. All system components shall be manufactured and/or supplied by Kidde Fire Systems, 400 Main Street, Ashland, MA 01721, USA; Phone (508) 881-2000; URL: [http:// www.kiddefiresystems.com](http://www.kiddefiresystems.com)
- C. All materials and equipment shall be new and unused. Recycled products shall not be acceptable.

1.2 System Description

- A. The clean agent suppression system shall be a total flooding type Kidde Natura Fire Suppression System. The system shall offer Nitrogen IG-100 or IG-55 or IG-541 or IG-01 as agent. The system hardware and cylinders shall be rated for working pressure of 4350 psig at 70°F (300 Bar at 21°C).
- B. Agent cylinders shall comply with ISO to UN9809 and/or D.O.T requirements.
- C. Agent cylinders shall be of capacity 80 Liter and 140 Liter for North America and international markets.
- D. The release unit shall be mounted on pilot cylinder, and it shall include solenoid for actuation, pressure gauge with low pressure contacts, manual release actuation and built-in pressure regulator to provide lower pressure for actuation line.
- E. The remaining cylinders shall be provided with removable pressure gauge with low pressure contacts.
- F. The actuation line hoses shall be of quick connect type to cut down the installation time.
- G. The low-pressure contacts at the all the gauges shall be provided with quick connect cables in a daisy chain format.
- H. It shall be possible to test the system without discharging agent during testing & commissioning or during periodical maintenance testing.
- I. The system shall not have a separate pilot cylinder to actuate the cylinder bank. The first cylinder from the cylinder bank shall function as pilot.
- J. All system cylinders shall be equipped with flow-pressure control valve that limits the output pressure to 55-60 bar and all downstream components shall be suitably rated.
- K. All cylinders shall be equipped with pressure indicating switches that activate upon a reduction of 20% in cylinder pressure.
- L. The system shall have Global listing such as UL, ULC and FM or LPCB approvals.
- M. The system shall be compatible for use with 180 and 360 discharge nozzles, the locations of which shall be based on system configuration design and the manufacturers' agency approval documentation.

- N. The suppression system shall comply with the NFPA 2001 and FM5600 requirements to supervise the placement of electrical solenoid heads on cylinder valves and selector/directional valves. Removal of the electrical actuator shall generate a supervisory condition with appropriate audio and visual indication on the fire alarm control unit. Systems that neither supervise for placement of solenoids nor feature tamper proof hardware that prevent the removal of the system solenoids are not FM approved and are therefore not acceptable. Non-compliant systems shall be removed at the installers' expense.

1.3 CODES AND COMPLIANCE

- A. The design, installation, testing and maintenance of the clean agent fire suppression system shall be in accordance with the following applicable codes, standards and regulatory bodies:

1. NFPA 2001: Clean Agent Fire Extinguishing Systems
2. NFPA 70: National Electrical Code (NEC)
3. NFPA 72: National Fire Alarm and Signaling Code
4. NFPA 75: Protection of Electronic Computer/Data Process Equipment
5. NFPA 76: Fire Protection for Telecommunications Systems
6. FM5600: Approval Standard for Clean Agent Extinguishing System
7. ANSI B1.20.1: Standard for Pipe Threads, General Purpose
8. NFPA 92A: Recommended Practice for Smoke Control Systems
9. UL 2166: Halocarbon Clean Agent Extinguishing System Units
10. UL 268-8: Standard for Smoke Detectors for Open Areas
11. UL 268A: Standard for Smoke Detectors for Duct Application
12. Requirements of the Local Authority Having Jurisdiction
13. Manufacturer's Design, Installation, Operation & Maintenance Manual

- B. The complete system shall have the following listings and approvals:

1. Underwriters Laboratories, Inc. (UL)
2. Factory Mutual Global (FM)
3. Loss Prevention Control Board (LPCB)

1.4 QUALIFICATIONS

- A. Manufacturer

1. The manufacturer/supplier of the system hardware and components shall have a minimum of fifteen (15) years' experience in the design and manufacture of systems of similar type.

2. The manufacturer/supplier of the systems shall be certified to ISO 9001 for a minimum period of five (5) years for the design, production and distribution of fire detection, fire alarm and fire suppression systems.
3. The manufacturer/supplier's name and /or part number shall appear on all major components.
4. All equipment shall be provided by the same manufacturer / supplier.

B. Contractor

1. The system shall be supplied and installed by a factory authorized, Kidde Fire Systems distributor.
2. The Contractor shall be trained by the manufacturer to calculate/design, install, test and maintain the system and shall be able to produce a certificate stating such on request.
3. The Contractor shall employ a person who can show proficiency at least equal to a NICET level III or IV certification in special hazards design.
4. The Contractor shall confirm in writing that they stock a full complement of spare parts and offer 24-hour emergency service for all equipment being furnished.
5. The Contractor shall maintain or have access to a recharging station capable of recharging the suppression system within 48hrs after discharge.

1.5 WARRANTY

- A. The manufacturer shall warrant the system equipment for 36-months from the date of shipment from the factory.
- B. The contractor will warrant the installation for 12-months from time of customer acceptance or commissioning.

1.6 SUBMITTALS

- A. The architect will review all submittals for conformance to the drawings and specifications. The Contractor shall be required to resubmit any materials, with appropriate modifications, that are found to be in non-conformance with the requirements of the drawings and these specifications after review by the architect. Approval of the submittals by the architect shall not relieve the Contractor of their responsibility to meet the requirements of the drawings and specifications.
- B. The contractor shall submit the manufacturers' product technical data and catalog cut sheets for each component or device used in the system.
- C. Engineered Design Drawings: The Contractor's NICET III or IV certified designer shall design the system and provide documents that shall include but are not limited to the following details:
 1. Plan, elevation and isometric drawings showing the location, installation and mounting details of the agent cylinders, valves, nozzles and other accessories.
 2. Design calculations for enclosure volume, agent quantity based on required design concentration for each hazard area.

3. Dimensions, weights and loads of equipment assemblies, components, method of field assembly, clearance requirements, mounting and bracing practices, etc.
4. Flow Calculation Reports showing the following:
 - i. Customer information and project data
 - ii. Hazard information shall include the minimum design concentration and adjusted design concentration, minimum and maximum enclosure ambient temperature, minimum agent required, volume of enclosures and any corresponding non-permeable volume.
 - iii. Cylinder information shall include total agent required, cylinder capacity, cylinder part number, cylinder quantities (both main and reserve), agent fill amount per cylinder and floor loading per cylinder.
 - iv. Calculation to determine the vent area required. The calculated venting area shall be equal or less than the venting area calculated for chemical clean agent system.
 - v. Pipe network information shall include pipe type, pipe diameter, pipe length, change in elevation, pipe equivalent length and the equivalent length of any added accessory.
 - vi. Graphical presentation of the pipe network with plan, elevation and isometric view shall be part of the output printable reports.
 - vii. The flow calculations software shall provide option to select discharge time of 60 seconds for Class B and 120 seconds for Class A and Class C hazards. Discharge time of 60 seconds shall not be accepted for Class A and C in lieu of large venting areas.
 - viii. Nozzle information shall include the number of nozzles, flow rate per nozzle, nozzle nominal pipe size, nozzle type and nozzle orifice area.
 - ix. Pipe fittings information shall include a detailed list by nominal diameter and quantity.
 - x. **[OPTIONAL]** Due to multiple hazards being protected by a common bank of cylinders, calculations showing the above details shall be completed for every hazard connected to that common bank. The individual hazard piping shall be separated by directional valves and shall be modeled with the valve 'open' for the given hazard but 'closed' for the others. The equivalent length of the directional valve must be included in the calculations.
5. Any other requirements of NFPA-2001 latest edition.
6. Conduit routings shall be shown, with number of conductors, type of wire, and wire sizes indicated for each conduit segment.
7. Point-to-point wiring diagram showing the termination points for all field-wiring circuits to the Fire Alarm Control Unit (FACU).
8. Plan and riser drawings showing the location of the FACU and the locations and necessary installation and mounting details of all field devices such as smoke detectors, manual-release stations and notification appliances.

9. A primary-power calculation that details the power requirements for the FACU and all field devices such as smoke detectors, notification appliances and releasing solenoids. Include the required capacity of the main AC power-line feed from the commercial power and light company.
 10. A secondary power calculation that shows the quiescent and alarm power requirements for the FACU and all field devices. Include the periods of time for which the quiescent and alarm power requirements shall be supported to determine the necessary standby battery capacity.
 11. Conduit routings shall be shown, with number of conductors, type of wire, and wire sizes indicated for each conduit segment.
- D. Commissioning Equipment List: The Contractor shall provide a commissioning equipment list for each installed system. The equipment list shall identify all installed equipment and configurations.
- E. Test Plan: The Contractor shall submit a test plan that describes how the system equipment and room integrity shall be tested. This shall include a step-by-step description of all tests and shall indicate type and location of test apparatus to be used. At a minimum, the tests to be conducted shall be per NFPA 2001 and any additional supplemental tests required by the AHJ. Tests shall not be scheduled nor conducted until the engineer of record or end-user's representative approves the test plan.
- F. The Contractor shall submit the following Installation drawings.
1. Four (4) sets of installation drawings for each installed suppression system, one (1) set of the calculation report (if not included in the drawings themselves), owner's manual and product data sheets shall be submitted to the end-user/owner.
 2. Upon completion of installation and commissioning acceptance, two (2) sets of "As-Built" installation drawings and one (1) set of the calculation report for each installed system shall be submitted to the owner/end-user.
- G. The Contractor shall submit the following Manuals after complete installation.
1. Two (2) copies of the manufacturer's Design, Installation, Operation and Maintenance Manual (DIOM), for the inert agent.
 2. Two (2) sets of As-Built drawings with As-Built Flow Calculations reports.

1.7 System Exclusions

- A. Room sealing requirements shall be communicated and coordinated between the suppression system contactor and the project's main General Contractor and all sub-contractors.
- B. Room venting requirements shall be communicated and coordinated between the suppression system contactor and the project's main General Contractor and all sub-contractors.

1.8 Agent Concentration Requirements

- A. The system shall be designed to suppress Class A / B / C (select option) fires.
- B. The agent design concentration achieved shall be as required by the system manufacturer for the specific Class.

- C. In case the design concentration exceeds the Lowest Observable Adverse Effect Level (LOAEL) for the agent as published in NFPA 2001, the system shall include the following safety items:

- Pneumatic Siren
- Pneumatic Discharge Delay
- Lockout Valve
- Signage

1.9 System Performance

A. System Discharge

1. The discharge time required to achieve 95% of the minimum design concentration for flame extinguishment shall not exceed 60 seconds for Class B OR 120 seconds for Class A and C (select option).

B. Duration of Protection

1. 85% of the minimum design concentration shall be maintained for the longer of 10-minutes or the time period required by trained personnel to take effective emergency action.
2. Room integrity shall be verified using equipment from a recognized manufacturer of test equipment and a level 1 certificate shall be provided.

C. Nozzle performance

1. 360/180-degree nozzle shall be listed to be mounted at heights up to 16 feet (4.88 m) from the floor.
2. 360/180-degree nozzle shall be listed to cover an area of 35.6 ft. x 35.6 ft. (10.85 m x 10.85 m).

1.10 Cylinder Locations:

- A. The agent cylinders shall be located in a secure area suitable for the purpose.
- B. The flow calculation report submitted shall verify the timing performance requirement.

1.11 Cylinder Assemblies

- A. The agent shall be stored in cylinders manufactured and marked in accordance with US Department of Transportation (DOT) specification or to ISO complying with UN9809 and Transport Canada (TC) specifications.
- B. The cylinder discharge valve shall be of self-regulating type to provide a controlled pressure not exceeding 60 Bar (870 psig). The valve shall be designed to shutoff when the pressure at the discharge port exceeds 60 Bar (870 psig).
- C. The cylinder pressure gauge shall be integral with the Release Unit and shall be color-coded for fast referencing of pressure readings.

- D. All cylinders shall have a low-pressure switch to electrically signal a supervisory condition if the cylinder pressure drops to 2320 psi (160-bar) for a 200 Bar (2900 psig) system or to 240 Bar (3480 psig) for a 300 Bar (4350 psig) system. The low-pressure switch shall be equipped with dry contacts and all such contacts shall be connected using Quick Connect cables in daisy chain arrangement.
- E. The first cylinder of the cylinder bank shall be installed with a release unit that includes solenoid, pressure gauge with integral pressure monitoring switch to function as the pilot cylinder. The pilot cylinder shall be listed to operate not less than 62 secondary cylinders of 80 L capacity or not less than 54 secondary cylinders of 140L.
- F. All secondary cylinders shall be actuated pneumatically through pilot actuation hose. The hoses shall be quick-connect type with steel braided hoses.
- G. Each cylinder shall be connected through a discharge hose and manifold check valve to a prefabricated manifold.
- H. All system cylinders shall be installed in a rack of either single row or 2 rows, but not exceeding 3 rows.
- I. A pre-piped set of reserve cylinders with the same size and quantity as the main bank of cylinders shall be provided. A manual main-to-reserve transfer switch shall also be provided.

1.12 Fire Suppression Agent

- A. The cylinder shall be filled with agent, Nitrogen (IG-100) or Argonite (IG-55) or IG-541 or IG-01 (Argon),
- B. The purity of the gases shall comply with the requirements specified in the manufacturer's manual and NFPA 2001 purity requirements. The manufacturer shall be able to provide a certificate of purity for the bulk gases and a certificate of composition and purity for each cylinder.
- C. The cylinders shall be filled with agent at a FM approved first fill facility.

1.13 Pipe and Fittings

- A. Distribution piping, and fittings, shall be Schedule 40 type for all sizes below 2". For pipe sizes larger than 2 1/2", Schedule 80 shall be installed. The pipes and fittings shall be in accordance with NFPA 2001, approved piping standards and the engineered fire suppression system manufacturer's requirements.

1.14 ACTUATION HARDWARE

- A. The primary agent cylinder shall be electrically actuated, and the secondary cylinders can be pressure actuated.
- B. Solenoid actuators shall be supervised for its placement. Removal of the electrical actuator shall generate a supervisory condition with appropriate audio and visual indication on the fire alarm control unit. Systems that do neither supervise for placement of solenoids nor feature tamper proof hardware that prevent the removal of the system solenoids are not UL listed and FM approved and are not acceptable. Non-compliant systems shall be removed at the installers' expense.

1.15 Nozzles

- A. System nozzles shall be made of brass.
- B. Nozzles shall be spaced in the protected area to achieve uniform distribution of the agent.
- C. Nozzles shall have 360-degree or 180-degrees discharge patterns.
- D. The nozzles shall be suitable to be installed in pendent or upright manner.
- E. Nozzles shall be designed for efficient agent dispersion.
- F. Nozzles shall be approved for use with the agent and the manufacturer's hardware.

1.16 **OPTIONAL** Multi Hazard System:

- A. All protected areas shall be protected by a common bank of cylinders.
- B. Protected areas shall be separated by directional valves specifically listed for the purpose.
- C. Directional valves shall be electrically actuated and shall also have a manual operator.
- D. Directional Valves shall be rated to a working pressure of at least 1500-psig @ 70°F (103-bar @ 21°C).
- E. Electrical solenoids on directional valves shall either be supervised for placement or shall be of non-removable tamper proof design.

1.17 CONDUCTORS AND CONDUITS

- A. All conductors shall be enclosed in rigid or thin-walled, steel conduit unless open wiring is permitted by the local electrical code.
- B. Any conduit or raceway exposed to dampness or other similar conditions shall be properly sealed and installed to prevent moisture entrapment. Provisions for draining and drying shall be employed as required.
- C. All wiring shall be of the proper size to conduct the circuit current but shall not be smaller than #18 AWG unless permitted by the local electrical code. Wire that has scrapes, nicks, gouges, or crushed insulation shall not be used. The manufacturer's minimum wire-bending radii shall be observed in all enclosures, raceways, and conduits. Aluminum wire shall not be used.

2. EXECUTION

2.1 CLEAN AGENT FIRE SUPPRESSION SYSTEM INSTALLATION

- A. The system shall be supplied and installed by a factory-authorized, Kidde Fire Systems Distributor. The Distributor shall be trained and certified by Kidde Fire Systems to design, install and maintain the Kidde fire suppression system. The distributor shall install the system in accordance with the manufacturer's design, installation, operation and maintenance manual.

2.2 ELECTRICAL SYSTEM INSTALLATION

- A. All electrical enclosures, raceways, and conduits shall be provided and installed in accordance with applicable codes and intended use and shall contain only those electrical circuits associated with the

fire-detection and control system. No circuit or circuits that are unrelated to the fire alarm or suppression system shall be routed through the enclosures, raceways, and conduits dedicated to the fire alarm or suppression system.

- B. Splicing of circuits shall be kept to a minimum and is only permitted in an electrical box suitable for the purpose. Appropriate hardware shall be used to make the wire splices. Wires that are spliced together shall have the same color insulation.
- C. White colored wire shall be used exclusively for the identification of the neutral conductor of an alternating-current circuit. Green colored wire shall be used exclusively for the identification of the earth-ground conductor of an AC or DC circuit. Appropriate color-coding shall be utilized for all other field wiring.
- D. All electrical circuits shall be numerically tagged with suitable markings at each terminal point. All circuits shall correspond with the installation draw.

2.3 SYSTEM CHECKOUT

- A. Entire system shall be checked out, inspected, and functionally tested by factory authorized and trained personnel.
- B. Inspection shall be performed in the presence of the Owners representative, engineer or architect's representative, insuring authority, and/or the local AHJ (Authority Having Jurisdiction)
- C. Prior to final acceptance, the contractor shall provide operational and safety training in all concepts of the system to the Owners key personnel. Release of clean agent shall not be part of the training requirements.

2.4 ROUTINE MAINTENANCE

- A. Routine maintenance on equipment shall be performed by a certified Kidde Fire System Distributor, in accordance with the most current version of NFPA 2001 and the manufacturer's installation, operation and maintenance manual.