

1. GENERAL**1.1 INTENT OF SPECIFICATIONS**

This specification outlines the requirements for a total flooding clean agent fire extinguishing system comprising Kidde Fire Systems equipment employing Argonite inert gas. All requirements outlined in this specification must be completed in their entirety. These requirements, which are in accordance with the items listed in Section 1.3, combined with good engineering practices shall be followed in order to produce a safe and effective clean agent fire extinguishing system.

1.2 GENERAL DESCRIPTION

The clean agent fire extinguishing system shall perform as outlined in the following sub-sections.

- A. Achieve a 37.9% (v/v) extinguishing concentration for Class A (Surface Type Fires) hazards.
- B. Achieve a 37.9% (v/v) extinguishing concentration for Class C (Energized Electrical Equipment) hazards.
- C. Within 60 seconds, the clean agent fire extinguishing system shall discharge 95% of the required suppression agent mass.
- D. The clean agent fire extinguishing system shall consist of one or more Kidde Fire Systems agent cylinders and related equipment. The cylinders may be either connected to a discharge pipe arrangement separately or connected to a common manifold and discharge pipe arrangement. The agent cylinders shall be filled with 50% Nitrogen and 50% Argon to a working pressure of 2900 PSIG at 70°F (200 bar gauge at 21°C).

1.3 CODES AND COMPLIANCE

- A. The design, installation, testing and maintenance of the clean agent fire extinguishing system, shall be in accordance with the following codes, standards and regulatory bodies:
 - 1. NFPA 2001: Standard for Clean Agent Fire Extinguishing Systems
 - 2. UL2127: Standard for Inert Gas Clean Agent Extinguishing System Units
 - 3. ANSI B1.20.1: Standard for pipe threads, General Purpose
 - 4. NFPA 70: National Electrical Code (NEC)
 - 5. NFPA 72: National Fire Alarm Code
 - 6. Factory Mutual Approval Guide
 - 7. Requirements of the Local Authorities Having Jurisdiction (AHJ)
 - 8. Kidde Fire Systems Manual P/N 38-KFSARG-000
- B. The complete system shall have the applicable following listings and approvals:
 - 1. Factory Mutual Global
 - 2. Underwriters Laboratories of Canada (ULC)
- C. The manufacturer shall meet ISO 9001 requirements for the design, production and distribution of the Argonite fire suppression system.
- D. All components of the clean agent fire extinguishing system shall be the products of the same manufacturer or listed by that manufacturer as compatible with those devices, components and equipment.

1.4 SYSTEM DESIGN CRITERIA

- A. A total flooding clean agent fire extinguishing system, employing Argonite inert gas, shall be installed to meet a minimum design concentration of ____% by volume in all designated spaces to be protected.

1.5 QUALIFICATIONS

- A. Manufacturer

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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 name of the manufacturer/supplier and manufacturer part numbers shall appear on all major components.
 4. All devices, components and equipment shall be the products of the same manufacturer/supplier.
 5. The system manufacturer/supplier shall have the ability to provide multiple suppression system arrangements to accommodate the performance criteria required by the project.
 6. All devices, components and equipment shall be listed by the standardizing agencies (ULC and/or FM).
- B. Contractor
1. The distributor shall be trained by the manufacturer to calculate/design, install, test and maintain the clean agent fire extinguishing system employing Argonite inert gas and shall be able to produce a certificate stating such on request.
 2. The installing contractor shall employ a person who can show proficiency at least equal to a NICET level III certification in special hazards design.
 3. The Contractor shall confirm in writing that he stocks a full complement of spare parts and offers 24-hour emergency service for all equipment being furnished.
- 1.6 WARRANTY
- A. Components provided by the manufacturer shall carry a warranty of thirty-six (36) months from date of shipment or one (1) full year from the date of installation.
- 1.7 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. Engineered Design Drawings: The Contractor shall provide all required documents that shall include the following details:
1. The factory-authorized Kidde Fire Systems Distributor shall provide all required installation drawings per NFPA 2001.
- C. Flow Calculation Reports
1. The distributor shall provide the following information in the flow calculation report.
 - i. Customer information and project data
 - ii. Hazard information. At a minimum, hazard information is to include minimum design concentration, minimum enclosure ambient temperature, maximum enclosure ambient temperature, minimum agent required and volume of enclosures, and identify discharge nozzles by quantity and style
 - iii. Cylinder information. At a minimum, cylinder information shall include cylinder capacity and stored pressure and quantity of cylinders
 - iv. Pipe network information. At a minimum, pipe network information shall include pipe type, pipe diameter, pipe length, change in elevation, pipe equivalent length and any added accessory equivalent length. In addition, the following nozzle information shall be provided; number of nozzles and identification of enclosure

- location, flow rate of associated nozzle, nozzle nominal pipe size, nozzle type and nozzle orifice area.
- v. Pipes and pipe fittings. A detailed list of pipe, by schedule, nominal diameter and length, and fittings, by Class Rating, nominal diameter and quantity.
- 2. OPTIONAL: Directional Ball Valve Information. A calculation shall be completed for each directional valve in the piping network. Modeling of the Directional Ball Valve shall be shown in the pipe network
- D. Commissioning Equipment List: The distributor shall provide a commissioning equipment list for each installed clean agent fire extinguishing system. The equipment list shall identify all installed equipment and configurations.
 - E. Test Plan
 - 1. The distributor 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 approves the test plan.
 - F. Installation Drawings
 - 1. Four (4) sets of installation drawings for each installed clean agent fire extinguishing system and one (1) set of the calculation report, 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 clean agent fire extinguishing system shall be given to the owner/end-user for use and reference.
 - G. Operation and Maintenance Manuals
 - 1. Two (2) copies of the Kidde Fire Systems Design, Installation, Operation and Maintenance Manual for the clean agent fire extinguishing system employing Argonite inert gas shall be submitted after complete installation.

2. SUPPRESSION SYSTEM REQUIREMENTS

2.1 GENERAL

- A. The clean agent fire extinguishing system shall consist of Argonite inert gas, cylinder(s), Kidde actuation hardware and Kidde discharge nozzle(s) attached to a pipe network.

2.2 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.
- B. Duration of Protection
 - 1. 85% of the minimum design concentration shall be maintained for 10-minutes or a sufficiently longer period of time to allow effective emergency action by trained personnel. A level 1 certification in room integrity testing, provided by a recognized manufacturer of room integrity testing equipment, is required.
- C. Minimum System Design Limits
 - 1. Nozzles
 - i. Nozzles shall be listed and approved for a maximum ceiling height of 16 feet (4.88 m) and a minimum ceiling height of 1 foot (0.31 m).
 - ii. Nozzle area coverage for both 360- and 180-degree nozzles shall be a maximum of 35.6 ft. x 35.6 ft. square (10.85 m x 10.85 m).
 - iii. System Nozzles shall be listed and approved for a minimum of 445 PSIG (30.6 bar gauge) nozzle pressure.

2.3 PIPE AND FITTINGS

- A. Distribution piping, and fittings, shall be installed in accordance with NFPA 2001, approved piping standards and the engineered fire suppression system manufacturer's requirements.

2.4 ACTUATION HARDWARE

- A. The agent cylinders shall be actuated in accordance with the applicable design manual.
B. The suppression panel shall be UL Listed per UL 864, 9th Edition with the interfacing electric actuators.

2.5 NOZZLES

- A. Total flooding clean agent extinguishing system nozzles shall be made of brass.
B. Each nozzle shall be located in the space per the manufacturer's guidelines. Nozzles shall have a 360-degree discharge pattern.
C. Discharge nozzles shall be available in ½-in, ¾-in, 1-in and 1-½-in NPT sizes.
D. Within each nozzle size, the manufacturer shall offer multiple different orifice areas (minimum of 15).
E. Nozzles shall be FM Approved and ULC Listed for use with the manufacturer's clean agent extinguishing system employing Argonite inert gas

2.6 AGENT STORAGE CYLINDER ASSEMBLIES

- A. Argonite inert gas shall be stored in cylinders manufactured and marked in accordance with US Department of Transportation (DOT) specification 3AA-3000 and Transport Canada (TC) specification 3AAM-229. The agent storage cylinders shall be conditioned to 2900 PSIG @ 70°F (200 bar gauge @ 21°C). The system manufacturer shall be able to provide US DOT documentation that the registration number marked on the agent cylinders corresponds to a manufacturing location at a US address.
1. The agent used in Argonite cylinders shall be filled with 50% +0/-2% Argon and 50% +2%/-0% Nitrogen. The purity of the gases shall adhere to the requirements outlined by the manufacturer's manual. 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.
 2. Argonite inert gas cylinders shall be equipped with a pressure gauge to display internal pressures. The gauge shall be an integral part of the equipment and shall be color-coded for fast referencing of pressure readings.
 3. A low-pressure switch shall be provided as standard equipment on the Argonite inert gas cylinders. A decrease in pressure will cause the normally open contacts to close, indicating a trouble condition at the control panel. The low-pressure switch shall be field removable/replaceable while the cylinder is still fully charged

2.7 OPTIONAL EQUIPMENT

- A. When protecting multiple hazard areas from a single supply of Argonite inert gas, Kidde Directional Ball Valves shall be used.
1. The Directional Ball Valves shall be rated to a working pressure of 3000-psig @ 70°F (200-barg @ 21°C).
 2. The Directional Ball Valves shall be available in ½-in through 2-in NPT sizes.
 3. A maximum pressure of 120-psig (8-barg) shall be required to actuate the Directional Ball Valves.
 4. Each Directional Ball Valve shall be fitted with a manual operator.
 5. The Directional Ball Valves shall be installed and located in the piping network per the manufacturer's guidelines and design manual

3. EXECUTION**3.1 CLEAN AGENT FIRE EXTINGUISHING 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.

3.2 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.

3.3 ROUTINE MAINTENANCE

- A. Routine maintenance on equipment shall be performed as recommended by the manufacturer's installation, operation and maintenance manual. At a minimum the routine maintenance will include the following by a certified Kidde Fire System Distributor:
 - 1. Visual Check of Pipe network and distribution nozzles per the operation and maintenance manual.
 - 2. Weight and pressure of the Kidde Engineered System cylinders per the operation and maintenance manual.
 - 3. Inspect all cylinders and equipment for damage per the operation and maintenance manual.
 - 4. Pneumatic operation of the Directional Ball Valve. Routine maintenance on the suppression system as a whole shall be performed as recommended by NFPA 2001, current edition.