

## 1. GENERAL

### 1.1 INTENT OF SPECIFICATIONS

- A. This specification details the requirements for an engineered high pressure Carbon Dioxide (CO<sub>2</sub>) fire suppression system Model Kidde HPCO2. 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 GENERAL DESCRIPTION

- A. The High Pressure CO<sub>2</sub> suppression system shall be a Total Flooding System for Class A Surface Fires / Total Flooding System for Class B Inflammable Liquids / Total Flooding System for Deep Seated Fires / Local Application System **(select option)**.
- B. The system hardware shall consist of one or more cylinders filled with carbon dioxide at its own nominal vapor pressure of 850 psig at 70°F (58 bar gauge at 21°C) and other related equipment. The cylinders shall be connected either directly or via a common manifold to the discharge pipe network and discharged into the affected area using discharge nozzle(s).

### 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. ANSI B1.20.1: Standard for Pipe Threads, General Purpose
  - 2. NFPA 12: Standard for Carbon Dioxide Fire Extinguishing Systems
  - 3. NFPA 70: National Electrical Code (NEC)
  - 4. NFPA 72: National Fire Alarm and Signaling Code
  - 5. Manufacturer's Design, Installation, Operation & Maintenance Manual
  - 6. Requirements of the Local Authority Having Jurisdiction
- B. The complete system shall have the applicable following listings and approvals:
  - 1. Underwriters Laboratories (UL)
  - 2. Factory Mutual Global (FM)
  - 3. Underwriters Laboratories of Canada (ULC)

### 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 name and 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. 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.
  - 2. 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.
  - 3. 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.
  - 4. 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
- A. The contractor shall 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 per manufacturer's manual 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 CO2 mass, the estimated flow rate and number of nozzles.
    - iii. Cylinder information shall include cylinder capacity, cylinder part number, cylinder quantities (both main and reserve) and floor loading per cylinder.
    - iv. 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.
    - v. Nozzle information shall include the number of nozzles, flow rate per nozzle, nozzle nominal pipe size, nozzle type and nozzle orifice code.
    - vi. Pipe fittings information shall include a detailed list by nominal diameter and quantity.
    - vii. **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 equivalent length corresponding to the pipe size for the given hazard.
  - 5. Any other requirements of NFPA 12 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).
- 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 users representative approves the test plan.
- F. The Contractor shall submit the following 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 (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 HPCO2 Design, Installation, Operation and Maintenance Manual.

## 2. PRODUCT/SYSTEM REQUIREMENTS

### 2.1 System Exclusions

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

### 2.2 Agent Concentration Requirements

- A. The system shall be designed to suppress Class A Surface / Class B Inflammable Liquids / Deep Seated / Local Application (select option) fires.

### 2.3 System Performance

- A. The system shall be designed (select one of the following)
  - to achieve the required design concentration for Total Flooding Class A Surface fire-hazards within 60 seconds from the start of discharge
  - to achieve the required design concentration for Total Flooding Class B Inflammable Liquid fire-hazards within 60 seconds from the start of discharge
  - to achieve 30% concentration for Total Flooding Deep Seated fire-hazards hazards within 2 minutes from the start of discharge and the required design concentration within 7 minutes from the start of the discharge.
  - to provide and maintain a liquid discharge as required for Local Application systems for at least 30 seconds.

### 2.4 Cylinder Locations:

- A. The agent cylinders shall be located in an appropriate safe area not subject to damage.
- B. Where subject to moisture, cylinders shall be installed to provide a space of 2.0 in. (~51 mm) between the floor and the bottom of the container is required.
- C. Each cylinder shall have a restraint. A single cylinder or dual cylinders may be restrained by metal straps. Multiple cylinders shall be restrained by metal frame racking. All restraints shall be supplied by the system manufacturer.
- D. To facilitate annual inspection requirements, each location shall be fitted with a weigh bar arrangement supplied by the system manufacturer.

### 2.5 Cylinder Assemblies

- A. The CO2 agent shall be stored at its own nominal vapor pressure of 850 psig at 70°F (58 bar gauge at 21°C).
- B. The CO2 agent shall be stored in cylinders manufactured and marked in accordance with their capacities as follows:
  1. 50 lbm and less: US Department of Transportation (DOT) specification 3AA-2015 and Transport Canada (TC) specification 3AAM-154
  2. 75 & 100 lbm: US Department of Transportation (DOT) specification 3AA-2300 and Transport Canada (TC) specification 3AAM-176
- C. The system manufacturer shall provide US DOT documentation to show that the registration number marked on the agent cylinder corresponds to a manufacturing location at a US address.
- D. No cylinder shall be installed that bears a hydrostatic test date of more than one year ago.

- E. All cylinders shall be provided fitted with a steel shipping cap over the valve.
- F. Cylinders with capacities of 50-lbm or less shall be factory fitted with a bent metallic siphon tube to allow either vertical or horizontal installation.
- G. Cylinders with capacities greater than 50-lbm shall be factory fitted with a straight metallic siphon tube.
- H. All cylinders, of a given capacity, shall be factory fitted with the same valve allowing drop-in interchangeability at any cylinder location on a manifold.
- I. To enhance cylinder handling safety, the cylinder valve, while fitted with an actuator, shall be incapable of discharge when disconnected from the manifold isolation check.

## 2.6 Fire Suppression Agent

- A. The Fire Suppression Agent shall be carbon dioxide
- B. The agent shall comply with the following:
  - 1. The Agent Purity in vapor phase shall be greater or equal to 99.5%.
  - 2. The maximum Water Content in liquid phase shall be less than or equal to 0.01% by weight
  - 3. The maximum Oil Content shall be less than or equal to 10 ppm by weight
- C. The cylinders shall be filled with agent at a UL-listed first fill facility

## 2.7 Pipe and Fittings

- A. Distribution piping, and fittings, shall be installed in accordance with NFPA 12, approved piping standards and the engineered fire suppression system manufacturer's requirements.

## 2.8 ACTUATION HARDWARE

- A. The primary agent cylinders shall be electrically actuated and the secondary cylinders can be actuated via manifold back pressure.
- B. While in the stand-by condition, actuators attached to the cylinder valve shall not be exposed to the cylinder's internal pressure so as to avoid introducing additional leak paths or accidental discharges.
- C. For evacuation and safety purposes when protecting an occupiable space, agent discharge shall be preceded by the sounding of a Pneumatic Siren and delayed by a Pneumatic Discharge Delay.
- D. The pneumatic discharge delay shall automatically reset after system discharge completes.
- E. An optional Odorizer assembly constructed of stainless steel and factory filled with oil of wintergreen may be provided.
- F. Solenoid actuators shall not require replacement after each actuation.
- G. The suppression release Fire Alarm Control Unit (FACU) shall be UL Listed and FM Approved compatible with the electric actuators.

## 2.9 Nozzles

- A. Nozzles shall be of corrosion resistant construction and shall be designed specifically for carbon dioxide application.
- B. Nozzles shall be spaced in the protected area to achieve uniform distribution of the agent. .
- C. The manufacturers' nozzles shall be designed for efficient agent dispersion.
- D. Nozzles shall be UL Listed and FM Approved for use with the agent and the manufacturer's hardware.

## 2.10 [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 use pilot lines internal to the valve assembly.

## 2.11 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.

### 3. EXECUTION

#### 3.1 HPCO2 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 SYSTEM CHECKOUT

- A. Entire system shall be checked out, inspected, and functionally tested by factory authorized and trained personnel in accordance with NFPA 12.
- B. Inspection shall be performed in the presence of the owners representative, engineer or architects 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 CO2 agent shall not be part of the training requirements.

#### 3.4 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 12 and the manufacturer's installation, operation and maintenance manual.