

1. GENERAL

1.1 INTENT OF SPECIFICATIONS

- A. This specification details the requirements for an engineered high pressure Carbon Dioxide (CO₂) fire suppression system for marine applications, 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 CO₂ suppression system shall be a Total Flooding System type Kidde HPCO₂ system certified and approved for Marine applications.
- 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 HPCO₂ fire suppression system shall be in accordance with the following applicable codes, standards and regulatory bodies:
 - 1. US Code of Federal Regulations Title 46 - Shipping
 - 2. NVIC 6-72 - United States Coast Guard
 - 3. Canada Fire Detection and Extinguishing Equipment Regulations C.R.C., c. 1422
 - 4. International Maritime Organization – Safety Of Life At Sea (SOLAS)
 - 5. Applicable Ship Classification Society Rules and Type Approval
 - i. American Bureau of Shipping (ABS)
 - ii. Det Norske Veritas (DNV)
 - iii. Lloyds Register of shipping (LRS)
 - 6. Manufacturer's Design, Installation, Operation & Maintenance Manual
 - 7. Requirements of the Local Authority Having Jurisdiction
- B. The complete system shall have the applicable following listings and approvals:
 - 1. USCG Certificate of Approval
 - 2. Type Approval by Ship Classification Society
 - 3. UL – Underwriters Laboratories Inc.

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 confirm in writing that they stock a full complement of spare parts and offer 24-hour emergency service for all equipment being furnished.

3. 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 shall warrant the installation for 12-months from time of customer acceptance or commissioning

1.6 SUBMITTALS

- A. The naval architect/shipyard 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 naval architect/shipyard 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 designer certified to the satisfaction of the AHJ 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 flooding factors 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. Pipe and Nozzle Calculation showing the following:
 - i. Nozzle orifice area and pipe diameters in accordance with 46CFR.
 5. Any other requirements of the USCG.
- 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 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 the manufacturer's manual 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. The Contractor shall submit the following Installation drawings
 1. Four (4) sets of installation drawings for each installed HPCO2 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 (if not included in the drawings themselves), 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 marine HPCO2 Design, Installation, Operation and Maintenance Manual.
 2. USCG Certificate of Approval
 3. Class Society Type Approval (if vessel not USCG jurisdiction)

2. PRODUCT/SYSTEM REQUIREMENTS

2.1 System Exclusions

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

2.2 Agent Concentration Requirements

- A. The system shall be designed to suppress fires in Dry Cargo Spaces/ Electrical Propulsion Equipment/ Machinery Spaces/ Pump Room/ Paint Lockers/ Vehicle Cargo Spaces (select option) fires.

2.3 System Performance

A. System Discharge

1. The system shall be designed (select one of the following)
 - to achieve the required design concentration for Electrical Propulsion Equipment/ Machinery Spaces/ Pump Room/ Paint Lockers hazards within 120 seconds from the start of discharge.
 - to achieve the required design concentration for Vehicle Cargo Hold hazards within 10 minutes from the start of discharge.

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 deck and the bottom of the container is required.
- C. Each cylinder shall have a high and low restraint. A single cylinder may be restrained by metal straps. Multiple cylinders shall be restrained by oak wood 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. A weigh scale, supplied by the system manufacturer, shall be furnished as part of the system installation.

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 lower: 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 46CFR Part 56, approved piping standards and the engineered fire suppression system manufacturer's requirements.

2.8 ACTUATION HARDWARE

- A. The agent cylinders shall be mechanically actuated with two distinctive physical actions in compliance with USCG requirements.
- B. For evacuation and safety purposes, agent discharge shall be preceded by the sounding of a Pneumatic Siren for a duration of at least 20-sec.
- C. The pneumatic discharge delay shall automatically reset after system discharge completes.
- D. An Odorizer assembly constructed of stainless steel and factory filled with oil of wintergreen shall be provided.
- E. A stainless steel ball valve assembly shall be provided allowing a system lock-out to prevent a discharge into each protected space.
- F. To provide maximum installation flexibility, the **allowed** overall actuation line length shall be at least 300 feet.

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. Nozzles shall be installed at a height from the deck of at least 1/3 of the compartment height.
- D. The manufacturers' nozzles shall be designed for efficient agent dispersion.
- E. Nozzles shall be UL Listed and USCG 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 and conduits shall be per 46CFR Subchapter J.

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 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 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 HPCO2 shall not be part of the training requirements

3.3 ROUTINE MAINTENANCE

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