

**FIRE DETECTION/TOTAL FLOODING CARBON DIOXIDE SUPPRESSION SYSTEM  
ENGINEERING SPECIFICATIONS**

**PART 1 - GENERAL**

**1.01 DESCRIPTION OF WORK:**

- A. Design and installation of an engineered fire detection and Carbon Dioxide total flooding, gaseous agent, fire suppression system as manufactured by Ansul Fire Protection, Marinette, Wisconsin, or approved equal.
- B. Drawings: The contract drawings indicate the general arrangements of the areas to receive detection and Carbon Dioxide protection. Contractor is to review all drawings so that all items affecting the operation of the fire detection/Carbon Dioxide suppression system (such as equipment location, air diffusers, damper closures, and door openings) are considered in the design of the engineered system.

**1.02 REFERENCES**

- A. National Fire Protection Association (NFPA):
  - 1. NFPA 12 – Standard on Carbon Dioxide Extinguishing Systems.
  - 2. NFPA 70 – National Electrical Code.
  - 3. NFPA 72 – Standard For Protective Signaling Systems.
- B. Underwriters Laboratories, Inc. (UL) – Fire Protection Equipment Directory.
- C. Factory Mutual Insurance (FM) Approval Guide.
- D. Requirements of the Authority Having Jurisdiction (AHJ)

**1.03 REQUIREMENTS:**

- A. This installation shall be made in strict accordance with the drawings, specifications and applicable National Fire Protection Association Standards. All equipment and devices used shall be listed in both the UL Fire Equipment Directory and the Factory Mutual Approval Guide.
- B. Design and installation of the fire detection/Carbon Dioxide suppression system will be in strict accordance with the following guidelines and regulatory agencies:
  - 1. NFPA 12 Carbon Dioxide Extinguishing Systems
  - 2. NFPA 72 National Fire Alarm Code, Latest Edition
  - 3. NFPA 70 National Electric Codes, Latest Edition
  - 4. Americans with Disabilities Act, Title 24, Latest Edition

**1.04 GENERAL:**

- A. Furnish all engineering design and materials for a complete fire detection/Carbon Dioxide suppression system including charged Carbon Dioxide storage cylinders,

nozzles, control panel, detectors, wiring, annunciators, alarm and all other equipment necessary for a complete operational system.

- B. Major system components shall be produced by Ansul Fire Protection (no alternatives) and shall be installed by Interstate Fire Protection of North Conway, NH and Augusta, ME an authorized Ansul distributor certified for the design and installation and service of Carbon Dioxide suppression systems.
- C. Contractor shall, as a minimum, provide 24-hour emergency service, 7 days a week and shall be able to respond to an emergency situation within 2 hours of receiving an emergency trouble call. In addition, contractor shall maintain no less than \$2 million liability insurance.

**1.05 SUBMITTAL:**

- A. The following shall be submitted for approval within 21 days of award and prior to delivery of materials:
  - 1. Material and equipment information shall include manufacturer's catalog cut sheet and technical data for each component or device used in the system. This shall include, but not be limited to, the following:
    - a. Detectors
    - b. Manual discharge switches
    - c. Control panel
    - d. Release devices
    - e. Alarm devices
    - f. Agent storage cylinders
    - g. Mounting brackets
    - h. Discharge Nozzles
    - i. Piping isometrics
    - j. Flow calculations
- B. Provide information outlining the warranty of each component or device used in the system.
- C. Provide information outlining the operation and maintenance procedures that will be required of the owner. This information shall explain any special knowledge or tools the owner will be required to employ and all spare parts that should be readily available.
- D. Drawings shall indicate locations, installation details and operation details of all equipment associated with the Carbon Dioxide system. Floor plans shall be provided showing equipment locations, piping, point-to-point wiring and other details as required. Isometric piping layouts shall be provided with the shop drawings. In addition, point-to-point electrical layout drawings shall be provided.
- E. Sequence of operation, electrical schematics and connection diagrams shall be provided to completely describe the operation of the Carbon Dioxide system controls.

## **PART 2 – PRODUCTS**

### **2.01 SYSTEM DESCRIPTION AND OPERATION:**

- A. Design Requirements:
  - 1. Shall be the engineered type.
  - 2. Shall utilize a fixed nozzle agent distribution network.
  - 3. Shall be capable of automatic detection.
  - 4. Shall be capable of automatic and remote manual actuation.
  - 5. Additional equipment shall be available for fuel shut-off where required.
  
- B. Performance Requirements:
  - 1. Shall be capable of extinguishing fire in Class A, B, and C hazards.
  - 2. CO2 agent shall dilute oxygen content of protected hazard to a point where it will not support combustion.
  - 3. Detection system shall be tested to applicable FCC Rules and Regulations for Class “A” computing devices.

### **2.02 SEQUENCE OF OPERATION:**

- A. Activation of any single detector in any detection zone shall:
  - 1. Cause audio and visual pre-discharge alarms to operate.
  - 2. Energize a lamp on the activated detector and control panel (and graphic annunciator, if included).
  - 3. Transmit an alarm signal to remote monitoring or building alarm panel.
  - 4. Operate auxiliary contacts for air conditioning shutdowns and automatic dampers.
  - 5. Initiate a programmable time delay (Carbon Dioxide agent release).
  
- B. Upon completion of the time delay the Carbon Dioxide system shall:
  - 1. Cause a discharge alarm to be activated.
  - 2. Operate auxiliary contacts for emergency power off of all electrical equipment (excluding lighting and emergency circuits for life safety).

3. Energize control solenoid for Carbon Dioxide cylinders releasing gaseous agent into the protected area.

### **2.03 AUXILIARY COMPONENTS:**

- A. Double action manual releasing stations shall be provided at each exit of the protected area and shall, when activated, immediately release the Carbon Dioxide agent and cause all audible/visual alarms to activate. In addition, activation of the manual releasing stations shall cause immediate shutdown of air and power circuits.
- B. Graphic annunciator (optional) shall be provided at the control panel location. The graphic annunciator shall be provided by the equipment manufacturer in an approved NEMA enclosure with keyed faceplate. The graphic annunciator shall display the entire INERGEN protected area and shall indicate each smoke detector and its proximity. Smoke detectors, when activated, will individually annunciate at the graphic annunciator as follows:

Ceiling Detector: Red LED  
Subfloor Detector: Amber LED

### **2.04 QUALITY ASSURANCE**

- A. Qualifications:
  1. Manufacturer: The manufacturer of the system components shall have a minimum of 10 years experience in the manufacture and design of carbon dioxide fire suppression systems and related fire detection and control equipment.
  2. Installer: The installer shall be authorized and trained by manufacturer to design, install, and maintain carbon dioxide fire suppression systems.
- B. Regulatory Requirements:
  1. Conform to [Applicable]building code for requirements specified herein.
  2. Codes and Permits: Conform to the local code requirements applicable to this section. Obtain and pay any necessary permits prior to beginning work involved in this section.
  3. All system components must be UL listed as part of the manufacturer's total system.
  4. All system components must be approved by Factory Mutual Insurance (FM).

### **2.05 DELIVERY, STORAGE AND HANDLING**

- A. Acceptance at Site:
  - 1. Deliver materials to job site in sealed, original containers bearing the manufacturer's labels.
  - 2. Materials arriving at site without labels, opened, damaged, or containing less material than specified shall not be accepted for use.
- B. Storage and Protection:
  - 1. Store, protect, and handle products at site under provisions of Section 2.04. [Project Conditions.]
  - 2. Materials shall be stored in a well- ventilated area at temperatures between 0 °F and 130 °F (–18 °C and 54 °C).

## **2.06 PROJECT CONDITIONS**

- A. Environmental Requirements:
  - 1. Carbon Dioxide System:
    - a. Total Flood System: 0 °F to 130 °F (–18 °C to 54 °C) ambient temperature range of protected area.
    - b. Local Application: 32 °F to 120 °F (0 °C to 49 °C) ambient temperature range of protected area.
  - 2. AUTOPULSE® Control System:
    - a. Indoor application only with 32 °F to 120 °F (0 °C to 49 °C) ambient temperature range.

## **PART 3 - MATERIAL AND EQUIPMENT**

### **3.01 GENERAL REQUIREMENTS:**

- A. Materials and equipment shall be of a single manufacturer (Ansul Fire Protection). Alternates will not be accepted. The name of the manufacturer and the serial numbers shall appear on all major components.

### **3.02 GENERAL MATERIALS - ELECTRICAL:**

- A. All electrical enclosures, raceways and conduits shall be employed in accordance with applicable codes and intended use and contain only those electrical circuits associated with the fire detection and control system and shall not contain any circuit that is unrelated to the system.
- B. Unless specifically provided otherwise in each case, all conductors shall be enclosed in steel conduit, rigid or thin wall as conditions dictate.

- C. Any conduit or raceway exposed to weather or other similar conditions shall be properly sealed and installed to prevent damage. Provisions for draining and/or drying shall be employed.
- D. NEMA rating and/or electrically hazardous classifications shall be observed and any equipment or materials installed must meet or exceed the requirements of service.
- E. Any wiring shall be of the proper size to conduct the circuit current but shall not be smaller than #18 AWG unless otherwise specified for a given purpose. Wire that has scrapes, nicks, gouges or crushed insulation shall not be used. The use of aluminum wire is strictly prohibited.
- F. Splicing of circuits shall be kept to a minimum and are only to be found in an electrical device suited for the purpose.
- G. Wire spliced together shall have the same color insulation.
- H. Wire splices shall be made with appropriate devices suited for the purpose.
- I. All wire terminations shall be made with crimp terminals unless the device at the termination is designed for bare wire terminations.
- J. All electrical circuits shall be numerically tagged with suitable devices at the terminating point and/or splice. All circuit numbers shall correspond with the installation drawings.
- K. The use of colored wires is encouraged but not required unless dictated by state or local authorities.
- L. White colored wire shall be used exclusively for the identification of the neutral conductor of an alternating current circuit.
- M. Green colored wire shall be used exclusively for the identification of the earth ground conductor of an AC or DC circuit.

### **3.03 CONTROL SYSTEMS - GENERAL:**

- A. All control systems shall be UL Listed or FM approved and be utilized with listed or approved compatible operating devices and shall be capable of the following features:
  - 1. Ground fault indication
  - 2. Supervised detection circuit(s)
  - 3. Supervised alarm circuit(s)
  - 4. Supervised release circuit(s)
  - 5. Supervised manual pull circuit (if applicable)
  - 6. Supervised primary power circuit
  - 7. Alarm overrides trouble logic
  - 8. Battery standby
  - 9. Front panel indicating lamps (LEDs)
  - 10. Key lock steel enclosure

11. Programmable time delay
12. Programmable detection logic
13. Prioritized trouble logic
14. Microprocessor based logic
15. History buffer

### **3.04 CONTROL PANEL - AUTOPULSE Z-10 CONTROL SYSTEM:**

- A. The control panel shall be an Ansul model Z-10 and shall communicate with and control the following types of equipment used to make up the system: smoke detectors, manual release/abort stations, alarm notification appliances, releasing components and other system controlled devices.
- B. System Capacity - The control panel shall include two Style Y/Z (Class A/B) notification circuits, two releasing circuits, two Form- C alarm and one trouble contacts, four Style B/D (Class A/B) initiating circuits, two Style B/D (Class A/B) manual release circuits, and two Style B/D (Class A/B) abort circuits. For two zone applications, manual release & abort circuits are combined on one special purpose monitor circuits, and are controlled via an abort supervision module. (Current limiter). For class A wiring, onboard class A adapter modules are available.
- C. System Display - The system display shall indicate the status of the following system parameters:
  - AC POWER: Green LED
  - SYSTEM ALARM: Red LED
  - RELEASE: Red LED
  - SUPERVISORY: Yellow LED
  - SYSTEM TROUBLE: Yellow LED
  - ALARM SILENCED: Yellow LED
- D. System Control Switch Operation –
  1. Acknowledge Switch: Activation of the control panel acknowledge switch acknowledges system status during normal operation.
  2. Alarm Silence Switch: Activation of the alarm signal silence switch shall cause all alarm notification appliances to return to the normal condition after an alarm condition except after discharge time delay.
  3. System Reset Switch: Activation of the system reset switch shall cause all electronically-latched initiating devices, appliances as well as all associated output devices and circuits, to return to their normal condition. Holding system reset down shall perform a LAMP TEST function and will activate the piezo sounder.
- E. System Operation –
  1. Zone Status LEDs: The alarm, supervisory or trouble LED(s) shall flash until event(s) has been acknowledged. Any subsequent new alarm, supervisory or trouble condition will resound all indications and flash new events.

2. Supervisory: A short circuit on this zone shall cause the supervisory LED to flash. The tone silence switch shall silence the piezo causing the supervisory LED to illuminate steady. An open circuit shall report as a zone trouble.

F. Optional modules shall include:

Relay module includes four relays, form C 7A @ 120VAC, 5A @30 VDC, unsupervised contacts.

G. The control panel shall also include the following functions:

1. Output circuits shall be protected against false activation by using a 2-step electronic activation circuit.
2. Battery/earth fault supervision shall be provided.
3. Adjustable delay timer shall be available, zero to thirty seconds.
4. Cross-zone option shall be selectable (two zones in alarm before release).
5. Three abort functions options shall be selectable: (1) Standard UL method; (2) IRI method; and (3) local AHJ method.
6. A second release zone and circuit are available and fully programmable.
7. A supervised manual release circuit shall be provided which, when activated, shall override the Abort.
8. 7 AH to 12 AH battery options shall be available providing up to 90 hours standby.
9. A watchdog timer to supervise microprocessor shall be provided.
10. Slide-in zone identification labels shall be provided.

H. Power Supply –

1. The power supply shall be integral to the control panel and provide all control panel and peripheral device power needs.
2. Input power shall be 120 VAC, 60 Hz. The power supply shall provide an integral battery charger for use with batteries up to 12 AH.
3. The power supply shall also provide 2 amperes of regulated 24 VDC power for each release circuit and alarm notification circuits, (3A max. per panel). Aux power output for four-wire smoke detectors or other is rated at 24 VDC up to 750 mA, resettable or non-resettable.
4. The power supply shall be designed to meet UL and NFPA requirements for power-limited operation on all notification and initiating circuits.

5. Positive-temperature-coefficient thermistors, circuit breakers, fuses, or other over-current protection shall be provided on all power outputs.

I. Mechanical Design –

The control panel shall be housed in a cabinet designed for mounting directly to a wall or vertical surface. The back box and door shall be constructed of .060 steel with provisions for electrical conduit connections into the sides and top. The door shall provide a key lock and include a glass or other transparent opening for viewing of all indicators. The cabinet shall be approximately 4.25 inches (127 mm) deep, and 14.5 inches (368 mm) wide, and 16 inches (406 mm) high. An optional trim ring shall be used for flush mounting of the cabinet. Space shall be provided in the cabinet for 7 AH or 12 AH batteries.

J. Batteries –

1. Batteries shall be 2 - 12 volt, Gel-Cell type providing 24 VDC.
2. Batteries shall have sufficient capacity to power the fire alarm system for not less than 24 hours in standby plus 10 minutes of alarm upon a normal AC power failure.
3. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks, refilling, spills and leakage shall not be accepted.

### **3.05 SMOKE DETECTORS**

- A. Smoke detectors shall be 24 VDC and shall be UL listed and FM approved.
- B. Each detector shall include a visual status indicator, provide remote LED output, and include a built-in test capability.
- C. The sensitivity shall be factory set per UL 268.
- D. The detector cover and screen shall be easily removable for field cleaning.
- E. A special vandal-resistant locking screw shall be provided to lock the head to the base.
- F. the head-to-base connection shall be made by use of bifurcated contacts. Terminal connections to the base shall be the screw type that are accessible with the base installed on the mounting box.

- G. Where specifically identified on the contract drawings, detector bases shall incorporate a relay with Form C contacts rated at 1 amp, 120 VAC or 28 VDC for remote LED alarm annunciation of the detector.
- H. Ionization-type smoke detector shall be the dual chamber type and compatible with the Ansul control system. The detector shall have an LED in its base, which is illuminated in a steady-on mode when in alarm, and pulse mode when in standby. Reset of the detector shall be performed by the control unit reset switch.
- I. The design of the ionization detector compensating circuits shall provide stable operation with regard to minor changes in temperature, humidity and atmospheric conditions.
- J. Photoelectric-type smoke detector shall be the light reflective type and compatible with the Ansul control system. The detector shall have an LED in its base, which is illuminated in a steady-on mode when in alarm, and pulse mode when in standby. Reset of the detector shall be performed by the control unit reset switch.
- K. The design of the photoelectric detector compensating circuits shall provide stable operation with regard to minor changes in temperature, humidity and atmospheric conditions.
- L. Photoelectric-type smoke detector with heat detector shall be the light reflective type and compatible with the Ansul control system. The detector shall have an LED in its base, which is illuminated in a steady-on mode when in alarm, and pulse mode when in standby. Reset of the detector shall be performed by the control unit reset switch.

**3.06 INDICATING APPLIANCES:**

A. Sounder/Strobe Combination –

- 1. The sounder/strobe combination shall operate on 24 VDC and shall be approved for use with the listed control system.
- 2. The sounder/strobe combination shall be polarized and powered from the control unit.
- 3. The device shall be UL listed or FM approved.
- 4. The strobe shall be listed to UL Standard 1971 for the Hearing-Impaired, approved for Fire Protective Service, and rated at either 15 cd or 75 cd.

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**B-5.** The sounder shall have eight (8) tone options selected by means of programming clips.

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B. Strobe –

- 1. The strobe shall operate at 24 VDC and shall be approved for use with the listed control system.

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2. The strobe shall be polarized and powered from the control unit.
3. The strobe shall be UL listed or FM approved.
4. The strobe shall be listed to UL Standard 1971 for the Hearing-Impaired, approved for Fire Protective Service, and rated at either 15 cd or 75 cd.

C. Sounder –

1. The sounder shall operate at 24 VDC and shall be approved for use with the listed control system.
2. The sounder shall be polarized and powered from the control unit.
3. The device shall be UL listed or FM approved.
4. The sounder shall have eight (8) tone options selected by means of programming clips.

**3.07 MAINTENANCE LOCK-OUT SWITCH:**

~~C.A.~~ The maintenance lock-out switch shall be used where it is desired to disable the fire suppression system during routine maintenance.

~~D.B.~~ This switch shall be key operated allowing removal of the key in either the "Normal" or "Lock-Out" position. A red indicator lamp shall be included on the switch assembly to be illuminated when in the "Lock-Out" position. The control unit is to indicate a trouble condition when in the "Lock-Out" position.

~~E.C.~~ The switch shall include one (1) set of normally open and one (1) set of normally closed contacts rated at 28 VDC @ 1.1 amp make/break or 6 amp continuous carry.

~~F.D.~~ The terminal connections shall be of the screw type.

**3.08 SELECTOR SWITCH:**

- A. The selector switch shall be used where a connected reserve is required.
- B. This switch shall be key operated allowing removal of the key in either the "Main" or "Reserve" position.
- C. This switch shall be rated at 28 VDC @ 1.1 amp make/break or 6 amp continuous carry.
- D. The terminal connections shall be of the screw type.

**PART 4 - SYSTEM ARRANGEMENT**

**4.01 EXAMINATION**

- A. Verification of Conditions: The contractor shall verify that area being protected by carbon dioxide system meets requirements of NFPA 12.

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#### **4.02 CARBON DIOXIDE SYSTEM:**

- A. Carbon Dioxide fire system shall be of the engineered, permanently piped, fixed nozzle type with all pertinent components provided by Ansul Fire Protection.
- B. All agent storage cylinders shall be centrally located as vertical, freestanding cylinders with wall and/or floor mounted retaining brackets. Where multiple cylinders are required for the same hazard, a common manifold shall be employed. (Cylinders mounted horizontally shall be installed in accordance to the manufacturer's design manual.)
- C. On multiple cylinder arrangements (discharging into a common hazard), one cylinder shall be designated as the pilot cylinder and employ the restorable electric actuator, mechanical manual actuators, or both. Where the supply consists of three or more cylinders, there shall be one pilot cylinder more than the minimum required to actuate the system. All remaining cylinders shall be pneumatically operated from the Carbon Dioxide agent.
- D. Manifoldded cylinders shall employ a flexible discharge hose to facilitate installation and system maintenance. Each cylinder on a manifold shall also include an agent check valve installed to the manifold inlet.

#### **4.03 FLOW CALCULATIONS:**

- A. Computerized verification of flow calculations shall be submitted for each Carbon Dioxide fire suppression system and include the following data as a minimum:
1. Quantity of agent per nozzle
  2. Pressure at nozzle (psi)
  3. Nozzle body nominal pipe size (inch)
  4. Number and size of cylinders
  5. Total agent
  6. Pipe size per pipe section
  7. Pipe schedule per pipe section
  8. Number, size and type of fitting per pipe section
  9. Actual length per pipe section (feet)
  10. Equivalent length per pipe section (feet)
  11. Discharge time (seconds)

### **PART 5 - EQUIPMENT AND MATERIAL (MECHANICAL)**

#### **5.01 PIPE MATERIAL – CARBON DIOXIDE SYSTEM:**

- A. System piping shall be of non-combustible materials having physical and chemical characteristics such that its integrity under stress can be predicted with reliability.
- B. As a minimum, piping materials shall be black steel pipe conforming to ASTM A-53A ERW or ASTM A-106A seamless.
- C. Under no conditions shall ordinary cast iron pipe, steel pipe conforming to ASTM A-120 or ASTM A-53/A-120 be used.
- D. Piping joints shall be suitable for the design conditions and shall be selected with consideration of joint tightness and mechanical strength.
- E. Distribution lines up to 3/4 in. diameter shall be Schedule 40 seamless steel pipe, black iron or galvanized.
- F. Distribution lines greater than 3/4 in. diameter shall be Schedule 80 seamless steel pipe, black Iron or galvanized.
- G. For pipe sizes up to 2 in. diameter, Class 300 malleable or ductile iron fittings shall be used.
- H. For pipe larger than 2 in. diameter, IPS and forged steel fittings shall be used.
- I. All piping shall comply with NFPA 12.
- J. Piping shall be installed in accordance with good commercial practice to the appropriate codes, securely supported with UL Listed hangers and arranged with close attention to the design layout since deviations may alter the design flow performance as calculated.
- K. Piping shall be bracketed within 12" (.3 m) of all discharge nozzles.
- L. All piping shall be reamed, blown clear and swabbed with appropriate solvent to remove mill varnish and cutting oils before assembly.
- M. Multi-outlet fittings other than tees shall not be permitted.
- N. Assembly of all joints shall conform to the appropriate standards. Threaded pipe joints shall utilize Teflon tape applied to the male threads only.
- O. All dead end pipe lines to be provided with a 1/2 in. capped nipple, 2 in. long.

**5.02            EXTINGUISHING AGENT:**

- A. The agent shall be Carbon Dioxide.

**5.03            CARBON DIOXIDE STORAGE CYLINDERS:**

- A. Cylinder Assembly:

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- a. Steel construction with a red enamel or epoxy finish available in five sizes, and equipped with a pressure seat-type CV98 valve.
- b. Valve constructed of forged brass.
- c. Valve contains safety pressure relief device which provides relief at 2650 to 3000 psi (18269 to 20682 kPa).
- d. Cylinder charging pressure to be a minimum 850 psi at 70 °F (5861 kPa at 21 °C) with a filling density of not more than 68% of its water capacity.
- e. Cylinder shipped with maintenance record card and shipping cap attached.
- f. Cylinder serial number, along with the full and empty weight capacities, stamped near neck of cylinder.

A.B. Filling of the cylinder assembly shall be by Ansul Fire Protection. Initial filling and recharge shall be performed in accordance with the manufacturer's established procedures and shall not require replacement components for normal service.

**5.04 CYLINDER BRACKET:**

- A. Each cylinder assembly shall be furnished with a bracket made from welded steel. The bracket shall hold the cylinders in a saddle with a front bracket piece that secures the cylinders. The brackets shall be modular in design to allow added bracketing or stacking of cylinders depending on installation requirements.
- B. Cylinder brackets shall be UL listed and/or FM approved for use with the Carbon Dioxide system.

**5.05 VALVE ACTUATORS:**

- A. Electric valve actuators shall be of brass construction and stackable design with swivel connections to allow removal of actuators for maintenance or testing.
  - ~~B. Operation of actuators shall not require replacement of components. NO ELECTRO-EXPLOSIVE DEVICES may be used to actuate the valve assembly.~~

~~B.C. Electric actuators shall be continuous duty type for 24 VDC operation.~~ Actuation devices shall be UL listed and/or FM approved for use with the Carbon Dioxide system.

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**5.06 DISCHARGE HOSE/CHECK VALVE:**

~~A. A.~~ When manifolding, all cylinder assemblies shall include a flexible discharge hose and check valve for connection to the manifold inlet.

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~~B. B.~~ All hose/check valves shall be UL listed and/or FM approved for use with the CV-90 or CV-98 Carbon Dioxide valves as manufactured by Ansul Fire Protection.

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#### 5.07 DISCHARGE NOZZLES:

~~A. A.~~ Designed to direct discharge of carbon dioxide in a liquid or gaseous state.

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~~B. B.~~ Orifice size determined by flow rate and system design required.

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~~C. C.~~ Standard nozzles to be natural brass or painted red.

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~~D. D.~~ Optional chrome plating available.

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~~E. E.~~ All nozzles to be corrosion resistant and, if needed, equipped with blow-off caps or sealing discs.

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~~A.F. F.~~ Nozzles shall be permanently marked with the manufacturer's part number. The nozzles shall be threaded directly to the discharge piping without the use of special adapters.

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~~G. G.~~ Nozzles shall be UL listed as manufactured by Ansul Fire Protection.

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#### 5.08 SYSTEM CHECKOUT AND TESTING:

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~~A. A.~~ The completed installation shall be inspected by factory authorized and trained personnel. The inspection shall include a full operational test of all components per the equipment manufacturer's recommendations (including agent discharge).

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~~B. B.~~ Inspection shall be performed in the presence of the owner's representative, architect or engineer's representative, insuring authority and/or the local authority having jurisdiction.

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~~C. C.~~ All mechanical and electrical components shall be tested according to the manufacturer's recommended procedure to verify system integrity.

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~~D. D.~~ Inspection shall include a complete checkout of the detection/control system and certification of cylinder pressure. A written report shall be filed with the owner.

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~~E. E.~~ As-built drawings shall be provided by the contractor (2 copies) indicating the installation details. All routing of piping, electrical conduit and accessories shall be noted.

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~~F. F.~~ Equipment installation and maintenance manuals shall be provided in addition to the as-built drawings.

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~~G. G.~~ Prior to final acceptance, the contractor shall provide operational training in all concepts of the system to the owner's key personnel. Training shall consist of:

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- ~~1. 1.~~ Control system operation
- ~~2. 2.~~ Trouble procedures
- ~~3. 3.~~ **Abort procedures**
- ~~4. 3.~~ ~~4.~~ Emergency procedures
- ~~5. 4.~~ ~~5.~~ Safety requirements
- ~~6. 5.~~ ~~6.~~ Demonstration of the system (excluding Carbon Dioxide release)

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~~H. H.~~ The quantity of agent shall reflect the actual design quantity of Carbon Dioxide agent.

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~~I. I.~~ A functional test shall be completed consisting of detection, release, alarm, accessories related to the system, control unit and a review of the cylinders, piping, fittings, hangers and cylinder pressure.

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## **PART 6 - WARRANTY**

### **6.01 WARRANTY:**

~~A. A.~~ All Carbon Dioxide system components furnished under this contract shall be guaranteed against defect in design, material and workmanship for the full warranty time which is standard with the manufacturer and/or supplier but not less than one (1) year from the date of system acceptance. In addition, the installing contractor must guarantee the system against false actuation or leakage due to faulty equipment, design or workmanship for a period of one (1) year from final acceptance. In the event of Carbon Dioxide agent leakage or system discharge from

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any of the above conditions, the installing contractor shall completely recharge and recondition the system at no cost to the owner.

**END OF SECTION**

