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| 4. | Factory Mutual          | Approval Guide                                 |
| 5. | Underwriters Laboratory | Fire Protection Equipment Directory            |
| 6. | NEMA                    | Enclosures for Industrial Controls and Systems |
| 7. | Title 24                | Americans with Disabilities Act                |

#### 1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300:

1. Manufacturer's catalog cut sheet and technical data for detectors, manual and automatic discharge devices, control panel, alarms, agent storage cylinders, discharge nozzles, abort stations. Product data shall bear the stamp of approval of the [authority having jurisdiction].
2. Dimensioned drawings of all components of the system.
  - a. Floor plans shall show storage location, equipment locations, piping, and point to point wiring. Floor plans shall be at 1/8-inch to 1 foot or larger scale. Elevations and cross sections shall be at an equal or larger scale. Drawings shall bear the stamp of approval of the [authority having jurisdiction].
  - b. Isometric piping layouts
  - c. Electrical schematics
  - d. Connection diagrams
3. Design calculations bearing the stamp of approval of the [authority having jurisdiction] including verification that system pressures, orifice sizes, piping pressure losses, number of cylinders, and nozzle flow rates and pressures satisfy requirements.
4. Documentation of installer's qualifications.
5. Documentation of design engineer qualifications.

#### 1.6 OWNER'S MANUAL

A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01300.

1. Electrical schematic and written description of system design, drawings illustrating control logic and equipment locations, and technical brochures describing equipment.
2. List of recommended spare parts, special tools, and test equipment.
3. Checklists and procedures for emergency situations, troubleshooting techniques, abort functions, system control panel operation, trouble procedures, and safety requirements.
4. Test reports indicating successful completion of tests.

#### 1.7 SERVICES OF MANUFACTURER

- A. **Inspection:** An authorized representative of the manufacturer shall visit the Site to inspect the system, check for function and cylinder pressure, and adjust the equipment as necessary.
- B. **Instruction of OWNER's Personnel:**
  - 1. An authorized service representative of the manufacturer shall instruct the OWNER's personnel in all concepts of the system, including control system operation, trouble, abort, and emergency procedures, applicable safety requirements, and shall perform a demonstration of the system operation except for INERGEN release.
  - 2. The representative shall have at least 2 year's experience in training. A resume of the representative shall be submitted.
  - 3. Training shall be scheduled at least 3 weeks in advance of the first session.
  - 4. The OWNER may videotape the training session for later use by the OWNER's personnel.

#### 1.8 PROJECT RECORD DRAWINGS

- A. The following shall be included in the record drawings in compliance with Section 01300:
  - 1. Accurate record of exact location of equipment, equipment identification markings, conduit and piping routing details, and agent storage positions.

#### 1.9 QUALIFICATIONS

- A. **Installer:** Company authorized by Ansul Fire Protection Company for design, installation, and service of INERGEN systems.
- B. **Designs:** System shall be designed under direct supervision of a licensed professional engineer who is a member of The Society of Fire Protection Engineers, who is experienced in design of this work using a [UL] [FM] approved calculation method.

#### 1.10 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. **Delivery of Materials:** Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer. Flooding agent shall be delivered in manufacturer-approved containers.
- B. **Storage:** Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.

#### 1.11 MAINTENANCE SERVICE

- A. The WORK of this Section includes the following:
  - 1. Inspections 5 and 12 months from Date of Substantial Completion to verify proper operation of system and to check agent container weight and pressure, including a thorough check of controls, detection, and alarm systems.
  - 2. Documents certifying satisfactory system operation, including manufacturer's certificate of acceptance of Inspector's qualifications.

## PART 2 -- PRODUCTS

### 2.1 GENERAL

#### A. System Description

1. The system shall be an INERGEN total flooding, gaseous, clean agent fire suppression type which provides a uniform concentration of flooding agent to the area to be protected.
2. The amount of INERGEN to be released shall be the amount necessary for the component gases to occupy a total of 37.5 to 42.8 percent by volume of the air in the area to be protected for a duration of 10 minutes, taking into account enclosable passageways if any, fan "rundown" time, damper closure time, and other factors affecting agent concentration. Concentration calculations shall be based on volume at 70 degrees F.
3. Smoke detectors shall be both ionization and photoelectric types, located to cover no more than 400 square feet, each. The system shall require alarm status from 2 cross-zone detectors before INERGEN release.

### 2.2 SMOKE DETECTORS

- A. Smoke detectors shall be powered by 24 VDC, be both UL listed and FM approved, and include visual status indicators, outputs to remote light emitting diode (LED) annunciator devices, and have built-in test capability. Reset switches shall be provided. Compensating circuitry shall maintain stable operation despite changes in temperature, humidity and atmospheric conditions. Sensitivity shall be factory set per UL 268.
- B. Ionization type detectors shall be dual chamber type with base mounted LED which is illuminated steady in [alarm] mode and in pulse mode when in [standby] mode.
- C. Photoelectric type smoke detectors shall be light reflective type with base mounted LED which is illuminated steady in [alarm] mode and in pulse mode when in [standby] mode.

### 2.3 CONTROL SYSTEM

#### A. Sequence of Alarm Operation

1. Activation of any single detector
  - a. Initiate a first stage alarm condition
  - b. Energize LED on the detector, lamp on the control panel, [lamp on graphic annunciator panel].
2. Activation of second detector
  - a. In addition to energizing LED on the second detector and lamp[s] on the control panel [and graphic annunciator panel], transmit alarm signal to [remote monitoring location][building alarm panel].
  - b. Energize a pre-discharge alarm stage.
  - c. Operate output contacts for air conditioning system shutdown and closure of automatic dampers.
  - d. Initiate a programmable time delay for INERGEN agent release.

3. Runout of discharge time delay
  - a. Energize a system discharge alarm
  - b. Operate output contacts for power cutoff to all electrical equipment in the protected area except for exit lighting and life safety circuits.
  - c. Activate strobe alarms at entrances to protected area.
  - d. Energize control solenoid and release INERGEN from cylinders into the protected area.

B. System Features

1. Ground fault indication
2. Supervised circuits for
  - a. Detection
  - b. Alarm
  - c. Release
  - d. Manual pull stations
  - e. Primary power circuit
3. Alarm overrides trouble logic
4. Battery standby power
5. Prioritized trouble logic
6. Programmable
  - a. Time delay to discharge
  - b. Detection logic
7. Microprocessor based logic
8. History buffer
9. Front panel LED's
10. Key lockable steel enclosure

C. Control Panel

1. The panel shall be an Ansul Autopulse 442R.
2. Capacity: The control panel shall include:
  - a. [2] Style Y/Z (Class A/B) notification circuits
  - b. [2] Releasing circuits
  - c. Form C alarm and trouble contacts
  - d. [2] Style B/D (Class A/B) indicating circuits
  - e. [1] Style B/D (Class A/B) manual release circuit
  - f. [1] Style B/D (Class A/B) abort circuit
3. Display shall indicate status of the following:

- |    |                                      |            |
|----|--------------------------------------|------------|
| a. | AC Power on                          | green LED  |
| b. | First and second stage system alarms | red LED    |
| c. | Release                              | red LED    |
| d. | Supervisory System                   | yellow LED |
| e. | System trouble                       | yellow LED |
| f. | Circuit trouble                      | yellow LED |
| g. | Power trouble                        | yellow LED |
| h. | Alarm silenced                       | yellow LED |

#### 4. Display Operation

- a. Zone Status LEDs: Alarm, supervisory, and trouble LEDs shall flash until the causative event has been acknowledged. A subsequent alarm, supervisory, or trouble signal received before the Alarm Silence Switch is pressed shall resound all indicators and restart flashing of the corresponding LED.
- b. Supervisory LEDs: A short circuit in supervisory circuits shall cause the corresponding supervisory LED to flash and the piezo signal shall activate. An open supervisory circuit shall be reported as trouble.
- c. Zone Disable: Disable/Enable of any initiating circuit shall be accomplished by a special sequence of pushing the four control panel switches. After a circuit has been disabled, a red LED shall be activated but no piezo signal or output circuit shall be activated.
- d. Last Event Recall: Last event recall shall return the display lighting pattern to what it was during the most recent event.

#### 5. Control Panel Switches

- a. Tone Silence Switch: Pressing this switch shall silence the panel piezo signal and change the alarm, supervisory, or trouble LED from flashing to steady on. A new alarm or trouble condition shall resound the piezo signal and repeat the alarm or trouble sequence.
- b. Alarm Silence Switch: Pressing this switch shall reset all alarm notifications to normal condition.
- c. System Reset Switch: Pressing this switch shall reset all electrically-latched initiating devices, output devices, and circuits to normal condition. Holding this switch down shall activate a lamp and piezo signal test function.
- d. Alarm Activate Switch: Pressing this switch shall activate and latch notification circuits and the alarm relay.

#### D. Control Panel Functions

1. Protect output circuits against false activation by using a two-step electronic activation circuit.
2. Provide supervision for battery fault and ground fault conditions.
3. Provide delay timer adjustable from zero to 30 seconds.
4. Provide cross zone alarm option precedent to release.

5. Provide 3 selectable abort options
  - a. Standard UL method
  - b. IRI method
  - c. Local "authority having jurisdiction" method
6. Provide a supervised manual release circuit to override the abort circuit.
7. Provide a battery backup for 90 hours of standby operations.
8. Provide a watchdog timer to supervise the microprocessor.

E. Power Supply

1. Power for all control panel and peripheral devices shall be supplied from the control panel.
2. Input power shall be 120 VAC, 60 Hz.
3. The power supply shall serve:
  - a. [2.25 A, 24 VDC] regulated power for release circuits and alarm annunciators.
  - b. Up to [200mA, 24 VDC] 4 wire power for smoke detectors.
  - c. Up to [200 ma, 24 VDC] non-resetable power.
  - d. Battery charger for batteries up to 15 AH.
4. The power supply unit shall be designed to meet UL and NFPA requirements for power-limited operation on initiating and annunciator circuits.
5. Provide positive temperature coefficient thermistors, circuit breakers, or fuses on all power output circuits.

F. **Enclosure:** The cabinet and door shall be constructed of 0.060-inch steel with provision for conduit connections on top and both sides. The door shall have a glass window for viewing all LEDs. The enclosure shall have space for 12 AH batteries.

G. Batteries

1. Provide two 12 volt gel type batteries connected in series, having capacity for 24 hours of system operation in standby plus 5 minutes of alarm.
2. The batteries shall be sealed, maintenance free type.

2.4 INDICATING DEVICES

A. Piezo signals and strobes shall operate on 24 VDC, be UL listed or FM approved. Piezo signals shall comply with UL 1971. Strobes shall be either 15 or 75 candelas.

2.5 MANUAL SWITCH STATIONS

- A. Manual pull stations located at exits from the protected area shall release the flooding agent when activated, activate alarms, and shut down electric power circuits. Devices shall be UL listed double action molded [semi-flush][surface] housings with "push-in" tab and "pull-down" lever which locks in position after releasing spring loaded contacts. Pull stations shall have the word "FIRE" on the front and both sides. An engraved label shall be attached to the wall beside the pull station which shows the area protected by the station and states that actuation will release suppressant agent. Manual pull stations shall override abort stations.
- B. Abort stations shall be located at exits from the protected area to interrupt discharge of agent and deactivation of electric power circuits. Abort switches shall be "dead man" momentary contacts requiring continuous pressure. Switches shall be rated 28 VDC, 1.1 A make/break, and 6A continuous.
- C. Maintenance lock out switch shall be provided at the location indicated. The switch shall be key operated with the ability to remove the key in both the "normal" and "locked out" positions. An integral red indicator lamp shall be illuminated when the switch is in the "locked out" position. Contacts in the switch shall be [one] NO and [one] NC, rated for 28 VDC, 1.1A make/break, 6A continuous.
- [D. Supply selector switch shall be key operated with the ability to remove the key in both the "main supply" and "reserve supply" positions. Contacts shall be rated 28 VDC, 1.1A make/break, 6A continuous.]

## 2.6 INERGEN DELIVERY SYSTEM

- A. Cylinders shall be steel finished with manufacturer's standard red epoxy coating.
- B. Brackets shall be UL-listed, FM-approved, and be modular to allow cylinder storage in upright or stacked position as determined by the storage space available and the number of cylinders which must be provided.
- C. Each cylinder shall be provided with a forged brass pressure seat type release valve, pressure gauge, and safety pressure relief device set at 3000 to 3360 psi per CGA test methods. Electric actuators shall be brass with swivel connections, UL-listed and FM-approved.
- D. Piping shall be seamless black steel complying with NFPA 2001, and with ASTM A 53, Type ERW, or ASTM A 106. No pipe complying with ASTM A 120 shall be used. Piping from the cylinder to the high pressure side of flow orifice shall be Schedule 80 and fittings shall be black steel, 300 psi class, conforming to ANSI B16.3. Piping on the low pressure side of the flow orifice shall be Schedule 40 minimum.
- E. Check valves shall be UL-listed and FM-approved for use with release valves.
- F. Discharge nozzle shall be UL listed twp-piece construction, sized for the proper flow rate and be provided with flow limiting orifices. Orifice sizes and flows shall be calculated by a UL listed computer program. Nozzles shall be marked with the manufacturer's part number.

## PART 3 -- EXECUTION

### 3.1 ELECTRICAL



- A. Enclosures, raceways, and conduits shall comply with applicable codes. Only fire detection and suppression circuits shall be installed therein.
- B. Conduit shall be rigid or thin wall steel as conditions require. Conduit exposed to weather shall be properly sealed and shall employ provisions for draining and drying.
- C. Wiring shall be the proper size for the intended current, but shall never be smaller than 18 AWG. No wire with scrapes, nicks, gouges, or crushed areas shall be installed. Aluminum wire is prohibited.
- D. Splicing of circuits shall be minimized.
- E. Only wires of the same color insulation shall be spliced together. Use only appropriate splicing devices.
- F. Only white insulated wire shall be used for the neutral conductor of an AC circuit. Green insulated wire shall only be used for ground conductors.
- G. Wiring in all circuits shall be identified by numerical tags at each termination and splice. Circuit numbers shall match the installation drawings.
- H. Wire terminations shall be by crimped terminal unless the device at the termination is designed for bare wire contact.

### 3.2 PIPING

- A. Piping shall be provided in accordance with appropriate codes using UL-listed hangers. Piping shall be bracketed within 12 inches of discharge nozzle.
- B. Threaded joints shall be assembled with teflon tape.

### 3.3 FIELD TESTING

- A. A complete functional test including operation of all detectors, alarms, accessories and output signals from the system, controls, and release of INERGEN shall be performed in the presence of the OWNER, CONSTRUCTION MANAGER, and Authority having jurisdiction.
- B. A concentration test similar to the functional shall be conducted. Concentration testing shall be performed according to the test location and test procedure recommended by the manufacturer. The pass/fail criteria shall be the concentration and time requirements indicated above.
- C. If the system does not satisfy the pass/fail criteria, the CONTRACTOR shall determine the cause of failure, correct the problem, recharge, and retest the system at no increased cost to the OWNER.

\*\* END OF SECTION \*\*