

Engineering Specifications



**INERGEN® Clean Agent
Fire Suppression System
with iFLOW Technology**

**ANSUL® INERGEN® CLEAN AGENT FIRE SUPPRESSION SYSTEM
WITH iFLOW TECHNOLOGY
ENGINEERING SPECIFICATIONS
2018-JULY**

**Johnson Controls
One Stanton Street Marinette, WI 54143-2542**

1-800-862-6785 / 1-715-735-7415

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Design and installation of an engineered fire detection and INERGEN® iFLOW total flooding, gaseous agent, fire suppression system as manufactured by Johnson Controls.
- B. In areas where multiple separate hazard zones are protected with a common bank of containers, the use of selector valves shall be used to direct the flow of INERGEN agent to the selected protected zones. Quantity of INERGEN iFLOW containers shall be based upon the largest zone of protection. Selector valves shall be provided to deliver the proper design concentration for each specific protected zone.
- C. Drawings: The contract drawings indicate the general arrangements of the areas to receive detection and INERGEN iFLOW system protection. Contractor is to review all drawings so that all items affecting the operation of the fire detection/INERGEN iFLOW fire suppression system (such as equipment location, air diffusers, damper closures, and door openings) are considered in the design of the engineered system.

1.2 APPLICABLE PUBLICATIONS

- A. The following publications listed below, but referred to thereafter by basic designation only, form a part of this specification. This list is not meant to be all inclusive.
 - 1. National Fire Protection Association (NFPA) Standards:
 - No. 2001 Clean Agent Fire Extinguishing Systems
 - No. 70 National Electrical Code
 - No. 72 National Fire Alarm Code
 - No. 75 Protection of Information Technology Equipment
 - No. 76 Fire Protection for Telecommunication Systems
 - No. 909 Code for the Protection of Cultural Resource Properties -
Museums, Libraries, and Places of Worship
 - No. 914 Code for Fire Protection of Historic Structures
 - 2. Factory Mutual Systems (FM) 5600 Publication:
 - Factory Mutual Approval Guide
 - Factory Mutual Data Sheets

3. Underwriters Laboratories, Inc. (UL) Publication
 - UL 217: Smoke Detectors, Single and Multiple Stations
 - UL 228: Door Closers–Holders for Fire Protective Signaling Systems
 - UL 268: Standard for Smoke Detectors for Open Areas
 - UL 268A: Standard for Smoke Detectors for Duct Application
 - UL 521: Heat Detectors for Fire Protective Signaling Systems
 - UL 864 9th ed: Control Units and Accessories for Fire Alarm Systems
 - UL 1638: Visual Signaling Appliances
 - UL 1971: Signaling Devices for Hearing Impaired Fire Protection Equipment Directory with quarterly supplements
 - UL 2127 Inert Gas Clean Agent Extinguishing System
4. National Electrical Manufacturers Association (NEMA) Publication. Enclosures for Industrial Controls and Systems
5. U.S. Environmental Protection Agency, Protection of Stratospheric Ozone 59 FR 13044, March 18, 1994 (Final SNAP Ruling)
6. Requirements of the Authority Having Jurisdiction (AHJ)
7. Manufacturer’s Design, Installation, Operation and Maintenance Manual
8. The complete system shall have the following applicable listings and approvals
 - a) Underwriters Laboratories Inc.
 - b) Factory Mutual Global

1.3 REQUIREMENTS

- A. This installation shall be made in strict accordance with the drawings, specifications, and applicable NFPA Standards. All equipment and devices used shall be listed by the applicable agencies (UL, ULC, and FM).
- B. Design and installation of the fire detection / INERGEN iFLOW fire suppression system will be in strict accordance with the following guidelines and regulatory agencies:
 1. NFPA 2001 Clean Agent Fire 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

1.4 GENERAL

- A. Furnish all engineering design and materials for a complete fire detection / INERGEN iFLOW fire suppression system including charged INERGEN iFLOW storage containers, nozzles, control unit, detectors, wiring, raceways, annunciators, alarms and all other equipment necessary for a complete operational system.
- B. Major system components shall be produced by Johnson Controls (no alternatives) and shall be installed by an authorized distributor certified for the design, installation and service of INERGEN iFLOW fire suppression systems.
- C. New and unused materials and equipment must be used for the system, the exception being listed and approved factory reconditioned container assemblies.

- D. Distributor 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 liability insurance.

1.5 SUBMITTAL

- A. The following shall be submitted for approval 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 release switches
 - c) Control unit
 - d) Release devices
 - e) Alarm devices
 - f) Agent storage containers
 - g) Mounting brackets
 - h) Discharge nozzles
 - i) Abort switches
 - j) Piping isometrics
 - k) 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 use and all spare parts that should be readily available.
- D. In accordance with NFPA 2001, drawings shall indicate locations, installation details, and operation details of all equipment associated with the INERGEN iFLOW system. Floor plans shall be provided showing equipment locations, piping, point-to-point wiring, and other details as required. Floor plans shall be drawn to a scale of not less than 1/100 (1/8 in. = 1 ft 0 in.).
- E. Elevations, cross sections, and other details shall be drawn to a larger scale as required. Isometric piping layouts shall be provided with the shop drawings. In addition, point-to-point electrical layout drawings shall be provided.
- F. Show a complete riser diagram with specific detail on connections to all monitor and control functions.
- G. Testing plan that includes means, methods and schedules for interface testing with systems that will be interfaced to via monitor or control modules.
- H. Sequence of operation and electrical connection diagrams shall be provided to completely describe the operation of the INERGEN iFLOW system controls, in accordance with NFPA 72.
- I. System Flow Calculations per Section 4.2 shall be provided.

PART 2 – PRODUCTS

2.1 SYSTEM DESCRIPTION AND OPERATION

- A. The equipment manufacturer shall be Johnson Controls sold under brands including ANSUL, INERGEN and AUTOPULSE.
- B. The system shall be an INERGEN iFLOW total flooding, gaseous, clean agent, fire suppression system designed to provide a uniform concentration of INERGEN agent for the protected area. Agent shall be IG-541.

The amount of INERGEN agent to be provided shall be at least the amount required to obtain a uniform (minimum) concentration as required by the ANSUL INERGEN iFLOW Design, Installation, Operation, and Maintenance Manual for a minimum period of 10 minutes or for a time period to allow for response by trained personnel. Take into consideration such factors as non-closable openings (if any), “rundown” time of fans, time required for dampers to close (and requirements for any additional dampers), and any other feature of the facility that could affect concentration. The design concentration shall meet the requirements of the ANSUL INERGEN iFLOW Design, Installation, Operation, and Maintenance Manual.

- C. The INERGEN iFLOW system shall be automatically actuated by either counting zone detection circuits or cross-zoned detection circuits. Smoke detectors shall be photoelectric with compatibility listings for use with the control unit. Smoke detectors shall be installed at no more and 250 ft² (23.2 m²) of coverage per detector. The system shall require two detectors on separate zones in alarm prior to automatic agent release.

2.2 SEQUENCE OF OPERATION

- A. Activation of any single detector in any detection zone shall:
 - 1. Cause a first-stage alarm.
 - 2. Energize a lamp on the activated detector and control unit (and graphic annunciator, if included).

Note: The shutdown of electrical equipment will be optional based on requirements of the local AHJ or applicable standards.
- B. Activation of a second smoke detector shall:
 - 1. Transmit an alarm signal to remote monitoring or building alarm panel.
 - 2. Cause a second-stage (pre-discharge) alarm to operate.
 - 3. Operate auxiliary contacts for air conditioning shutdowns and automatic dampers.
 - 4. Initiate a programmable pre-discharge time delay (INERGEN agent release).
- C. Upon completion of the time delay, the INERGEN iFLOW 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. Activate visual alarms (strobe) at protected area entrance.
4. Energize control solenoid for INERGEN iFLOW container, releasing gaseous agent into the protected area.

2.3 AUXILIARY COMPONENTS

- A. Double action manual releasing stations shall be provided at each exit of the protected area, and shall, when activated, release the INERGEN 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. Abort station shall be provided at each exit of the protected area, and shall, when operated, interrupt the pre-discharge time delay of the INERGEN agent and emergency power-off functions. The abort stations shall be momentary devices (dead-man) requiring constant pressure to maintain contact closure.

Note: Manual Releasing Station activation shall override any abort station. Abort station operation shall be per FM guidelines.

PART 3 – MATERIAL AND EQUIPMENT

3.1 GENERAL REQUIREMENTS

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

3.2 GENERAL MATERIALS – ELECTRICAL

- A. All electrical enclosures, raceways, and conduits shall be installed 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 in place.
- 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. Colored wire, in-line with national standard, 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.

3.3 CONTROL SYSTEM – GENERAL

- A. All control systems shall be UL Listed and FM Approved, and shall 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 release circuit (if applicable)
 6. Supervised primary power circuit
 7. Alarm overrides trouble logic
 8. Battery standby
 9. Front panel indicating lamps (LED's)
 10. Key lock steel enclosure
 11. Programmable time delay
 12. Programmable detection logic
 13. Prioritized trouble logic
 14. Microprocessor based logic
 15. History buffer

3.4 CONTROL UNIT

- A. The control unit shall communicate and control the following types of equipment used to make up the system: smoke detectors, manual abort switches, alarm notification appliances, releasing components, and other system controlled devices.
- B. System Capacity: The control unit shall include 2 Style Y/Z (Class A/B) notification circuits, 2 releasing circuits, Form – C alarm and trouble contact, 2 Style B/D (Class A/B) initiating circuits, 1 Style B/D (Class A/B) manual release circuit, and 1 Style B/D (Class A/B) abort circuit.
- C. System Display: The system display shall indicate the status of the following system parameters:
1. AC Power: Green LED
 2. System Alarm: Red LED
 3. Release: Red LED
 4. Supervisory: Yellow LED
 5. System Trouble: Yellow LED
 6. Circuit Trouble: Yellow LED
 7. Alarm Silenced: Yellow LED
 8. Power Trouble: Yellow LED

D. System Control Switch Operation

1. Tone Silence Switch: Activation of the control unit tone silence switch, in response to alarms, troubles, and supervisory conditions, shall silence the local panel piezo electric signal and change the system alarm or trouble LED from flashing mode to steady ON mode. Occurrence of any new alarm or trouble conditions in the system shall cause the control unit to re-sound the local piezo sounder and repeat the alarm or trouble sequences.
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.
3. System Reset Switch: Activation of the system reset switch shall cause all electronically- latched initiating circuits, appliances as well as all associated output circuits, to return to their normal condition. Holding system reset down shall perform a LAMP TEST function and will activate the piezo sounder.
4. Alarm Activate Switch: Operation of the alarm activate switch shall activate both notification circuits and the alarm relay. Alarm activation shall be a latching function.

E. System Operation

1. Zone Status LED's: The alarm, supervisory, or trouble LED(s) shall flash until event(s) has been acknowledged. Any subsequent new alarm, supervisory or trouble condition, will re-sound 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.
3. Zone Disable: Disable / enable of any initiating circuit shall be accomplished using a special sequence of operation of the four control switches. If a zone has been disabled, an alarm shall activate the red zone LED but not the piezo or any output circuit.
4. Last Event Recall: Last event recall shall allow the user to display the previous panel status. Last event recall may be used to diagnose intermittent trouble conditions.

F. Optional modules shall include:

1. Optional module for additional relays
2. Optional transmitter module (shall comply with 1993 NFPA 72)
3. Optional LED interface module and supervised remote annunciator (two modules)

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

1. Output circuits shall be protected against false activations by using a two-step electronic activation circuit.
2. Battery / earth fault supervision shall be provided.
3. Adjustable delay timer shall be available, 0 to 60 seconds.

4. Cross-zone option shall be selectable (two zones in alarm before release).
 5. Two abort functions options shall be selectable: (1) Standard UL method; (2) local AHJ method.
 6. A second release circuit may be selected in place of a third notification circuit.
 7. A supervised manual release circuit shall be provided which, when activated, shall override the Abort.
 8. 7 AH to 18 AH battery options shall be available providing up to 90 hours standby.
 9. A watchdog timer to supervise microprocessor shall be provided.
- H. Power Supply
1. The power supply shall be integral to the control unit and provide all control unit and peripheral devices 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 26 AH.
 3. The power supply shall also provide a minimum of 1.0 amperes of regulated 24 VDC power for release circuits and alarm notification devices, four-wire smoke detector power of 24 VDC up to 500 mA, non-resettable power of 24 VDC up to 500 mA.
 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
1. The control unit shall be housed in a cabinet designed for mounting directly to a wall or vertical surface. An optional trim ring shall be used for flush mounting of the cabinet. Space shall be provided in the cabinet for up to 18 AH batteries.
- J. Batteries
1. Batteries shall be 12 volt, Sealed Lead-Cell type providing 24 VDC (two required).
 2. Batteries shall have sufficient capacity to power the fire alarm system for not less than 24 hours in standby, plus 5 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.

3.5 SMOKE DETECTORS

- A. Smoke detectors shall be 24 VDC, and shall be UL Listed and/or 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 provided to lock the head to the base.
- E. A special vandal-resistant locking method 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 types.
- 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 30 VDC for remote LED alarm annunciation or the detector.
- H. Photoelectric-type smoke detector shall be the light reflective type and compatible with the 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 photoelectric detector compensating circuits shall provide stable operation with regard to minor changes in temperature, humidity, and atmospheric conditions.

3.6 INDICATING APPLIANCES

A. Sounder / Strobe Combination

- 1. The sounder / strobe combination shall operate on 24 VDC, and shall be approved for use with the control system.
- 2. The sounder / strobe combination shall be polarized and powered from the control unit.
- 3. The device shall be UL Listed and FM Approved.
- 4. The strobe shall be listed to UL Standard 1971 for the Hearing Impaired and approved for Fire Protective Service.
- 5. The sounder shall have 8 tone options selected by means of programming clips.

B. Strobe

- 1. The strobe shall operate at 24 VDC and shall be approved for use with the listed and control system.
- 2. The strobe shall be polarized and powered from the control unit.
- 3. The strobe shall be UL Listed and FM Approved.
- 4. The strobe shall be listed to UL Standard 1971 for the Hearing Impaired, approved for Fire Protection Service, and rated as a multi selectable candela device.

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 and FM Approved.
- 4. The sounder shall have 8 tone options selected by means of programming clips.

3.7 MANUAL RELEASE STATIONS

- A. The manual release stations shall be provided for the release (electrical) of the fire suppression system in case of an emergency.
- B. The device shall be UL Listed.
- C. Manual stations shall be metal with clearly visible operation instructions provided on the cover. The word, AGENT shall appear on the front and both sides of the stations.
- D. Operations shall require two actions (Push/Pull).

3.8 ABORT SWITCH

- A. The abort switch shall be used when an investigative delay is desired between detection and actuation of the fire suppression system.
- B. The switch shall be a momentary contact “dead-man” type switch requiring constant pressure to transfer one set of contacts. Clear operating instructions shall be provided at the abort switch.
- C. The 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.

3.9 MAINTENANCE LOCK-OUT SWITCH

- A. The maintenance lock-out switch shall be used when it is desired to disable the fire suppression system during routine maintenance.
- B. This switch shall be key operated allowing removal of the key in the “Normal” position only. 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.
- C. The switch shall include 1 set of normally open and 1 set of normally closed contacts rated at 28 VDC @ 1.1 amp make/break or 6 amp continuous carry.
- D. The terminal connections shall be of the screw type.

3.10 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

4.1 INERGEN iFLOW FIRE SUPPRESSION SYSTEM

- A. The INERGEN iFLOW fire suppression system shall be of the engineered, permanently piped, fixed nozzle type with all pertinent ANSUL components provided by Johnson Controls.
- B. All agent storage containers shall be centrally located as free-standing containers with wall and/or floor mounted retaining brackets.
- C. One container shall be designated as the pilot container.
- D. Manifolded containers shall employ a flexible discharge hose and horizontal check valve to facilitate installation and system maintenance.

4.2 FLOW CALCULATIONS

- A. Computerized verification of flow calculations shall be submitted for each INERGEN iFLOW fire suppression system and include the following data as a minimum:
 - 1. Quantity of agent per nozzle
 - 2. Type of nozzle
 - 3. Average pressure at nozzle
 - 4. Nozzle body nominal pipe size
 - 5. Number and size of containers
 - 6. Total agent
 - 7. Pipe size per pipe section
 - 8. Pipe schedule per pipe section
 - 9. Number, size, and type of fitting per pipe section
 - 10. Actual length per pipe section
 - 11. Equivalent length per pipe section
 - 12. Discharge time

PART 5 – EQUIPMENT AND MATERIAL – MECHANICAL

5.1 PIPE AND FITTINGS MATERIAL – INERGEN iFLOW SYSTEM

- A. System piping shall be of non-combustible material 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. As a minimum, fittings beyond the pressure reducing (iFLOW) valve shall be class 300 M.I. fittings conforming to ANSI B-16.3. Ordinary cast iron fittings shall not be used. Distribution piping downstream of the pressure regulating container valve shall be a minimum of Schedule 40.
- G. All piping and fittings shall comply with NFPA 2001.
- H. Piping shall be installed in accordance with good commercial practice to the appropriate codes, securely supported with UL Listed hangars, and arranged with attention to the design layout since deviations may alter the design flow performance as calculated.
- I. Piping shall be bracketed within 12 in. (305 mm) of all discharge nozzles.
- J. All piping shall be reamed, blown clear, and swabbed with appropriate solvent to remove mill varnish, debris, oils, and any other contaminants before assembly.
- K. Multi-outlet fittings, other than tees, shall not be permitted.
- L. Assembly of all joints shall conform to the appropriate standards.
- M. Threaded pipe joints shall utilize Teflon tape or pipe sealant applied to the male threads only.

5.2 EXTINGUISHING AGENT

- A. The agent shall be INERGEN (IG-541).
- B. The agent shall be a mixture of three inerting (oxygen diluting) gases: 52% nitrogen, 40% argon, and 8% carbon dioxide.

5.3 INERGEN iFLOW STORAGE CONTAINERS

- A. Container assemblies shall be of steel construction certified to UN ISO standards and acceptable to the Department of Transportation (DOT) with a standard RED enamel paint finish. Each container shall be equipped with a nominal 870 psi (60 bar) pressure regulating valve and a gauge. The system shall utilize iFLOW valve assemblies. Each valve shall be constructed of forged brass and shall attach to the container providing a leak-tight seal. The valve design must fail safe (closed) to prevent pressure from exceeding a nominal 870 psi (60 bar) in the event of a blocked pipe.
 - 1. Each valve shall also include a safety pressure relief device, which provides relief at 5802 psi to 6237 psi (400 bar to 430 bar) per CGA test methods.
- B. First filling of the container assembly shall be by a Johnson Controls recognized first fill facility.

5.4 CONTAINER MATRIX BRACKETING SYSTEM

- A. The container matrix bracketing system, when utilizing 788 ft³ (80 L) containers, shall have container brackets constructed of polymeric material utilizing threaded bolts.
- B. A horizontal check valve allowing for various installation layouts shall be in place.
- C. The matrix bracketing system shall allow the interconnection of up to six containers without the use of a manifold.

Note: Only when a 120 second discharge is utilized.

- D. Container brackets shall be UL Listed and FM Approved for use with the INERGEN iFLOW fire suppression system.

5.5 VALVE ACTUATORS

- A. No electro-explosive devices may be used to actuate the valve assembly.
- B. Electric actuators shall be a continuous duty type for 24 VDC operations.
- C. Actuation devices shall be UL Listed and FM Approved for use with the INERGEN iFLOW fire suppression system.

5.6 DISCHARGE HOSE / HORIZONTAL CHECK VALVE

- A. When manifolding, all container assemblies shall include the matrix system, flexible discharge hose, and horizontal check valve for connection to the manifold inlet.
- B. All hose / check valves shall be UL Listed and/or FM Approved for use with the iFLOW valve as manufactured by Johnson Controls.

5.7 DISCHARGE NOZZLES

A. Standard Discharge Nozzle

1. Discharge nozzles shall be of two-piece construction and sized to provide flow rates in accordance with system design flow calculations.
2. A nozzle inlet orifice plate shall be included. The orifice size shall be determined by a computerized UL listed flow calculation program.
3. Orifice(s) shall be machined in the nozzle body to provide a horizontal discharge pattern based upon the approved coverage arrangements.
4. 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.
5. Nozzles shall be UL listed as manufactured by Johnson Controls.

B. Acoustic Damping Discharge Nozzle

1. Acoustic damping discharge nozzles shall be used in installations requiring reduced acoustic footprint, such as data centers. The reduced acoustic footprint limits sensitive electronics from being exposed to high sound levels.
2. For acoustic sensitive installations, an acoustic impact evaluation should be performed specific to the hazard area being protected. The report shall include the sound power generated by the suppression system, room parameters and estimated sound pressure level impact on sensitive electronic equipment such as Hard Disc Drives.
3. The sound pressure level impact on Hard Disc Drives shall be below 110dbZ across the 1/3 octave sound bands from 500Hz to 10K Hz.
4. Discharge nozzles shall be constructed to provide flow rates in accordance with system design flow calculations.
5. The nozzles shall be threaded to the discharge piping via an orifice pipe assembly that includes the nozzle inlet orifice plate.
6. The nozzle orifice plate drill size shall be determined by a computerized UL listed flow calculation program.
7. Agent discharge orifice(s) shall be machined in the nozzle body to provide a horizontal discharge pattern based upon the approved coverage arrangements.
8. Sound control mechanisms shall be deployed as an integral element of the Acoustic Nozzles.
9. Nozzles shall be UL listed and the acoustic performance shall be UL verified as manufactured by Johnson Controls.

5.8 SELECTOR VALVES

- A. Selector valves shall be a full port straight ball valve type.
- B. Selector valves shall be UL Listed and FM Approved, as manufactured by Johnson Controls.

5.9 SYSTEM CHECKOUT AND TESTING

- 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. A system discharge concentration test may also be performed if the required.
- B. Inspection shall be performed in the presence of the owner's representative, architect, or engineer's representative, insuring authority and/or the local AHJ.
- C. All mechanical and electrical components shall be tested according to the manufacturer's recommended procedure to verify system integrity.
- D. Inspection shall include a complete checkout of the detection / control system and certification of container pressure. A written report shall be filed with the owner.
- E. As-built drawings shall be provided by the contractor (two copies) indicating the installation details. All routing of piping, electrical conduit, and accessories shall be noted.
- F. Equipment installation and maintenance manuals shall be provided in addition to the as-built drawings.
- G. Prior to final acceptance, the contractor shall provide operational training in all aspects of the system to the owner's key personnel. Training shall consist of:
 - 1. Control system operations
 - 2. Trouble procedures
 - 3. Abort switches procedures
 - 4. Emergency procedures
 - 5. Safety requirements
 - 6. Demonstration of the system (excluding INERGEN agent release)
- H. The quantity of agent shall reflect the actual design quantity of INERGEN agent.
- I. If a discharge concentration test is required, a prior functional test shall be completed consisting of detection, alarm, release, accessories related to the system, control unit, and a review of the containers, piping, fittings, hangers, and container pressure.
- J. Discharge concentration testing shall be performed under the supervision of the contractor's authorized personnel in the presence of the owner's representative, local authorities, and any other authority.
- K. The contractor shall provide a gas analyzer capable of automatically recording sampling points. Concentration recording shall continue until authorities are satisfied with hazard integrity or until 10 minutes have elapsed.
- L. The sampling point(s) shall be located at a strategic area(s) but no higher than the highest combustible contents.
- M. If the test results indicate that the design concentration was not achieved and/or held, the contractor shall determine the cause of the failure. After determination of the cause, the system shall be recharged and again placed in operation. The contractor shall only be responsible for retest based on equipment design failure.

PART 6 – WARRANTY

6.1 WARRANTY

- A. Environmental: The manufacturer (Johnson Controls) shall offer a 20-year warranty covering regulations banning or restricting use of the INERGEN agent due to environmental issues.
- B. Evergreen Discharge: Replacement cost for the INERGEN agent shall be covered in a 20-year discharge warranty, except for the system commissioning discharge test, regardless of the cause of the fire suppression system discharge.
- C. Components / System: Limited one-year warranty shall be offered for defects in workmanship and material.

Note: The converted metric values in this document are provided for dimensional reference only and do not reflect an actual measurement.

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