1. GENERAL

1.1 INTENT OF SPECIFICATIONS

A. This specification details the requirements for an engineered clean agent / waterless fire suppression system Model Kidde ADS Fluoro-K Fire Suppression Agent. The detection & control subsystem shall consist of the ARIES-MLX Multi-Loop Intelligent Suppression Fire Alarm Control Unit (FACU) utilizing SmartOne protocol Detectors for initiation of fire signals. 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

C. All agent, materials and equipment shall be new and unused. Recycled or reclaimed products shall not be acceptable

1.2 System Description

A. The clean agent suppression system shall be a total flooding type Kidde Advanced Delivery System (ADS) using Fluoro-K Fire Suppression Agent.

B. The system hardware shall consist of Fluoro-K Agent in Cylinder(s) super-pressurized with Nitrogen to 360 psig at 70F (25 bar at 21C), driven by Nitrogen in separate cylinders pressurized to 1800 psig at 70°F (124 bar at 21°C) and discharged into the affected area using discharge nozzle(s) attached to a pipe network.

C. The suppression system shall comply with the NFPA 2001 (latest edition), UL 2166 and FM5600 requirements to supervise the placement of electrical solenoid heads on cylinder valves and selector/directional valves. Removal of the electrical actuator shall generate a supervisory condition with appropriate audio and visual indication on the fire alarm-suppression control unit. Systems that do neither supervise for placement of solenoids nor feature tamper proof hardware that prevent the removal of the system solenoids are not UL listed and FM approved and are not acceptable.

D. The ARIES-MLX Multi-Loop addressable, fire alarm-suppression control unit shall perform fire alarm, supervisory, and trouble event initiation; occupant notification; event annunciation; local control functions; fire extinguishing system release, and off premises transmission.

E. The ARIES-MLX' distributed intelligence shall extend to the SmartOne™ automatic initiating devices on its signaling line circuit (SLC). Each automatic initiating device shall have a microprocessor capable of independently determining whether or not a fire signature at its monitored location is of sufficient magnitude to warrant the issuance of an alarm signal to the FACU.

F. FACUs intended for suppression release function shall feature release circuits protected against inadvertent activation by a Triple Failure Redundancy (Triple-R™) safeguard system that shall require the microprocessor to issue two commands of opposite polarity via two separate signaling channels, combined with a signal from the FACU's watchdog timer confirming proper microprocessor operation, prior to activation. FACUs featuring release circuits that are not similarly protected or those that use simple notification appliance circuits to control agent release shall not be accepted as equal.

G. Suppression System FACUs shall be monitored remotely in real-time with event notification pushed to web and phone apps for use by plant personnel and service provider.

H. [OPTIONAL] Kidde ModuLaser Sampling Smoke Detection System(s) shall be installed in areas designated on construction drawings and shall provide very early "active" detection of smoke and products of combustion present in both still and high airflow environments.

1.3 CODES AND COMPLIANCE

A. The design, installation, testing and maintenance of the integrated fire suppression system shall be in accordance with the following applicable codes, standards and regulatory bodies:

1. NFPA 2001: Clean Agent Fire Extinguishing Systems
2. NFPA 70: National Electrical Code (NEC)
3. NFPA 72: National Fire Alarm and Signaling Code
4. NFPA 75: Protection of Electronic Computer/Data Process Equipment
5. NFPA 76: Fire Protection for Telecommunications Systems
6. NFPA 92A: Recommended Practice for Smoke Control Systems
7. UL 864-10: Control Units and Accessories for Fire Alarm Systems
8. UL 2166: Halocarbon Clean Agent Extinguishing System Units
9. UL 268-8: Standard for Smoke Detectors for Open Areas
10. UL 268A: Standard for Smoke Detectors for Duct Application

11. ANSI B1.20.1: Standard for Pipe Threads, General Purpose
12. Factory Mutual
13. Requirements of the Local Authority Having Jurisdiction
14. Manufacturer's Design, Installation, Operation & Maintenance Manual

B. The complete fire-alarm suppression system shall have the applicable following listings and approvals:
   1. Underwriters Laboratories, Inc. (UL)
   2. Factory Mutual Global (FM)

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's name and part number shall appear on all major components.
   4. All equipment shall be provided by the same manufacturer / supplier.

B. Contractor
   1. The system shall be supplied and installed by a factory authorized, Kidde Fire Systems distributor. The Contractor shall be trained by the manufacturer to calculate/design, install, test and maintain the system and shall be able to produce a certificate stating such on request.
   2. The Contractor shall employ a person who can show proficiency at least equal to a NICET level III or IV certification in special hazards design.
   3. The Contractor shall confirm in writing that they stock a full complement of spare parts and offer 24-hour emergency service for all equipment being furnished.

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 architect will review all submittals for conformance to the drawings and specifications. The contractor shall be required to resubmit any materials, with appropriate modifications, that are found to be in non-conformance with the requirements of the drawings and these specifications after review by the architect. Approval of the submittals by the architect shall not relieve the Contractor of their responsibility to meet the requirements of the drawings and specifications.
B. The contractor shall submit the manufacturers' product technical data and catalog cut sheets for each component or device used in the system
C. Engineered Design Drawings: The Contractor's NICET-III or IV certified designer shall design the system and provide documents that shall include but are not limited to the following details:
   1. Plan, elevation and isometric drawings showing the location, installation and mounting details of the agent cylinders, valves, nozzles and other accessories.
   2. Design calculations for enclosure volume, agent quantity based on required design concentration for each hazard area.
   3. Dimensions, weights and loads of equipment assemblies, components, method of field assembly, clearance requirements, mounting and bracing practices, etc
   4. Flow Calculation Reports showing the following:
      i. Customer information and project data
      ii. Hazard information shall include the minimum design concentration and adjusted design concentration, minimum and maximum enclosure ambient temperature, minimum agent required, volume of enclosures and any corresponding non-permeable volume.
      iii. Cylinder information shall include total agent required, cylinder capacity, cylinder part number, cylinder quantities (both main and reserve), agent fill amount per cylinder and floor loading per cylinder.

iv. Pipe network information shall include pipe type, pipe diameter, pipe length, change in elevation, pipe equivalent length and the equivalent length of any added accessory.
v. Nozzle information shall include the number of nozzles, flow rate per nozzle, nozzle nominal pipe size, nozzle type and nozzle orifice area.
vi. Pipe fittings information shall include a detailed list by nominal diameter and quantity.
vii. Pressure venting area required, calculated on the basis of enclosure strength as per NFPA-2001 requirements.
viii. OPTIONAL: Due to multiple hazards being protected by a common bank of cylinders, calculations showing the above details shall be completed for every hazard connected to that common bank. The individual hazard piping shall be separated by directional valves and shall be modeled with the valve 'open' for the given hazard but 'closed' for the others. The equivalent length of the directional valve must be included in the calculations.

5. Any other requirements of NFPA-2001 latest edition.
6. Plan and riser drawings showing the location of the FACU and the locations and necessary installation and mounting details of all field devices such as smoke detectors, manual-release stations and notification appliances.
7. A primary-power calculation that details the power requirements for the FACU and all field devices such as smoke detectors, notification appliances and releasing solenoids. Include the required capacity of the main AC power-line feed from the commercial power and light company.
8. A secondary power calculation that shows the quiescent and alarm power requirements for the FACU and all field devices. Include the periods of time for which the quiescent and alarm power requirements shall be supported in order to determine the necessary standby battery capacity.
9. [OPTIONAL] Plan, riser and isometric drawings showing the location and necessary installation and mounting details of the ASD.
10. [OPTIONAL] The air sampling pipe network PipeCAD report complete with calculated transport time and sample hole diameters
11. [OPTIONAL] A power calculation that shows the quiescent and alarm power requirements for the ASD in order to determine the necessary standby battery capacity.
12. Conduit routings shall be shown, with number of conductors, type of wire, and wire sizes indicated for each conduit segment.
13. Point-to-point wiring diagram showing the termination points for all field-wiring circuits to the internal PCB. All internal wiring and communications cabling shall be shown.
14. Any other requirements of the latest edition of the relevant NFPA codes.
15. A complete component and equipment list with model numbers and Kidde part numbers.
16. Product information sheets for each item of equipment.
17. A document describing the sequence of operation and system functionality.
18. A detailed matrix of all the initiating points, control modules, and field circuits that identifies the labeling of all components and shows the relationships and activation sequences among the various initiating points and the control modules and / or field circuits

D. Commissioning Equipment List: The Contractor shall provide a commissioning equipment list for each installed system. The equipment list shall identify all installed equipment and configurations.

E. Test Plan: The Contractor shall submit a test plan that describes how the system equipment and room integrity shall be tested. This shall include a step-by-step description of all tests and shall indicate type and location of test apparatus to be used. At a minimum, the tests to be conducted shall be per NFPA 2001 and NFPA72 and any additional supplemental tests required by the AHJ. Tests shall not be scheduled nor conducted until the engineer of record or end users representative approves the test plan.

F. The Contractor shall submit the following Installation drawings
1. Four (4) sets of installation drawings for each installed clean agent fire extinguishing system and one (1) set of calculation reports, owner's manuals and product data sheets shall be submitted to the end-user/owner.
2. A description of system functionality and a detailed matrix of all the initiating points, control modules, and field circuits that identifies the labeling of all components and shows the relationships and activation sequences among the various initiating points and the control modules and/or field circuits.

3. Upon completion of installation and commissioning acceptance, two (2) sets of "As-Built" installation drawings and One (1) set of the calculation report for each installed system shall be submitted to the owner/end-user.

G. The Contractor shall submit the following Manuals after complete installation
1. Two (2) copies of the ADS Fluoro-K Design, Installation, Operation and Maintenance Manual.
2. Two (2) copies of the FACU Installation, Operation and Maintenance Manual
3. [OPTIONAL] Two (2) copies of the ASD Installation, Operation and Maintenance Manual

2. PRODUCT 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 Class A / B / C (select option) fires.
B. The agent design concentration achieved shall be as per NFPA 2001 latest edition.
C. In no case shall the design concentrations exceed the Lowest Observed Adverse Effects Level (LOAEL) for the agent as published in NFPA 2001

2.3 System Performance

A. System Discharge
1. The discharge time required to achieve 95% of the minimum design concentration for flame extinguishment shall not exceed 10 seconds.

B. Duration of Protection
1. 85% of the minimum design concentration shall be maintained for 10-minutes or a sufficiently longer period of time to allow effective emergency action by trained personnel.

C. Nozzle performance
1. Both 180-degree and 360-degree nozzles shall be listed to be mounted at heights up to 18.5 feet (5.64 m) from the floor.
2. Both 180-degree and 360-degree nozzles shall be listed to cover an area of 42.5 ft x 42.5 ft (12.95 m x 12.95 m).

2.4 Cylinder Locations:

A. The agent and nitrogen driver cylinders shall be suitable for being located up to 180 ft of equivalent length from the top of the riser to the first tee in the protected area.
B. The system shall deliver 95% of its contents within 10 seconds of the start of the discharge.
C. The flow calculation report submitted shall verify this performance requirement.
D. The inability to meet the design requirements and selected cylinder locations by any system will be considered as not meeting the intent of the specification.

2.5 Cylinder Assemblies

A. The Fluoro-K agent shall be stored in cylinders manufactured and marked in accordance with US Department of Transportation (DOT) specification 4BW-500 and Transport Canada (TC) specification 4BW-M34. The agent cylinders shall be conditioned to 360 psig @ 70°F (24.8 bar gauge @ 21°C).
B. The external nitrogen propellant shall be stored in seamless cylinders manufactured and marked in accordance with US DOT specification 3AA-2015 and TC specification 3AAM-154. The external nitrogen cylinders shall be conditioned to 1800 psig @ 70°F (124.12 bar gauge @ 21°C).
C. The system manufacturer shall provide US DOT documentation proving that the registration number marked on the agent and nitrogen cylinders corresponds to a USA based manufacturing location.
D. The Fluoro-K agent cylinders shall comply with the following:
1. The cylinders shall be equipped with a permanent integral liquid level indicator (LLI) to enable the owner's representative to measure the weight of agent in each individual cylinder without having to physically move or lift the cylinders. Systems without integral LLIs shall not be considered as equal.
2. The cylinders shall have a pressure gauge to indicate the actual container pressure
E. All cylinders shall have a low-pressure switch to electrically signal a supervisory condition if the cylinder pressure drops to 305 psi for the agent cylinders and 1623 psi for the nitrogen drivers.

2.6 Fire Suppression Agent
- A. The Fire Suppression Agent used shall be Kidde Fluoro-K™
- B. The Fluoro-K agent shall have a Class A Minimum Design Concentration of 4.5%, Class B Minimum Design Concentration of 5.85% and Class C Minimum Design Concentration of 4.52%
- C. The Fire Suppression OEM shall provide documentary evidence including actual test results proving the purity of the agent as per NFPA 2001 latest edition. Agents without such evidence shall not be accepted
- D. The Fire Suppression OEM shall provide documents evidencing the combined listing by UL of the Agent, Cylinder-Valve Assembly and associated delivery system hardware. Products without such evidence shall not be accepted
- E. The cylinders shall be filled with the Fluoro-K agent at a UL-listed and FM approved First Fill facility
- F. The cylinders shall be refilled exclusively with Fluoro-K in case of discharge and no alternate agent shall be used.
- G. In order to ensure that the replacement agent used in case of a discharge matches the agent originally filled, the vendor shall guarantee in writing the commitment to use the same agent for refill.
- H. At the time of refilling, the vendor shall provide documents evidencing the use of the same agent originally filled for the initial installation.

2.7 Pipe and Fittings
- A. Distribution piping, and fittings, shall be installed in accordance with NFPA 2001, approved piping standards and the engineered fire suppression system manufacturer's requirements.

2.8 ACTUATION HARDWARE
- A. The agent cylinders and secondary Nitrogen drivers shall be pressure actuated by the primary Nitrogen driver which shall be electrically actuated.
- B. While in the stand-by condition, actuators attached to the cylinder valve shall not be exposed to the cylinder's internal pressure so as to avoid introducing additional leak paths or accidental discharges.
- C. Solenoid actuators shall not require replacement after each actuation.
- D. Solenoid actuators shall be supervised for its placement. Removal of the electrical actuator shall generate a supervisory condition with appropriate audio and visual indication on the fire alarm control unit. Systems that do neither supervise for placement of solenoids nor feature tamper proof hardware that prevent the removal of the system solenoids are not UL listed and FM approved and are not acceptable.
- E. The suppression release Fire Alarm Suppression Control Unit (FACU) shall be UL Listed and FM Approved compatible with the electric actuators.

2.9 Nozzles
- A. System nozzles shall be made of stainless steel
- B. Nozzles shall be spaced in the protected area to achieve uniform distribution of the agent.
- C. Nozzles shall have 180-degree and 360-degree discharge patterns.
- D. The manufacturers' nozzles shall be designed for efficient agent dispersion.
- E. Nozzles shall be UL Listed and FM Approved for use with the agent and the manufacturer's hardware.

2.10 [OPTIONAL] Multi Hazard System:
- A. All protected areas shall be protected by a common bank of cylinders.
- B. Protected areas shall be separated by directional valves specifically listed for the purpose.
- C. Directional valves shall be electrically actuated
- D. Electrical solenoids on directional valves shall either be supervised for placement or shall be of non-removable tamper proof design.

2.11 Fire Alarm Control Unit (FACU):
- A. The FACU shall consist of a main circuit board (MCB) with an integral display/control assembly, a primary power supply, modular card cage to support expansion and additional functionality and an enclosure with removable door and viewing window.
- B. The MCB shall contain the system microprocessor, real-time clock, the history buffers, watchdog timer and serial and USB ports.
- C. The MCB shall provide terminations for the following:
  1. Two (2) signaling line circuits (SLC)

2. Two (2) Agent Release Circuits/Notification Appliance Circuits (RNACs) usable either for Agent Release or Notification
3. Two (2) Notification Appliance Circuits (NAC)
4. Three (3) programmable relays and one (1) trouble relay with contacts rated 3 Amps at 30 VDC / 120 VAC.
5. Annunciator communications circuit
6. Battery charging circuit
7. AC input power connections
8. Functional / Expansion card cage

D. The Functional / Expansion card cage shall provide space for up to twenty-four (24) modules in any combination per below:
1. Up to 6 SLC modules
2. Multiple Release/Notification modules with 3 circuits each
3. Multiple Relay modules with 4 relays each
4. Maximum 1 City Tie module
5. Maximum 1 Digital Alarm Communicator Transmitter module
6. Maximum 1 Internet Communications Module
7. Maximum 1 Panel to Panel Networking Module

E. The power-supply / charger assembly shall have the following specifications:
1. The PSU shall accept 120 or 240 VAC input voltage, and shall provide from 5.4 to 10.8 Amps at 24 VDC as may be required for system operation and to charge the standby battery.
2. The charger assembly shall be capable of charging batteries of capacities up to 165 AH.
3. Two auxiliary power circuits rated 2.0 A at 24 VDC shall be provided.

F. The user-interface (UI) shall have the following features:
1. The UI shall include a 4 x 40 alphanumeric display and built-in keypad
2. The display shall support English, French Canadian, Spanish and Portuguese languages
3. The UI shall enable programming, menu navigation, test initiation and review of event history
4. The UI shall have 4 programmable switches usable for end-user operations as may be desired.
5. The system shall have memory for 10,000 event logs.

G. All Signaling Line Circuits (SLC) shall have the following features:
1. Each SLC shall be capable of supporting up to 255 automatic detectors and other devices.
2. SLC's shall be suitable for Class A, B or X wiring style
3. SLC's shall be provided on-board disconnect switches to physically isolate field wiring
4. SLC's shall be provided 2 LEDs to indicate communications transmission and reception

H. All Agent Releasing Circuits (ARC) shall have the following features:
1. ARCs shall be independently programmable.
2. ARCs shall be listed compatible with Kidde Control heads, FM sprinkler solenoids (groups A, B, D, E, F, G, I, J and K)
3. Each ARC shall be capable of simultaneously activating two (2) control heads or solenoid valves.
4. ARCs shall be power-limited
5. Each ARC shall feature an NFPA 2001 compliant disconnect switch
6. ARC shall be suitable for both Class A and Class B wiring styles

I. All Notification Appliance Circuits (NACs) shall have the following features:
1. NACs shall be independently programmable.
2. Each NAC shall be capable of delivering a current of up to 1.5 A at 24 VDC to the appliances.
3. Each NAC shall be field configurable to activate appliances for the following:
   i. 60 bpm, 120 bpm, temporal per ANSI S3.41 or continuous
   ii. Silenceable or non-silenceable operation
4. It shall be possible to override one master code with another depending on the state (i.e., pre-alarm, pre-release, release, or time limit cutout) of the particular suppression zone.
5. It shall be possible to shut off and re-activate a NAC as required by the system operating sequence without requiring any supplemental equipment.
6. NACs shall be synchronized without the need for external synchronization modules
7. NACs shall be power limited
8. NACs shall be suitable for both Class A and B wiring styles.

J. All Relays shall have the following features:
1. Relays shall be independently programmable to operate on Alarm, Trouble and Supervisory conditions.

2. The dedicated trouble relay on MCB shall be energized upon startup and change state for any Trouble event, including failure of the Main Controller. All other relays shall be normally de-energized.
3. Relay contacts shall be rated 3 A at 30 VDC or 120 VAC.

K. [OPTIONAL] The Digital Alarm Communicator Transmitter (DACT) module shall have the following features:
1. The DACT shall transmit system status over phone lines to a Central Station
2. The DACT shall feature a modem and 2-Loop Public Switched Telephone Network connections.
3. The DACT shall be provided status LEDs for data transmission (green) and reception (yellow).
4. The DACT shall support SIA DC-05-1999.09 Ademco Contact ID and SIA DC-03-1990.01 (R2003.10) protocols.

L. [OPTIONAL] The Panel Network Interface Card (NIC) shall have the following features:
1. The NIC shall support a 64-node peer-to-peer network with each panel requiring one NIC
2. Each node shall be a fully functional FACU with features described in previous sections
3. The NIC shall allow inputs on one node to drive outputs on others
4. Connectivity between NICs shall be either copper or fiber with single mode fiber required for distances 1 mile and over. Any fiber optic converters used shall be listed for compatibility with the FACU.

M. The FACU shall communicate with its monitoring cloud using a cellular compatible gateway.

N. The FACU enclosure shall have the following features:
1. The enclosure shall be painted red, rated NEMA 1 and constructed from 16 AWG cold rolled steel per ASTM A-366.
2. The enclosure shall be sized to accommodate the control unit electronics and 2 x 12 VDC 17 AH SLA batteries while fitting between standard 16”-spaced wall studs.

2.12 SPOT DETECTORS

A. SmartOne Photoelectric Detector
1. The Detector shall be a light scattering type, low profile, intelligent, microprocessor-based sensor that senses a broad range of smoldering and flaming-type fires. The sensing chamber shall permit a full 360° smoke entry.
2. The Detector shall be electronically addressable and fully field-programmable.
3. The Detector shall be capable of having alert and alarm thresholds set.
4. The Detector shall provide a real-time value of current, local obscuration level in percent per foot readout when requested by an operator at the FACU.
5. The Detector shall feature alarm thresholds that are dynamically adjustable as a result of an alarm event anywhere in the system.
6. The Detector shall store its calibration, address, alert and alarm thresholds, and drift-compensation algorithm in its individual non-volatile memory. Systems that store all detector parameters in the FACU shall not be considered as equivalent.
7. [OPTIONAL] The Detector shall be programmable for alarm verification in periods of up to 180 seconds in 1-second increments.

B. SmartOne Thermal Detector
1. The Detector shall be a thermistor-type, low profile, intelligent, microprocessor-based heat sensor that responds to a fixed temperature with minimal thermal lag. The sensing chamber shall permit full 360° heat entry.
2. The Detector shall be electronically addressable and fully field-programmable.
3. The Detector shall be capable of having alert and alarm thresholds set.
4. The Detector shall provide a real-time value of current, local temperature in °F readout when requested by an operator at the FACU.
5. The Detector shall store its calibration, address, alert and alarm thresholds, and drift-compensation algorithm in its individual non-volatile memory. Systems that store all detector parameters in the FACU shall not be considered as equivalent.

2.13 [OPTIONAL] Air Sampling Detection System

A. The Air Sampling Smoke Detectors installed at locations shown in the bid documents shall have the following features:
1. The ASD system shall consist of a distributed air sampling pipe network connected to the inlet manifold of a central detection unit housing flow sensor(s), aspirator, particle filtration system, laser chamber and termination points for system networking and interface to other systems.

2. The ASD shall operate on laser light scattering mass detection and particle evaluation principles.
3. The ASD pipe network shall be designed using PipeCAD™ such that performance requirements such as transport times and hole-sensitivity can be validated.
4. The ASD shall have a sensitivity measurement range of 0.0046% to 7.62% obscuration per foot with a particle sensitivity range of 0.003 to 10 microns.
5. The ASD shall provide programmability of four smoke density alarm thresholds within the sensitivity measurement range. Setting of time delays for each of the four alarm thresholds shall also be programmable. Relay outputs shall be provided for remote indication of alarm conditions.
6. Resistance to unwanted alarms while still achieving maximum sensitivity is of paramount importance. The ASD shall feature ClassiFire™ Perceptive Artificial Intelligence which shall automatically configure the detector during initial setup and then shall automatically and continuously adjust the sensitivity of the detector to compensate for normal changes in the environment throughout the life of the detector. Mass scattering detectors which allow only fixed sensitivity settings are prone to false alarms and are not acceptable.
7. The ASD shall incorporate a dual technology system for the automatic discrimination of signals from non-fire related sources such as dust. The system shall automatically compensate for changes in environmental conditions and the negative effect of filter contamination.
8. The ASD shall supervise filter contamination, detection chamber operation, microprocessor malfunction, network condition, and airflow in sampling pipes outside normal limits. Configurable relay output shall be provided for remote indication of fault conditions.
9. The ASD shall provide for automatic detector chamber sensitivity adjustments to compensate for the negative effect of filter contamination/ageing. The system shall also be capable of monitoring filter usage, and allow programming of maintenance interval reminders.
10. The ASD shall be provided an airflow sensor in each pipe inlet to supervise for changes in the sampling flow rate. Fault thresholds shall be programmable to accommodate normal fluctuations in the protected area.
11. All system devices shall be capable of communicating with each other via an RS485 network without the need for any additional hardware. The network shall support up to 127 ASDs. Remote displays, programmers, and network relay modules on the network shall not require a network address.
12. The ASD shall be programmed by an integral or remote programmer/ network controller, or by PC. The PC based tool shall be able to configure and manage the entire device network.
13. The configuration tool shall support the following features:
    i. Programming of individual ModuLaser detectors.
    ii. Initiating ClassiFire “Perceptive Artificial Intelligence” viewing window.
    iii. Viewing of the status of ModuLaser detectors.
    iv. Testing of relays assigned to a specific zone to aid commissioning.
    v. Adjustment of any adjustable parameter.
    vi. Event log viewing/printing.
14. Wherever shown, the Kidde ModuLaser Air Sampling detectors shall have the following features;
    i. The ModuLaser shall be optimized for medium to large area applications.
    ii. The ModuLaser shall be designed on modular concept and shall be scalable and expandable from one to 8 zones of detection.
    iii. Each Zone of the ModuLaser shall support one pipe inlet of length up to 820 feet (250 m)
    iv. Each Zone pipe shall support up to 50 sampling holes
    v. The design of the ModuLaser shall support pipe entry from either top or bottom with the exhaust either top or bottom.
15. [OPTIONAL] The following requirements shall apply for ASDs used in duct applications:
    i. The ASD shall sample the HVAC duct supply, return, or both.
    ii. The complete HVAC-related system may be shut down in event of smoke detection.

B. [OPTIONAL] Addressable Panel Interface Card (APIC)
1. The ASD shall connect directly to the SmartOne addressable loop of an ARIES-MLX FACU with an APIC module.
2. Any hardware required for the addressable loop connection shall be integrated within the ASD.
3. The ASD shall communicate the following through the FACU SLC:
    i. Alarm and Pre-Alarm conditions
    ii. Real-time smoke and airflow levels
    iii. Trouble conditions

C. Sampling Pipe Network

1. The ASD shall be connected to an air sampling pipe network through which air is drawn from the protected area to the ASD.
2. The sampling pipe shall be smooth bore CPVC or ABS pipe. Non-metallic pipes shall also be acceptable.
3. All sampling pipe joints shall be airtight to prevent leakage.
4. All sampling pipe shall be clearly marked as “smoke detection sample pipe.”
5. All sampling points and ports shall be clearly marked to identify their purpose.
6. The sampling pipe network shall be designed using PipeCAD design calculation software.
7. The maximum transport time of the entire pipe network shall not exceed local codes, specified end-user limitations, or NFPA 72 requirements of 120 seconds.

D. Power Supplies
1. The system shall be powered from a UL-1481 listed regulated power supply of nominal 24 VDC.
2. The power supply unit shall be suitable for 110 V AC input
3. The power supply shall be provided with battery backup that transfers automatically from AC to battery in the event main AC power is interrupted
4. The battery backup shall be calculated to be based on 24 hours standby duty followed by 10 minutes in an alarm condition.
5. The calculated battery capacity shall be derated 20% for battery selection.

E. [OPTIONAL] Remote Display Units (RDU) shall be provided for remote annunciation at locations marked. RDUs shall have the following features:
1. RDUs shall be suitable for being installed anywhere along the RS485 network and associated with any detector on the network.
2. RDUs shall be provided a 20 segment bar-graph display.
3. RDUs shall be provided four independent high intensity alarm indicators: Auxiliary, Pre-Alarm, Fire 1 and Fire 2, corresponding to the four alarm settings of the detector.
4. RDUs shall be provided a Common fault indicator.
5. RDUs shall be provided an OK indicator.
6. RDUs where specified shall be provided a remote relay board.
7. RDUs shall be suitable for either 19” card frame mounting or shall be housed in single wall mounted enclosure.

2.14 ANNUNCIATION

The following remote annunciators and operator controls shall be provided at locations indicated on the bid documents. The total number of remote annunciators or controls need not exceed 31 units.

A. Remote Display Control Module, Model RDCM
1. The FACU shall be capable of supporting with up to 15 RDCMs.
2. The RDCM shall completely duplicate the display and operator-interface capabilities of the FACU-User Interface.
3. The RDCM shall communicate with the FACU using RS-485 protocol.
4. The RDCM shall operate on 24 VDC sourced either from the ARIES Multi-Loop FACU or from a power supply that is UL Listed or FM Approved for fire alarm applications.
5. The RDCM shall supervise its input power connections.
6. The ARIES Multi-Loop FACU-UI or any one RDCM shall be programmed as the master unit which shall give it immediate operator-intervention privileges in the case of an alarm or fault condition. The master shall have control for a minimum period of 30 seconds during which period all other units shall be locked out and notified of the locked-out condition.

B. Remote LED Annunciator Module (R-LAM)
1. The FACU shall be capable of supporting up to 16 R-LAMs.
2. The R-LAM shall provide 48 independently programmable LEDs (red/yellow) with space available to place a label to identify the annunciated event.
3. The R-LAM shall provide LEDs for Power, System Trouble and Signal Silenced; and switches for Signal Silence and System Acknowledge/Self-Test commands.
4. The R-LAM shall operate on 24 VDC sourced either from the ARIES Multi-Loop FACU or from a power supply that is UL Listed or FM Approved for fire alarm applications.
5. The RDCM shall supervise its input power connections.

C. Annunciator Terminal Modules, Models ATM-L and ATM-R
1. The ARIES Multi-Loop FACU shall be capable of supporting up to 16 ATM-Ls and 16 ATM-Rs.

2. The Model ATM-L shall provide up to 32 programmable outputs for remote LEDs along with 6 system-level LEDs and 5 system-level functional switches.
3. The Model ATM-R shall provide up to 32 programmable outputs for remote relays.
4. The ATMs shall communicate with the FACU using RS-485 protocol. The most-remote module shall be capable of being located up to 4,000 feet from the FACU.
5. The ATMs shall operate on 24 VDC sourced either from the ARIES Multi-Loop FACU or from a power supply that is UL Listed or FM Approved for fire alarm applications.

2.15 REMOTE MONITORING

A. The web and mobile applications shall be password protected and the same login credentials shall be used for both.
B. The mobile application shall be iOS and Android compatible.
C. The web portal dashboard shall provide an overview of the state of systems at first glance.
D. Alarms have higher priority than other events. For a system with an Alarm event, the dashboard shall prioritize and report the Alarm state.
E. Subsequent events for a system in Alarm shall be captured while the primary state of the system remains in Alarm until Normal.
F. On receipt of any event at the cloud monitoring platform, an e-mail shall be transmitted to all addresses on record and a notification to the mobile application.

2.16 SYSTEM CONFIGURATION

A. Activation of the suppression system shall be via crossed-zoned smoke detection.
B. The system shall have the ability to define single or multiple detectors into detection groups to support cross zoning applications.
C. It shall require the activation of at least one detector from each of the two crossed-zoned detector groups to trigger the automatic release of the suppression system.

2.17 CONDUCTORS AND CONDUITS

A. All conductors shall be enclosed in rigid or thin-walled, steel conduit unless open wiring is permitted by the local electrical code.
B. Any conduit or raceway exposed to dampness or other similar conditions shall be properly sealed and installed to prevent moisture entrapment. Provisions for draining and drying shall be employed as required.
C. All wiring shall be of the proper size to conduct the circuit current, but shall not be smaller than #18 AWG unless permitted by the local electrical code. Wiring for the signaling line circuit shall be in accordance with the FACU Installation, Operation, and Maintenance Manual. Wire that has scrapes, nicks, gouges, or crushed insulation shall not be used. The manufacturer's minimum wire-bending radii shall be observed in all enclosures, raceways, and conduits. Aluminum wire shall not be used.

3. EXECUTION

3.1 CLEAN AGENT FIRE EXTINGUISHING SYSTEM INSTALLATION

A. The system shall be supplied and installed by a factory-authorized, Kidde Fire Systems Distributor. The Distributor shall be trained and certified by Kidde Fire Systems to design, install and maintain the Kidde fire suppression system. The distributor shall install the system in accordance with the manufacturer's design, installation, operation and maintenance manual.

3.2 ELECTRICAL SYSTEM INSTALLATION

A. All electrical enclosures, raceways, and conduits shall be provided and installed in accordance with applicable codes and intended use, and shall contain only those electrical circuits associated with the fire-detection and control system. No circuit or circuits that are unrelated to the fire alarm or suppression system shall be routed through the enclosures, raceways, and conduits dedicated to the fire alarm or suppression system.
B. Splicing of circuits shall be kept to a minimum, and is only permitted in an electrical box suitable for the purpose. Appropriate hardware shall be used to make the wire splices. Wires that are spliced together shall have the same color insulation.
C. White colored wire shall be used exclusively for the identification of the neutral conductor of an alternating-current circuit. Green colored wire shall be used exclusively for the identification of the

earth-ground conductor of an AC or DC circuit. Appropriate color-coding shall be utilized for all other field wiring.

D. All electrical circuits shall be numerically tagged with suitable markings at each terminal point. All circuits shall correspond with the installation draw.

3.3 BLOWER DOOR FAN TEST

A. As required by NFPA 2001 section 5.6, a blower door fan test shall be performed. A minimum concentration of 85% of the design concentration shall be held at the highest level of combustibles for a minimum period of 10 minutes or for a time period to allow for response by trained personnel.

3.4 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 clean agent shall not be part of the training requirements

3.5 ROUTINE MAINTENANCE

A. Routine maintenance on equipment shall be performed by a certified Kidde Fire System Distributor, in accordance with the most current version of the relevant NFPA standards and the manufacturer's installation, operation and maintenance manual.

B. [OPTIONAL] Maintenance for the ASD shall include the following:

1. Visual check of pipe network integrity.
2. Battery status check of all power supply batteries.
3. Gross smoke test of all installed detectors.
4. System Transport Time Test
5. Detector cleanliness