

FIRE-ALARM / -SUPPRESSION-SYSTEM CONTROL UNIT

1. GENERAL SPECIFICATION

1.1 The contractor shall provide an ARIES addressable, distributed-intelligence control unit and fire-alarm / -suppression system to perform the following operations:

- ◆ fire-alarm-, supervisory-, and trouble-event initiation
- ◆ occupant notification
- ◆ event annunciation
- ◆ local control functions
- ◆ fire-extinguishing-system release, and
- ◆ off-premises transmission.

1.2 The system's distributed intelligence shall extend to the SmartOne™ automatic initiating devices on the signaling line circuit. 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 control unit.

1.3 Systems that use application-specific integrated circuits (ASICs) in the automatic initiating devices, and rely on the control unit to analyze a stream of data from each automatic initiating device to determine whether or not a fire signature is present at the initiating device's location, shall not be considered to be of sufficiently distributed intelligence. Such systems shall not be considered as equivalent to the equipment specified herein.

2. CODES/STANDARDS COMPLIANCE

2.1 The design, installation, testing and maintenance of the fire alarm / suppression system shall be in accordance to the following codes and standards:

- A. NFPA 12A - Standard on Halon 1301 Fire Extinguishing Systems
- B. NFPA 13 - Standard for the Installation of Sprinkler Systems
- C. NFPA 15 - Standard for Water Spray Fixed Systems for Fire Protection
- D. NFPA 70 - National Electrical Code
- E. NFPA 72 – National Fire Alarm Code
- F. NFPA 75 - Standard for the Protection of Electronic Computer/Data-Processing Equipment
- G. NFPA 76 - Fire Protection of Telecommunications Facilities
- H. NFPA 2001 – Standard for Clean Agent Fire Extinguishing Systems

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2.2 All of the components of the fire-alarm / -suppression system shall have the following listings and approvals:

- A. Underwriters Laboratories (UL)
- B. Factory Mutual System (FM)
- C. California State Fire Marshall (CSFM)
- D. New York City Materials and Equipment Approval (MEA)

2.3 The manufacturer shall meet ISO 9001 requirements for the design, production and distribution of fire detection and fire alarm systems.

3. SYSTEM DESCRIPTION

3.1 All system components must be manufactured and / or supplied by:

Kidde Fire Systems
400 Main Street
Ashland, MA 01721
U.S.A.

Phone: (508) 881-2000

URL: <http://www.kiddefiresystems.com>

3.2 The manufacturer shall warrant the ARIES Control Unit and the SmartOne initiating and control devices for 60 months from date of shipment.

3.3 The system shall be supplied and installed by a factory-authorized Kidde Fire Systems distributor. The distributor shall be trained by the manufacturer to design, install, test and maintain the ARIES fire-alarm / -suppression system and shall be able to produce a certificate stating such on request.

3.4 The factory-authorized Kidde Fire Systems distributor shall confirm in writing that he stocks a full complement of spare parts and offers 24-hour emergency service for all equipment being furnished.

3.5 All materials and equipment shall be new.

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4. COMPONENTS**4.1 Control Unit**

- A. The control-unit configuration shall consist of:
- ◆ a printed-circuit board (PCB) with the main microprocessor, an integral display/control assembly, and terminations for all field circuits
 - ◆ a primary power supply
 - ◆ an enclosure with removable door and viewing window.
- B. The PCB shall contain the main-system microprocessor, the real-time clock, the history buffers, the watchdog timer, one USB device port, and two RS-232 serial communications ports. It shall also provide terminations for the following field circuits:
- ◆ one (1) signaling line circuit (SLC)
 - ◆ two (2) notification-appliance circuits (NACs)
 - ◆ two (2) combination NAC / releasing circuits (Combos)
 - ◆ two (2) releasing circuits
 - ◆ three (3) programmable relays
 - ◆ one (1) trouble relay
 - ◆ one (1) RS-485 communications circuit
 - ◆ battery-charging circuit
 - ◆ AC-input-power connections.
- C. The integral display-and-control assembly shall provide an 80-character, backlit liquid-crystal display (LCD). The LCD shall be 2 lines by 40 characters, and each SLC initiating and/or control device shall be identifiable by a label of up to 40 characters in length. The display shall automatically indicate the time remaining prior to discharge upon attainment of the discharge criterion in the area protected by a waterless extinguishing system.
- D. The display-and-control assembly shall have four control keys for system reset, event acknowledgement, alarm silence, and multiple-event scrolling, plus twelve additional numeric and navigation keys for access to the system service and configuration menus. All user access to the system menus shall be password protected. A system buzzer shall annunciate each alarm, supervisory, or trouble event.
- E. The SLC shall serve as the hardware and software interface between the intelligent initiating and control devices and the ARIES Control Unit. The SLC shall be capable of communicating with up to 255 automatic detectors, monitor modules,

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and control devices, in any combination, without restrictions on the numbers of each type of field device. The communications protocol shall be fully digitized for speed and accuracy of data transmission. Communications protocols that are not fully digitized, or that place restrictions on the numbers and types of field devices that can be used on the signaling line circuit, shall not be considered as equivalent.

- F. The signaling line circuit shall be capable of being wired in a Class-B, Style-4 manner, or in a Class-A, Style-6 or -7 configuration. Isolator modules shall be available for use with any of these wiring styles to prevent a short-circuit fault from disabling the entire signaling line circuit.
- G. All field devices connected to the SLC shall be electronically addressed and shall have a microprocessor with 4K of non-volatile memory. Each automatic initiating device shall be capable of independently determining whether or not a fire signature at its monitored location is of sufficient magnitude to warrant the issuance of an event signal to the control unit. The system's intelligence shall be distributed to the individual-initiating-device level.
- H. Systems that only distribute intelligence and/or processing power to the control-unit circuit-board level and rely on the control unit, rather than the initiating devices themselves, to determine whether or not an alarm condition exists at a specific location, or that use mechanically-operated code switches for device addressing, shall not be considered as equivalent.

4.2 SmartOne™ Ionization Detector

- A. The SmartOne Ionization Detector, Model CPD-7052, shall be a microprocessor-based smoke detector. The ionization detector shall be a dual-chamber, low-profile, intelligent type that senses both visible and invisible products of combustion. The sensing chamber shall permit a full 360° smoke entry.
- B. Each ionization detector shall be electronically-addressable and fully field-programmable. It shall be possible to set both alert and alarm thresholds anywhere from 0.5 to 1.5% per foot obscuration in 0.1%-per-foot increments. Alarm thresholds shall be dynamically adjustable as a result of another alarm event anywhere in the system. Where permitted, each detector shall be programmable for alarm verification in periods of up to 180 seconds in 1-second increments. Each detector shall provide a real-time value of current, local obscuration level in percent-per-foot readout when requested by an operator at the control unit.

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- C. It shall be possible to configure each ionization detector for non-latching operation to prevent inadvertent or spurious fire signatures from accidentally discharging a waterless extinguishing system. The control unit shall latch the alarm report, but the discharge sequence shall be interrupted if the fire signature at the detector drops below the detector's programmable alarm threshold.
- D. Detector calibration, address, alert and alarm thresholds, and drift-compensation algorithm shall be stored in each detector's non-volatile memory. Systems that store all detector parameters in the control unit (i.e., non-distributed-intelligence-to-the-device-level architecture) shall not be considered as equivalent.
- E. A detector housing, Model DH-2000, shall be available to allow an ionization detector to monitor for the presence of combustion products in an air duct. The detector housing shall be rated for air-duct velocities ranging from 500 to 4,000 feet per minute. It shall also be possible to mount the ionization detector in an air duct with velocities ranging up to 2,000 feet per minute.

4.3 SmartOne™ Photoelectric Detector

- A. The SmartOne Photoelectric Detector, Model PSD-7252, shall be a microprocessor-based smoke detector. The photoelectric detector shall be a light-scattering-type, low-profile, intelligent detector that senses a broad range of smoldering and flaming-type fires. The sensing chamber shall permit a full 360° smoke entry.
- B. Each photoelectric detector shall be electronically-addressable and fully field-programmable. It shall be possible to set an alert threshold anywhere from 0.2 to 3.4% per foot obscuration in 0.1%-per-foot increments, and to set an alarm threshold anywhere from 0.5 to 3.5% per foot obscuration in 0.1%-per-foot increments. Alarm thresholds shall be dynamically adjustable as a result of another alarm event anywhere in the system. Where permitted, each detector shall be programmable for alarm verification in periods of up to 180 seconds in 1-second increments. Each detector shall provide a real-time value of current, local obscuration level in percent-per-foot readout when requested by an operator at the control unit.
- C. It shall be possible to configure each photoelectric detector for non-latching operation to prevent inadvertent or spurious fire signatures from accidentally discharging a waterless extinguishing system. The control unit shall latch the alarm report, but the discharge sequence shall be interrupted if the fire signature at the detector drops below the detector's programmable alarm threshold.

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- D. Detector calibration, address, alert and alarm thresholds, and drift-compensation algorithm shall be stored in each detector's non-volatile memory. Systems that store all detector parameters in the control unit (i.e., non-distributed-intelligence-to-the-device-level architecture) shall not be considered as equivalent.
- E. A detector housing, Model DH-2000, shall be available to allow an photoelectric detector to monitor for the presence of combustion products in an air duct. The detector housing shall be rated for air-duct velocities ranging from 500 to 4,000 feet per minute. It shall also be possible to mount the photoelectric detector in an air duct with velocities ranging up to 4,000 feet per minute.

4.4 SmartOne™ Thermal Detector

- A. The SmartOne Thermal Detector, Model THD-7252, shall be a microprocessor-based heat detector. The thermal detector shall be a thermistor-type, low-profile, intelligent detector that responds to a fixed temperature with minimal thermal lag. The sensing chamber shall permit a full 360° heat entry.
- B. Each thermal detector shall be electronically-addressable and fully field-programmable. It shall be possible to set both alert and alarm thresholds anywhere from 80°F to 155°F in 1°F increments. Each detector shall provide a real-time value of current, local temperature in °F readout when requested by an operator at the control unit.
- C. It shall be possible to configure each thermal detector for non-latching operation to prevent inadvertent or spurious fire signatures from accidentally discharging a waterless extinguishing system. The control unit shall latch the alarm report, but the discharge sequence shall be interrupted if the fire signature at the detector drops below the detector's programmable alarm threshold.
- D. Detector calibration, address, and alert and alarm thresholds shall be stored in each detector's non-volatile memory. Systems that store all detector parameters in the control unit (i.e., non-distributed-intelligence-to-the-device-level architecture) shall not be considered as equivalent.

4.5 SmartOne™ Monitor Module (AI)

- A. The SmartOne Monitor Module, i.e., AI, shall be a microprocessor-based contact-input device. The monitor module shall be a low-profile-type, intelligent device that mounts inside the electrical box that serves as the mechanical connection point for its monitored initiating device.
- B. Each monitor module shall be electronically-addressable and fully field-

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programmable to function as any of following event-initiating device types: manual alarm, manual release, extinguishing-system abort, waterflow, supervisory, trouble, off-normal status, event acknowledgement, alarm silence, or system reset. Monitor modules shall be available in two models capable of monitoring either normally-open or normally-closed initiating-device contacts. Terminals shall be provided for the connection of an optional device-status LED.

- C. The monitor module shall be encapsulated and UL Listed for temperatures ranging from -31°F to 151°F.

4.6 SmartOne™ Orion-XT Interface Module (PALM)

- A. The SmartOne Orion-XT Interface Module, i.e., PALM, shall be a microprocessor-based initiating device. The PALM shall be a low-profile-type, intelligent device that mounts inside the housing of its associated Orion-XT High Sensitivity Smoke Detector and plugs into a receptacle on the detector's printed-circuit board.
- B. Each PALM shall be electronically-addressable and fully field-programmable to issue both pre-alarm and alarm signals directly to the ARIES Control Unit via the SLC.
- C. Systems that interface to high-sensitivity smoke detectors by monitoring the detectors' alarm and trouble dry contacts shall not be considered as equivalent.

4.7 SmartOne™ Alarmline™ Monitor Module (AAM)

- A. The SmartOne Alarmline Monitor Module, i.e., AAM, shall be a microprocessor-based initiating device. The AAM shall be a low-profile-type, intelligent device that monitors one linear-heat-detector (i.e., Alarmline) circuit for continuity and over-temperature fire signatures.
- B. Each AAM shall be electrically-addressable and fully field-programmable to issue both pre-alarm and alarm signals directly to the ARIES Control Unit via the SLC.

4.8 SmartOne™ Control Module (AO)

- A. The SmartOne Control Module, i.e., AO, shall be a microprocessor-based control device with a Form-C relay. The control module shall be a low-profile-type, intelligent device that mounts inside the electrical box that serves as the mechanical connection point for its controlled output device. The relay contact shall be rated for 1 A at 30 VDC.
- B. Each AO shall be electronically-addressable and fully field-programmable for

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actuation upon occurrence of any single initiating event or combination of multiple initiating events. An integral LED shall be provided for visual indication of the control-module's operating status.

- C. The control module shall be encapsulated and UL Listed for temperatures ranging from -31°F to 151°F.

4.9 SmartOne™ Addressable Signal Module (ASM)

- A. The SmartOne Addressable Signal Module, i.e., ASM, shall be a microprocessor-based control device with a notification-appliance circuit. The ASM shall be a low-profile-type, intelligent device that mounts to a standard, extra-deep electrical box.
- B. The notification-appliance circuit (NAC) shall be configurable for Class-A, Style-Z or Class-B, Style-Y operation. The NAC shall support conventional audio-visual notification appliances. It shall be rated for 2 A at 30 VDC.
- C. The ASM shall supervise the connection to and the voltage level of input power for the notification appliances, and shall provide a supervised initiating circuit to monitor an un-powered, normally-open contact associated with an auxiliary power supply. Signaling modules that require a relay and a monitor module to supervise the auxiliary-power connection to their notification appliance circuits shall not be considered as equivalent.
- D. Each ASM shall be electronically-addressable and fully field-programmable for actuation upon occurrence of any single initiating event or combination of multiple initiating events. An integral LED shall be provided for visual indication of the signal-module's operating status.

4.10 Isolator Modules

- A. Isolator modules shall be available to protect the SLC from wire-to-wire short-circuit faults. The isolator modules shall segregate the short-circuited portion of the SLC from the unaffected parts of the circuit, allowing the rest of the initiating devices to issue reports and the rest of the control and signal modules to process and execute activation commands.
- B. The isolator devices shall be available in two mounting styles:
 - ◆ detector-base-mount
 - ◆ single-gang-electrical-box-mount.

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4.11 Power Supply

- A. The basic power-supply / charger assembly shall consist of an AC to DC switching power unit. The power-supply / charger assembly shall be configurable to accept either 120 or 240 VAC input voltage, and shall provide 5.4 A at 24 VDC of filtered and regulated power to operate the system and charge the system's standby battery. The charger assembly shall be capable of charging batteries of capacities up to 70 AH.
- B. Two user-configurable auxiliary-power circuits shall be provided on the PCB to power peripheral devices. The auxiliary-power circuits shall be software programmable for either continuous or interruptible power output, and shall be rated for 1.0 A at 24 VDC. It shall not be necessary to set jumpers or dip switches on the PCB to make these outputs continuous or interruptible.

4.12 Control-Unit Outputs

The control unit shall provide the following programmable outputs:

A. Notification-Appliance Circuits

- 1. The two notification-appliance circuits (NACs) shall be independently-programmable and configurable for either Class-A or -B operation.
- 2. NACs configured for Class-B, Style-Y NAC operation shall perform in accordance with the requirements of NFPA 72. Notification appliances shall be activated by the reversing-polarity action of the circuit. Wiring integrity shall be monitored by the use of an end-of-line resistor.
- 3. The input power to the NAC shall be filtered and regulated. The NAC shall be capable of delivering a current of up to 1.5 A @ 24 VDC to the notification appliances.
- 4. It shall be possible to field-configure each Class-B, Style-Y NAC to activate notification appliances with any and all of the following parameters via a personal-computer-based configuration program:
 - ◆ 20-character location
 - ◆ drill activation
 - ◆ silenceable / non-silenceable operation
 - ◆ walk-test activation

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- ◆ master-coded operation
 - 60 bpm
 - 120 bpm
 - temporal per ANSI S3.41
 - continuous
 - ◆ cutoff delay
 - 5 minutes
 - 10 minutes
 - 15 minutes
 - ◆ silence inhibit
 - 1 minute
 - 3 minutes
 - 5 minutes
5. It shall be possible to override one master code with another depending on the state (i.e., prealarm, prerelease, release, or time-limit-cutout) of the particular suppression zone. It shall also be possible to shut off and re-activate a NAC as required by the approved system operating sequence. No supplemental equipment shall be required to perform this functionality.
 6. It shall not be necessary to use external synchronization modules to synchronize the audible and visual notification signals created by any NAC.
 7. Terminals for connection of field conductors to the NACs shall be large enough to accommodate #12 AWG wiring.
 8. Output circuits configured for Class-A, Style-Z NAC operation shall perform in accordance with the requirements of NFPA 72. Notification appliances shall be activated by the reversing-polarity action of the circuit.
 9. All other requirements for the Class-A, Style-Z NACs shall be the same as detailed for Class-B NACs.
- B. Releasing Circuits
1. The two releasing circuits shall be capable of actuating either an electrical actuator, Kidde control heads, or solenoid valves. Each releasing circuit shall be independently-programmable to activate any of the following configurations of extinguishing-system actuators:
 - ◆ one (1) Metron actuator
 - ◆ one (1) control head or solenoid valve

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- ◆ two (2) control heads or solenoid valves, supervised in series and activated in parallel. It shall not be necessary to use identical solenoid valves when two valves are activated on one releasing circuit.
 - 2. The releasing circuits shall be capable of actuating any Factory Mutual System classified valves as follows:
 - ◆ Group A
 - ◆ Group B
 - ◆ Group D
 - ◆ Group E
 - ◆ Group G.
 - 3. Each releasing circuit, when configured for solenoid-valve activation, shall be independently programmable for the following design options:
 - ◆ continuous activation
 - ◆ initial- and cyclical-time-limit-cutoff activation. The time-limit-cutoff intervals shall be independently-programmable for either 180 seconds or 180 minutes for each releasing circuit.
 - ◆ de-activation and / or subsequent reactivation via
 - ◆ approved operating sequence
 - ◆ thermal sensors configured for cycling
 - 4. The releasing circuits shall protected against inadvertent activation by a triple-failure-redundancy safeguard system. This system shall require the main microprocessor to issue two release commands, of opposite polarity and via separate signaling channels, combined with a signal from the control unit's watchdog timer confirming proper microprocessor operation, in order to activate a release circuit. This triple-failure-redundancy must ensure that an electrical transient or disturbance that temporarily interferes with the operation of the main microprocessor will not inadvertently activate an extinguishing system.
- C. Combination Circuits
- 1. The two combination circuits shall be configurable as either NACs or releasing circuits for solenoid valves. These combination circuits shall be independently programmable.
 - 2. The requirements for NACs shall be in accordance with Section 4.12 A when both circuits are used as NACs.

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3. The requirements for the solenoid releasing circuits shall be in accordance with Section 4.12 B.
 4. Combination circuits configured as solenoid-valve-type releasing circuits shall be capable of actuating one Kidde control head or one Factory Mutual System classified valve.
 5. Each combination circuit, when configured for solenoid-valve activation, shall be independently-programmable for the following design options:
 - ◆ continuous activation
 - ◆ initial- and cyclical-time-limit-cutoff activation. The time-limit-cutoff intervals shall be independently-programmable for either 180 seconds or 180 minutes for each releasing circuit.
 - ◆ de-activation and / or subsequent reactivation via
 - approved operating sequence
 - thermal sensors configured for cycling
 6. The combination circuits shall be protected against inadvertent activation by a triple-failure-redundancy safeguard system when programmed as releasing circuits. This system shall require the main microprocessor to issue two release commands, of opposite polarity and via separate signaling channels, combined with a signal from the control unit's watchdog timer confirming proper microprocessor operation, in order to activate a combination circuit configured for releasing. This triple-failure-redundancy must ensure that an electrical transient or disturbance that temporarily interferes with the operation of the main microprocessor will not inadvertently activate an extinguishing system.
- D. Relays
1. The three programmable relays on the PCB shall be of a Form-C type, with a contact rating as follows:
 - ◆ 1 A @ 30 VDC (resistive)
 - ◆ 0.5 A @ 30 VDC (inductive)
 - ◆ 0.5 A @ 120 VAC (inductive).

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2. Each relay shall be independently-programmable for any of the following conditions:
 - ◆ loss of AC power only
 - ◆ general or point- / zone-specific
 - prealarm
 - prerelease
 - release
 - time-limit-cutoff
 - supervisory service
 - trouble.
3. A relay programmed for general trouble shall also have the option to be programmed for concurrent central-station service. This relay shall delay the loss-of-primary-power transmission to the central-station monitoring facility in user-configurable, one-hour periods of up to 12 hours.
4. The fourth on-board relay shall be a dedicated trouble relay.

5. Accessory Modules

- 5.1 Accessory modules shall be available to provide remote-event annunciation and operator control. The accessory modules shall be of two styles: either textual-type with control switches and indicators that duplicate the functionality of the main-control-unit display or point-driver-type for interface to graphical annunciators.

A. Textual-Type Remote Display

1. Model RDCM shall completely duplicate the display and operator-intervention capabilities of the main-control-unit display.
2. The RDCM shall communicate with the ARIES Control Unit via RS-485 communications, and the system shall be capable of supporting with up to 15 remote displays.
3. The remote displays shall operate on 24 VDC power provided by the ARIES power supply, or by any remote power supply that is UL-Listed or FM-Approved for fire-alarm applications. The remote-display modules shall supervise their input-power connections.
4. The main ARIES Control Unit display or one RDCM shall be capable of being programmed as the master unit with immediate operator-intervention privileges upon the occurrence of any alarm or fault condition. The master unit shall have control for a minimum period of 30 seconds, and all other control

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points shall be locked out and notified of the locked-out condition if another operator attempts to intervene during the locked-out period imposed by the master control module.

B. Output Driver Modules

1. The Model ATM-L Annunciator Driver Module shall provide the ARIES Control Unit with up to 32 programmable outputs for remote LEDs, along with 6 system-level LEDs and 5 system-level functional switches.
2. The system-level LEDs shall correspond to the following general conditions: module power, alarm, pre-alarm, alarm silence, supervisory, and trouble.
3. The functional switches provide for the following operator intervention: system reset, event acknowledgement, alarm silence, fire drill, and lamp test.
4. The Model ATM-R Relay Driver Module shall provide the ARIES Control Unit with up to 32 programmable outputs for remote relays.
5. The ATM-L and -R Modules shall communicate with the ARIES Control Unit via the RS-485 communications circuit, with the most-remote module capable of being located up to 4,000 feet from the control unit. The ATM-Ls and ATM-Rs shall be capable of being installed in various combinations as long as the maximum number of 16 for each module type is not exceeded.
6. Both modules can be powered from the ARIES power supply, or from an external, regulated, and power-limited power supply Listed and Approved for use with fire-protective-signaling systems, depending upon the total load of the remote outputs. A typical external power supply is Kidde P/N 297106.

6. Typical Sequence of Operation

- 6.1 Activation of the extinguishing system shall be via crossed-zoned smoke detection. One half of the crossed-zoned smoke-detection system shall consist of either Model PSD-7152 SmartOne Photoelectric Detectors or Orion-XT High Sensitivity Smoke Detectors. The other half of the crossed-zoned smoke-detection system shall consist of Model CPD-7052 Ionization Detectors.
- 6.2 The Model PSD-7152 SmartOne Photoelectric Detectors or Orion-XT High Sensitivity Smoke Detectors shall be used as the primary pre-alarm detection system because they are more likely to alarm during the pre-combustion or early stages of the fire development. The Model CPD-7052 Ionization Detector shall be utilized primarily as a

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fire-confirmation detector to ensure the presence of a flame before the extinguishing system is discharged. Ionization detectors are small-particle detectors and are more likely to respond to flaming fires.

- 6.3 Spot-type detectors from each half of the crossed-zoned detection system shall be alternated throughout the protected area. It shall require the activation of at least one detector from each of the two crossed-zoned detector groupings to trigger the automatic release of the extinguishing system.
- 6.4 Systems that use multi-criteria detectors that cannot be programmed to respond to the various stages of fire development, or systems that do not use different smoke-detection principles to confirm the presence of a flaming fire, shall not be considered as equivalent or as meeting the intent of this specification.
- 6.5 Activation of any smoke detector in the suppression zone shall:
- cause a pre-alarm condition
 - create an audible and visible indication on the control unit display and any associated remote display or graphic annunciator
 - display the address and the location of the detector in alarm
 - activate audible pre-alarm notification appliances (e.g., bells) in the affected area
 - perform any necessary control functions such as HVAC equipment shutdown and activate any safety procedures such as closing doors
 - transmit an off-premises report to a Listed central or remote station, or directly to the local fire department.
- 6.6 Activation of a smoke detector from each of the two crossed zones shall:
- cause a pre-release condition
 - create an audible and visible indication on the control unit display and any associated remote display or graphic annunciator
 - display the address and the location of the detector in alarm
 - initiate a programmable time delay, and indicate the time remaining prior to extinguishing-system discharge
 - silence the pre-alarm audible notification appliances
 - activate pre-release audible and visual notification appliances (e.g., horns and strobes) in the affected area
 - perform any necessary control functions such as the closure of dampers and activate any safety procedures such as closing doors.

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- 6.7 The system shall, upon expiration of the time delay,
- cause a release condition and energize the control head and/or electrical actuator to discharge the extinguishing agent into the protected area
 - create an audible and visible indication on the control unit display and any associated remote display or graphic annunciator
 - display the attainment of the discharge condition
 - silence the pre-release audible notification appliances and activate audible discharge alarms in the protected area
 - continue to activate the visual notification appliances (i.e., strobes) in the affected area
 - perform any necessary control functions such as the emergency power off for all electrical equipment except for lighting and circuits required for life safety.
- 6.8 The extinguishing system shall be capable of manual activation by dual-action manual-release stations. Operation of a manual-release station shall cause all alarm and shutdown devices to operate as if the system had operated automatically and shall cause an immediate activation of the fire- extinguishing system. Operation of a manual-release station shall override the operation of all abort switches.
- 6.9 Abort switches shall, when operated, interrupt the countdown delay for the activation of the extinguishing system and prevent the operation of any alarms and control functions associated with the discharge of the extinguishing agent. The abort switches shall be momentary, dead-man-type devices that require a constant force to remain engaged and active. Manual- releasing stations shall override the operation of any abort switch. Abort switches shall be configured for operation according to the requirements of the authority having jurisdiction.

7. Programming

- 7.1 The system shall be programmable and configurable in the field without the need for special tools or electronic equipment, and shall not require field replacement of electronic integrated circuits when modifying the site-specific applications program.
- 7.2 All site-specific applications programs shall be stored in non-volatile memory.

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- 7.3 The sequence of operation for the site-specific application program shall consist of a series of conditional control statements constructed from combination, relational, and executable operators that logically join initiating points to control-unit-based outputs and remote control modules. Systems that establish input-to-output relationships and create operating sequences through fixed-logic software zones shall not be considered as equivalent.
- 7.4 A special program-check function shall be provided to detect common operator errors.

8. General Materials Electrical

- 8.1 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.
- 8.2 All conductors shall be enclosed in rigid or thin-walled, steel conduit unless open wiring is permitted by the local electrical code.
- 8.3 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.
- 8.4 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 ARIES 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.
- 8.5 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.
- 8.6 White colored wire shall be used exclusively for the identification of the neutral conductor of an alternating-current circuit.
- 8.7 Green colored wire shall be used exclusively for the identification of the earth-ground conductor of an AC or DC circuit.

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- 8.8 Appropriate color-coding shall be utilized for all other field wiring.
- 8.9 All electrical circuits shall be numerically tagged with suitable markings at each terminal point. All circuits shall correspond with the installation drawings.

9. SUBMITTALS**9.1 Engineered Design Drawings**

- A. The factory-authorized Kidde Fire Systems distributor shall provide all required installation drawings that shall include the following details.
- B. Plan and riser drawings showing the location of the ARIES Control Unit and the locations of all field devices such as smoke detectors, manual-release stations and notification appliances. Include all necessary installation and mounting details. Conduit routings shall be shown, with number of conductors, type of wire, and wire sizes indicated for each conduit segment.
- C. Point-to-point wiring diagram showing the termination points for all field-wiring circuits to the internal ARIES PCB. All internal wiring and communications cabling shall be shown.
- D. A primary-power calculation that details the power requirements for the ARIES Control Unit 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.
- E. A secondary-power calculation that shows the quiescent- and alarm-power requirements for the ARIES Control Unit and all field devices such as smoke detectors, notification appliances, and releasing solenoids. 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.

9.2 Supporting Materials

- A. The contractor shall provide the following supporting materials for the equipment being utilized in this project.
- B. A complete component and equipment list with model numbers and Kidde Fire Systems part numbers

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- C. Product information sheets for each item of equipment
- D. A theory of operations, with a description of system functionality
- E. 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.
- F. 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 his responsibility to meet the requirements of the drawings and specifications.

9.3 Test Plan

- A. The contractor shall submit a test plan that describes how the system 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. Tests shall not be scheduled or conducted until the engineer of record approves the test plan.

9.4 Operation and Maintenance Manuals

- A. Five (5) copies of the ARIES Installation, Operation and Maintenance Manual shall be submitted after complete installation.

10. SYSTEM INSTALLATION AND COMMISSIONING**10.1 Equipment**

- A. The contractor shall install the system in accordance with the appropriate Kidde Fire Systems installation, operation and maintenance manual.
- B. Locations of all electrical equipment, the ARIES Control Unit, and all system components are subject to the approval of the architect.

10.2 Training Requirements

- A. The contractor shall be certified and trained by Kidde Fire Systems on installation, design and maintenance of the ARIES System.

10.3 Final Commissioning Tests

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- A. The contractor shall record all equipment, tests and system configurations.
- B. All final-acceptance tests shall be performed in the presence of the architect and the authority having jurisdiction. All control heads and / or actuators for the extinguishing system, if present, shall be disconnected during the acceptance testing.
- C. All conductors shall be tested for continuity, shorts to earth ground and shorts between pairs.
- D. All real-time, clean-air-obscuration levels shall be read and recorded for each smoke detector. Pre-alarm and alarm thresholds shall also be read and recorded. Systems that are incapable of providing real-time, clean-air obscuration levels for each smoke detector shall not be considered as equivalent.
- E. All real-time temperature levels shall be read and recorded for each thermal detector. Pre-alarm and alarm thresholds shall also be read and recorded. Systems that are incapable of providing real-time temperature levels for each thermal detector shall not be considered as equivalent.
- F. Each initiating point shall be tested for proper alarm or supervisory reporting. Receipt of all alarm and supervisory signals, including appropriate trouble signals as required, shall be verified at the ARIES Control Unit.
- G. Specialty detectors such as the Orion-XT High Sensitivity Smoke Detector and the Alarmline Linear Heat Detection System shall be tested, and proper operation verified, in accordance with the appropriate Kidde Fire Systems installation, operation, and maintenance manuals.
- H. All notification appliances shall be tested for proper operation.
- I. A complete functional test shall be conducted to confirm the operation of the system to the requirements of this specification.
- J. A copy of the commissioning tests and results shall be provided to the architect, the authority having jurisdiction, and the end-user.
- K. The system shall be properly armed and readied for its intended service following the successful completion of the commissioning tests. The end user shall be immediately notified when the system is put into service.

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10.4 Maintenance

- A. System maintenance and periodic testing shall be performed as required by NFPA 72 and NFPA 2001, current editions, and as recommended by the ARIES Installation, Operation and Maintenance Manual.

11. REMOTE SYSTEM MONITORING

11.1 The system shall have the ability to use an optional Intelligent Communications Module (ICM). The ICM shall be a device server that provides Internet access to the ARIES Control Unit via any standard Web browser such as Internet Explorer or Netscape Navigator.

11.2 The ICM shall provide the following client services:

- dial-up control-unit monitoring and status reporting
- automatic event detection and reporting via e-mail
- Web-browser-based
 - ◆ emulated display for the control unit
 - ◆ access to items in the control unit's List Menu.

11.3 Authorized users shall be able view the ARIES system event history, status, and device properties. Viewing system information shall require password-protected interaction with the control unit.

11.4 The ICM shall be used to list the following information:

- isolated SLC devices or control-unit-based outputs
- event logs
- detector sensitivities
- active events
- programming
- SLC assignments
- SLC-device voltage levels
- battery charge
- on-board-outputs configurations
- remote display/control modules.

11.5 Authorized users shall be able to save any or all of this data in standard ASCII text files that can be viewed with Windows Notepad, Word, and other applications.

11.6 The ICM shall connect to the Internet via an Ethernet jack. The Ethernet Local- or Wide- Area Network (LAN / WAN) can be a dedicated LAN / WAN or the user's existing LAN / WAN network.

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11.7 E-Mail Off-Premises Reports

- A. The ICM shall alert users and service personnel via e-mail when alarms, troubles, or supervisory events occur in an ARIES system.
- B. The off-premises-reporting system shall group events into two broad categories – alarms and troubles/supervisories. The system shall associate events with time intervals and send only one e-mail per interval. It shall be possible to view the details about the system event that caused an off-premises report via the ICM Listings screen. Each off-premises report shall contain a hyperlink that automatically communicates with the ICM and control unit that initiated the report.
- C. It shall be possible to select whether e-mail off-premises reports are sent for alarms, troubles/supervisories, both, or neither.
- D. Alarms shall have a higher priority than troubles/supervisories. Subsequent alarm, trouble, and supervisory off-premises reports shall not be sent within the guard interval described below if an alarm report has already been transmitted. An alarm notification shall be sent and a new guard interval shall be established if a trouble/supervisory report has been sent and a subsequent alarm occurs.
- E. The guard interval is the period of time during which no further off-premises reports of the same or lower priority are sent. The interval shall be user selectable in 2-, 4-, 8-, or 24-hour periods. The guard interval shall start when an off-premises report is sent. One of two conditions will exist at the end of the guard interval. Either all events have been cleared or events remain active. The system shall enter a state where it waits for the next event if all events have been cleared. The system shall send a “reminder” report and shall extend the guard period by one guard interval if events are still active. This cycle shall occur indefinitely until all events are cleared. Only a single reminder shall be sent per guard interval even though there may be a mixture of alarms and troubles/supervisories active. The reminder message shall show the control unit that has an alarm or trouble/supervisory and will shall indicate that this is a reminder message. It shall contain a hyperlink to the control unit’s ICM where detailed status information and event history are available.

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- F. The system shall wait 10 minutes before sending a off-premises report when a trouble or supervisory event is first detected. A report shall be sent, subject to the rules stated above, if the trouble/supervisory still exists and the end of this time. This procedure shall prevent off-premises reports from being sent as a result of maintenance operations and transient conditions.
- G. The e-mail off-premises-reporting feature shall be capable of being tested on-line by clicking the Test button on the ICM's Software Setup screen. This shall send a test e-mail to each recipient in order to verify correct operation of the e-mail server and routing to each recipient. The system shall also be configurable to send a test e-mail periodically during normal operations in order to verify correct operation. The test interval shall be a user-selectable period of 1, 7, 30, 90, or 365 days.