This master should be used by designers working on Port of Portland construction projects and by designers working for PDX tenants (“Tenants”). Usage notes highlight a few specific editing choices, however the entire section should be evaluated and edited to fit specific project needs.

SECTION 283100 - FIRE DETECTION AND ALARM

1. GENERAL
	* + 1. DESCRIPTION
				1. Install a complete point addressable and fully programmed fire alarm system to interface through the existing Siemens Building Technologies Apogee Life Safety 3 (ALS3) fire alarm panel with the FireWorks network. Performance of the added system shall meet all performance aspects of the existing Siemens ALS3 system. Work shall include but not be limited to:

Edit or delete the following subparagraphs, or any of their following items, as appropriate.

Providing UL-listed, electrically operated, electrically supervised, stand-alone fire alarm control panel with connection to the existing FireWorks network.

Providing alarm silence switch in all new ALS3 panels to override alarm while testing water flow. Switch in silence position shall be monitored as a trouble alarm.

Providing voice evacuation amplifiers.

Providing alarm initiating devices: manual pull stations, area smoke detectors, and duct detectors as required.

Providing monitor modules and wiring (conduit, wire, etc.) required to power and/or interconnect devices supplied under other divisions, including:

Sprinkler valve supervisory switches.

Sprinkler valve flow switches.

Fuel shut off switches.

Loading bridge heat detectors.

Automatic transfer switch.

Sanitary lift station alarm.

Revolving vestibules.

Providing detection devices, control, and/or monitor modules to:

Signal HVAC system to shut down new air handling units.

Interrupt power to magnetic locks at emergency exits.

Signal HVAC system to release fire/smoke dampers.

Provide control signals to elevators for recall and power shutdown.

Connecting second coil of public address system speakers in public areas to fire alarm system.

Providing single coil fire alarm speakers as shown on the drawings.

Providing visual/audible alarm devices.

Providing software and programming required to interface new fire alarm equipment to the existing FireWorks network. Work shall include but not be limited to:

Providing the necessary programming, start-up, and testing of new point addressable loops to ensure fire detection and transmission of all automatic and manual trouble and alarm signals to the existing FireWorks network.

Generating graphic representation of the floor plans showing all initiating and indicating devices, using symbols consistent with NFPA standards.

Assigning each point with hardware address, Port-approved point description and associated message.

Generating system one-line diagram with direct screen access to selected system graphic through screen pointing device.

Building floor plan graphics to contain resident overall site Key Plan for instant access to selected building through screen pointing device.

Update Port’s existing AutoCAD fire alarm system drawings as follows:

System architecture drawing.

Schedule of alarm and detection device addresses and descriptions.

Floor plans at 1:10" scale showing location and addresses of all alarm and detection devices.

* + - 1. RELATED WORK SPECIFIED ELSEWHERE

Edit or delete any of the following related work paragraphs, as required, and add Section numbers, as appropriate.

* + - * 1. Section 260500, Common Work Results for Electrical
				2. Section 260519, Low-Voltage Electrical Power Conductors and Cables
				3. Section 260533, Raceway and Boxes for Electrical Systems
				4. Water Flow Switches.
				5. Sprinkler Valve Supervisory Switches.
				6. Air Handler and Fire/Smoke Damper Control.
				7. Division 14, Conveying Equipment, for moving walks, elevators, and escalators.
				8. Section 347716, Baggage Conveyors.
				9. Fuel Control System.
				10. Sanitary Lift Stations.
				11. Revolving Vestibules.
			1. REFERENCES
				1. ADA: Americans with Disabilities Act
				2. ANSI: American National Standards Institute
				3. FCC: Federal Communications Commission

FCC Part 15: Radio Frequency Devices

* + - * 1. IBC: International Building Code
				2. ISO: International Organization for Standardization
				3. NFPA: National Fire Protection Association

NFPA 72: National Fire Alarm and Signaling Code

NFPA 72D: Installation Maintenance and Use of Proprietary Protective Signaling Systems for Watchman Fire Alarm and Supervisory Service

* + - * 1. UL: Underwriters Laboratories

UL 864: Standard for Control Units and Accessories for Fire Alarm Systems

* + - 1. CODES AND APPROVALS
				1. Obtain all necessary approvals from local authorities, for all materials to be supplied, methods of installation and system operations, as required herein and by the local authorities. Unless otherwise specified, the following standards apply:

UL 864.

NFPA 72D.

* + - * 1. All electronic equipment shall conform to the requirements of FCC regulation Part 15, Section 15 governing radio frequency electromagnetic interference and be so labeled.
				2. Use only components listed in the FM Global Research Approval Guide and only components listed for use together.
			1. SUBMITTALS
				1. Pre-Design Narrative:

Prepare pre-design narrative of anticipated system design. Include:

Proposed connection to existing fire alarm system.

ALS3 panel requirements or impacts.

Voice evacuation requirements or impacts.

Types of alarm initiating devices and general locations of use.

Types of monitoring modules and uses.

Visual alarm devices and general locations of use.

Edit or delete smoke detectors, manual pull stations, visual alarm devices, and/or speakers, as required.

* + - * 1. Submit technical data on all equipment, including the fire alarm control panel, smoke detectors, manual pull stations, visual alarm devices, and speakers.
				2. Submit data regarding communication cables.
				3. Submit equipment installation details and drawings.
				4. Submit schedule of point descriptors to the Port for review and approval prior to final FireWorks programming.
				5. Submit operation and maintenance manuals.
				6. Required submittals for existing FireWorks network include:

Sketches of all graphics.

Graphic penetration tree showing all graphics and all points.

Data entry forms for initial parameters. Provide English listing of all analog points with columnar blanks for high and low warning limits and high and low alarm limits. Do not proceed with data entry until all text and graphics have been approved by the Port.

Detailed color conventions proposed for all graphics and graphic elements and states.

* + - 1. DRAWINGS
				1. Shop Drawings:

Prepare shop drawings of the system design. Shop drawings shall be new, prepared by the Contractor utilizing AutoCAD and project backgrounds.

Shop drawings shall include, but not be limited to, the following:

Complete floor plans with all systems included as part of the work of this section shown, 1/8" = 1'-0" scale.

Sections of congested areas at 1/4" = 1'-0" scale.

Controls at scale to suit controls supplier.

Fabricated equipment at not less than 1/4" = 1'-0" scale.

Shop drawings shall indicate, but not be limited to, the following:

Conduit routing and wiring.

Control and riser diagrams.

Schematic diagrams.

Panel and elevations.

Sequence of operation.

* + - * 1. Installation Drawings shall consist of reproducible drawings with all outlets, devices, terminal cabinets, conduits and wiring. Submit prints of these drawings prior to starting installation.

The Contractor-submitted drawings, when approved by the Port, shall then form the basis for installation.

At the completion of the work, incorporate all deviations from the installation into the reproducibles to indicate “as-built” conditions. Submit these drawings to the Port as record drawings for the system.

Delete if work is not at PDX.

* + - * 1. PDX System Master Plan:

Upon completion of the work, the Contractor shall have the PDX systems master plan updated by the vendor to reflect the as-constructed configuration of the fire alarm system.

Costs for update, reproduction, and distribution of the system master plans shall be borne by the Contractor.

Submit updated master plan in hard copy and on CD.

* + - 1. QUALITY ASSURANCE
				1. Equipment shall be approved in accordance with NFPA and IBC requirements and shall be UL-listed both in individual components and as a system.
				2. Installation shall be supervised and tested by the manufacturer of the system equipment. The work shall be performed by skilled technicians under the direction of experienced engineers, all of whom shall be properly trained and qualified for this work.
				3. Perform programming and testing of fire alarm system with factory trained personnel.
			2. AUTOMATIC OPERATION FUNCTIONS
				1. Upon actuation of any fire alarm initiating device, fuel shutdown switch, automatic transfer switch activation, or sprinkler system waterflow switch, the following shall automatically occur:

The alarm condition shall be annunciated visually by a flashing red “Common Alarm” LED in the ALS3. Intelligent circuits shall indicate the appropriate circuit and device in alarm via unique LEDs or a numeric LED display of the appropriate circuit and device number.

The alarm shall be graphically displayed on the existing FireWorks network located in the airport Communications Center and fire station.

* + - * 1. Upon activation of a sprinkler valve supervisory switch, the above sequence shall be initiated. Supervisory alarm shall be differentiated from a trouble condition on the circuit.
				2. Upon actuation of a combination of fire sprinkler system water flow and any fire alarm initiating device within the fire sprinkler system zone of origin, the system shall activate all alarm indicating devices within the zone of origin.

The alarm signals shall sound continuously until manually silenced by authorized personnel or until five minutes have elapsed, when they shall automatically be silenced. It shall be possible to acknowledge the alarm at the ALS3 and silence the local audible without silencing the alarm indicating devices.

If communication with the main operating console is interrupted for any reason the fire alarm panel shall function in stand alone capacity, activating fire alarm indicating devices and initiating municipal connection, upon actuation of any fire alarm initiating device.

Interrupt power to all secured egress doors within that zone via a control module residing on the addressable loop.

Edit or delete the following paragraph, as required.

* + - * 1. In addition to the above, the fire alarm system shall perform the following: Initiate elevator control functions; capture the elevators and return them to the enplaning level, except if the fire is on enplaning level, then the elevators shall be returned to the deplaning level.
				2. Provide all smoke detector circuits with alarm verification with field-adjustable time from 0 to 60 seconds.
				3. Circuits that utilize addressable analog sensors shall perform in accordance with NFPA 72 Series Style B. A verified alarm shall initiate the sequence described above.
				4. Upon detection of an alarm within an HVAC zone, send a signal to the Metasys system to shut down air handling units.
			1. MANUAL OPERATION FUNCTIONS
				1. At any time, even without an alarm condition on an initiating circuit, the operator shall have the following manual capabilities at the ALS3 by means of the user interface located behind a key-locked cover:

Initiate the general alarm signal.

Silence the local audible signal. This shall also cause the LED(s) to cease flashing and to be on continuously.

Silence the alarm signals.

Disable the central station (Remote Station) transmitter.

Reset the ALS3 after all initiating devices have been restored to normal.

Disconnect any individual initiating or indicating circuit from the alarm sequence. This action shall light a “Disconnect” LED and cause a trouble condition.

Perform a complete operational test of the system microprocessor with a visual indication of satisfactory communications with each board.

Test all panel LEDs for proper operation without causing a change to the condition on any zone.

* + - * 1. It shall be possible to command test, reset and alarm silence from both the ALS3 and the main operating console.
			1. SYSTEM SUPERVISION FUNCTIONS
				1. Upon application of primary power, or reapplication following power failure, the ALS3 shall automatically energize all circuitry and shall automatically be in a normal supervisory condition.
				2. In the normal supervisory condition, only the green “Power” LED, indicating the presence of primary power and the green “Run” LED, indicating the normal operation of the microprocessor and memory data shall be illuminated. All initiating and indicating device circuits shall be electrically supervised.
				3. Upon power failure, the system shall sound an audible trouble signal. Standby power will be automatically provided by the system’s batteries. The system’s batteries and power supply shall be sized to provide four hours of supervisory operation with the capability of sounding the general alarm for at least fifteen minutes at any time during the four-hour period following the loss of AC power. Following restoration to normal AC power, the trouble indicators shall be automatically reset.
				4. An open circuit in an initiating loop shall cause the common trouble LED at the ALS3 to be lighted. The trouble audible at the ALS3 will sound.
				5. Other circuit faults in the system shall light the common trouble LED and sound the audible trouble signal at the ALS3. The LED assigned to the specific fault shall light at the ALS3. Individual LEDs shall be provided for central station (Remote Station) disconnect, initiating or indicating circuit disconnect, ground fault on any extended system wiring, low battery voltage and fault on any initiating or signaling circuit.
				6. Operation of a momentary “Silence” switch shall silence the audible trouble signal, but the visual “Trouble” LEDs shall remain on until the malfunction has been corrected and the system reset. To prevent the system from being inadvertently left in an abnormal condition, the “Silence” function shall be such that a new trouble condition will re-initiate the sequence above.

Use for PDX only.

* + - 1. SAFETY FIRE WATCH
				1. If an area defined by four or more detectors is out of service for more than four hours, then a fire watch shall be provided by the Contractor until the fire detection system is back in service for the specific area. If large areas of the facility are not being monitored by the fire detection system, then the fire watch shall be responsible for monitoring the entire affected area on a regular basis. The purpose of the fire watch will be to notify the Portland International Airport Communications Center in the event that a fire occurs in the space. The person providing the fire watch may be a construction worker assigned to or working in the area, and shall be provided 24 hours per day, 7 days per week through the duration of the project.
1. PRODUCTS

Per Port’s Contract Review Board Rules adopted Nov. 12, 2003, the Apogee Life Safety 3 (ALS3) point addressable fire alarm system and Fire Works graphically interfaced Fire Life Safety detection system are approved “No Substitution” exemptions when used at the PDX airport. Exemptions expire December 31, 2021.

* + - 1. MANUFACTURER
				1. All fire alarm system components furnished under this contract shall be fully addressable and compatible with the existing Siemens ALS3 fire alarm system and shall integrate directly with the Siemens ALS3 fire alarm panel currently installed. All devices shall report fully through the ALS3 fire alarm panel to the Siemens Fireworks graphic monitoring system through the ALS3 network with no compromise to the operation, as determined by the Port. Features such as detector sensitivity analysis, status indication, device reporting, and device programming shall be fully functional as intended by the manufacturer. All fire alarm products shall be manufactured or furnished by Siemens Building Technologies. No substitutions will be permitted.
			2. FIRE ALARM CONTROL PANEL (SIEMENS ALS3)
				1. The ALS3 shall be:

UL listed independently as a fire alarm control unit in addition to being listed as a critical component in a proprietary multiplex system.

Of a solid state, modular design with integral static protection. All indicating lamps shall be long-life, low-maintenance, solid state light-emitting diodes (LEDs) with rated life of 40 years.

* + - * 1. All controls shall be labeled, all zone locations shall be identified, and the ALS3 shall be provided with a set of permanently mounted operating instructions, to avoid confusion. Zone location identification shall be as approved by the Port and contain up to three lines of text with 1/8‑inch minimum character height.
				2. Include the following:

Central Processor, 3-CPU1:

16-bit processor.

1750 history events.

RS-485 local rail communications.

Multiplexed audio channels.

Display Module, 3-LCD:

Displays system events in text format.

Provides a minimum of 8 lines by 21 characters.

In addition to the standard control switches, provide Setup, Test, Manual Evacuation Alarm, and Acknowledge switches. Provide LEDs for “Power,” “Run,” “Trouble,” “Disconnect,” “Low Battery,” and “Ground Fault.”

Control Display Module, 3-12SG:

Zone annunciation with zone disable.

Power Supplies, 3-PPS/M, 3-BPS/M:

Capable of being paralleled.

Perform automatic load test of batteries.

Sufficient to power the components of the ALS3 and initiating and indicating devices.

Signature Driver Controllers, 3-SSDC:

Intelligent interface between central processor and Signature Series devices.

Supports up to 125 detectors and 125 modules.

Network Communications Card.

Batteries:

Sufficient capacity to provide the indicated operation.

Maintenance-free, sealed lead-acid type.

* + - * 1. Enclosure: ALS3 electronics and control switches shall be contained in an enclosure made of minimum 14-gauge steel. Access to ALS3 switches and electronics shall be via key lock (key locks shall match existing ALS3 panel locks); no other tools shall be required. Visual indicators of ALS3 status shall be visible without opening the key-locked cover.
			1. INTEGRATED AUDIO
				1. The fire alarm system shall incorporate a true digital integrated audio system into the network, multiplexing eight independent audio channels over a single pair of wires. Include distributed audio amplifiers, one for each speaker circuit, for superior system survivability.
				2. Provide a local temporal backup tone at each amplifier to allow evacuation signals to be broadcast in the protected premises in the event of a loss of data communication from the multiplexed audio riser.
				3. A digital message unit shall be provided which provides up to 32 minutes of pre-recorded emergency messaging. The message contained in the fully digital message unit shall be recordable in the field on a computer and directly downloaded to the audio source unit.
			2. AUDIO SOURCE UNIT
				1. The fire alarm system shall have a fully integrated emergency communications system. The emergency communications system shall include a paging microphone, digital message playback unit, and eight fully digitized and multiplexed audio channels. Four dedicated page mode control switches shall provide the emergency operator with instantaneous one-touch paging to safely control the staged evacuation of building occupants. Automatic programming shall dynamically group the most frequently targeted paging zones:

The All Call switch shall direct the manual page to the entire facility.

The Page To Evac switch shall direct the manual page to those building areas automatically receiving the evacuation signal.

The Page To Alert switch shall direct the manual page to those building areas automatically receiving the alert signal.

The All Call Minus switch shall direct the manual page to those building areas which are currently not selected to receive either the alert or evacuation signal.

* + - * 1. The system shall have paging control switches and LEDs to support specific zone selection as shown on the drawings. The zone control/displays shall confirm amplifier selection and shall annunciate amplifier and amplifier circuit trouble.
				2. Incorporate a 3‑second pre-announce signal, which shall be digitally programmable as either a tone or voice message. The pre-announce signal shall be configurable to occur only during an alarm condition or to occur always, whenever the emergency operator presses the microphone talk key.

A “Ready-To-Page” LED shall flash during the pre-announce and shall turn steady when the system is ready for the user’s page delivery. This light shall illuminate only after all automatic speaker selection has been confirmed by the system.

Include a programmable page deactivation timer that activates when the emergency user releases the microphone talk key. Should the user subsequently press the microphone key during the deactivation period, a page can be delivered immediately. Should the timer complete its cycle, the system shall automatically restore emergency signaling, and any subsequent paging shall be preceded by the pre-announce tone. A VU display shall display microphone audio level to the emergency operator.

* + - 1. AUDIO AMPLIFIERS
				1. Each audio power amplifier shall have integral audio signal de-multiplexers, allowing the amplifier to select any one of eight digitized audio channels. The channel selection shall be directed by the system software. Up to eight multiple and different audio signals shall be able to broadcast simultaneously from the same system network node/panel.

Each amplifier output shall include a dedicated, supervised 25/70 VRMS speaker circuit that is suitable for connection of emergency speaker appliances.

Each 15-watt or 30-watt amplifier shall also include a notification appliance circuit (NAC) rated at 24Vdc at 3.5A for connection of visible (strobe) appliances. This circuit shall be fully programmable and able to define the circuit for support of audible, visible, or ancillary devices. The NAC shall be fully power-limited; circuits which are current-limited without respect to voltage are not acceptable.

* + - * 1. Provide standby audio amplifiers to automatically sense the failure of a primary amplifier. These amplifiers shall automatically program themselves to select the same audio information channel of the failed primary amplifier, and shall fully replace the function of the failed amplifier. Systems which do not provide the ability of one amplifier to select and back up any channel shall provide a separate backup amplifier for each of the eight digital audio channels.

At least one standby amplifier shall be provided in each node or cabinet where amplifiers are present. This amplifier shall be sized for the maximum load for that location.

* + - * 1. In the event of a total loss of digital audio data communications either between nodes or within a cabinet, all amplifiers shall default to the local EVAC channel. If the panel has an alarm condition, then all amplifiers shall select an integral backup tone generator to provide evacuation signaling to the speaker circuits.

A backup tone generator for evacuation signaling is required at every amplifier location. The tone shall be the temporal pattern as specified in the ANSI/NFPA/ISO standards.

* + - * 1. Audio amplifiers shall automatically detect a short circuit condition on the connected speaker circuit wiring, and shall be inhibited from driving into that short circuit condition.
			1. INTELLIGENT DETECTORS - GENERAL OPERATION
				1. The intelligent detectors shall be capable of full digital communications using both broadcast and polling protocol. Each detector shall be capable of performing independent fire detection algorithms. The fire detection algorithm shall measure sensor signal dimensions and time patterns, and shall combine different fire parameters to increase reliability and distinguish real fire conditions from unwanted deceptive nuisance alarms. Signal patterns that are not typical of fires shall be eliminated by digital filters. Devices not capable of combining different fire parameters or employing digital filters are not acceptable.
				2. Each detector shall have an integral microprocessor capable of making alarm decisions based on fire parameter information stored in the detector head. Distributed intelligence shall improve response time by decreasing the data flow between detector and intelligent loop controller. Detectors not capable of making independent alarm decisions will not be acceptable. Maximum total intelligent loop response time for detecting a changing state shall be 0.5 seconds.
				3. Each detector shall have a separate means of displaying communication and alarm status. A green LED shall flash to confirm communication with the intelligent loop controller. A red LED shall flash to display alarm status. Both LEDs on steady shall indicate alarm stand-alone mode status.
				4. The detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector and shall be accessible through a laptop download or connection of a service tool.
				5. Each smoke detector shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble, and need cleaning information. It shall be possible to program control panel actions to each level. Each smoke detector may be individually programmed to operate at any one of five sensitivity settings and shall also provide for an alternate sensitivity setting.
				6. Each detector microprocessor shall contain an environmental compensation algorithm, which identifies and sets ambient environmental thresholds approximately six times an hour. The microprocessor shall continually monitor the environmental impact of temperature, humidity, and other contaminates, as well as detector aging. The process shall employ digital compensation to adapt the detector to both 24-hour long term and 4-hour short term environmental changes. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 50 percent and 100 percent of the allowable environmental compensation value. Differential sensing algorithms shall maintain a constant differential between selected detector sensitivity and the learned base line sensitivity. The base line sensitivity information shall be updated and permanently stored at the detector approximately once every hour.
				7. The intelligent device and the intelligent loop controller shall provide increased reliability and inherent survivability through intelligent stand-alone operation. The device shall automatically change to stand-alone conventional device operation in the event of a loop controller polling communications failure. In the stand-alone detector mode, the analog detector shall continue to operate using sensitivity and environmental compensation information stored in its microprocessor at the time of communications failure. The intelligent loop controller shall monitor the loop and generate a loop alarm if any detector indicates an alarm condition.
				8. Each intelligent device shall be capable of automatic electronic addressing and/or custom addressing without the use of DIP or rotary switches. Devices using DIP or rotary switches for addressing, either in the base or on the detector, will not be acceptable.
				9. The intelligent detectors shall be suitable for mounting on a standard, relay, or isolator-type detector mounting base. The intelligent detectors shall not require special twisted or shielded wiring to operate properly.
			2. INTELLIGENT DETECTORS - FIXED TEMPERATURE HEAT DETECTOR
				1. The intelligent heat detector shall have a low mass thermistor heat sensor and operate at a fixed temperature. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and shall initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions will not be acceptable. The heat detector shall have a nominal alarm point rating of 135ºF. The heat detector shall be rated for ceiling installation at a minimum of 70-foot centers and shall be suitable for wall mount applications.
				2. Use in Baggage Road applications.
			3. INTELLIGENT DETECTORS - MULTISENSOR DETECTOR – 3D
				1. The intelligent multisensor analog detector shall use a light-scattering type photoelectric smoke sensor and an ambient temperature sensor to sense changes in air samples from its surroundings. The integral microprocessor shall employ time-based algorithms to dynamically examine values from the two sensors simultaneously and shall initiate an alarm based on that data. The multisensor detector shall be capable of adapting to ambient environmental conditions. The temperature sensor shall self-adjust to the ambient temperature of the surrounding air and input an alarm when there is a change of 65ºF in ambient temperature. Systems using central intelligence for alarm decisions will not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental effects of dirt, smoke, temperature, age, and humidity. The information shall be stored in the integral processor and transferred to the intelligent loop controller for retrieval using a laptop PC or the service tool. Separately mounted photoelectric detectors and heat detectors in the same location, or algorithms, which combine information from multiple detectors mounted within an area, are not acceptable alternatives. The multisensor smoke detector shall be rated for ceiling installation at a minimum of 30-foot centers and suitable for wall mount applications. The multisensor shall be suitable for direct insertion into air ducts up to 3 feet high and 3 feet wide, and air velocities up to 500 feet per minute without requiring specific duct detector housings or supply tubes.
				2. The percent of smoke obscuration per foot alarm set point shall be field-selectable to any of five sensitivity settings ranging from 1.0 to 3.5 percent. The integral heat sensor shall cause an alarm when it senses a change in ambient temperature of 65ºF or reaches its fixed temperature alarm set point of 135ºF nominal. The multisensor detector shall be suitable for operation in the following environment:

Temperature: 32ºF to 100ºF.

Humidity: 0-93 percent RH, non-condensing.

Elevation: Up to 6,000 feet.

* + - * 1. Use in duct detector applications.
			1. INTELLIGENT DETECTORS - MULTISENSOR DETECTOR – 4D
				1. The intelligent multisensor analog detector shall use a light-scattering type photoelectric smoke sensor, a uni-polar ionization smoke sensor, and an ambient temperature sensor to sense changes in air samples from its surroundings. The integral microprocessor shall employ time-based algorithms to dynamically examine values from the three sensors simultaneously and shall initiate an alarm based on that data. The multisensor detector shall be capable of adapting to ambient environmental conditions. The temperature sensor shall self-adjust to the ambient temperature of the surrounding air and input an alarm when there is a change of 65ºF in ambient temperature. Systems using central intelligence for alarm decisions will not be acceptable. The detector shall continually monitor any changes in sensitivity due to the environmental effects of dirt, smoke, temperature, age, and humidity. The information shall be stored in the integral processor and transferred to the intelligent loop controller for retrieval using a laptop PC or the service tool. Separately mounted photoelectric detectors, ionization detectors, and heat detectors in the same location, or algorithms, which combine information from multiple detectors mounted within an area, are not acceptable alternatives. The multisensor smoke detector shall be rated for ceiling installation at a minimum of 30-foot centers and suitable for wall mount applications.
				2. The percent of smoke obscuration per foot alarm set point shall be field-selectable to any of five sensitivity settings ranging from 1.0 to 3.5 percent. The integral heat sensor shall cause an alarm when it senses a change in ambient temperature of 65ºF or reaches its fixed temperature alarm set point of 135ºF nominal. The multisensor detector shall be suitable for operation in the following environment:

Temperature: 32ºF to 100ºF.

Humidity: 0-93 percent RH, non-condensing.

Elevation: Up to 6,000 feet.

* + - 1. INTELLIGENT DETECTORS - MOUNTING BASES
				1. Standard detector mounting bases shall be suitable for mounting on 1-gang, 3 1/2-inch or 4‑inch octagon boxes and 4-inch square boxes. The mounting base shall contain no electronics and shall support all intelligent detector types specified above. The mounting base shall have the following minimum requirements:

Removal of the respective detector shall not affect communications with other detectors.

Terminal connections shall be made on the room side of the base. Bases that must be removed to gain access to the terminals will not be acceptable.

The base shall be capable of supporting one remote alarm LED indicator.

* + - 1. INTELLIGENT DETECTORS - RELAY BASES
				1. Relay detector mounting bases shall be suitable for mounting on 1-gang, 3 1/2‑inch or 4‑inch octagon boxes and 4-inch square boxes. The relay shall support all intelligent detector types listed above, and shall have the following minimum requirements:

The relay shall be a bi-stable type and selectable for normally open or normally closed operation.

The position of the contact shall be supervised.

The relay operation shall be exercised by the detector processor upon power up.

The relay shall automatically de-energize when a detector is removed.

The operation of the relay base shall be controlled by its respective detector processor. Detectors operating in stand-alone mode shall operate the relay upon changing to alarm state. Relay bases not controlled by the detector microprocessor will not be acceptable.

Form C relay contacts shall have a minimum rating of 1 amp at 30 VDC and shall be listed for pilot duty.

Removal of the respective detector shall not affect communications with other detectors.

Terminal connections shall be made on the room side of the base. Bases that must be removed to gain access to the terminals shall not be acceptable.

Only keep the following article if Class A circuits are used for the fire alarm, otherwise delete.

* + - 1. INTELLIGENT DETECTORS - ISOLATOR DETECTOR BASES
				1. Detector mounting bases shall be suitable for mounting on 1-gang, 3 1/2‑inch or 4‑inch octagon boxes and 4-inch square boxes. The operation of the isolator base shall be controlled by its respective detector processor. Isolators that are not controlled by a detector processor will not be accepted. Following a short circuit condition, each isolator/detector shall be capable of performing an internal self-test procedure to re-establish normal operation. Isolator/detectors not capable of performing independent self tests will not be acceptable. The isolator base shall support all detector types specified above and shall have the following minimum requirements:

The isolator shall operate within a minimum of 23 milliseconds of a short circuit condition on the communication line.

When connected in Class A configuration, the intelligent loop controller shall identify an isolated circuit condition and provide communications to all non-isolated analog devices.

Terminal connections shall be made on the room side of the base. Bases that must be removed to gain access to the terminals will not be acceptable.

* + - 1. INTELLIGENT DETECTORS - DUCT DETECTOR MOUNTING PLATE
				1. Provide a mounting plate assembly suitable for mounting an intelligent detector for direct insertion into a low velocity duct 3 feet high and 3 feet wide, ceiling plenum, or raised floor. The mounting plate shall be code gauge steel with corrosion resistant red enamel finish. The detector mounting plate shall support an intelligent analog photoelectric detector, or photoelectric/heat combination detector, or multisensor detector along with a standard, relay, or isolator detector mounting base. Locate duct detector according to NFPA 72 recommendations.
			2. INTELLIGENT DUCT DETECTOR HOUSING
				1. Provide a metal smoke detector duct housing assembly for mounting an intelligent photoelectric, photoelectric/heat combination, or multisensor detector to an air duct. The housing shall allow for mounting a standard, isolator, or relay base as required for the application. Provide for variations in duct air velocity between 300 and 4000 feet per minute (300 to 1000 for multisensor detector). Protect the measuring chamber from damage and insects. Provide an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten feet. Provide drilling templates and gaskets to facilitate locating and mounting the housing. Provide five 1-gang knockouts for mounting optional intelligent modules. Finish the housing in baked red enamel. Provide remote alarm LEDs and test stations.
			3. INTELLIGENT DETECTORS - REMOTE ALARM LED
				1. Provide a remote LED alarm indicator anywhere a detector LED is not visible from below. LED shall have a 180‑degree viewing angle and shall mount on a standard 1-gang box. Finish shall be high impact white plastic and shall be clearly marked as an alarm device.
			4. INTELLIGENT MODULES - GENERAL
				1. It shall be possible to address each intelligent module without the use of switches. Devices using switches, or requiring special tools for addressing, will not be acceptable. The personality of multi-function modules shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the analog loop controller. Modules requiring EPROM, PROM, or ROM changes, or switch and/or jumper changes will not be acceptable.
				2. The modules shall have a minimum of two diagnostic LEDs mounted behind a finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes that can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment:

Temperature: 32ºF to 120ºF.

Humidity: 0-93 percent RH, non-condensing.

* + - 1. SINGLE INPUT MODULE
				1. The intelligent single input module shall provide one supervised Class B input circuit capable of a minimum of four personalities, each with a distinct operation. The module shall be suitable for mounting on 2 1/2-inch deep, 1-gang boxes and 1 1/2-inch deep, 4‑inch square boxes with 1‑gang covers. The single input module shall support the following circuit types:

Normally open alarm latching (manual stations, heat detectors, etc.).

Normally open alarm delayed latching (waterflow switches).

Normally open active non-latching (monitor, fans, dampers, doors, etc.).

Normally open active latching (supervisory, tamper switches).

* + - 1. DUAL INPUT MODULE
				1. The intelligent dual input module shall provide two supervised Class B input circuits, each capable of a minimum of four personalities, each with a distinct operation. The module shall be suitable for mounting on 2 1/2-inch deep, 1-gang boxes and 1 1/2-inch deep, 4‑inch square boxes with 1-gang covers. The dual input module shall support the following circuit types:

Normally open alarm latching (manual stations, heat detectors, etc.).

Normally open alarm delayed latching (waterflow switches).

Normally open active non-latching (monitor, fans, dampers, doors, etc.).

Normally open active latching (supervisory, tamper switches).

* + - 1. MONITOR MODULE
				1. The intelligent monitor module shall be factory set to support one supervised Class B normally open active non-latching monitor circuit. The monitor module shall be suitable for mounting on 2 1/2-inch deep, 1-gang boxes and 1 1/2-inch deep, 4-inch square boxes with 1‑gang covers.
			2. SINGLE INPUT SIGNAL MODULE
				1. The intelligent single input (single riser select) signal module shall provide one supervised Class B output circuit capable of a minimum of two personalities, each with a distinct operation. When selected as a telephone power selector, the module shall be capable of generating its own ring tone. The module shall be suitable for mounting on 2 1/2‑inch deep, 2‑gang boxes and 1 1/2-inch deep, 4-inch square boxes with 2-gang covers. The single input signal module shall support the following operations:

Audible/visible signal power selector (polarized 24 VDC at 2A, 25Vrms at 50w, or 70 Vrms at 35w of audio).

Telephone power selector with ring tone.

* + - 1. DUAL INPUT SIGNAL MODULE
				1. The intelligent dual input (dual riser select) signal module shall provide a means to selectively connect one of two signaling circuit power risers to one supervised output circuit. The module shall be suitable for mounting on 2 1/2-inch deep, 2-gang boxes and 1 1/2-inch deep, 4‑inch square boxes with 2-gang covers. The dual input signal module shall support the following operation:

Audible/visible signal power selector (polarized 24 VDC at 2A, 25 Vrms at 50w or 70 Vrms at 35w of audio).

* + - 1. CONTROL RELAY MODULE
				1. The intelligent control relay module shall provide one form C dry relay contact rated at 2 amps at 24 VDC to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty. The position of the relay contact shall be confirmed by the system firmware. The control relay module shall be suitable for mounting on 2 1/2-inch deep, 1-gang boxes and 1 1/2-inch deep, 4-inch square boxes with 1-gang covers.
			2. INTELLIGENT DOUBLE ACTION FIRE ALARM STATION
				1. Provide intelligent double action, single stage fire alarm stations. The fire alarm station shall be of lexan construction with an internal toggle switch. Provide a locked test feature. Finish the station in red with white “PULL IN CASE OF FIRE” lettering. The manual station shall be suitable for mounting on 2 1/2-inch deep, 1-gang boxes and 1 1/2-inch deep, 4-inch square boxes with 1-gang covers.
			3. BEAM TYPE SMOKE DETECTORS
				1. Provide projected beam type smoke detectors. The beam detectors shall be four-wire 24 VDC and powered from the control panel four-wire smoke power source. This unit shall consist of a separate transmitter and receiver capable of being powered separately or together. This unit shall operate in either a short range of 30 to 100 feet or a long range of 100 to 300 feet. The detector shall feature a bank of four alignment LEDs on both the receiver and transmitter that are used to ensure proper alignment without the use of special tools.
				2. The beam detector shall feature automatic gain control that shall compensate for gradual signal deterioration from dirt accumulation on lenses. Ceiling or wall mount as shown on the drawings. Testing shall be carried out using calibrated test filters. Provide a key activated remote test station.
				3. Provide monitor modules for alarm and trouble and control relay module for reset.
			4. FIRE ALARM NOTIFICATION APPLIANCES - GENERAL REQUIREMENTS
				1. All appliances which are supplied for the requirements of this specification shall be UL-listed for fire protective service, and shall be capable of providing the “Equivalent Facilitation,” which is allowed under the Americans with Disabilities Act Accessibility Guidelines (ADA[AG]), and shall be UL 1971 and ULC S526-listed.
			5. SELF-SYNCHRONIZED STROBES
				1. Strobes shall be supplied by the panel manufacturer to ensure system compatibility and proper UL compatibility listings. In/out screw terminals shall be provided for wiring. Screw terminals shall be rated for No. 12 AWG wire. The strobes shall have a red or white metal face plate, as selected. Strobes shall be synchronized to meet the requirements of ADA and NFPA standards. It is the requirement of the system provider to assign the proper candela-rated strobe appliance to each area based on the size and requirement of the area of coverage. Mount strobes in 4-inch square boxes. The strobe shall have lens markings oriented for wall mounting. Ceiling mounted strobes shall have lens markings with correctly oriented lettering. Removal of an installed strobe to change the lens markings will not be acceptable.
			6. BELL/STROBE ADAPTER PLATES
				1. The bell/strobe plates shall be supplied by the panel manufacturer to ensure system compatibility and proper UL compatibility listings. In/out polarized wire leads shall be provided for wiring. Screw terminals shall be rated for No. 12 AWG wire. The bell/strobe plates shall have a red metal face plate. It shall be possible to mount listed bells to the plate. Strobes shall be synchronized to meet the requirements of ADA and NFPA standards. It is the requirement of the system provider to assign the proper candela-rated strobe appliance to each area based on the size and requirement of the area of coverage. The strobe shall have lens markings oriented for wall mounting. Removal of an installed strobe to change the lens markings will not be acceptable.
			7. HORN/STROBES - ELECTRONIC TYPE
				1. Horn/strobes shall be supplied by the panel manufacturer to ensure system compatibility and proper UL compatibility listings. The horn/strobes shall have a red or white plastic housing as selected. Strobes shall be synchronized to meet the requirements of ADA and NFPA standards. It is the requirement of the system provider to assign the proper candela-rated strobe appliance to each area based on the size and requirement of the area of coverage. The strobe shall have lens markings oriented for wall mounting. Ceiling mounted strobes shall have lens markings with correctly oriented lettering. Removal of an installed horn/strobe to change the lens markings will not be acceptable. Horns shall provide a 100 dBA peak sound output with adjustable output level. Horns/strobes shall mount in 4-inch electrical boxes using the two screws provided with each box. Screw terminals shall be rated for No. 12 AWG wire. It shall not be necessary to completely remove the backbox screws to facilitate mounting.
				2. Horns shall include an integral synchronized, ANSI compliant, temporal alarm signal generator to comply with NFPA 72 requirements for use of the temporal pattern for evacuation signaling. Units shall not require external synchronization modules or coded outputs from the control panel.
			8. CONE TYPE SPEAKERS
				1. Speakers shall be mylar cone-type supplied by the panel manufacturer to ensure system compatibility and proper UL compatibility listings. Paper-type cones are not acceptable. The rear of the speaker shall be completely sealed, protecting the cone during installation. Screw terminals shall be provided for wiring. Screw terminals shall be rated for No. 12 AWG wire. Speaker housings shall be red or white as selected. Speakers shall be provided for use with 70V systems. Speakers shall provide power taps at 1/4w, 1/2w, 1w, and 2w. Speakers shall provide 90 dBA peak sound output at 2w. Mount speakers in 4‑inch electrical boxes with extension rings using the two screws provided with each ring. It shall not be necessary to completely remove the screws to facilitate mounting.
			9. CONE TYPE SPEAKER/STROBES
				1. Speaker/strobes shall be supplied by the panel manufacturer to ensure system compatibility and proper UL compatibility listings. Speaker/strobes shall have a red or white housing as selected. Speakers shall be mylar cone-type. Paper-type cones are not acceptable. The speakers shall be for use with 70V systems. Speakers shall provide power taps at 1/4w, 1/2w, 1w, and 2w. Speakers shall provide 87dBA peak sound output at 2w. Screw terminals shall be provided for wiring. Screw terminals shall be rated for No. 12 AWG wire. Strobes shall be synchronized to meet the requirements of ADA and NFPA standards. It is the requirement of the system provider to assign the proper candela-rated strobe appliance to each area based on the size and requirement of the area of coverage. The strobe shall have lens markings oriented for wall mounting. Ceiling mounted speaker/strobes shall have lens markings with correctly oriented lettering. Removal of an installed speaker/strobe to change the lens markings will not be acceptable. Mount speakers in 4‑inch electrical boxes with extension ring using the two screws provided with each ring. It shall not be necessary to completely remove the screws to facilitate mounting.
1. EXECUTION
	* + 1. GENERAL
				1. Completely check out, calibrate, and test all connected hardware and software to ensure the system performs in accordance with the specifications.
				2. Update diskette copies of all data file and application software for reload use in the event of a system crash or memory failure. Submit one copy to the Port during training session, and archive one copy within a local software vault provided by the Contractor.
				3. Existing system ALS3 panel modifications and shutdowns for additional system connections shall be coordinated with the Port. Obtain Port approval one week prior to any shutdown.
				4. Fire alarm devices shall be installed and activated within 48 hours of Siemens programming and downloading the program changes to the ALS3 network and the Fireworks workstations. If devices are not activated within that time frame, the Contractor shall, at his own expense, have Siemens restore the system programming to the condition that it was prior to making the programming changes.
			2. WIRING
				1. Install systems with all conduits, conductor outlet boxes, fittings, connectors and accessories necessary to ensure a complete, operable system in compliance with all applicable codes and regulations.
				2. Install conduits in accordance with Section 260533.
				3. Install all wiring in metal conduit or within equipment. Install conductors in accordance with Section 260519. Conductors within equipment enclosures shall be carefully cabled and laced. Individual conductors shall be tagged with E-Z code markers indicating circuit number and type. Use markers on all conductors at each outlet to pull box at each equipment enclosure.
				4. Outlet pull and junction boxes shall be painted red on the exterior and shall be installed in accordance with Section 260533.
				5. T-tapped connections will not be allowed on any supervised circuits. Connections shall be made directly to and from device terminal screws. Screw terminals shall have rising plates to terminate more than one wire or each wire shall be terminated to individual screws or each wire shall terminate in a ring lug.
			3. TRAINING
				1. Provide operation and maintenance training for Port personnel.
				2. Conduct a minimum of three maintenance training sessions (one for each shift). Maintenance training sessions shall include a walk-through of the completed facilities identifying the location, address, and means of access to every device monitored by the fire alarm system.
				3. Conduct training sessions for two operator levels.

Operator training. Provide a minimum of three refresher and system update training sessions (one for each shift) of on-the-job training.

Supervisor training. Provide a system update training session for supervisory functions.

* + - * 1. Training sessions shall be given by a fully qualified, trained representative of the equipment manufacturer who is thoroughly knowledgeable of the specific installation.
			1. TESTING AND REPORTS
				1. Upon completion of the system’s installation, an approved representative of the system manufacturer shall be employed to conduct a thorough test of the system and submit a written report of the findings to the Port.
				2. Submit an installation test procedure form to be used during testing. The installation tests shall not take place until the Port approves the form. The installation test procedure form shall follow a consistent format and shall:

Include overall test schedule, including time for unstructured testing.

Contain test number, name and description for each test.

Define each step-by-step procedure, providing the expected response for each step and providing space for the actual response.

Contain minimal reference to other documents.

Be structured so that simpler tests generally are run first.

Provide space for approval by both the Port and Contractor at each test.

* + - * 1. Exercise every function of the equipment during test to ascertain integrity of the equipment. Testing shall include verification of the following:

The functional operation of each resettable initiating device (manual stations, detectors, etc.) and circuit.

The functional operation of each and every alarm device and circuit.

The functional operation of each monitored device circuit.

The functional operation of each control circuit.

The supervision function of each initiating, indicating, monitoring, control, and supply circuit.

Transmission of all alarm and trouble conditions to the existing FireWorks network at the communications center in the airport terminal and the airport fire station.

* + - * 1. The tests shall be witnessed by the Port or a designated representative.
				2. Notify the Port in writing at least one week prior to the tests that the equipment is ready for testing.
				3. In the event that the tests are not successful in the first pass, correct deficiencies and notify the Port at least two days in advance, that testing is ready to resume.
				4. Document and maintain in a Problem Log File discrepancies found during testing. Describe the subsequent correction. The Port will verify proper operation of the system and its equipment. Faulty and/or incorrect operation of major functions may, at the discretion of the Port, be cause for suspending or restarting any test, pending correction of that problem. Minor discrepancies shall be noted, corrected, and retested. The Port may request that other system equipment that may be impacted by a correction be retested also.
				5. Submit all system acceptance testing reports to the Port for approval before acceptance of the system.
			1. LABELING
				1. Label all alarm initiating devices with 1-inch by 3-inch Lamicoid nameplates, indicating ALS3 point designation. Locate nameplates in vicinity of the device as approved by the Port.
				2. Provide Brady type wire markers to identify all conductors at each junction or terminal. Use numbers indicated on the wiring diagrams.

END OF SECTION 283100