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## UNIFIED FACILITIES GUIDE SPECIFICATIONS

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#### DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

##### SECTION 28 31 53.00 40

##### FIRE ALARM INITIATING DEVICES

06/06

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Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

#### NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2006) Life Safety Code, 2006 Edition
NFPA 70	(2005) National Electrical Code
NFPA 72	(2002) National Fire Alarm Code
NFPA 90A	(2002) Standard for the Installation of Air Conditioning and Ventilating Systems

#### UNDERWRITERS LABORATORIES (UL)

UL 268	(2003; R 2005) Standard for Smoke Detectors for Fire Alarm Signaling Systems
UL 38	(2005) Standard for Signaling Boxes for Fire Alarm Systems
UL 464	(2003) Standard for Audible Signal Appliances

### 1.2 SYSTEM REQUIREMENTS

Fire-alarm system shall be a supervised, noncoded electrical alarm system with NFPA 72 Style D initiating device circuits and NFPA 72 Style 7 signaling line circuits with control units electrically connected to sound the general alarm continuously upon operation of one or more initiating devices with remote reporting circuits. This system shall conform to the applicable requirements of NFPA 72, NFPA 70, NFPA 90A and NFPA 101.

System component installation in hazardous facilities shall be in accordance with NFPA 70.

Each circuit shall be individually and independently arranged so that an open circuit, a ground, or an open circuit and a ground occurring at the same time in the circuit will not prevent the transmission of a clear and intelligible alarm signal before the trouble is cleared.

Circuits shall be electrically supervised through closed-loop circuits to detect interruptions, shorts, or ground faults and report these as trouble.

### 1.3 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-01 Preconstruction Submittals

Material, Equipment, and Fixture Lists shall be submitted in accordance with paragraph entitled, "Fire Alarm Systems," of this section.

#### SD-02 Shop Drawings

Schematics shall be submitted by the Contracting Officer in accordance with paragraph entitled, "Alarm Control Units," of this section.

Installation drawings shall be submitted for fire-alarm and detection systems in accordance with the paragraph entitled, "Installation," of this section.

#### SD-03 Product Data

Manufacturer's catalog data shall be submitted for the following items:

- Fire Alarm Systems
- Alarm Control Units
- Heat-Actuated Detectors
- Product-Of-Combustion Detectors
- Manual Alarm Stations
- Vibrating Alarm Bells
- Wiring and Raceway
- Revolving Beacon
- Strobe Lights
- Software for New or Modified System

#### SD-05 Design Data

Design analysis and calculations shall be submitted for fire-alarm and detection systems in accordance with paragraph's entitled, "Fire Alarm Systems" and "Alarm Control Unit."

Listing of Product Installations for fire-alarm and detection systems shall be submitted in accordance with paragraph entitled, "Installation," of this section.

#### SD-06 Test Reports

Test reports shall be submitted for Fire-Alarm and Detection Systems for the following field tests in accordance with the paragraph entitled, "External System Wiring," of this section.

- Preliminary Tests
- Acceptance Test
- Existing System Tests
- Ground Detection Test
- Standby Power Test
- Trouble Test

#### SD-07 Certificates

Certificates from the manufacturer shall be submitted for the following items showing conformance with the referenced standards contained in this section.

- Fire Alarm Systems
- Alarm Control Units
- Heat-Actuated Detectors
- Product-Of-Combustion Detectors
- Manual Alarm Stations
- Vibrating Alarm Bells
- Wiring and Raceway
- Revolving Beacon
- Strobe Lights
- Fire Alarm Contractor Qualifications

### 1.4 QUALITY ASSURANCE

Equipment to be provided shall be the standard catalog product of a

manufacturer regularly engaged in the manufacture of fire-alarm equipment. Fire-alarm equipment shall be the latest standard design and approved by [Underwriters' Laboratories] [and] [Factory Mutual]. Devices shall be approved by the control panel manufacturer and fire alarm authority having jurisdiction for use with the new or existing panel.

#### 1.5 FIRE ALARM CONTRACTOR QUALIFICATIONS

[A licensed fire alarm contractor shall supervise the installation and testing on the fire-alarm system at the site.

Licensed fire alarm contractor shall have conducted installation and testing for not less than five projects of comparable size and complexity.

Work shall be done by or under the direct supervision of the licensed fire alarm contractor.]

### PART 2 PRODUCTS

#### 2.1 FIRE ALARM SYSTEMS

Fire alarm system shall contain, but not be limited to,:

[Alarm control units]

[Emergency battery and charger unit]

[Remote Report Devices]

[Combination fixed temperature and rate-of-rise detectors]

[Product-of-combustion detectors including air handling unit (AHU) duct detection]

[Rate compensation detectors]

[Manual alarm stations]

[Alarm bells]

[Alarm bell/visual indicators]

[Revolving beacons/strobes]

[Water-flow switches]

[Annunciation panels]

[Auxiliary components and devices]

[Raceways]

[Wiring, and associated circuitry]

[Water pressure switches]

[Air handler controls]

[Ventilating system control]

Material, Equipment, and Fixture Lists shall be submitted for fire-alarm and detection systems including manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site information.

Design analysis and calculations shall be submitted for fire-alarm and detection systems consisting of detector installation location analysis and calculations, and battery capacity and loading calculations to verify the requirements listed in this section.

## 2.2 ALARM CONTROL UNITS

Alarm unit shall comprise [\_\_\_\_\_] active zones, expandable to [\_\_\_\_\_] zones. Unit shall have the number of active zones required to perform as specified herein.

Alarm control unit shall contain power-on, fire and trouble indicating lights that are plainly visible when the cabinet is closed. Unit shall also contain the alarm silence switch, the trouble silence switch, the power on-off switch, and the alarm/trouble reset switch, and shall be accessible only by unlocking and opening the unit.

Alarm control unit shall function when a detector or manual alarm station or water-flow switch connected to the unit is activated. Fire-alarm indicator and alarm-control circuits shall energize and activate the external audible and visible signal and auxiliary devices, providing zone indication and sending an alarm signal to the remote central station fire monitoring system.

Control unit shall contain components and circuitry to operate a local annunciator and auxiliary devices such as air handlers, ventilating fans, damper solenoids, and magnetic door holders.

Control unit shall report the following conditions as trouble: open supervised circuits, ground faults, loss of primary power, power supply anomalies, low battery voltage, loss of battery voltage, and activation of the alarm silence switch. These troubles shall activate the trouble indicator and a trouble buzzer located within the cabinet, provide zone indication, and send a trouble signal to the central station fire monitoring system.

Schematics consisting of ladder diagrams of control system showing interaction of components as a system shall be submitted for approval prior to installation.

Module schematic drawings, minimum size 11 inches by 17 inches 300 by 420 millimeter (A3), shall also be submitted prior to system acceptance testing.

### 2.2.1 Alarm Control Unit Switches

Power on-off switch shall disconnect all power sources, 120 V(ac) and 24 V(dc), to the control panel.

Alarm/trouble reset switch shall reset the detector system in alarm or trouble. Trouble signals shall not be self-restoring without activating the reset switch.

Alarm and trouble silence switches shall silence the alarm and trouble



audibles. Either switch placed in other than the normal position shall provide the following:

Report as a trouble to the central station fire monitoring system.

Transfer audible noise to a panel lamp visual indication.

Re-ring the trouble audible when the problem has been cleared but the switch has been left in the silence position.

When the alarm silencing switch is in the silence position, subsequent alarms in other zones shall operate the alarm-sounding devices.

Alarm-control unit shall be approved for use with the detectors and manual alarm stations and other fire alarm devices.

#### 2.2.2 Control Relays

Relays shall be supervised, continuous duty, have self-cleaning contacts of silver or an alloy of equivalent performance, and be [UL] [and] [FM] approved for system use. Supervisory relays shall be protected against dust by individual covers. Relays that provide zone and external functions such as remote reporting, control device activation, signal lights, and bells shall have at least one set of spare contacts. Relays shall be permanently marked with the coil resistance, operating-current range, and internal pin connections identified by standard pin numbers.

#### 2.2.3 Enclosure

Control-unit cabinet shall be steel and shall be provided with a hinged cover and an integral pin-tumbler cylinder lock that will accept the key presently in use with other control units existing in the area. Cabinet shall be painted with a prime coat and [one] [\_\_\_\_\_] finish coats of scratch-resistant baked red enamel in accordance with manufacturer's instructions.

An [etched metal] [engraved laminated-plastic] identification plate shall be affixed to the cabinet door of the alarm-control unit to identify the cabinet as a fire-alarm cabinet.

#### 2.2.4 Alarm Control Panel

Alarm control panel shall have supervised normally closed, dry, single pole double throw (SPDT) contact that opens for trouble conditions and a normally open, dry, SPDT contact that closes for alarm conditions. Conductors shall be installed from these contacts as to a [four-point terminal strip] [\_\_\_\_\_] in the [telephone terminal cabinet (TTC)] [\_\_\_\_\_].

Control units shall be provided with a battery backup automatically switched alternate power source. Interruption of primary power shall cause the unit to switch automatically to the alternate power source and initiate a trouble signal.

Backup battery shall be capable of operating the alarm control unit in normal supervisory condition for [\_\_\_\_\_] hours, minimum. An alarm signal receipt during battery backup operation shall cause an alarm signal to be sent via the remote report circuit and shall sound the local alarm-signaling appliances for [\_\_\_\_\_] minutes, minimum.

Alarm control unit shall be able to operate on facility power when the backup batteries are disconnected for any reason. A system trouble signal shall be sent if the battery is disconnected or has low voltage.

### 2.3 HEAT-ACTUATED DETECTORS

[Heat-actuated detectors (HADs) shall be rated [\_\_\_\_\_] [136] degrees F [58] degrees C fixed temperature and 15 degrees F 27 degrees C per minute rate-of-rise. HADs shall be self-restorable for the rate-of-rise feature and nonrestorable for fixed temperature.]

[HADs shall be the rate-compensation type, rated [\_\_\_\_\_] [140] degrees F [60] degrees C.]

HADs shall have a set of normally open contacts that close to initiate an alarm. Components of the HADs shall be rust- and corrosion-resistant.

Non-restorable detectors shall have a visual identifier to show when device has been expended to facilitate replacement.

### 2.4 PRODUCT-OF-COMBUSTION DETECTORS

Detectors shall operate on the ionization or the smoke obscuration principle, or both, and shall be activated by the presence of combustion gases, invisible particles, or visible smoke particles. Detectors shall include a molded base, detector head, and locking means. Smoke detectors shall conform to UL 268.

Detector heads shall be plug-in units and shall contain no moving parts. Replacements or readjustments shall not be required to restore it to normal operation after an alarm has been given. Sensitivity shall be adjustable to compensate for ambient operating conditions.

Base shall have terminals for making connections and shall incorporate a light emitting diode or neon indicator that shall provide a visual indication when the detector initiates an alarm. Base shall contain the receptacle for the plug-in detector head. Components of the detectors shall be rust- and corrosion-resistant.

### 2.5 MANUAL ALARM STATIONS

Manual alarm stations shall be [break-glass] [\_\_\_\_\_] alarm-initiating devices designed in accordance with UL 38 for use with automatic and manual fire alarm systems.

Station door shall have a protected, pull-down operating lever with finger grip that does not project out from the front of the case.

Terminal blocks shall be readily accessible from station front.

Stations shall be the noncoded type which, when operated, close one or more sets of contacts and lock the contacts in the operated position until reset. Stations with a pushbutton that depend upon a spring-loaded device to close the contacts when the handle is pulled are not acceptable. Stations shall not be resettable without the use of a key or a wrench. Exposed metal surfaces of enclosing cases shall be painted with a prime coat and [one] [\_\_\_\_\_] finish coats of red enamel to produce a smooth, hard, durable finish. Identification and directions for operating manual-alarm stations shall be provided on the cover in raised or depressed

white-enameled letters. Plastic or composite material is not acceptable.

Surface-mounted stations shall be furnished with matching [cast-iron] [cast-aluminum] back boxes with top and bottom threaded-conduit connections.

Manual alarm stations shall be positioned so that they are readily accessible. Locations shall comply with NFPA 101 and NFPA 72.

A flush pin-tumbler cylinder lock and key shall be provided on general alarm type stations to sound the general alarm for fire drill or test without breaking the glass rod in the latching mechanism. Locks on manual alarm stations shall be keyed alike and shall accept the keys presently in use with other manual alarm stations at the installation.

## 2.6 VIBRATING ALARM BELLS

Fire-alarm bells shall be red, electric, [\_\_\_\_\_] [10] inches [250] millimeter vibrating, under-dome alarm-indicating devices in accordance with UL 464. Bell shall produce at least [86] [\_\_\_\_\_] dB at [\_\_\_\_\_] [10] feet [3000] millimeter.

Alarm bells shall be solenoid-operated plunger sounding devices. Operating mechanism shall be rustproof, protected from dust and insects and shall be located behind the gong shell.

Surface-mounted alarm bells installed in unfinished areas with conduit exposed shall be secured to surface-mounted back boxes. Back boxes shall be cast iron or cast aluminum, with threaded conduit connections. Surface-mounted alarm bells installed outdoors shall be weatherproof with a neoprene gasket and shall be protected against corrosion.

Exposed metal surfaces shall be factory painted with a prime coat and one or more finish coats of red enamel to provide a smooth, hard, durable finish.

## 2.7 WIRING AND RACEWAY

Wiring materials shall conform to the requirements of NFPA 70 copper wiring.

## 2.8 POWER SOURCE

Normal power for the local systems for all purposes shall be [120/208] [120/240] volts, 60 hertz. System shall operate when supplied with 85 to 110 percent of normal voltage. Source shall be on the load side of the facility main ahead of the distribution panel. [Dedicated branch circuits are not acceptable unless authorized by fire authority.] [Fire alarm shall be on a dedicated branch circuit or on an uninterruptible power supply.]

Fire-alarm-system disconnect and protective device shall be a circuit breaker or fused switch and shall be red with a factory finish. In addition, the device shall be marked "FIRE-ALARM DISCONNECT" with 1/2-inch 15 millimeter high letters in white paint or engraved phenolic identification plate fastened to the device with sheetmetal screws.

## 2.9 REVOLVING BEACON

Revolving beacon for use as a fire warning light shall be capable of accepting 75-watt sealed-beam spot lamps. Each lamp shall project its beam downward on a reflector that rotates 360 degrees 60 times per minute at a

45-degree angle. Lens shall be a heat-resistant red plastic dome. Unit shall be suitable for upright mounting on conduit sized 1/2-inch 15 millimeter minimum.

## 2.10 STROBE LIGHTS

Strobe lights for use as warning lights shall be capable of accepting xenon type flash tube rated at 70,000 to 250,000 candle power 70,000 to 250,000 candela in excess of 1,000 hours of operation at [1] [\_\_\_\_\_] to [2] [\_\_\_\_\_] flashes per second, actuated by solid state trigger circuitry enclosed in lens. Units utilized for direct current applications shall be polarized for supervision purposes.

## PART 3 EXECUTION

### 3.1 SYSTEM SEQUENCE OF OPERATION

#### 3.1.1 Normal Operation

All switches shall be in the normal position. Available power lamp shall be "ON" and the trouble and detector identification lamps shall be "OFF." All circuits shall be electrically supervised.

#### 3.1.2 Alarm Condition

Detectors, manual alarm stations, water flow switches, or other alarm devices shall close a contact that activates the appropriate alarm control unit. Alarm control unit shall transmit a signal to a [remote reporting device] [\_\_\_\_\_] of the base fire alarm system, activate the building alarm bells, provide zone indication when used, control air-handling and ventilating units, provide an input to remote annunciators when used, and provide indication or control to other devices.

#### 3.1.3 Trouble Condition

System conditions, identified in the paragraph entitled, "Alarm-Control Unit," that will transmit a trouble signal to the [remote reporting device] [\_\_\_\_\_] of the base fire alarm system, shall provide zone indication when used, activate a trouble signal in the alarm-control unit, and provide input to remote annunciators when used. Trouble signal in the alarm-control unit shall be comprised of a trouble lamp and buzzer.

### 3.2 INSTALLATION

Manufacturer's catalog data shall be submitted for Software for New or Modified System.

Listing of Product Installations for fire-alarm and detection systems shall include identification of at least [5] [\_\_\_\_\_] units, similar to those proposed for use, that have been in successful service for a minimum period of [5] [\_\_\_\_\_] years. List shall include purchaser, address of installation, service organization, and date of installation.

#### 3.2.1 Alarm-Control Units

An alarm-control unit, complete with accessories and devices, shall be installed in each protected building.

### 3.2.2 Product-of-Combustion Detectors

Product-of-combustion detectors shall be installed in accordance with applicable NFPA standards. Smoke detectors shall be installed after the work of other trades has been accomplished.

### 3.2.3 Manual Alarm Stations

Manual stations shall be mounted [\_\_\_\_\_] [48]-inches [1220] millimeter above the finished floor level.

### 3.2.4 Bells/Strobes/Beacons

Bells shall be mounted 7-feet 2100 millimeter above the finish floor level and below the bottom surface of the ceiling.

### 3.2.5 Wiring

Conductors shall be continuous from device to device. Splices shall not be permitted.

Fire alarm system conductors shall be contained in a separate raceway system.

#### 3.2.5.1 Power Source

There shall be two protected phase wires and a solid grounded neutral, operating power for the system shall be obtained from the grounded neutral and one phase wire. Supervisory power shall be obtained from the grounded neutral and the other phase wire.

#### 3.2.5.2 Color Codes

Signal-initiating and alarm detector circuit shall have one black loop and one blue loop. Alarm-bell signal-sounding circuits wired in series shall have both wires colored red. Alarm-bell signal-sounding circuits wired in parallel shall have a red wire for the positive conductors and an orange wire for the negative conductor. Lights, beacons, and indicator circuits shall have brown wires. Each circuit shall maintain the same color code throughout its length.

Fire-alarm-circuit wiring shall be continuous from terminal point to terminal point. Splices shall not be permitted.

Standard lens color to be used as the graphic panel indicating lights shall be:

<u>Color</u>	<u>Device Indicated</u>
[Amber] [_____]	Pull Station
	Smoke Detector Located in:
[Red] [_____]	Ceiling
[White] [_____]	Underfloor
[Blue] [_____]	Above Ceiling

<u>Color</u>	<u>Device Indicated</u>
[Green] [_____]	Duct

### 3.2.5.3 Installation in Cabinets and Boxes

Wiring in control cabinets and boxes shall be installed with wires properly grouped parallel and perpendicular to the major axis of the building and shall be supported and identified. Control wiring shall be continuous from terminal point to terminal point with no splices. Wires entering or leaving control cabinets and boxes shall be permanently marked and terminated on screw terminals.

### 3.3 EXTERNAL SYSTEM WIRING

The following tests shall be performed on the external wiring of the system before connection to the control panel:

Resistance of each zone circuit shall be checked with an ohmmeter. Temporary jumpers shall be inserted in appropriate sockets of missing detectors and the end-of-line resistor shall be installed when this test is performed. Resistance reading for each zone circuit shall be the value of the end-of-line resistor, plus or minus 10 percent.

Resistance of supervised bell-circuit wiring shall be checked with the resistor connected to the last alarm bell in the circuit. Resistance shall be the value of the end-of-line resistor, plus or minus 10 percent.

Each wire shall be checked for grounds with a 500-volt insulation resistance test set. Resistance to ground shall be not less than 20 megohms.

#### 3.3.1 Field Testing

After complete installation of the equipment and at such time as directed by the Contracting Officer, tests shall be conducted to demonstrate that the installation requirements of this specification have been met and that the sequential functions of the system comply with the given requirements. The following tests shall be performed:

Preliminary (Prior to final acceptance): This "in house" test shall verify the systems and components. [Preliminary Tests](#) shall be performed as many times as necessary to perform one full test without malfunction.

Final Acceptance: After successful completion of the preliminary testing, the systems be fully tested in the presence of the Contracting Officer for final acceptance.

[Contractor shall provide [one] [\_\_\_\_\_] copy of the test procedures and recording forms for the preliminary tests.]

[Contractor shall provide [10] [\_\_\_\_\_] copies of the test procedures and recording forms for the final [Acceptance Test](#) for approval [30] [\_\_\_\_\_] calendar days prior to system testing.]

### 3.3.2 Fire Alarm System Preliminary Tests

After completion of the above tests, the external wires of the system shall be connected to the appropriate terminals in the control panel and the following tests shall be performed:

Each manual alarm station shall be activated to demonstrate proper operation.

Each product-of-combustion detector shall be activated in accordance with the manufacturer's recommendations to demonstrate proper operation.

One lead on each product-of-combustion detector, manual pull station, HAD, or other input device shall be removed to simulate the trouble condition.

Leads at each alarm-initiating and indicating device shall be removed to verify trouble and then alarm over trouble.

Rate-of-rise function on each HAD in each zone shall be tested by application of heat from heat lamp. HADs shall alarm the system. HADs shall sustain repeated tests of the rate-of-rise function without damage or destruction of the fixed temperature element. HADs reacting to body heat shall be replaced.

Each alarm-initiating circuit shall be demonstrated to operate its associated alarm-control unit.

[Each [remote reporting device] shall be demonstrated to operate in all modes.]

Each alarm-control unit shall be demonstrated to operate in all modes.

Interconnections with fire-protection systems and motor controllers shall be demonstrated to operate as indicated.

### 3.3.3 Final Fire Alarm System Acceptance Test

After preliminary testing, the Contractor shall perform final system acceptance testing. Testing shall include preliminary functional test and requirements defined in NFPA 72. Testing shall further demonstrate device and equipment functions.

### 3.3.4 Existing System Tests

Prior to any work, the existing fire alarm devices, including those at the point of connection and those that are electrically on both sides of the point of connection, shall be functionally tested.

Upon completion of the modification, the newly installed devices and the devices that are electrically on both sides of the point of connection.

Reproducible copies of the test results shall be furnished to the Contracting Officer.

### 3.3.5 Test Procedures and Test Record Forms

Contractor shall use the following test procedure and test record forms to conduct and record the test.

### 3.3.5.1 Fire Detection and Alarm System Test Procedure

#### PRIOR TO TEST, VERIFY THE FOLLOWING:

Contracting Officer has been notified at least [5] [\_\_\_\_\_] calendar days prior to test.

Low voltage wiring continuity and 500 V(dc) insulation resistance tests have been performed.

Record test results on Fire Alarm Test Log.

#### PRELIMINARY TESTS:

POWER ON - Apply power to fire alarm control panel and verify that "Power On" lamp illuminates. All switches should be in normal position. All other lamps should be off. When other lamps are on, depress reset button for 3 seconds.

LAMP TEST - Depress lamp test button and verify all zone alarm and trouble lamps on. Trouble signal will sound during lamp test.

#### TROUBLE TEST:

Remove one lead at a time from each alarm initiating and signaling device, including HADs, product-of-combustion detectors, manual stations and flow switches, to simulate trouble condition. Verify trouble lamp comes on for each zone, troubler buzzer, remote report signal at remote reporting device [\_\_\_\_\_] trouble silence, trouble ringback, reset.

#### ALARM TEST:

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NOTE: Deactivate alarm device. Reset system by depressing reset button on control panel for 10 seconds. Verify alarm lamps are off and absence of alarm signal at remote reporting device.  
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Activate each alarm initiating device in accordance with paragraph entitled, "Fire Alarm System Acceptance Test." Coordinate flow switch activation with water flow test.

For each of the alarm initiating devices, verify the following:

1. Fire alarm bells ring. (Depress "PUSH TO SILENCE ALARM SIGNALS" pushbutton.)
2. Zone alarm lamp is on.
3. Alarm signal at [remote reporting devices] [\_\_\_\_\_] .
4. Shut-down of air-handling units

Verify alarm signal over trouble condition for each loop and ground.

#### GROUND DETECTION TEST:



Connect temporary jumper from ground to each initiating and signal circuit and to each zone circuit conductor at a terminal in panel or at a device.

1. Verify trouble buzzer and trouble lamp are on and verify remote recording.
2. Remove the temporary jumper and verify trouble buzzer is off. Verify lamps off except "POWER ON" lamp.

#### STANDBY POWER TEST:

Place system on standby power by turning off 120V primary power. Verify trouble indication is on.

Initiate an alarm. Verify fire alarm bells, alarm signal at remote reporting device [\_\_\_\_], and air-handling units shutdown.

Reset system.

Reapply 120V primary power and verify "POWER ON" lamp is on.

With batteries fully charged, turn off 120V primary power. Upon completion of [24] [60] [90] hours of operation on battery, place the system in alarm and verify operation of all alarm devices for [15] [\_\_\_\_] minutes, recording battery voltage under no load conditions.

#### 3.3.5.2 Test Record Form

Fire detection system acceptance test report shall be completed after each test. The Contractor shall use the "Inspection and Testing Form" found in **NFPA 72** for the test report to be submitted to the Contracting Officer. Acceptance shall be witnessed by the Contractor Officer.

-- End of Section --