

REQUIREMENTS FOR NEW FIRE ALARM SYSTEMS AT EGLIN AFB:

ELECTRONIC FIRE ALARM AND SUPPRESSION SECTION

The Electronic/Alarm and Fire Suppression section of Civil Engineers are technical support to the Authority Having Jurisdiction (AHJ) only. They are here to review, inspect, observe tests, and will not take part in the execution of any section of an awarded project on this installation (Examples; disable, safe, or shut down a complete system or a part of one; bring systems back on line, etc...).

Before Any Technician will program the fire alarm transceiver for any project, the Electronic/Alarm Section require the following items to be in their possession; NFPA 72 Record of Completion, a test plan, a copy of all test results (meggar, smoke sensitivity, resistance, intelligibility, and any device and panel), a set of working drawings, sized 12 X 18, the box of spare parts, the Technician Interface Tool (laptop, if required)-plus any special connecting cables or devices to interface with all systems to include VESDA, fire pump controllers, and flame detectors, a copy of all data bases on a thumb drive, and 1 copy of all manuals (installation, programming, & operation), which now can be electronic.

FIRE ALARM TRANSCEIVERS

All Fire Alarm transceivers shall be standalone units (BT-XFs) and completely compatible with the existing Monaco Enterprises Model D-21-M central station system.

Transceivers shall have the appropriate number of zones to interface with the Fire Alarm Control Panel and other required equipment. The authority having jurisdiction shall approve the fire alarm zones. Transceivers shall operate on a frequency of 141.3625 MHZ. Transceivers shall not be mounted higher than 60 inches from floor level.

**Notes:

Monaco Audio Board and Relay Board (BT-XMs) are not required and shall not be installed.

External activation (WIDE AREA CONTROL) of in-building live voice MNS will be the function of Command Post/ATHOC. A connection point or D-mark location shall be installed for future live voice input.

Lightning arrestors shall be mounted IAW installation manuals from the manufacturer and in a location easily accessible for maintenance with reasonable effort and without removal of additional facility finishes (sheet rock, ceiling grid, etc).

The installer is responsible to determine the proper location and type of antenna to be utilized. When it is determined that the use of a directional (YAGI) antenna is required, the following shall apply. YAGI antennas installed on buildings shall be mounted on 1 inch heavy wall galvanized rigid conduit, utilizing positive means to prevent the antenna and/or mast from twisting by wind.

In cases where it is determined that an "Omni" antenna will be sufficient, the antenna may be mounted on $\frac{3}{4}$ inch rigid electrical conduit or a mast of proved equal strength.

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Both antenna types require good line of sight clearance for proper transmission and the Omni's grounding plane requires 3 feet of clearance over roofs and other objects.

Coaxial cable shall be enclosed in metal conduit from the transceiver to the antenna. In cases where overhead outdoor routing is necessary, the cable shall be installed in accordance with all codes and directives. Coaxial cables running overhead shall be approved for the purpose and installed accordingly. Cable length will be used to determine if low loss coaxial cable is necessary. Follow manufacturer's recommendation on cable length and type. Measures shall be taken to avoid sharp bends or "kinking" of coaxial cables.

The installer shall demonstrate the forward and the reflected power of installed antenna systems prior to acceptance in accordance with manufacturer's specifications.

AC power sources for the transceiver shall be protected by surge/lightning suppressors. Suppressors shall not be installed within the enclosure of the transceiver.

FIRE ALARM AND MASS NOTIFICATION SYSTEMS

Control panels (FACPs) must be located in office/administrative space or other rooms with similar temperature/humidity controls — control panels shall not be located in the aircraft servicing areas or mechanical/utility spaces without both temperature and humidity controls. Simple heating (i.e., for freeze protection) and/or ventilation is not sufficient for these electronic systems. Manufacturers are referenced in paragraph 2.3.

The following is an excerpt from one manufacturer's literature for their most current control system and clearly demonstrates this sensitivity. While the literature indicates compliance with NFPA 72 requirements, it clearly recommends much narrower environmental limits for locating the control panel.

Temperature and Humidity Ranges are as follows;

This system meets NFPA requirements for operation at 0-49°C/32-120°F and at a relative humidity 93% ± 2% RH (non-condensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15-27°C/60-80°F.

The following "Technician Interface Tool" (laptop) requirements shall apply for intelligent fire alarm systems. One laptop shall be turned over to the Electronic/Alarm (E/A) section with the latest approved operating system required for the programming the fire alarm software, the latest manufacturer's software required to program the FACP, a disc drive (to conform to Air Force security) and any associated systems or devices, to include; Vesda smoke detection, electrical/electronic fire pump controllers, etc... It should also contain software associated with developing documents (i.e. Microsoft Excel in order to perform load calculations and develop points lists) as required by the programming software. All original manufacturers' software for each Interface Tool when addressable fire alarm systems are installed shall be provided to the Eglin AFB's E/A section. The following requirements shall apply: all software, hardware, passwords, cables, adapters, security keys (hasps and dongles) etc., required for the maintenance, testing, and reprogramming of the fire alarm system, support systems, and devices shall be unconditionally turned over to the E/A section, and the above noted software, hardware, passwords, etc..., will become the unconditional property of the government. Software turned over to

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Gov't shall be the original manufacturer's licensed software on cd (or DVD) with jeweled case; copies of software shall not be acceptable. Software and cd, or DVD, shall be brand new and unused.

The contractor shall provide the manufacturer technician's recommended/required level of training on all the installed equipment and software, regarding installation, operation, maintenance, testing, future expansion, and programming of the fire alarm system for two (2) personnel. This training shall meet or exceed NFPA 72 National F/A and Signaling Code 10.4.2.2 for System Installers, 10.4.3.1 (1) for Inspection, Testing and Maintenance Personnel as well as the manufacturer technician's required level of training and shall guarantee the unconditional operation and future purchase of additional and/or replacement equipment. The training shall take place at one of the locations normally used by the manufacturer and/or distributor to conduct factory training for their in-house employees. The government employees shall be trained alongside technicians employed by the installed equipment manufacturer and/or distributor. Upon successful completion of all curriculum requirements the government personnel shall be awarded a certification, security keys, and provided full access to all available technical support resources, to include at a minimum, on-line and telephone support provided to manufacture and/or distributor personnel. This goes for all systems being installed, to include: the main fire alarm system, subordinate releasing panels, VESDA systems, mass notification textual sign systems, and electrical/electronic fire pump controllers. The Electronic/Alarm section will also require 8 hours, minimum, of familiarization training at the facility on the new panel, all new equipment, and the software installed.

Provide as-built drawings and a final testing points list of the fire alarm system, as follows: floor plans shall show all fire alarm system components and their addresses. Fire alarm riser diagram shall show all fire alarm components. Two copies of the programming and of any drawings will be provided to the Eglin Electronic/Alarm Maintenance section on compact disc or thumb drive left in the panel or document box, under lock and key. Drawings need to be accessible and viewable with the laptop. Points list can be a paper or electronic list showing all points (description and address) to be tested for final acceptance. All requirements shall be accomplished prior to final acceptance.

PROVIDE AS-BUILT DRAWINGS OF FIRE ALARM SYSTEM, AS FOLLOWS

1. FLOOR PLAN/S SHOWING ALL FIRE ALARM SYSTEM COMPONENTS and their addresses
2. FIRE ALARM RISER DIAGRAM SHOWING ALL FIRE ALARM COMPONENTS
3. FIRE ALARM LEGEND
4. FIRE ALARM NOTES
5. ABOVE NOTED ITEMS "1" THRU "4", SHALL BE PROVIDED ELECTRONICALLY ON A CD OR THUMB DRIVE (under lock & key) AND PAPER COPY, A TRUE HALF SIZE (12 X 18).

SECTION 1.0

1.1 DESCRIPTION:

A. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for Auxiliary Protected Premises Signaling Systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.

B. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for Remote Station Protected Premises Signaling Systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.

C. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

D. The installing company shall employ NICET (minimum Level III Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

1.2 SCOPE:

Basic Performance for Intelligent Systems:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Class B, A, or X only on the Signaling Line Circuits (SLC). Class B circuitry must be installed in series and T-taps will be allowed, but must be kept to a minimum so that the resistance level is 10% below the manufacturer's maximum recommended resistance level.
2. Notification Appliance Circuits (NAC) shall be wired Class A circuit, to ensure the circuit will operate as designed with only one fault.
3. All circuits shall be power-limited, UL864 9th edition requirements.
4. A single ground fault on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
5. All AC power to the fire systems shall be protected by the use of surge/lightning protectors. All circuits of the fire systems that enter or exit the protected facility shall have surge/lightning protectors installed. NOTE: **DO NOT** install AC power surge suppressors inside the FACP cabinet.

1.3 SUBMITTALS

A. General:

1. Two copies of all submittals shall be submitted to the CE SABER PM/CE Engineer for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings:

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1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
4. Show annunciator layout, configurations, and terminations.

C. Manuals:

1. Submit simultaneously with the shop drawings, installation, programming, operating, and maintenance manuals listed for the manufacturer's panel and product(s), including technical data sheets. This applies to panels installed; main, sub, releasing, etc.
2. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.
3. Provide one complete sets of manuals to Civil Engineering Electronic/Alarm maintenance section at acceptance (can be on a computer disc or thumb drive).

D. Software Modifications:

Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system and all other sub-systems on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

1.4 GUARANTY:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.5 APPLICABLE STANDARDS AND SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

A. National Fire Protection Association (NFPA) - USA:

- No. 13 Sprinkler Systems
- No. 70 National Electric Code (NEC)

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No. 72 National Fire Alarm Code
No. 101 Life Safety Code

B. All Unified Facilities Criteria (UFC)

C. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

D. Local and State Building Codes

E. All requirements of the Authority Having Jurisdiction (AHJ)

1.8 APPROVALS:

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

UL Underwriters Laboratories Inc

ULC Underwriters Laboratories Canada

FM Factory Mutual

MEA Material Equipment Acceptance (NYC)

CSFM California State Fire Marshal

SECTION 2.0 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL:

A. All equipment and components shall be new, the manufacturer's current model and version. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a fire protective signaling system, meeting the National Fire Alarm Code.

B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings) and accessible for maintenance and testing. Fasteners and supports shall be adequate to support the required load.

2.2 CONDUIT AND WIRE:

A. Conduit:

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
2. All wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
3. Conduit shall not enter the fire alarm control panel or any other remotely mounted control panel equipment or back boxes, except where conduit entry is specified by the FACP manufacturer.
4. Conduit shall be 3/4-inch (19.1 mm) minimum, red in color.

B. Wire:

1. All fire alarm system wiring shall be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer.
3. Wiring for 24-volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
4. Wiring installation — practices in ANSI/NECA 305-2001 shall be followed. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-136. Power wiring and limited power wiring shall not be co-located in the same conduit, raceway, or enclosure. Such wiring may only be located together within the listed control panel and shall be installed in accordance with the manufacturer's guidance. There should be no stray detectable voltages, no ground faults, open circuits, or short circuits when tested IAW NEC 305.
5. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
6. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NEC 760 (e.g., FPLR).
7. All field wiring shall be electrically supervised for open circuits and ground faults. UFC 3-600-01 states that wiring between devices shall be splice free.

C. Terminal Boxes, Junction Boxes and Cabinets: All boxes and cabinets shall be UL listed for their use and purpose. They shall be installed to have a working clearance that is unobstructed and be readily accessible.

D. The fire alarm control panel shall be connected to a separate dedicated 120-VAC branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet

shall be grounded securely to facility ground. The control panel enclosure shall feature a quick removal chassis to facilitate rapid replacement of the FACP electronics.

1. The FACP shall be capable of coding Notification Appliance Circuits in March Time Code (120 PPM), Temporal (NFPA 72 A-2-2.2.2), and California Code. Main panel notification circuits (NACs 1 & 2) shall also automatically synchronize any of the following manufacturer's notification appliances connected to them: System Sensor, Wheelock, or Gentex with no need for additional synchronization modules.

2.3 MAIN FIRE ALARM CONTROL PANEL:

A. The fire alarm control panel (FACP) shall be one of three manufacturers; NOTIFIER, GAMEWELL/FCI, or EST3. A fourth manufacturer, Det-Tronics panels, are currently the only AFCEC approved releasing type panel for use in Air Force hangars. This falls under AFCEC's category of "Management Initiative" to reduce excessive maintenance, training, and support costs. It shall be intelligent and contain a microprocessor-based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent initiating devices, addressable modules, printer, annunciators, and other system controlled devices.

1. It should contain all correct modules and printed circuit boards required for the designed system.

2.4 SYSTEM COMPONENTS:

A. Fire Alarm Initiating Devices:

1. Shall be compatible with the installed FACP
2. **Shall be addressable and use rotary dials to set the addresses.** UL listed, and of a new condition.
 - a. Manual stations; shall be non-glass break, shall have a visual indication that it has been set off, have a key lock for reset and testing, the word FIRE shall be on it, (Manual discharge or agent release stations shall not be located within 5 feet of a manual fire alarm pull station. When a manual foam discharge station and a manual fire alarm station are both located at a doorway the stations shall be located on opposite sides of the doorway. Manual discharge or agent release stations shall be housed under a clear plastic tamper proof cover. They shall comply with the signage and color coding in ETL 02-15 UFC 4-211-01)
 - b. Heat Detectors; shall have a fixed temperature rating for the area/s of installation (135 degrees Fahrenheit (57.2 Celsius) for areas where ambient temperatures do not exceed 100 degrees (37.7 Celsius), and 200 degrees (93.33 Celsius) for areas where the temperature does not exceed 150 degrees (65.5 Celsius), shall be of low profile, shall fit the environment (paint booth, fuel vapors, etc...)
 - c. Smoke Detectors; shall use the photoelectric (light-scattering) principal to measure smoke density and on command from the control panel, send data to the panel representing the analog level of smoke density
 - d. Laser Smoke Detectors; shall have nine sensitivity levels and be sensitive to a minimum obscuration of 0.03 percent per foot, shall support standard, relay, isolator and sounder detector bases, shall not require other cleaning requirements than those listed in NFPA 72, shall include two bicolor LEDs that flash green in normal operation and turn on steady red in alarm.

- e. Duct Smoke Detectors; shall be installed upon the composite supply/return air ducts, be installed with properly sized air sampling tubes that visually extend through the air duct, activation shall shut down units and close dampers, etc.. as designed by the FPE, shall be resettable at the FACP. They shall be reset using the FACP's reset switch and/or a key operated test/reset switch located near the detector.
- f. Multi-Criteria Detectors; shall monitor a minimum of photoelectric and thermal technologies in a single sensing device, shall be able to adapt to its environment, shall allow a wide sensitivity window, no less than 1 to 4% per foot obscuration, design shall be capable of selecting the appropriate sensitivity levels based on the environment type it is in (office, manufacturing, kitchen etc.), it shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.
- g. Flow, Pressure, and Tamper Switches (mechanical switching devices); shall be installed on suppression systems and monitored by the appropriate electronic modules connected to the FACP.

B. Notification Appliances:

- 1. Shall be compatible with the installed FACP
- 2. Shall be UL listed, and of a new condition.
- 3. Shall have an audible sound level of 84-90 dB measured at 10 feet from the device
 - a. Horn/Strobes and Sounder Bases; shall operate on 24 VDC nominal, shall be field programmable without the use of special tools, Shall be flush or surface mounted as shown on plans
 - b. Speakers; shall operate on 25 or 70 VRMS or with field selectable output taps from 0.5 to 2.0 Watts, shall produce a nominal sound output of 84 dB at 10 feet (3m), shall have a frequency response at a minimum of 400 HZ to 4000 HZ, the back of each speaker shall be sealed to protect the speaker cone from damage and dust
 - c. Strobe Lights; shall meet the requirements of the ADA, UL Standard 1971, be fully synchronized, shall have a maximum pulse duration of 2/10 of one second, intensity and flash rate shall meet the requirements of UL 1971. They shall have a clear lens and the device shall be marked "ALERT", when installed along with mass notification.
 - d. Textual signs at points of egress for the hearing impaired are now mandatory.

C. Monitor/Control/Isolation Modules:

- 1. Shall be compatible with the installed FACP
- 2. Shall be addressable and use rotary dials to set the addresses, UL listed, and of a new condition
 - a. Zone/Monitor Modules; shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs, shall have a LED flash under normal conditions and a distinctive indication for an alarm condition, for difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm), shall be capable of addresses 1 thru 159, IDC zone modules shall

be wired for Class A operation.

- b. Control/Relay Modules; shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered polarized audio/visual notification appliances, NAC audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply, control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC, shall be capable of addresses 1 thru 159, relay modules shall be available for HVAC control and other building functions, relay module contacts shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive
- c. Isolator Modules; shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch, shall automatically open-circuit (disconnect) the SLC during a short condition and shall automatically reconnect the isolated section, shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated, shall not be necessary to replace or reset an isolator module to its normal operation, at least one isolator module shall be provided for each floor or protected zone of the building
- e. Alphanumeric LCD Type Annunciator; shall be a supervised, remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text, shall display all alarm and trouble conditions in the system, shall be possible to connect up to 32 LCD displays and be capable of wiring distances up to 6,000 feet, shall connect to a separate dedicated "terminal mode" EIA-485 interface, shall be capable of the following system functions: Acknowledge, Signal Silence and Reset and will be protected from unauthorized use by a key switch or password, shall be UL listed

D. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL standard 864.

2.5 BATTERIES:

- A. The battery shall have sufficient capacity to power the fire alarm system for not less than 48 hours of supervision, plus 15 minutes of alarm notification upon a normal AC power failure.
- B. The batteries are to be completely maintenance free and none of them no larger than 55 amp-hour. If a larger capacity is figured, parallel sets of batteries, 55 A/H and smaller together. The handling of larger batteries has produced an inherent safety hazard. Fluid level checks for refilling, spills, and leakage shall not be required.
- C. If necessary to meet standby requirements, external battery and charger systems may be used.

SECTION 3.0 - EXECUTION

3.1 INSTALLATIONS:

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, UFC criteria, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. All Fire Alarm Control Panels and BT-XF transceivers shall be mounted in conditioned air space and no higher than 60 inches from the finished floor to top of the enclosure.
- C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2 TESTING:

The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. He or she must provide a points list of devices (a test plan) to be tested prior the final test. All testing shall be in accordance with NFPA 72.

- A. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
- B. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL INSPECTIONS:

- A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect, including connection to with the "Technician Interface Tool" (laptop), if required. Also, provide a box of spare components (smoke detectors, pull stations, etc...), at least two of each device installed on the system. This does not include spare panels, NAC power supplies, or transceivers.

3.4 INSTRUCTION (Training):

- A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten documents, to include; NFPA 72 report (listing all devices installed), a system narrative/description (a

sequence of operation), a set of working drawings to include a riser diagram, equipment technical data sheets, battery and voltage drop calculations, a written record of completion (NFPA 72), a service directory; to include a list of names who's providing service during the warrantee period, and As-built drawings in a true half size (12 X 18).

C. Provide the manufacturer's recommended/required level of factory training on all the installed equipment and software, regarding installation, operation, maintenance, testing, future expansion, and programming of the fire alarm system for two (2) personnel. This training shall meet or exceed NFPA 72 National F/A and Signaling Code 10.4.2.2 for System Installers, 10.4.3.1 (1) for Inspection, Testing and Maintenance Personnel as well as the manufacturer's required level of training and shall guarantee the unconditional operation and future purchase of additional and/or replacement equipment. The training shall take place at one of the locations normally used by the manufacturer and/or distributor to conduct factory training for their in-house employees. The government employees shall be trained alongside technicians employed by the installed equipment manufacture and/or distributor. This goes for all systems being installed, to include: the main fire alarm system, subordinate releasing panels, VESDA systems, mass notification textual sign systems, and electrical/electronic fire pump controllers. Upon successful completion of all curriculum requirements, the government personnel shall be awarded full access to all available technical support resources, to include at a minimum, on-line and telephone support provided to manufacture and/or distributor personnel.