

## **17 – Fire Alarm Systems Standards**

354th Civil Engineering Squadron

OPR: CES/CEOFA

ISSUED: 12 September 2017

### **Purpose**

This standard shall be used in conjunction with the latest version of Unified Facilities Criteria (UFC) 3-600-01, *FIRE PROTECTION ENGINEERING FOR FACILITIES* and UFC 4-021-01, *DESIGN AND O&M: MASS NOTIFICATION SYSTEMS* as the minimum standard(s) for the planning and development of projects and, design, construction and commissioning documentation used for procurement of facilities that fall under the responsibility of the 354th Fighter Wing, Eielson AFB, AK. Examples include, but are not limited to, the development of scopes of work, DD1391 documentation, drawings, specifications and request for proposals. These standards will serve as the primary fire protection criteria reference document for services provided by architectural and engineering (A&E) firms and consultants in the development of both design-bid-build and design-build contracts. This document shall be used in conjunction with detailed design documents in the procurement of Facility construction. No part of this document should be considered inclusive to all government requirements.

Contact the 354<sup>th</sup> CES Alarm Shop at 907-377-6666 for any questions, comments or concerns.

### **1. General**

#### **1.1. Fire Protection Engineering Services**

- 1.1.1. Under the terms of UFC 3-600-01 all Major Projects require the design, review and oversight services of a Qualified Fire Protection Engineer (QFPE). Refer to UFC 3-600-01 for the definition of Major Project and QFPE. Qualifications for QFPE are also listed in the UFC.
- 1.1.2. At the initial design conference, or at another time convenient to all parties prior to final design submission, the QFPE shall meet with the 354<sup>th</sup> CES Alarm Shop and 354<sup>th</sup> CES Fire Department personnel to review all the fire protection aspects of the design.
- 1.1.3. The QFPE shall provide sound pressure and light level calculations at the final design submittal or the contractor shall submit this information as a Government Approved submittal after design. As a minimum, provide the following for each room and space: ambient sound pressure level (SPL) including contributions from equipment, maximum and minimum intelligibility, maximum and minimum strobe light level and maximum and minimum alarm SPL.

#### **1.2. Contractor Qualifications**

- 1.2.1. All Fire Alarm (including foam system) and s Notification System (MNS) panels and terminal cabinets shall be terminated by either a NICET Level III technician or an individual licensed by the State of Alaska for fire alarm and MNS installation (Class IC). A licensed electrician or NICET Level I Fire Alarm Technician shall install conduit and pull wire for the fire alarm system. A NICET Level II Fire Alarm Technician shall terminate Fire alarm devices. Installers shall have a minimum of 5 years of experience with systems of similar complexity. Proof of qualifications shall be submitted.

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1.2.2. Fire sprinkler (including foam system) equipment and piping installation shall be installed by a NICET II or an individual licensed by the state of Alaska (Class IB). Installer shall have a minimum of 5 years of experience on systems of similar complexity. Proof of qualifications shall be submitted to the Contracting Officer Representative who will provide a copy to the Alarm Shop.

1.3. Access Requirements

1.3.1. Full access for testing and maintenance of all fire protection systems equipment and devices shall be provided. Equipment requiring testing or maintenance shall be provided with sufficient clearance to allow the work to be done without having to remove any piping, structure, doors or other surrounding items. Access to all fire protection system equipment and components shall be unhindered and a minimum of 1 m wide by 2 m high (3.3 ft wide by 6.6 ft high). Access shall not require crawling over or under structures, pipes or other items.

1.4. Panels

1.4.1. A Monaco, Siemens or Simplex addressable fire alarm and MNS panel shall be provided.

1.4.2. The panels for fire alarm, MNS and booster panels shall each have a dedicated circuit. The Monaco transceiver shall have a dedicated circuit. The Whelen IPS 400 shall have a dedicated circuit. The circuits shall be clearly marked inside each panel. The circuit shall be red and lockable. The fire and MNS panel circuits shall be identified as "FIRE ALARM AND MNS" inside the circuit panel. The Fire Alarm Transceiver shall be identified as "FIRE TRANSCEIVER" inside the circuit panel. The Whelen IPS 400 transceiver shall be identified as "MNS TRANSCEIVER" inside the circuit panel.

1.4.3. All standby or backup batteries shall be installed in the fire alarm and MNS panel if space permits. If space is not available, batteries shall be installed in a manufacturer listed battery panel with enough room so batteries can be properly placed in the cabinet on their base, not sides or end. Batteries shall be wired in parallel for proper supervision.

1.4.4. All equipment and devices connected to the Fire Alarm and Mass Notification Panel must be listed to be used with the panel and installed in accordance with NFPA 72, UFC 3-600-01 and the manufacturer's instructions.

1.4.5. The panel selected shall have at minimum two (2) Signaling Loop Circuits (SLC). A failure of one SLC shall not cause a facility to lose over 50% of its detection capability.

1.4.6. All access panels and cabinets for fire alarm, MNS, booster batteries, sprinkler systems and other access as determined by the Installation AHJ shall be keyed alike. The key type shall be labeled on the outside of each door. All spare keys

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shall be turned into the Alarm Shop. The Alarm Shop will ensure proper distribution of keys between the Shop and the Fire Prevention Office.

1.4.7. The fire alarm contractor shall provide the main fire alarm control panel near the main entrance of the building. If the panel cannot be located near the main entrance, a remote annunciator shall be provided and shall be coordinated with the Installation AHJ. The remote annunciator must have a silence and reset button and provide the same textural annunciation as the fire alarm panel. The remote annunciator must be locked against unauthorized access.

1.4.8. The fire alarm control panel shall provide smoke detection, flow switches and supervised addressable relays for elevator functions as required by UFC 3-600-01. Control systems for elevators must be wired and programmed by certified elevator and fire alarm personnel.

1.5. Antennas

1.5.1. When there is a pitched roof, the antenna must be mounted on the gable end of the building that is closest to Emergency Communication Center (located in Building 3134) to prevent damage from ice buildup. The grounding wire cannot be attached to any fixed ladders. The antenna shall be mounted a minimum of 2' above the roof line and must be mounted securely (nut and bolt) to withstand the wind load. Mounting the bracket using screws through the building's metal skin is not acceptable. The contractor is responsible for cutting the antenna to its proper length, in order to match the frequency and transmit correctly, and is responsible for installing the antenna cable connectors correctly. The antenna cable must have a lightning arrester installed inline, in a weatherproof box. The assembly must be properly grounded per manufacturer specifications. As part of the 100 percent functional performance tests, witnessed by the Alarm Shop personnel, the transmitter must pass manufacturer's specification for forward and reflective power and all signals transmitted or received must be accurate.

1.6. Wiring and Circuits

1.6.1. All circuits for the fire alarm and MNS shall be in red conduit. All conduit shall be a minimum of ¾". All junction box covers shall be painted red.

1.6.2. The fire alarm and MNS wiring shall be Class B.

1.6.3. All conductor connections shall be made under screw terminals. Provide insulated barrier type terminal strips at junction points. Use of wire nuts, crimped connectors, or twisting of conductors is prohibited.

1.7. Strobes

1.7.1. Strobes shall be provided to alert persons with hearing disabilities, and shall be installed per NFPA 72, and located as required to meet Architectural Barriers Act Accessibility Guidelines (ABAAG) requirements. Wall-mounted appliances shall

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be mounted such that the entire lens is not less than 80” above the highest floor level or 6” below the ceiling, whichever is lower. Ceiling strobes are permitted, and shall be located and installed per NFPA 72, and may be part of a combined audible/visual device. A single clear strobe with a red plate with white lettering stating “ALERT” shall be provided for the fire alarm and MNS.

### **1.8. Protection From Freezing**

- 1.8.1. For any wet-pipe systems that have sprinklers under overhead doors, sprinklers shall be provided with heat trace. Other areas with wet pipe sprinkler systems will be required to be heat traced as determined by the Installation AHJ.
- 1.8.2. Any heat trace associated with the sprinkler system shall be on a dedicated circuit breaker, shall be red and lockable and shall be monitored by the fire alarm and MNS. Power source to the heat trace shall be monitored by the fire alarm panel so that in the event that power is lost a signal will be sent to the Eielson Fire Department.
- 1.8.3. Fire alarm and MNS devices shall not be located in arctic entries.
- 1.8.4. Mechanical rooms in which sprinkler risers are located are required to have a low temperature sensor in them to prevent damage due to freezing. Upon activation of the low temperature alarm, a supervisory signal shall be sent to the Eielson Fire Department.
- 1.8.5. All open bay areas or areas where freezing is probable as determined by the Installation AHJ, a dry pipe system electronically actuated on low air shall be provided. A low air pressure switch is mandatory for a dry system, and must be address or zoned independently.
- 1.8.6. Any area determined to be susceptible to arctic conditions as determined by the Installation AHJ shall be provided with insulation and heat trace.

## **2. Fire Alarm System**

- 2.1. Addressable fire alarm panels shall be required for facilities over 1000 square feet, deemed to be mission critical or as determined by the Installation AHJ.
- 2.2. Transceivers
  - 2.2.1. The contractor shall provide a Monaco transceiver for each building in the project.
  - 2.2.2. Fire alarm systems shall communicate wirelessly with the Eielson Monaco D-21 supervising station at a frequency of 139.675 MHz.
  - 2.2.3. Provide a Monaco BT-XF transceiver capable of communicating with the Eielson Monaco D-21 supervising station.

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- 2.2.4. The contractor is responsible for programming and integration with the existing wireless D-21 front end server.
- 2.2.5. The fire alarm transceiver shall transmit all addressable devices or a minimum of the following zones:
  - a. Water flow alarm (1 per water flow switch)
  - b. Hangar foam system pressure switch (1 per pressure switch)
  - c. Hangar pre-action pressure switch (1 per pressure switch)
  - d. Hangar flame detector (1 per hangar bay)
  - e. Hangar manual foam pull station (1 per hangar bay)
  - f. Hangar automatic heat detector (1 per hangar bay)
  - g. Carbon Monoxide detector
  - h. Foam system tamper switch supervisory
  - i. Pump loss of power supervisory
  - j. Pump Phase reversal supervisory
  - k. Pump running supervisory
  - l. Foam key switch disable supervisory
  - m. Flame detector disable key switch supervisory
  - n. Pre-action key switch supervisory
  - o. Disable switch or feature supervisory
  - p. Pressure maintenance pump loss of power supervisory
  - q. Elevator flow switch
  - r. Elevator tamper switch
  - s. Elevator loss of shunt trip power supervisory
  - t. Manual Pull Station (1 per floor)
  - u. Automatic detector initiating building alarm (1 per floor per device type)
  - v. Dwelling unit heat detector alarm signal (1 per floor)
  - w. Dwelling unit smoke detector supervisory signal (1 per floor)
  - x. Tamper Switch trouble signal

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- y. Low Temperature supervisory signal for mechanical rooms
  - z. Heat trace power loss (supervisory)
  - aa. Air compressor power loss (supervisory)
  - bb. Duct Detector alarm signal (1 per floor)
  - cc. Mass Notification override of the fire alarm notification system supervisory signal
  - dd. General supervisory signal
  - ee. Common Trouble signal
  - ff. Two spare zones, including necessary relays and hardware in the fire alarm panel and transmitter panel.
- 2.2.6. NOTE: Depending on the complexity of the system or type of systems installed, more zones will be required. The contractor shall coordinate with the Installation AHJ for zones that may not be listed here.
- 2.3. All fire alarm systems components including sprinkler system control valve shall be electronically supervised and continuously monitored.
- 2.4. Provide a heating, ventilation and air conditioning (HVAC) shutdown button at the fire alarm and MNS control panel to shut down all the HVAC units. Shutdown button shall comply with UFC 4-021-01. Coordinate location of shutdown button with the Installation AHJ.
- 2.5. Where addressable modules are used on conventional devices, the addressable monitor module shall monitor, at most, one conventional initiating device.
- 2.6. The contractor shall include a disable switch or function for the following items (located at the main fire alarm control panel), if these items are included in the fire alarm system:
- 2.6.1. Air handler fan shutdown and smoke damper closure, horns or speaker strobes, automatic door hold open release, elevator recall, elevator shunt trip, fire pump, etc.
  - 2.6.2. If a disable switch or feature is activated, an LED will illuminate at the panel indicating a trouble condition. A trouble signal shall be transmitted to the Eielson Fire Department and a description of the feature disabled shall be displayed at the fire alarm panel.
- 2.7. Field Devices

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- 2.7.1. Fixed temperature heat detectors shall be used due to the repeated nuisance alarms. Heat detectors shall be installed per code or as required by manufacturer's recommended location or spacing.
- 2.7.2. Detectors located in dormitory sleeping areas shall have low frequency sounder bases in all dwelling units. Activation of any detector in a dwelling unit shall activate all sounder bases in the dwelling unit and transmit a supervisory signal to the Eielson Fire Department. Activation of any two (2) dwelling unit detectors will initiate a building alarm and detectors will latch in alarm. The first dwelling unit smoke detector activation shall be non-latching and self-restoring.
- 2.7.3. Fire/smoke doors in primary egress path shall be held open by magnetic devices controlled by the fire alarm panel. This requirement does not apply to hangars per UFC 4-211-01. Smoke detectors shall be provided at all doors held open by magnetic hold open device, regardless of door type.
- 2.7.4. All duct detectors that are installed must be readily accessible and clearly labeled. Locations that result in the need for maintenance personnel to climb over ductwork and/or need a ladder over 6' in height for access is unacceptable. Any duct detector that is not readily accessible or is more than 6' above the finished floor shall have a remote LED/test/reset device. All duct detectors shall be of the auto reset type.
- 2.7.5. All duct detectors shall have duct access doors to maintain and access the duct detector tube. Door shall be a minimum of 18" x 18" unless smaller size is necessary which requires approval of the Installation AHJ.
- 2.7.6. Provide pull stations where required by applicable codes and criteria. At a minimum, a pull station shall be located within 5' of each exit or where required per the Installation AHJ.
- 2.8. A device label shall be provided on the exterior for each device that matches the device number at the panel. Notification Appliance Circuit (NAC devices) shall also be labeled with loop number and device number that matches the drawings.
- 2.9. A weatherproof speaker/strobe, listed for use in Eielson's low temperatures, shall be installed on each side of the exterior of the building.

**3. Mass Notification System**

- 3.1. All buildings having a fire alarm system shall also have an MNS installed unless otherwise directed by the Installation AHJ.
- 3.2. Building Mass Notification System (BMNS)
  - 3.2.1. Provide a BMNS in accordance with all requirements UFC 4-021-01, except as noted herein.

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3.2.2. The contractor is to note that Whelen IPS 400 does not currently meet UL standard 864 and therefore cannot be used to power speakers to broadcast a fire alarm evacuation signal. Therefore, BMNS must be either stand-alone and have separate speakers from the fire alarm system or IPS 400 must be electrically isolated from a combination fire alarm/mass notification system, in accordance with UFC 4-021-01.

3.3. Connect to the Wide Area Mass Notification System (MNS)

3.3.1. The individual BMNS system shall be interfaced with the Eielson-wide mass notification central control system. The existing Eielson-wide central control system was provided by Whelen. In order for the individual BMNS to be fully and completely integrated into the Eielson-wide central control system, it must be added and programmed into the Whelen central receiving station by a Whelen authorized representative. The installation of a new combination fire alarm/MNS or stand-alone MNS will not be deemed complete until the Whelen central receiving station has had the new or renovated building added as a new site. MNS testing will include testing of the interface and control of the BMNS by the Eielson central MNS. The contractor must coordinate installation, testing and connection of the MNS system with the Eielson Alarm Shop and Base Communications.

3.4. Mass notification sequence of operation

3.4.1. For a combined fire alarm and MNS, the ACU is the main fire alarm control panel. For separate systems, the ACU is the BMNS panel. The ACU shall take precedence over the Whelen IPS 400 signal and over any LOC function. The LOC shall take precedence over the IPS signal. Once the ACU is activated, the LOC shall not be able to override the ACU. The MNS shall take priority over the fire alarm and the PA system (if installed). The fire alarm system shall override the PA. Any mass notification or fire alarm even shall override the microphone used as a PA.

3.5. Audible Appliances

3.5.1. Design criteria for locating audible appliances. The sound pressure level in a room or area shall not vary by more than 6 dB across the room or area (starting at a point 10 feet from the speaker or horn).

3.5.2. Voice notification appliances shall have adjustable or multi-tap settings with available settings both above and below the design settings (except that 15 watt devices, where permitted, can be at the highest setting). Devices shall be spaced such that the device does not need to be tapped higher than 0.5 watt to meet audibility and intelligibility requirements.

3.5.3. Amplifier circuits shall be loaded to no more than 70 percent of rated continuous capacity when producing sound levels as required by NFPA 72 against normal



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ambient background noise levels for this occupancy for simultaneous operation of all speakers for all areas in the voice zone. Annotate data for each circuit on the drawing.

3.6. Local Operator Consoles (LOC)

- 3.6.1. All LOC are required to have an adjustable microphone gain. All LOC's shall have handheld microphone.
- 3.6.2. The contractor shall provide instructions located inside the LOC cabinet and at the ACU describing the procedures for initiating either live voice messages or pre-recorded messages. These instructions shall be permanently attached to the cabinet.
- 3.6.3. LOC microphones shall be located and adjusted so that the microphones can be used to provide a message meeting the intelligibility requirements of UFC 4-021-01. LOC's may be located in the stairs; however travel distance defined in UFC 4-021-01 must still be met. If LOC's are provided in the stairs, the contractor shall provide an amber strobe at each floor landing in the stairs.
- 3.6.4. The LOC shall be capable of a minimum of 8 pre-recorded messages. The following pre-recorded messages shall be programmed into and clearly labeled on the LOC's:
  - a. Attention all personnel: There has been a bomb threat. Evacuate immediately and proceed to your designated evacuation point. This is not a drill.
  - b. Attention all personnel: Lockdown, lockdown, lockdown. There is an active shooter on the premises. This is not a drill.
  - c. Attention all personnel: Please evacuate the building immediately. Listen for announcement of alternate exit path if required. This is not a drill.
  - d. Attention all personnel: Attention, attention. The Force Protection Condition for Eielson AFB has been elevated. All personnel are to immediately implement prescribed actions. Tune your television to the Commander's access channel or access the base intranet for further information.
  - e. Attention all personnel: Please proceed to your designated shelter-in-place room immediately and wait for further instruction. This is not a drill.
  - f. Attention all personnel: This is a severe weather warning. Make sure to keep track of weather conditions and be prepared to take shelter.
  - g. Attention all personnel: The building emergency or test has now ended. Please resume your normal duties. Thank you for your cooperation.

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- h. Attention all personnel: This is a test of the Mass Notification system. This is only a test.

3.6.5. LOC's should be labeled "Mass Notification System LOC".

**4. Sprinkler/Suppression Systems**

4.1. Piping and Connections

4.1.1. Plastic pipe is prohibited.

4.1.2. Flexible hose connections for sprinklers are prohibited.

4.1.3. All piping used on the fire suppression system shall be black steel Schedule 40.

4.1.4. Fittings for non-grooved steel pipe shall be malleable iron conforming to ASME B16.3. Fittings into which sprinklers, drop nipples or riser nipples (sprigs) are screwed shall be threaded type. Plain-end fittings with mechanical couplings, mechanical tee's, fittings that use steel gripping devices to bite into the pipe and segmented welded fittings shall not be used. Gasket for grooved couplings shall be the flush type that fills the entire cavity between the fitting and the pipe. Reductions in pipe sizes shall be made with one-piece tapered reducing fittings.

4.2. Valves and Backflow Prevention

4.2.1. Inspector's test valve is to be located at the farthest point of the suppression system.

4.2.2. The contractor shall provide a floor control valve assembly or separate riser for each floor in the building. Assembly shall comply with Figure 4-1 of UFC 3-600-01.

4.2.3. All control valves except the backflow preventer may be butterfly valves or outside screw & yoke (OS&Y) gate type and shall be provided with tamper switches connected to the Fire Alarm Control Panel (FACP). Backflow preventer shall be OS&Y type. Butterfly valves for a normally closed valve shall be supervised in the normally closed position.

4.2.4. Control valves shall be installed in a location accessible by maintenance personnel and inaccessible to building occupants.

4.2.5. A double-check backflow prevention assembly that complies with ASSE 1013 or ASSE 1015 shall be provided at the sprinkler riser connection to the potable water system. Provide piping, valves, test header, and other devices necessary to provide a permanent method for forward flow testing of the backflow prevention assembly at system demand. Forward flow test shall not require removal of check valve disk. If a reduced pressure backflow preventer is provided, the disinfection requirements located elsewhere are not required. Vent from the reduced pressure backflow preventer shall be provided with drain piping to an adequately sized floor drain. Prior to final sprinkler testing, the backflow

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preventer shall be tested by a certified backflow assembly tester. Backflow preventer testing documentation will need to be supplied to 354<sup>th</sup> CES Utilities Shop Supervisor, Sheldon Sites or his replacement. Backflow preventer test header shall be exterior to the building with a supervised shut-off valve inside the building.

- 4.3. All arctic entries to be protected by dry sprinklers where required.
- 4.4. If a wet pipe system is utilized, ensure a time-delay programming for the flow switch installed to counter any water pressure instability.
- 4.5. Hydraulic calculations shall take into account the domestic water demand in addition to the fire sprinkler and hose stream demand. All calculations shall include a 10 percent safety factor on the system pressure. Water velocity in the piping system shall not exceed 20 feet per second. Software that uses k-factors for typical branch lines is not acceptable.
- 4.6. Provide manual air vents and/or auxiliary drains to allow bleeding of air from all the sprinkler piping.
- 4.7. Sprinkler pipe shall not be located in the communications room or elevator machine room. Sprinklers protecting the communications room or elevator machine rooms shall be sidewall type and provided with a guard.
- 4.8. Sprinklers located in the hangars bays shall be pre-action type in accordance with UFC 4-211-01, *Aircraft Maintenance Hangars* and 4-211-02, *Aircraft Corrosion Control and Paint Facilities*.
- 4.9. Sprinklers shall be provided to protect all floor areas under the first floor stair including landings and risers.
- 4.10. Hydrant flow shall be re-tested prior to design work on the sprinkler system to obtain the flow quantities. Fire Protection Engineer Designer of Record is required to witness flow tests.
- 4.11. Dormitories only: Flushed concealed sprinkler heads shall be provided in the dwelling units and the corridors located outside the dwelling units.
- 4.12. If an elevator pit sprinkler is provided, a flow switch shall be provided in the same location as the pit sprinkler control valve.
- 4.13. Water motor alarms shall not be used. See Section 4.14 for electrically operated bell.
- 4.14. Waterflow exterior alarm signal shall be an electrically operated 24VDC waterflow bell on exterior of the building and shall be non-silenceable.

## **5. Closeout Requirements**

- 5.1. Asbuilt Drawings

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- 5.1.1. The contractor shall supply electronic copies (a .pdf file) of the final as-built drawings, O&M manuals and a copy of the fire alarm/sprinkler system program to the Alarm Shop.
- 5.1.2. Wall maps at 1/8" to 1 foot scale shall be provided for each system and mounted next to their respective system. The Fire alarm map shall show the location of each device and the device ID. The sprinkler maps shall show the location of each low point drain and each main drain point. The Contractor shall supply a .pdf file of the final as-builts to the Alarm Shop.
- 5.1.3. All blueprints and as-builts related to the fire alarm and suppression systems need to be forwarded to the Alarm Shop 48 hours prior to the 100% acceptance test. As-built drawings must show the location and address or zone of each device in the system. Intelligent devices must be labeled with their address.
- 5.1.4. Two suitably framed drawings are required in the suppression room: one drawing showing all interconnections of suppression components, and one drawing listing the sequence of operation for testing, and resetting after a system trip.
- 5.2. O&M Manuals
  - 5.2.1. The contractor shall provide a fire alarm sequence of operation matrix.
  - 5.2.2. Copies of manuals for all systems and equipment shall be turned over to the 354th CES Alarm Shop for system maintenance, reprogramming, and testing.
  - 5.2.3. A locked cabinet keyed to the fire alarm panel shall be provided near the fire alarm panel. The contractor shall place hard copies of the O&M manuals for the fire alarm/sprinkler system and as-built drawings within the cabinet.
  - 5.2.4. The contractor shall provide copies of the fire programming software, including operating software keys, and interface equipment for both the fire alarm panel and all fire system devices requiring programming, even if these items are proprietary. Any revisions to the fire alarm software, and any revisions of the software in the systems with which the fire alarm software interfaces, shall be verified for compatibility in accordance with the requirements of NFPA 72 Paragraph 23.2.2.1.1.
- 5.3. Training
  - 5.3.1. Fire Alarm Training
    - a. Training course shall be provided for Alarm Shop personnel. The course shall be conducted in the building where the system is installed or as designated by the Contracting Officer. The training shall consist of two, 2-hour training sessions held on consecutive days with one training session per day, unless otherwise setup with the Alarm Shop. The training shall start after the system is functionally completed but prior to final acceptance tests. The instruction

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shall cover items contained in the operation and maintenance instructions. The contractor shall provide all required training material, visual aids, software/hardware to supply the number of personnel to be trained in each training session.

5.3.2. Sprinkler System Training

- a. Training course shall be provided for Alarm Shop personnel. The course shall be conducted in the building where the system is installed. The training shall consist of a single, 2-hour training session. The training shall start after the system is functionally complete.

5.3.3. MNS Training

- a. Training course shall be provided for Alarm Shop personnel. The course shall be conducted in the building where the system is installed. The training shall consist of a single, 2-hour training session. The training shall start after the system is functionally complete.

5.4. Testing

5.4.1. Sprinkler System Testing

- a. The system, including the underground water mains, and the aboveground piping and system components, shall be tested in accordance with NFPA 13 and NFPA 24 to assure that equipment and components function as intended. Upon completion of specified tests, the contractor shall complete and submit the Contractor's Material and Test Certificates. The contractor shall coordinate with the Contracting Officer's Representative to invite Alarm Shop personnel and Fire Department personnel to witness final testing. Final testing schedule shall be flexible to accommodate Fire Alarm Shop schedule.

5.4.2. Fire Alarm & MNS Testing

- a. The fire alarm and MNSs shall be fully tested with a functional and operational performance tests including each installed initiating and notification device, meggering of conductors for grounded, shorted or open circuits. An acceptance test shall be performed in accordance with NFPA 72. Each device shall be tested. After testing is completed, the contractor shall furnish to the Contracting Officers Representative completed originals of the NFPA 72 Record of Completion and the NFPA 72 Testing and Inspection form. The contractor shall coordinate with the Contracting Officer's Representative to invite Alarm Shop personnel and Fire Department personnel to witness final testing. Final testing schedule shall be flexible to accommodate Fire Alarm Shop schedule.

5.4.3. Shop MNS Final Test

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- a. Audibility and intelligibility testing of the MNS shall be accomplished in accordance with UFC 4-021-01. UFC 4-021-01 requires an average of three (3) readings of each room to determine the CIS score. The 3 readings will be taken as follows: the most remote point from the speakers in the room; a middle point between speakers to be field determined based on wall or ceiling mounted speakers; and a point close to the speaker. Readings will be recorded on an 11x17 plan of the building with CIS scores identified on the drawings.

**6. Warranty Coverage**

- 6.1. Include in the warranty statement that any code violations not discovered during acceptance testing, but found during the warranty period, will be corrected by the contractor. The 1 year warranty shall begin when the entire facility is signed off, not when the fire alarm portion of the project is complete. Contact the Alarm Shop for further clarification if needed.
- 6.2. One month prior to all fire protection system warranty expiration, the equipment distributor shall perform (at no extra cost) all maintenance as recommended on an annual basis by the manufacturer and required by associated NFPA's. Any defective or damaged equipment shall be replaced, any user requested software changes shall be made and the system recertified. Spare parts provided under this contract shall not be consumed during this period.

**7. Alarm Shop Support**

- 7.1. In the event that a contractor requires 354th CES Alarm Shop support for the performance of duties as outlined in a contract or is doing work on a fire system, the contractor must coordinate with the Alarm Shop Supervisor/NCOIC, 24 to 72 hours in advance for scheduling purposes.