SECTION 28 31 76

INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, ADDRESSABLE
08/20

PART 1 GENERAL

1.1 REFERENCES

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.

ACOUSTICAL SOCIETY OF AMERICA (ASA)

ASA S3.2	(2020) American National Standard Method for Measuring the Intelligibility of Speech Over Communication Systems (ASA 85)

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 4	(2018) Standard for Integrated Fire Protection and Life Safety System Testing
NFPA 70	(2020; TIA 22-1; ERTA 1 2022) National Electrical Code
NFPA 72	(2022; ERTA 22-1) National Fire Alarm and Signaling Code
NFPA 90A	(2021) Standard for the Installation of Air Conditioning and Ventilating Systems
NFPA 170	(2021) Standard for Fire Safety and Emergency Symbols

TINKER AIR FORCE BASE (TAFB)

TAFB FPS	(2022) Tinker Air Force Base Fire Protection Standard

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-600-01	(2016; with Change 6, 2021) Fire Protection Engineering for Facilities
UFC 3-601-02	(2021) Fire Protection Systems Inspection, Testing, and Maintenance
UFC 4-010-06	(2016; with Change 1, 2017) Cybersecurity of Facility-Related Control Systems
UFC 4-021-01	(2008; with Change 1) Design and O&M: Mass

Notification Systems

UNDERWRITERS LABORATORIES (UL)

UL 268	(2016; Reprint Nov 2021) UL Standard for Safety Smoke Detectors for Fire Alarm Systems
UL 268A	(2008; Reprint Oct 2014) Smoke Detectors for Duct Application
UL 464	(2016; Reprint Sep 2017) UL Standard for Safety Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
UL 864	(2014; Reprint May 2020) UL Standard for Safety Control Units and Accessories for Fire Alarm Systems
UL 1480	(2016; Reprint Sep 2017) UL Standard for Safety Speakers for Fire Alarm and Signaling Systems, Including Accessories
UL 1638	(2016; Reprint Sep 2017) UL Standard for Safety Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
UL 1971	(2002; Reprint Oct 2008) Signaling Devices for the Hearing Impaired
UL 2572	(2016; Bul. 2018) UL Standard for Safety Mass Notification Systems
UL Fire Prot Dir	(2012) Fire Protection Equipment Directory

1.2 RELATED SECTIONS

Refer to the following sections for related work and coordination:

Section 21 13 13 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION
Section 21 21 03.00 10 WET CHEMICAL FIRE EXTINGUISHING SYSTEM

1.3 SUMMARY

1.3.1 Scope

a. This work includes designing and modifying the existing fire alarm and mass notification (MNS) system as described herein and on the contract drawings. New fire alarm and mass notification devices shall be installed to achieve code compliance within the work area in Building 9001. Include system wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, initiating devices, notification appliances, supervising station fire alarm transmitters/mass notification transceiver, and other accessories and miscellaneous items required for a complete operational system even though each item is not specifically mentioned or described. Provide system complete and ready for operation. Existing interior fire alarm system was manufactured by Simplex Grinnell 4120 , by Johnson Controls..

Design and installation must comply with UFC 3-600-01, UFC 4-010-06, UFC 4-021-01, and TAFB FPS standards.

b. Provide equipment, materials, installation, workmanship, inspection, and testing in strict accordance with NFPA 72, UFC 3-600-01, UFC 4-021-01, and TAFB FPS standards, except as modified herein. The system layout on the drawings show the intent of coverage and suggested locations. Final quantity, system layout, and coordination are the responsibility of the Contractor.

c. Each remote fire alarm control unit must be powered from a wiring riser specifically for that use or from a local emergency power panel located on the same floor as the remote fire alarm control unit. Where remote fire control units are provided, equipment for notification appliances may be located in the remote fire alarm control units.

f. The fire alarm and mass notification system must be independent of the building security, building management, and energy/utility monitoring systems other than for control functions.

1.3.2 Qualified Fire Protection Engineer (QFPE)

Services of the QFPE must include:

a. Reviewing SD-02 and SD-03 submittal packages for completeness and compliance with the provisions of this specification. Construction (shop) drawings and calculations must be prepared by an individual who has obtained National Institute for Certification in Engineering Technologies, Fire alarm systems, Level III certification, at a minimum. The QFPE must review the shop drawings, calculations and material submittal. The QFPE must affix their professional engineering stamp with signature to the shop drawings, calculations, and material data sheets, indicating approval prior to submitting the shop drawings to the DFPE.

b. Providing a letter documenting that the SD-02 and SD-03 submittal package has been reviewed and noting any outstanding comments.

c. Performing in-progress construction surveillance prior to installation of ceilings (rough-in inspection).

d. Witnessing pre-Government and final Government functional performance testing and performing a final installation review.

e. Signing applicable certificates under SD-07.

1.4 DEFINITIONS

Wherever mentioned in this specification or on the drawings, the equipment, devices, and functions must be defined as follows:

1.4.1 Interface Device

An addressable device that interconnects hard wired systems or devices to an analog/addressable system.

1.4.2 Fire Alarm and Mass Notification Control Unit (FMCU)

A master control unit having the features of a fire alarm control unit

(FACU) and an autonomous control unit (ACU) where these units are interconnected to function as a combined fire alarm/mass notification system. The FACU and ACU functions may be contained in a single cabinet or in independent, interconnected, and co-located cabinets.

1.4.3 Local Operating Console (LOC)

A unit designed to allow emergency responders and/or building occupants to operate the MNS including delivery of recorded messages and/or live voice announcements, initiate visual, textual visual, and audible appliance operation and other relayed functions.

1.4.4 Designated Fire Protection Engineer (DFPE)

The DoD fire protection engineer that oversees that Area of Responsibility for that project. This is sometimes referred to as the "cognizant" fire protection engineer. Interpret reference to "authority having jurisdiction" and/or AHJ in referenced standards to mean the Designated Fire Protection Engineer (DFPE). The DFPE may be responsible for review of the contractor submittals having a "G" designation, and for witnessing final inspection and testing.

1.4.5 Qualified Fire Protection Engineer (QFPE)

A QFPE is an individual who is a licensed professional engineer (P.E.), who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveying (NCEES) and has relevant fire protection engineering experience.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval.

Shop drawings (SD-02), product data (SD-03) and calculations (SD-05) must be prepared by the fire alarm designer and combined and submitted as one complete package. The QFPE must review the SD-02/SD-03/SD-05 submittal package for completeness and compliance with the Contract provisions prior to submission to the Government. The QFPE must provide a Letter of Confirmation that they have reviewed the submittal package for compliance with the contract provisions. This letter must include their registered professional engineer stamp and signature. Partial submittals and submittals not reviewed by the QFPE will be returned by the Government disapproved without review.

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualified Fire Protection Engineer (QFPE); G

Fire alarm system designer; G

Supervisor; G

Technician; G

Installer; G

Test Technician; G

Fire Alarm System Site-Specific Software Acknowledgement; G

SD-02 Shop Drawings

Wiring Diagrams; G

System Layout; G

Notification Appliances; G

Initiating devices; G

Amplifiers; G

Battery Power; G

Voltage Drop Calculations; G

SD-03 Product Data

Local Operating Console (LOC); G

Amplifiers; G

Tone Generators; G

Manual Stations; G

Smoke Detectors; G

Duct Smoke Detectors; G

Heat Detectors; G

Addressable Interface Devices; G

Addressable Control Modules; G

Isolation Modules; G

Notification Appliances; G

Textual Display Signs; G

Batteries; G

Battery Chargers; G

Alarm Wiring; G

Back Boxes and Conduit; G

Ceiling Bridges for Ceiling-Mounted Appliances; G

SD-06 Test Reports

Test Procedures; G

SD-07 Certificates

Verification of Compliant Installation; G

Request for Government Final Test; G

SD-10 Operation and Maintenance Data

Operation and Maintenance (O&M) Instructions; G

Instruction of Government Employees; G

SD-11 Closeout Submittals

As-Built Drawings

Spare Parts

1.5.1 Coordinated Submittal

The general contractor shall provide the shop drawings and data sheets of fire alarm and mass notification system, Wet Chemical System, and sprinkler system submittals in the same package for review.

1.6 SYSTEM OPERATION

The existing fire alarm and mass notification system functions and operations will remain the same unless noted within the specification. .

1.6.1 Alarm Initiating Devices and Notification Appliances (Visual, Voice, Textual)

a. Connect alarm initiating devices to initiating device circuits (IDC) Class "B", or to signaling line circuits (SLC) Class "B" and installed in accordance with NFPA 72, UFC 3-600-01, UFC 4-021-01, and TAFB FPS standards..

b. Connect notification appliances to notification appliance circuits (NAC) Class "B".

1.6.2 Functions and Operating Features

The system must provide the following functions and operating features:

a. Visual alarm notification appliances must be synchronized as required by NFPA 72.

b. Electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control unit.

c. An audible and visual trouble signal to activate upon a single break or open condition, or ground fault. The trouble signal must also operate upon loss of primary power (AC) supply, absence of a battery supply, low battery voltage, or removal of alarm or supervisory control unit

modules. After the system returns to normal operating conditions, the trouble signal must again sound until the trouble is acknowledged. A smoke detector in the process of being verified for the actual presence of smoke must not initiate a trouble condition.

d. A trouble signal silence feature that must silence the audible trouble signal, without affecting the visual indicator.

e. Program capability via switches in a locked portion of the FMCU to bypass the automatic notification appliance circuits, fire reporting system features. Operation of this programmed action must indicate on the FMCU display as a supervisory or trouble condition.

f. Alarm functions must override trouble or supervisory functions. Supervisory functions must override trouble functions.

g. The system must be capable of being programmed from the control unit keyboard. Programmed information must be stored in non-volatile memory.

h. The system must be capable of operating, supervising, and/or monitoring non-addressable alarm and supervisory devices.

i. There must be no limit, other than maximum system capacity, as to the number of addressable devices that may be in alarm simultaneously.

j. Where the fire alarm/mass notification system is responsible for initiating an action in another emergency control device or system, such as HVAC, the addressable fire alarm relay must be located within 3 feet of the device to be controlled..

1.7 TECHNICAL DATA AND SITE-SPECIFIC SOFTWARE

Technical data and site-specific software (meaning technical data that relates to computer software) that are specifically identified in this project, and may be required in other specifications, must be delivered, strictly in accordance with the CONTRACT CLAUSES. The fire alarm system manufacturer must submit written confirmation of this contract provision as "Fire Alarm System Site-Specific Software Acknowledgement". Identify data delivered by reference to the specification paragraph against which it is furnished. Data to be submitted must include complete system, equipment, and software descriptions. Descriptions must show how the equipment will operate as a system to meet the performance requirements of this contract. The site-specific software data package must also include the following:

a. Items identified in NFPA 72, titled "Site-Specific Software".

b. Identification of programmable portions of the system equipment and capabilities.

c. Description of system revision and expansion capabilities and methods of implementation detailing both equipment and software requirements.

d. Provision of operational software data on all modes of programmable portions for fire alarm and mass notification.

e. Description of Fire Alarm and Mass Notification Control Unit equipment operation.

f. Description of auxiliary and remote equipment operations.

1.8 EXISTING EQUIPMENT

a. Equipment and devices must be compatible and operable with the existing fire alarm/mass notification system and must not impair reliability or operational functions of existing supervising station fire alarm system. The supervising equipment is existing and consists of the following brands and models: supervising station control unit manufactured by Simplex Grinnell 4120 , by Johnson Controls..

b. Equipment and devices must be compatible and operable with the existing building reporting system. Equipment must not impair reliability or operational functions of the existing system. The existing building reporting system manufactured by Monaco.

1.9 QUALITY ASSURANCE

1.9.1 Submittal Documents

1.9.1.1 Preconstruction Submittals

Within 36 days of contract award but not less than 14 days prior to commencing any work on site, the Contractor must submit the following for review and approval. SD-02, SD-03 and SD-05 submittals received prior to the review and approval of the qualifications of the fire alarm subcontractor and QFPE must be returned disapproved without review. All resultant delays must be the sole responsibility of the Contractor.

1.9.1.2 Shop Drawings

Shop drawings must not be smaller than ANSI D. Drawings must comply with the requirements of NFPA 72 and NFPA 170. Minimum scale for floor plans must be 1/8"=1'.

1.9.1.3 Nameplates

Nameplate illustrations and data to obtain approval by the Contracting Officer before installation.

1.9.1.4 Wiring Diagrams

Two (2) hard copies and one pdf version on electronic media copy of point-to-point wiring diagrams showing the points of connection and terminals used for electrical field connections in the system, including interconnections between the equipment or systems that are supervised or controlled by the system. Diagrams must show connections from field devices to the FMCU and remote FMCU, initiating circuits, switches, relays and terminals, including pathway diagrams between the control unit and shared communications equipment within the protected premises. Point-to-point wiring diagrams must be job specific and must not indicate connections or circuits not being utilized. Provide complete riser diagrams indicating the wiring sequence of all devices and their connections to the control equipment. Include a color-code schedule for the wiring.

1.9.1.5 System Layout

Two (2) hard copies and one pdf version on electronic media copy of plan view drawing showing device locations, terminal cabinet locations, junction boxes, other related equipment, conduit routing, conduit sizes, wire counts, conduit fill calculations, wire color-coding, circuit identification in each conduit, and circuit layouts for all floors. Indicate candela rating of each visual notification appliance. Indicate the wattage of each speaker. Clearly identify the locations of isolation modules. Indicate the addresses of all devices, modules, relays, and similar. Show/identify all acoustically similar spaces. Indicate if the environment for the FMCU is within its environmental listing (e.g. temperature/humidity).

Provide a complete description of the system operation in matrix format similar to the "Typical Input/Output Matrix" included in the Annex of NFPA 72.

1.9.1.6 Notification Appliances

Calculations and supporting data on each circuit to indicate that there is at least 25 percent spare capacity for notification appliances. Annotate data for each circuit on the drawings.

1.9.1.7 Initiating Devices

Calculations and supporting data on each circuit to indicate that there is at least 25 percent spare capacity for initiating devices. Annotate data for each circuit on the drawings.

1.9.1.8 Amplifiers

Calculations and supporting data to indicate that amplifiers have sufficient capacity to simultaneously drive all notification speakers at tapped settings plus 25 percent spare capacity. Annotate data for each circuit on the drawings.

1.9.1.9 Battery Power

Calculations and supporting data as required in paragraph Battery Power Calculations for alarm, alert, and supervisory power requirements. Calculations including ampere-hour requirements for each system component and each control unit component, and the battery recharging period, must be included on the drawings.

1.9.1.10 Voltage Drop Calculations

Voltage drop calculations for each notification circuit indicating that sufficient voltage is available for proper operation of the system and all components, at a minimum rated voltage of the system operating on batteries. Include the calculations on the system layout drawings.

1.9.1.11 Product Data

Two (2) hard copies and one pdf version on electronic media copy of annotated descriptive data to show the specific model, type, and size of each item. Catalog cuts must also indicate the NRTL listing. The data must be highlighted to show model, size, and options that are intended for consideration. Data must be adequate to demonstrate compliance with all

contract requirements. Product data for all equipment must be combined into a single submittal.

Provide an equipment list identifying the type, quantity, make, and model number of each piece of equipment to be provided under this submittal. The equipment list must include the type, quantity, make and model of spare equipment. Types and quantities of equipment submitted must coincide with the types and quantities of equipment used in the battery calculations and those shown on the shop drawings.

1.9.1.12 Operation and Maintenance (O&M) Instructions

Two copies of the Operation and Maintenance Instructions. The O&M Instructions must be prepared in a single volume or in multiple volumes, with each volume indexed, and may be submitted as a Technical Data Package. Manuals must be approved prior to training. The Interior Fire Alarm And Mass Notification System Operation and Maintenance Instructions must include the following:

a. "Manufacturer Data Package five" as specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA.

b. Operating manual outlining step-by-step procedures required for system startup, operation, and shutdown. The manual must include the manufacturer's name, model number, service manual, parts list, and preliminary equipment list complete with description of equipment and their basic operating features.

c. Maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals must include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed.

d. Complete procedures for system revision and expansion, detailing both equipment and software requirements.

e. Software submitted for this project on CD/DVD media utilized.

f. Printouts of configuration settings for all devices.

g. Routine maintenance checklist. The routine maintenance checklist must be arranged in a columnar format. The first column must list all installed devices, the second column must state the maintenance activity or state no maintenance required, the third column must state the frequency of the maintenance activity, and the fourth column provided for additional comments or reference. All data (devices, testing frequencies, and similar) must comply with UFC 3-601-02.

h. A final Equipment List must be submitted with the Operating and Maintenance (O&M) manual.

1.9.1.13 As-Built Drawings

The drawings must show the system as installed, including deviations from both the project drawings and the approved shop drawings. These drawings must be submitted within two weeks after the final Government test of the system. At least one set of the as-built (marked-up) drawings must be provided at the time of, or prior to the final Government test. In accordance with, TAFB FP Standard,Intelligibility measurement results shall

be documented on the record drawings, in addition to the information required by NFPA 72.

1.9.2 Qualifications

1.9.2.1 Fire Alarm System Designer

The fire alarm system designer must be certified as a Level III (minimum) Technician by National Institute for Certification in Engineering Technologies (NICET) in the Fire Alarm Systems subfield of Fire Protection Engineering Technology or meet the qualifications for a QFPE.

1.9.2.2 Supervisor

A NICET Level III fire alarm technician must supervise the installation of the fire alarm/mass notification system. The fire alarm technicians supervising the installation of equipment must be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.9.2.3 Technician

Fire alarm technicians with a minimum of NICET Level II technician to install and terminate fire alarm/mass notification devices, cabinets and control units. The fire alarm technicians installing the equipment must be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.9.2.4 Installer

NICET Level II technician to assist in the installation of fire alarm/mass notification devices, cabinets and control units. Control equipment shall be installed and circuits terminated by a contractor who is NICET Level III (minimum). Device termination shall be performed by a contractor who is NICET Level II (minimum), and conduit and circuits shall be installed by a contractor who is NICET Level I (minimum). A licensed electrician will be allowed to install wire, cable, conduit and backboxes for the fire alarm system/mass notification system. The fire alarm installer must be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.9.2.5 Test Technician

Fire alarm technicians with a minimum of eight years of experience and NICET Level III utilized in testing and certification of the installation of the fire alarm/mass notification devices, cabinets and control units. The fire alarm technicians testing the equipment must be factory trained in the installation, adjustment, testing, and operation of the equipment installed as part of this project.

1.9.2.6 Manufacturer

Components must be of current design and must be in regular and recurrent production at the time of installation. Provide design, materials, and devices for a protected premises fire alarm system, complete, conforming to NFPA 72, except as specified herein.

1.9.3 Regulatory Requirements

Equipment and material must be listed or approved. Listed or approved, as used in this section, means listed, labeled or approved by a Nationally Recognized Testing Laboratory (NRTL) such as UL Fire Prot Dir or FM APP GUIDE. The omission of these terms under the description of any item of equipment described must not be construed as waiving this requirement. All listings or approvals by testing laboratories must be from an existing ANSI or UL published standard. The recommended practices stated in the manufacturer's literature or documentation must be considered as mandatory requirements.

1.10 DELIVERY, STORAGE, AND HANDLING

Protect equipment delivered and placed in storage from the weather, humidity, and temperature variation, dirt and dust, and other contaminants.

1.11 MAINTENANCE

1.11.1 Spare Parts

Furnish the following spare parts in the manufacturers original unopened containers:

a. One manual stations.

b. Two of each type of audible and visual alarm device installed.

c. One textual visual notification appliance.

d. Two of each type of addressable monitor module installed.

e. Two of each type of addressable control module installed.

1.11.2 Special Tools

Software, connecting cables and proprietary equipment, necessary for the maintenance, testing, and reprogramming of the equipment must be furnished to the Contracting Officer, prior to the instruction of Government employees.

PART 2 PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENT

All fire alarm and mass notification equipment must be listed for use under the applicable reference standards. Interfacing of UL 864 or similar approved industry listing with Mass Notification equipment listed to UL 2572 must be done in a laboratory listed configuration, if the software programming features cannot provide a listed interface control.

2.2 MATERIALS AND EQUIPMENT

2.2.1 Standard Products

Provide materials, equipment, and devices that have been tested by a nationally recognized testing laboratory and listed for fire protection service when so required by NFPA 72 or this specification. Select material from one manufacturer, where possible, and not a combination of manufacturers, for any particular classification of materials. Material and equipment must be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 2 years prior to bid opening.

2.3 FIRE ALARM AND MASS NOTIFICATION CONTROL UNIT

Use the existing fire alarm and mass notification control unit (FMCU) in Building 9001.

2.4 LOCAL OPERATING CONSOLES (LOC)

2.4.1 General

The LOC must consist of a remote microphone station incorporating a push-to-talk (PTT) hand-held microphone and system status indicators. The LOC must have the capability of being utilized to activate prerecorded messages. The unit must incorporate microphone override of any tone generation or recorded messages. The unit must be fully supervised from the FMCU. The housing for the LOC must not be lockable. LOC shall not be provided with push buttons to initiate the "Carbon Monoxide Emergence" or "Fire Emergency" messages.

2.5 AMPLIFIERS, PREAMPLIFIERS, TONE GENERATORS

Any amplifiers, preamplifiers, tone generators, digitalized voice generators, and other hardware necessary for a complete, operational, textual audible circuit conforming to NFPA 72 must be housed in a remote FMCU, terminal cabinet, or in the FMCU. Individual amplifiers must be 100 watts maximum.

2.5.1 Operation

The system must automatically operate and control all building speakers.

2.5.2 Construction

Amplifiers must utilize computer grade solid state components and must be provided with output protection devices sufficient to protect the amplifier against any transient up to 10 times the highest rated voltage in the system.

2.6 MANUAL STATIONS

Provide metal or plastic, flush mounted, double-action, addressable manual stations, that are not subject to operation by jarring or vibration. Stations must be equipped with screw terminals for each conductor. Stations that require the replacement of any portion of the device after activation are not permitted. Stations must be finished in red with molded raised lettering operating instructions of contrasting color. The use of a key must be required to reset the station.

Manual stations shall have a label affixed permanently to the exterior of the device identifying its assigned address and circuit. These shall match the information provided in the record drawings.

2.7 SMOKE DETECTORS

2.7.1 Spot Type Detectors

Provide addressable photoelectric smoke detectors as follows:

a. Provide analog/addressable photoelectric smoke detectors utilizing the photoelectric light scattering principle for operation in accordance with UL 268. Smoke detectors must be listed for use with the FMCU.

b. Provide self-restoring type detectors that do not require any readjustment after actuation at the FMCU to restore them to normal operation. The detector must have a visual indicator to show actuation.

c. Vibration must have no effect on the detector's operation. Protect the detection chamber with a fine mesh metallic screen that prevents the entrance of insects or airborne materials. The screen must not inhibit the movement of smoke particles into the chamber.

d. Provide twist lock bases with sounder that produces a minimum of 90 dBA at 10 feet with screw terminals for each conductor. The detectors must maintain contact with their bases without the use of springs.

e. The detector address must identify the particular unit, its location within the system, and its sensitivity setting. Detectors must be of the low voltage type rated for use on a 24 VDC system.

f. Smoke detectors shall have a label affixed permanently to the exterior of the device identifying its assigned address and circuit. These shall match the information provided in the record drawings.

2.7.2 Duct Smoke Detectors

Duct-mounted addressable photoelectric smoke detectors must consist of a smoke detector, as specified in paragraph Spot Type Detectors, mounted in a special housing fitted with duct sampling tubes. Detector circuitry must be mounted in a metallic or plastic enclosure exterior to the duct. It is not permitted to cut the duct insulation to install the duct detector directly on the duct. Detectors must be listed for operation over the complete range of air velocities, temperature and humidity expected at the detector when the air-handling system is operating. Detectors must be powered from the FMCU.

a. Sampling tubes must run the full width of the duct. The duct detector package must conform to the requirements of NFPA 90A, UL 268A, and must be listed for use in air-handling systems. The control functions, operation, reset, and bypass must be controlled from the FMCU.

b. Lights to indicate the operation and alarm condition must be visible and accessible with the unit installed and the cover in place. Remote indicators must be provided where required by NFPA 72. Remote indicators as well as the affected fan units must be properly identified in etched plastic placards.

c. Detectors must provide for control of auxiliary contacts that provide control, interlock, and shutdown functions specified in Section 23 09 00 to INSTRUMENTATION AND CONTROL FOR HVAC. Auxiliary contacts provide for this function must be located within 3 feet of the controlled circuit or appliance. The auxiliary contacts must be supplied by the fire alarm system manufacturer to ensure complete system compatibility.

d. Duct smoke detectors shall have a label affixed permanently to the exterior of the device identifying its assigned address and circuit. These shall match the information provided in the record drawings.

2.8 ADDRESSABLE INTERFACE DEVICES

The initiating device being monitored must be configured as a Class "B" initiating device circuits. The module must be listed as compatible with the control unit. The module must provide address setting means compatible with the control unit's SLC supervision and store an internal identifying code. Monitor module must contain an integral LED that flashes each time the monitor module is polled and is visible through the device cover plate. Pull stations with a monitor module in a common backbox are not required to have an LED. Existing fire alarm system initiating device circuits must be connected to a single module to supervise the circuit. Modules must be listed for the environmental conditions in which they will be installed.

2.9 ADDRESSABLE CONTROL MODULES

The control module must be capable of operating as a relay (dry contact form C) for interfacing the control unit with other systems, and to control door holders or initiate elevator fire service. The module must be listed as compatible with the control unit. The indicating device or the external load being controlled must be configured as Class B notification appliance circuits. The system must be capable of supervising, audible, visual and dry contact circuits. The control module must have both an input and output address. The supervision must detect a short on the supervised circuit and must prevent power from being applied to the circuit. The control module must provide address setting means compatible with the control unit's SLC supervision and store an internal identifying code. The control module must contain an integral LED that flashes each time the control module is polled and is visible through the device cover plate. Control Modules must be listed for the environmental conditions in which they will be installed.

2.10 NOTIFICATION APPLIANCES

Notification appliances shall have a label affixed permanently to the exterior of the device identifying its device number and circuit. These shall match the information provided in the record drawings.

2.10.1 Audible Notification Appliances

Audible appliances must conform to the applicable requirements of UL 464. Appliances must be connected into notification appliance circuits. Surface mounted audible appliances must be painted white. Recessed audible appliances must be installed with a grill that is painted white.

2.10.1.1 Speakers

a. Speakers must conform to the applicable requirements of UL 1480.

Speakers must have six different sound output levels and operate with audio line input levels of 70.7 VRMs and 25 VRMs, by means of selectable tap settings. Interior speaker tap settings must include taps of 1/4, 1/2, 1, and 2 watt, at a minimum. Exterior speakers must also be multi-tapped with no more than 15 watt maximum setting. Speakers must incorporate a high efficiency speaker for maximum output at minimum power across a frequency range of 400 Hz to 4,000 Hz, and must have a sealed back construction. Speakers must be capable of installation on standard 4-inch square electrical boxes. Where speakers and strobes are provided in the same location, they may be combined into a single unit. All inputs must be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the FMCU.

b. Provide speaker mounting plates constructed of cold rolled steel having a minimum thickness of 16 gage or molded high impact plastic and equipped with mounting holes and other openings as needed for a complete installation. Fabrication marks and holes must be ground and finished to provide a smooth and neat appearance for each plate. Each plate must be primed and painted.

c. Speakers must utilize screw terminals for termination of all field wiring.

2.10.2 Visual Notification Appliances

Visual notification appliances must conform to the applicable requirements of UL 1638, UL 1971 and conform to the Architectural Barriers Act (ABA). Visual Notification Appliances must have clear high intensity optic lens, xenon flash tubes, or light emitting diode (LED) and be marked "Alert" in letters of contrasting color. The light pattern must be dispersed so that it is visible above and below the strobe and from a 90 degree angle on both sides of the strobe. Strobe flash rate must be 1 flash per second and a minimum of 15 candela based on the UL 1971 test. Strobe must be clear/white strobe and semi-flush mounted.

2.10.3 Textual Display Signs

LED text displays (textural visible appliances) for hearing impaired occupants. The textual displays shall be programmable, slim line, and with minimum of 3-color. The displays shall be able to provide a minimum of 2 inch high letters and be located in high traffic areas easily seen by building occupants. The display shall be rated for the environmental conditions installed. The system shall interface with the Programmable sign controller to activate the proper message. Non dot matrix displays having two fixed independent text messages, "Announcement" and "Evacuate" visible, when not illuminated and one over the other shall not be acceptable.

2.11 ELECTRIC POWER

2.11.1 Primary Power

Power must be 120 VAC 60 Hz service for the FMCU from the AC service to the building in accordance with NFPA 72.

2.12 SECONDARY POWER SUPPLY

Provide for system operation in the event of primary power source failure. Transfer from normal to auxiliary (secondary) power or restoration from

auxiliary to normal power must be automatic and must not cause transmission of a false alarm.

2.12.1 Batteries

Provide sealed, maintenance-free, sealed lead acid batteries as the source for emergency power to the FMCU. Batteries must contain suspended electrolyte. The battery system must be maintained in a fully charged condition by means of a solid state battery charger. Provide an automatic transfer switch to transfer the load to the batteries in the event of the failure of primary power.

2.12.1.1 Capacity

Battery size must be the greater of the following two capacities. This capacity applies to every control unit associated with this system, including supplemental notification appliance circuit panels, auxiliary power supply panels, fire alarm transmitters, and Base-wide mass notification transceivers. When determining the required capacity under alarm condition, visual notification appliances must include both textual and non-textual type appliances.

a. Sufficient capacity to operate the fire alarm system under supervisory and trouble conditions, including audible trouble signal devices for 48 hours and audible and visual signal devices under alarm conditions for an additional 15 minutes.

b. Sufficient capacity to operate the mass notification for 60 minutes after loss of AC power.

2.12.1.2 Battery Power Calculations

a. Verify that battery capacity exceeds supervisory and alarm power requirements for the criteria noted in the paragraph "Capacity" above.

    (1) Substantiate the battery calculations for alarm and supervisory power requirements. Include ampere-hour requirements for each system component and each control unit component, and compliance with UL 864.

    (2) Provide complete battery calculations for both the alarm and supervisory power requirements. Submit ampere-hour requirements for each system component with the calculations.

    (3) Provide voltage drop calculations to indicate that sufficient voltage is available for proper operation of the system and all components. Calculations must be performed using the minimum rated voltage of each component.

b. For battery calculations assume a starting voltage of 24 VDC for starting the calculations to size the batteries. Calculate the required Amp-Hours for the specified standby time, and then calculate the required Amp-Hours for the specified alarm time. Using 20.4 VDC as starting voltage, perform a voltage drop calculation for circuits containing device and/or appliances remote from the power sources.

2.12.2 Battery Chargers

Provide a solid state, fully automatic, variable charging rate battery

charger. The charger must be capable of providing 120 percent of the connected system load and must maintain the batteries at full charge. In the event the batteries are fully discharged (20.4 Volts dc), the charger must recharge the batteries back to 95 percent of full charge within 48 hours after a single discharge cycle as described in paragraph CAPACITY above. Provide pilot light to indicate when batteries are manually placed on a high rate of charge as part of the unit assembly if a high rate switch is provided.

2.13 WIRING

Provide wiring materials under this section as specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM with the additions and modifications specified herein.

2.13.1 Alarm Wiring

IDC and SLC wiring must be solid copper cable in accordance with the manufacturers requirements. Copper signaling line circuits and initiating device circuit field wiring must be No. 16 AWG size conductors at a minimum. Visual notification appliance circuit conductors, that contain audible alarm appliances, must be copper No. 14 AWG size conductors at a minimum. Speaker circuits must be copper No. 16 AWG size twisted and shielded conductors at a minimum. Wire size must be sufficient to prevent voltage drop problems. Circuits operating at 24 VDC must not operate at less than the listed voltages for the detectors and/or appliances. Power wiring, operating at 120 VAC minimum, must be a minimum No. 12 AWG solid copper having similar insulation. Acceptable power-limited cables are FPL, FPLR or FPLP as appropriate with red colored covering. Nonpower-limited cables must comply with NFPA 70.

2.14 AUTOMATIC FIRE ALARM TRANSMITTERS

2.14.1 Radio Transmitter and Interface Panels

Contractor to reuse existing Monaco transmitter. Contractor shall program the D-21 Receiving station to accept the signals from the building

2.14.2 Signals to Be Transmitted to the Base Receiving Station

Contractor to verify existing signals within D-21. The following signals must be sent to the base receiving station:

a. Provide new Monaco Zone/ID for the kitchen hood systems.

PART 3 EXECUTION

3.1 VERIFYING ACTUAL FIELD CONDITIONS

Before commencing work, examine all adjoining work on which the contractor's work is in any way dependent for perfect workmanship according to the intent of this specification section, and report to the Contracting Officer's Representative any condition which prevents performance of first class work. No "waiver of responsibility" for incomplete, inadequate or defective adjoining work will be considered unless notice has been filed before submittal of a proposal.

3.2 INSTALLATION

3.2.1 Manual Stations

Locate manual stations as required by NFPA 72 and as indicated on the drawings. Mount stations so they are located no farther than 5 feet from the exit door they serve, measured horizontally. Manual stations must be mounted at 44 inches measured to the operating handle.

3.2.2 Notification Appliances

a. Locate notification appliance devices as required by NFPA 72 where indicated and to meet the intelligibility requirements. Where two or more visual notification appliances are located in the same room or corridor or field of view, provide synchronized operation. Devices must use screw terminals for all field wiring. Audible and visual notification appliances mounted in acoustical ceiling tiles must be centered in the tiles plus or minus 2 inches.

b. Audible and visual notification appliances mounted on the exterior of the building, within unconditioned spaces, or in the vicinity of showers must be listed weatherproof appliances installed on weatherproof backboxes.

c. Speakers must not be located in close proximity to the FMCU or LOC so as to cause feedback when the microphone is in use.

3.2.3 Smoke and Heat Detectors

Locate detectors as indicated on the drawings on a 4-inch mounting box. Install heat detectors not less than 4 inches from a side wall to the near edge. Heat detectors located on the wall must have the top of the detector at least 4 inches below the ceiling, but not more than 12 inches below the ceiling. Smoke detectors are permitted to be on the wall no lower than 12 inches from the ceiling with no minimum distance from the ceiling. Install smoke detectors no closer than 3 feet from air handling supply diffusers. Detectors installed in acoustical ceiling tiles must be centered in the tiles plus or minus 2 inches.

3.2.4 Local Operating Console (LOC)

Locate the LOC(s) as required by UFC 4-021-01 and as indicated on the contract drawings. Mount the console so that the top message button and microphone is no higher than 4 feet above the floor and the bottom (lowest) message button and microphone is at least 3 feet above the finished floor.

3.2.5 Ceiling Bridges

Provide ceiling bridges for ceiling-mounted appliances. Ceiling bridges must be as recommended/required by the manufacturer of the ceiling-mounted notification appliance.

3.3 SYSTEM FIELD WIRING

3.3.1 Wiring within Cabinets, Enclosures, and Boxes

Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure, or cabinet. Conductors that are terminated, spliced, or

otherwise interrupted in any enclosure, cabinet, mounting, or junction box must be connected to screw-type terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. The use of wire nuts or similar devices is prohibited. Wiring to conform with NFPA 70.

Indicate the following in the wiring diagrams:

a. Point-to-point wiring diagrams showing the points of connection and terminals used for electrical field connections in the system, including interconnections between the equipment or systems that are supervised or controlled by the system. Diagrams must show connections from field devices to the FMCU and remote fire alarm/mass notification control units, initiating circuits, switches, relays and terminals.

b. Complete riser diagrams indicating the wiring sequence of devices and their connections to the control equipment. Include a color code schedule for the wiring. Include floor plans showing the locations of devices and equipment.

3.3.2 Alarm Wiring

a. Voltages must not be mixed in any junction box, housing or device, except those containing power supplies and control relays.

b. Utilize shielded wiring where recommended by the manufacturer. For shielded wiring, ground the shield at only one point, in or adjacent to the FMCU.

c. Pigtail or T-tap connections to signal line circuits, initiating device circuits, supervisory alarm circuits, and notification appliance circuits are prohibited.

d. Color coding is required for circuits and must be maintained throughout the circuit. Conductors used for the same functions must be similarly color coded. Conform wiring to NFPA 70.

e. Pull all conductors splice free. The use of wire nuts, crimped connectors, or twisting of conductors is prohibited. Where splices are unavoidable, the location of the junction box or pull box where they occur must be identified on the as-built drawings. The number and location of splices must be subject to approval by the Designated Fire Protection Engineer (DFPE).

3.3.3 Back Boxes and Conduit

In addition to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, provide all wiring in rigid metal conduit or intermediate metal conduit unless specifically indicated otherwise. Minimum conduit size must be 3/4-inch in diameter. Do not use electrical non-metallic tubing (ENT) or flexible non-metallic tubing and associated fittings.

a. Galvanized rigid steel (GRS) conduit must be utilized where exposed to weather, where subject to physical damage, and where exposed on exterior of buildings. Intermediate metal conduit (IMC) may be used in lieu of GRS as allowed by NFPA 70.

b. Electrical metallic tubing (EMT) is permitted above suspended ceilings or exposed where not subject to physical damage. Do not use EMT underground, encased in concrete, mortar, or grout, in hazardous

locations, where exposed to physical damage, outdoors or in fire pump rooms. Use die-cast compression connectors.

c. For rigid metallic conduit (RMC), only threaded type fitting are permitted for wet or damp locations.

d. Flexible metal conduit is permitted for initiating device circuits 6 feet in length or less. Flexible metal conduit is prohibited for notification appliance circuits and signaling line circuits. Use liquid tight flexible metal conduit in damp and wet locations.

e. Schedule 40 (minimum) polyvinyl chloride (PVC) is permitted where conduit is routed underground or underground below floor slabs. Convert non-metallic conduit, other than PVC Schedule 40 or 80, to plastic-coated rigid, or IMC, steel conduit before turning up through floor slab.

f. Exterior wall penetrations must be weathertight. Conduit must be sealed to prevent the infiltration of moisture.

3.4 DISCONNECTION AND REMOVAL OF EXISTING SYSTEM

Maintain existing fire alarm/mass notification equipment fully operational until the new equipment has been tested and accepted by the Contracting Officer. As new equipment is installed, label it "NOT IN SERVICE" until the new equipment is accepted. Once the new system is completed, tested, and accepted by the Government, it must be placed in service and connected to the supervising station. Remove tags from new equipment and tag the existing equipment "NOT IN SERVICE" until removed from the building.

a. After acceptance of the new system by the Contracting Officer, remove existing equipment not connected to the new system, remove unused exposed conduit, and restore damaged surfaces. Remove the material from the site and dispose.

b. Disconnect and remove the existing fire alarm/mass notification and smoke detection systems where indicated and elsewhere in the specification.

c. Control units and fire alarm devices and appliances disconnected and removed must be turned over to the Contracting Officer.

d. Properly dispose of fire alarm outlet and junction boxes, wiring, conduit, supports, and other such items.

3.5 PAINTING

a. In unfinished areas (including areas above drop ceilings), paint all exposed electrical conduit (serving fire alarm equipment), fire alarm conduit, surface metal raceway, junction boxes and covers red. In lieu of painting conduit, the contractor may utilize red conduit with a factory applied finish.

b. In finished areas, paint exposed electrical conduit (serving fire alarm equipment), fire alarm conduit, surface metal raceways, junction boxes, and electrical boxes to match adjacent finishes. The inside cover of the junction box must be identified as "Fire Alarm" and the conduit must have painted red bands 3/4-inch wide at 10-foot centers and at each side of a floor, wall, or ceiling penetration.

c. Painting must comply with Section 09 90 00 PAINTS AND COATINGS.

3.6 FIELD QUALITY CONTROL

3.6.1 Test Procedures

Submit detailed test procedures, prepared and signed by the NICET Level III Fire Alarm Technician, and the representative of the installing company, and reviewed by the QFPE 60 days prior to performing system tests. Detailed test procedures must list all components of the installed system such as initiating devices and circuits, notification appliances and circuits, signaling line devices and circuits, control devices/equipment, batteries, transmitting and receiving equipment, power sources/supply, annunciators, special hazard equipment, emergency communication equipment, interface equipment, and surge protective devices. Test procedures must include sequence of testing, time estimate for each test, and sample test data forms. The test data forms must be in a check-off format (pass/fail with space to add applicable test data; similar to the forms in NFPA 72 and NFPA 4.) The test procedures and accompanying test data forms must be used for the pre-Government testing and the Government testing. The test data forms must record the test results and must:

a. Identify the NFPA Class of all Initiating Device Circuits (IDC), and Notification Appliance Circuits (NAC), Voice Notification System Circuits (NAC Audio), and Signaling Line Circuits (SLC).

b. Identify each test required by NFPA 72 Test Methods and required test herein to be performed on each component, and describe how these tests must be performed.

c. Identify each component and circuit as to type, location within the facility, and unique identity within the installed system. Provide necessary floor plan sheets showing each component location, test location, and alphanumeric identity.

d. Identify all test equipment and personnel required to perform each test (including equipment necessary for smoke detector testing. The use of magnets is not permitted.

e. Provide space to identify the date and time of each test. Provide space to identify the names and signatures of the individuals conducting and witnessing each test.

3.6.2 Pre-Government Testing

3.6.2.1 Verification of Compliant Installation

Conduct inspections and tests to ensure that devices and circuits are functioning properly. Tests must meet the requirements of paragraph entitled "Minimum System Tests" as required by NFPA 72. The contractor and an authorized representative from each supplier of equipment must be in attendance at the pre-Government testing to make necessary adjustments. After inspection and testing is complete, provide a signed Verification of Compliant Installation letter by the QFPE that the installation is complete, compliant with the specification and fully operable. The letter must include the names and titles of the witnesses to the pre-Government tests. Provide all completion documentation as required by NFPA 72 including all referenced annex sections and the test reports noted below.

a. NFPA 72 Record of Completion.

b. NFPA 72 Record of Inspection and Testing.

c. Fire Alarm and Emergency Communication System Inspection and Testing Form.

d. Audibility test results with marked-up test floor plans.

e. Intelligibility test results with marked-up floor plans.

f. Documentation that all tests identified in the paragraph "Minimum System Tests" are complete.

3.6.2.2 Request for Government Final Test

When the verification of compliant installation has been completed, submit a formal request for Government final test to the Designated Fire Protection Engineer (DFPE). Government final testing will not be scheduled until the DFPE has received copies of the request for Government final testing and Verification of Compliant Installation letter with all required reports. Government final testing will not be performed until after the connections to the installation-wide fire reporting system and the installation-wide mass notification system have been completed and tested to confirm communications are fully functional. Submit request for test at least 15 calendar days prior to the requested test date.

3.6.3 Correction of Deficiencies

If equipment was found to be defective or non-compliant with contract requirements, perform corrective actions and repeat the tests. Tests must be conducted and repeated if necessary until the system has been demonstrated to comply with all contract requirements.

3.6.4 Government Final Tests

The tests must be performed in accordance with the approved test procedures in the presence of the DFPE. Furnish instruments and personnel required for the tests. The following must be provided at the job site for Government Final Testing:

a. The manufacturer's technical representative.

b. Marked-up red line drawings of the system as actually installed.

c. Loop resistance test results.

d. Complete program printout including input/output addresses.

e. Copy of pre-Government Test Certificate, test procedures and completed test data forms.

f. Audibility test results with marked-up floor plans.

g. Intelligibility test results with marked-up floor plans.

Government Final Tests will be witnessed by the , Designated Fire Protection Engineer. At this time, any and all required tests noted in the

paragraph "Minimum System Tests" must be repeated at their discretion.

3.7 MINIMUM SYSTEM TESTS

3.7.1 System Tests

Test the system in accordance with the procedures outlined in NFPA 72. The required tests are as follows:

a. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests must be witnessed by the Contracting Officer and test results recorded for use at the final Government test.

b. Verify the absence of unwanted voltages between circuit conductors and ground. The tests must be accomplished at the pre-Government test with results available at the final system test.

c. Verify that the control unit is in the normal condition as detailed in the manufacturer's O&M manual.

d. Test each notification appliance and circuit for proper operation and response at the control unit. Use of magnets is prohibited. Testing of duct smoke detectors must comply with the requirements of NFPA 72 except disconnect at least 20 percent of devices. If there is a failure at these devices, then supervision must be tested at each device.

e. Test the system for specified functions in accordance with the contract drawings and specifications and the manufacturer's O&M manual.

f. Test both primary power and secondary power. Verify, by test, the secondary power system is capable of operating the system for the time period and in the manner specified.

g. Determine that the system is operable under trouble conditions as specified.

h. Visually inspect wiring.

i. Test the battery charger and batteries.

j. Verify that red-line drawings are accurate.

k. Measure the current in circuits to ensure there is the calculated spare capacity for the circuits.

l. Measure voltage readings for circuits to ensure that voltage drop is not excessive.

m. Disconnect the verification feature for smoke detectors during tests to minimize the amount of smoke needed to activate the sensor. Testing of smoke detectors must be conducted using real smoke or the use of canned smoke which is permitted.

n. Measure the voltage drop at the most remote appliance (based on wire length) on each notification appliance circuit.

o. Verify the documentation cabinet is installed and contains all as-built shop drawings, product data sheets, design calculations, site-specific software data package, and all documentation required by paragraph titled "Test Reports".

3.7.2 Audibility Tests

Sound pressure levels from audible notification appliances must be a minimum of 15 dBa over ambient with a maximum of 110 dBa in any occupiable area. The provisions for audible notification (audibility and intelligibility) must be met with doors, fire shutters, movable partitions, and similar devices closed.

3.7.3 Intelligibility Tests

Intelligibility testing of the System must be accomplished in accordance with NFPA 72 for Voice Evacuation Systems, and ASA S3.2. Following are the specific requirements for intelligibility tests:

a. Intelligibility Requirements: Verify intelligibility by measurement after installation.

b. Ensure that a CIS value greater than the required minimum value is provided in each area where building occupants typically could be found. The minimum required value for CIS is .8. Rounding of values is permitted.

c. Areas of the building provided with hard wall and ceiling surfaces (such as metal or concrete) that are found to cause excessive sound reflections may be permitted to have a CIS score less than the minimum required value if approved by the DFPE, and if building occupants in these areas can determine that a voice signal is being broadcast and they must walk no more than 33 feet to find a location with at least the minimum required CIS value within the same area.

d. Areas of the building where occupants are not expected to be normally present are permitted to have a CIS score less than the minimum required value if personnel can determine that a voice signal is being broadcast and they must walk no more than 50 feet to a location with at least the minimum required CIS value within the same area.

e. Take measurements near the head level applicable for most personnel in the space under normal conditions (e.g., standing, sitting, sleeping, as appropriate).

f. The distance the occupant must walk to the location meeting the minimum required CIS value must be measured on the floor or other walking surface as follows:

(1) Along the centerline of the natural path of travel, starting from any point subject to occupancy with less than the minimum required CIS value.

(2) Curving around any corners or obstructions, with a 12 inches clearance there from.

(3) Terminating directly below the location where the minimum required CIS value has been obtained.

Use commercially available test instrumentation to measure intelligibility as specified by NFPA 72 as applicable. Use the mean value of at least three readings to compute the intelligibility score at each test location.

3.8 SYSTEM ACCEPTANCE

Following acceptance of the system, as-built drawings and O&M manuals must be delivered to the Contracting Officer for review and acceptance. The drawings must show the system as installed, including deviations from both the project drawings and the approved shop drawings. These drawings must be submitted within two weeks after the final Government test of the system. At least one set of as-built (marked-up) drawings must be provided at the time of, or prior to the Final Government Test.

a. The drawings must be prepared electronically and sized no less than the contract drawings. Furnish one set of CDs or DVDs containing software back-up and CAD based drawings in latest version of AutoCAD, DXF and portable document formats of as-built drawings and schematics.

b. Include complete wiring diagrams showing connections between devices and equipment, both factory and field wired.

c. Include a riser diagram and drawings showing the as-built location of devices and equipment.

d. Provide Operation and Maintenance (O&M) Instructions.

3.9 INSTRUCTION OF GOVERNMENT EMPLOYEES

3.9.1 Instructor

Provide the services of an instructor, who has received specific training from the manufacturer for the training of other persons regarding the operation, inspection, testing, and maintenance of the system provided. The instructor must train the Government employees designated by the Contracting Officer, in the care, adjustment, maintenance, and operation of the fire alarm system. The instructor must be thoroughly familiar with all parts of this installation. The instructor must be trained in operating theory as well as in practical O&M work. Submit the instructors information and qualifications including the training history.

3.9.2 Required Instruction Time

Provide 2 hours of instruction after final acceptance of the system. The instruction must be given during regular working hours on such dates and times selected by the Contracting Officer. The training must allow for rescheduling for unforeseen maintenance and/or fire department responses.

3.10 EXTRA MATERIALS

3.10.1 Repair Service/Replacement Parts

Repair services and replacement parts for the system must be available for a period of 10 years after the date of final acceptance of this work by the Contracting Officer. During the warranty period, the service technician must be on-site within 24 hours after notification. All repairs must be completed within 24 hours of arrival on-site.

3.10.2 Spare Parts

Spare parts furnished must be directly interchangeable with the corresponding components of the installed systems. Spare parts must be suitably packaged and identified by nameplate, tagging, or stamping. Spare parts must be delivered to the Contracting Officer at the time of the Government testing and must be accompanied by an inventory list.

-- End of Section --

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