
USACE / NAVFAC / AFCEA / NASA UFGS-28 31 76 (April 2006)

Preparing Activity: USACE Replacing without change
UFGS-13859 (January 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2008

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DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

SECTION 28 31 76

INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM

04/06

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SECTION 28 31 76

INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM 04/06

NOTE: This specification covers the requirements for an integrated fire detection, fire alarm evacuation and mass notification system.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

PART 1 GENERAL

NOTE: Smoke detectors should be shown on the drawings per requirements of NFPA 72. The following information, should be on the project drawings:

1. On electrical floor plans, show location of control panel, batteries and charger (if remotely mounted), transmitter, annunciator, primary power supply, remote trouble device, remote annunciator, detectors, notification appliances (unless performance requirements are specified), and each alarm initiating device including fire extinguishing system switches.

2. Show single-line fire alarm/mass notification

systems riser diagram, device and zone schedules. Each device on the riser should be identified by type and location, with device number. Indicate connection of equipment by circuit runs, or conduit runs.

3. In larger facilities, or systems with multiple types of devices and interfacing to other systems, it is recommended that a fire alarm operating matrix/mass notification system be placed on the drawings. Show actions of detectors, manual initiators, water flow contacts, etc. on one axis and bells, door releases, smoke control fans, elevator relays, etc. on the other. Entries which require descriptions, explanation of processes, sequences, interfaces, etc. can be flagged by symbols keyed to supplementary notes. Alternately provide a zone-by-zone sequence of operation or a schedule identifying all initiators, outputs, and interfaces.

4. Addressable Fire Alarm Systems generally utilized Signal Line Circuits (SLC) for communication between devices. Normally all devices are addressable or will have an addressable interface device installed integrally with the device. Initiating Device Circuits (IDC) should be provided for interfacing to existing IDC loops. IDC will be provided for special requirements. The IDC option has been left in the specification as to assist spec writers interfacing to older systems.

5. When only a Mass Notification System (MNS) is required, delete the requirements in the specification for fire alarm system. A Voice Notification System configured for MNS should be specified. The Voice Notification System should be a replacement for the existing fire alarm notification appliances or be installed as a completely freestanding system where an existing fire alarm is not present.

6. Provide 25 percent spare capacity for initiation and notification appliance circuits, where buildings are presently sprinkler protected throughout or where such protection is being provided under this design. Where automatic sprinkler protection will be provided later, use 50 percent spare capacity for initiation and 25 percent spare capacity for notification appliance circuits.

1.1 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in

this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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 (1989; R 1999) Method for Measuring the Intelligibility of Speech Over Communication Systems (ASA 85)

ASME INTERNATIONAL (ASME)

ASME A17.1 (2007) Safety Code for Elevators and Escalators

FM GLOBAL (FM)

FM P7825a (2005) Approval Guide Fire Protection

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41.1 (2002) IEEE Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits

IEEE C62.41.2 (2002) IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

IEC 60268-16 (2003) Sound System Equipment - Part 16: Objective Rating Of Speech Intelligibility By Speech Transmission Index

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 7240-16 (2007) Fire Detection And Alarm Systems - Part 16: Sound System Control And Indicating Equipment

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2005; Errata 2006; TIA 2006; TIA 2006) Life Safety Code, 2006 Edition
NFPA 170	(2005) Fire Safety Symbols
NFPA 241	(2004) Safeguarding Construction, Alteration, and Demolition Operations
NFPA 70	(2007) National Electrical Code - 2008 Edition
NFPA 72	(2006) National Fire Alarm Code
NFPA 90A	(2002; Errata 2003; Errata 2005) Standard for the Installation of Air Conditioning and Ventilating Systems

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

47 CFR 15	Radio Frequency Devices
47 CFR 90	Private Land Mobile Radio Services

UNDERWRITERS LABORATORIES (UL)

UL 1480	(2003; Rev thru Dec 2006); Standard for Safety Speakers for Fire Alarm, Emergency, and Commercial and Professional Use
UL 1638	(2001; Rev thru Nov 2003) Visual Signaling Appliances - Private Mode Emergency and General Utility Signaling
UL 1971	(2002; Rev thru May 2006) Signaling Devices for the Hearing Impaired
UL 2017	(2000; Rev thru Aug 2005) Standard for Safety for General-Purpose Signaling Devices and Systems
UL 228	(2006) Door Closers-Holders, With or Without Integral Smoke Detectors
UL 268	(2006) Standard for Smoke Detectors for Fire Alarm Signaling Systems
UL 268A	(1998; Rev thru Apr 2006) Smoke Detectors for Duct Application
UL 464	(2003; Rev thru Feb 2008) Standard for Audible Signal Appliances
UL 521	(1999; Rev thru Jul 2005) Heat Detectors for Fire Protective Signaling Systems
UL 864	(2003; Rev thru May 2007) Control Units

and Accessories for Fire Alarm Systems

UL Electrical Constructn

(2007) Electrical Construction Equipment Directory

UL Fire Prot Dir

(2008) Fire Protection Equipment Directory

1.2 RELATED REQUIREMENTS

Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS, applies to this section, with the additions and modifications specified herein. In addition, refer to the following sections for related work and coordination:

[Section 21 13 00.00 20 WET PIPE FIRE SUPPRESSION SPRINKLERS]
[Section 21 30 00 FIRE PUMPS]
[Section 21 23 00.00 20 WET CHEMICAL FIRE EXTINGUISHING for KITCHEN CABINET]
[Section 21 13 16.00 20 DRY-PIPE FIRE SPRINKLER SYSTEMS]
[Section 21 13 19.00 20 [DELUGE] [PREACTION] FIRE SPRINKLER SYSTEMS]
[Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS]
[Section 21 13 13.00 10 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION]
[Section 21 21 00 FIRE EXTINGUISHING SPRINKLER SYSTEMS (RESIDENTIAL)]
[Section 21 13 17.00 10 DRY PIPE SPRINKLER SYSTEM, FIRE PROTECTION]
[Section 21 13 18.00 10 PREACTION AND DELUGE SPRINKLER SYSTEMS, FIRE PROTECTION]
[Section 21 13 24.00 10 AQUEOUS FILM-FORMING FOAM (AFFF) FIRE PROTECTION SYSTEM]
[Section 21 13 20.00 20 FOAM FIRE EXTINGUISHING FOR AIRCRAFT HANGARS]
[Section 21 13 21.00 20 FOAM FIRE EXTINGUISHING FOR FUEL TANK PROTECTION] [Section 21 13 22.00 20 FOAM FIRE EXTINGUISHING FOR HAZ/FLAM MATERIAL FACILITY]
[Section 21 21 01.00 20 CARBON DIOXIDE FIRE EXTINGUISHING (HIGH PRESSURE)] [Section 21 21 02.00 20 CARBON DIOXIDE FIRE EXTINGUISHING (LOW PRESSURE)] [Section 21 21 03.00 10 WET CHEMICAL FIRE EXTINGUISHING SYSTEM]
[Section 21 22 00.00 20 HALON 1301 FIRE EXTINGUISHING]
[Section 21 12 00 STANDPIPE SYSTEMS].

[Section 08 71 00 DOOR HARDWARE for [door release] [door unlocking] and additional work related to finish hardware.]

[Section[s] [14 21 00.00 20 ELECTRIC TRACTION ELEVATORS] [and] [14 24 00 HYDRAULIC ELEVATORS] for additional work related to elevators.]

[Section 07 84 00 FIRESTOPPING for additional work related to firestopping.]

1.3 SUBMITTALS

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

A "G" following a submittal item indicates that the submittal requires Government approval. Some

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

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

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

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

SD-02 Shop Drawings

Include annotated catalog data, in table format on the drawings, showing manufacturer's name, model, voltage, and catalog numbers for equipment and components. Submitted shop drawings shall not be smaller than ISO A1.

Wiring Diagrams[; G][; G, [_____]]

Provide 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 shall show connections from field devices to the FACP and remote fire alarm control units, initiating circuits, switches, relays and terminals.

Provide 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.

System Layout[; G][; G, [_____]]

Provide plan view drawing showing device locations, terminal cabinet locations, junction boxes, other related equipment, conduit routing, wire counts, circuit identification in each

conduit, and circuit layouts for all floors. Drawings shall comply with the requirements of NFPA 170, Fire Safety Symbols.

System Operation[; G][; G, [_____]]

Provide a complete list of device addresses and corresponding messages.

Notification Appliances[; G][; G, [_____]]

Provide data on each circuit to indicate that there is at least [25] [50] percent spare capacity for notification appliances, [25] [50] percent spare capacity for initiating devices. Annotate data for each circuit on the drawings.

Amplifiers[; G][; G, [_____]]

Provide data to indicate that the amplifiers have sufficient capacity to simultaneously drive all notification speakers at the maximum rating plus 50 percent spare capacity. Annotate data for each circuit on the drawings.

As-Built Drawings

Prepare and submit to the Contracting Officer six sets of detailed as-built drawings. [Furnish one set of full size paper as-built drawings and schematics. The drawings shall be prepared on uniform sized mylar sheets not less than ISO A0 30 by 42 inches with 200 by 100 mm 8 by 4 inch title block similar to contract drawings.] [Furnish one set of CD or DVD discs containing software back-up and CAD based drawings in latest version of [MicroStation] [AutoCadd] and DXF format of as-built drawings and schematics.] The drawings shall include complete wiring diagrams showing connections between devices and equipment, both factory and field wired. Include a riser diagram and drawings showing the as-built location of devices and equipment. The drawings shall show the system as installed, including deviations from both the project drawings and the approved shop drawings. These drawings shall be submitted within two weeks after the final acceptance test of the system. At least one set of as-built (marked-up) drawings shall be provided at the time of, or prior to the final acceptance test.

SD-03 Product Data

Include UL or FM listing cards for equipment provided.

Technical Data And Computer Software[; G][; G, [_____]]

Fire alarm control panel (FACP)[; G][; G, [_____]]

Fire Alarm And Mass Notification Control Panel (FACP/FMCP); G

Printers[; G][; G, [_____]]

Video Display Unit (VDU)[; G][; G, [_____]]

Terminal cabinets/assemblies[; G][; G, [_____]]

Manual stations[; G][; G, [____]]

Transmitters (including housing)[; G][; G, [____]]

Batteries[; G][; G, [____]]

Battery chargers[; G][; G, [____]]

Smoke sensors[; G][; G, [____]]

Thermal sensors[; G][; G, [____]]

Wiring and cable[; G][; G, [____]]

Notification appliances[; G][; G, [____]]

Addressable interface devices[; G][; G, [____]]

Graphic annunciator[; G][; G, [____]]

Amplifiers[; G][; G, [____]]

Tone generators[; G][; G, [____]]

Digitalized voice generators[; G][; G, [____]]

Firefighter telephone[; G][; G, [____]]

Waterflow detectors[; G][; G, [____]]

Tamper switches[; G][; G, [____]]

Electromagnetic door holders[; G][; G, [____]]

Remote fire alarm control units[; G][; G, [____]]

Radio transmitter and interface panels[; G][; G, [____]]

Digital alarm communicator transmitter (DACT)[; G][; G, [____]]

Telegraphic transmitter[; G][; G, [____]]

SD-05 Design Data

System Operation[; G][; G, [____]]

Provide a complete description of the system operation [in matrix format] on the drawings.

Battery power[; G][; G, [____]]

Provide battery calculations as required in paragraph Battery Power Calculations.

SD-06 Test Reports

Field Quality Control test reports

Testing Procedures[; G][; G, [_____]]

Smoke sensor testing procedures[; G][; G, [_____]]

SD-07 Certificates

Installer Qualifications

SD-09 Manufacturer's Field Reports

Mass Notification System

Include the control panel and initiating and indicating devices, a unique identifier for each device with an indication of test results, and signature of the factory-trained technician of the control panel manufacturer and equipment installer. With reports on preliminary tests, include printer information. The Contractor shall include the NFPA 72 Record of Completion and NFPA 72 Inspection and Testing Form, with the appropriate test reports.

SD-10 Operation and Maintenance Data

Operation and Maintenance (O&M) Instructions[; G][; G, [_____]]

[Six][_____] copies of the Operation and Maintenance Instructions, indexed and in booklet form shall be submitted. The Operation and Maintenance Instructions shall be a single volume or in separate volumes, and may be submitted as a Technical Data Package. Manuals shall be approved prior to training.

Original and backup copies of all software delivered for this project shall be provided, on each type of CD/DVD media utilized.

Instruction of Government Employees

Submit the installers training history for the employees involved with this contract.

1.4 DESCRIPTION OF WORK

1.4.1 Scope

NOTE: Indicate the location of fire alarm system devices and riser locations on floor plans. Provide a fire alarm system riser diagram indicating circuits and risers.

This work includes completion of design and [providing a new, complete,] [and] [modifying the existing] analog/addressable fire alarm and mass notification system as described herein and on the contract drawings for the [building name]. The system shall include wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm, and supervisory signal initiating devices, alarm notification appliances, supervising station fire alarm system transmitter, and other accessories and miscellaneous items required for a complete operating

system even though each item is not specifically mentioned or described. Provide system[s] complete and ready for operation. Equipment, materials, installation, workmanship, inspection, and testing shall be in strict accordance with the required and advisory provisions of NFPA 72, ISO 7240-16, IEC 60268-16, except as modified herein. [The system layout on the drawings show the intent of coverage and are shown in suggested locations. Final quantity, system layout, and coordination is the responsibility of the Contractor.] [A single fire alarm control panel is indicated with terminal cabinets at each floor at each riser location. Where remote fire alarm control units are needed, they shall be provided at a terminal cabinet location.] Each remote fire alarm control unit shall 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.

1.4.2 Definitions

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

- a. Analog/Addressable System: A system where multiple signals are transmitted via the same conduction path to a remote fire alarm control unit and fire alarm control panel, decoded and separated so that each signal will initiate the specified response.
- b. Hard Wired System: A system where alarm and supervisory initiating devices are directly connected, through individual dedicated conductors, to a central control panel without the use of analog/addressable circuits or devices.
- c. Interface Device: An addressable device that interconnects hard wired systems or devices to an analog/addressable system.
- d. Remote Fire Alarm and Mass Notification Control Unit: A control panel, electronically remote from the fire alarm and mass notification control panel, that receives inputs from automatic and manual fire alarm devices; may supply power to detection devices and interface devices; may provide transfer of power to the notification appliances; may provide transfer of condition to relays or devices connected to the control unit; and reports to and receives signals from the fire alarm control panel.
- e. Fire Alarm and Mass Notification Control Panel (FACP/FMCP): A master control panel having the features of a fire alarm and mass notification control unit and fire alarm and mass notification control units are interconnected. The panel has central processing, memory, input and output terminals, [video display units (VDUs),] [and] [printers].
- f. Terminal Cabinet: A steel cabinet with locking, hinge-mounted door that terminal strips are securely mounted.

1.5 QUALITY ASSURANCE

Equipment and devices shall be compatible and operable with existing station fire alarm system and shall not impair reliability or operational functions of existing supervising station fire alarm system. [The

proprietary type Supervising Station (PSS) is located [in building [____]]
[____]] [The supervising equipment is existing and consists of the
following brands and models: [supervising station control panel [____]]
[____], [signal reporting components [____]], [annunciator [____]]
[____]].

1.5.1 Qualifications

1.5.1.1 Design Services

**NOTE: For Navy utilize only a registered fire
protection engineer.**

Installations requiring completion of installation drawings and
specification or modifications of fire detection, fire alarm, mass
notification system, fire suppression systems or mass notification systems
shall require the services and review of a qualified engineer. For the
purposes of meeting this requirement, a qualified engineer is defined as an
individual meeting one of the following conditions:

- a. A registered professional engineer having a Bachelor of Science or
Masters of Science Degree in Fire Protection Engineering from an
accredited university engineering program, plus a minimum of four years
work experience in fire protection engineering.
- b. A registered professional engineer (P.E.) in fire protection
engineering.
- c. Registered Professional Engineer with verification of experience
and at least four years of current experience in the design of the fire
protection and detection systems.
- d. A NICET Level 4 Fire Alarm Technicians.

1.5.1.2 Supervisor

**NOTE: NICET (National Institute for Certification
in Engineering Technologies) establishes the
qualifications of an individual as an Engineering
Technologist with verification of experience and
current NICET certification.**

The installing Contractor shall provide the following: [NICET Fire Alarm
Technicians to perform the installation of the system. A NICET Level
[3][4] Fire Alarm Technician shall supervise the installation of the fire
alarm system/mass notification system.] [Fire Alarm Technicians to perform
the installation of the system. A Fire Alarm Technician with a minimum of
8 years of experience shall perform/supervise the installation of the fire
alarm system/mass notification system.] The Fire Alarm technicians
supervising the installation of equipment shall be factory trained in the
installation, adjustment, testing, and operation of the equipment specified
herein and on the drawings.

1.5.1.3 Technician

The installing Contractor shall provide the following: Fire Alarm Technicians with a minimum of four years of experience shall be utilized to assist in the installation and terminate fire alarm/mass notification devices, cabinets and panels. The Fire Alarm technicians installing the equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.5.1.4 Installer

The installing Contractor shall provide the following: Fire Alarm installer with a minimum of two years of experience shall be utilized to assist in the installation of fire alarm/mass notification devices, cabinets and panels. An electrician shall be allowed to install wire or cable and to install conduit for the fire alarm system/mass notification system. The Fire Alarm installer shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.5.1.5 Test Personnel

The installing Contractor shall provide the following: Fire Alarm Technicians with a minimum of eight years of experience shall be utilized to test and certify the installation of the fire alarm/mass notification devices, cabinets and panels. The Fire Alarm technicians testing the equipment shall be factory trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

1.5.1.6 Manufacturer's Representative

The fire alarm and mass notification equipment manufacturer's representative shall be present for the connection of wiring to the control panel. The Manufacturer's Representative shall be an employee of the manufacturer with necessary technical training on the system being installed.

1.5.2 Manufacturer Qualifications

Components shall be of current design and shall 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 otherwise or additionally specified herein.

1.5.3 Regulatory Requirements

Devices and equipment for fire alarm service shall be listed by [UL Fire Prot Dir](#) or approved by [FM P7825a](#).

1.5.3.1 Requirements for Fire Protection Service

Equipment and material shall have been tested by UL and listed in [UL Fire Prot Dir](#) or approved by FM and listed in [FM P7825a](#). Where the terms "listed" or "approved" appear in this specification, they shall mean listed in [UL Fire Prot Dir](#) or [FM P7825a](#). The omission of these terms under the description of any item of equipment described shall not be construed as waiving this requirement. All listings or approval by testing

laboratories shall be from an existing ANSI or UL published standard.

1.5.3.2 Mass Notification System

The equipment furnished shall be compatible and be UL listed, FM approved, or approved or listed by a nationally recognized testing laboratory for the intended use. All listings or approval by testing laboratories shall be from an existing ANSI or UL published standard.

1.5.3.3 Testing Services or Laboratories

Fire alarm and fire detection equipment shall be constructed in accordance with UL Fire Prot Dir, UL Electrical Constructn, or FM P7825a.

1.5.4 Standard Products

Provide materials, equipment, and devices that have been tested by a nationally recognized testing laboratory, such as UL or FM, and listed or approved 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 shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least [two] [_____] years prior to bid opening.

1.5.5 Modification of References

a. In NFPA publications referred to herein, consider advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; interpret reference to "authority having jurisdiction" to mean the [Naval Facilities Engineering Command, [_____] , Fire Protection Engineer] [Contracting Offices Designated Representative (COR)].

b. The recommended practices stated in the manufacturer's literature or documentation shall be considered as mandatory requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 OPERATION AND MAINTENANCE (O&M) INSTRUCTIONS

1.7.1 System and System Equipment

The Interior Fire Alarm And Mass Notification System Operation and Maintenance Instructions shall include:

a. "Manufacturer Data Package [5] [_____] " 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 shall include the manufacturer's name, model number, service manual, parts list, and complete description of equipment and their basic operating features.

c. Maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals shall

include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed.

d. The manuals shall include complete procedures for system revision and expansion, detailing both equipment and software requirements.

e. Software delivered for this project shall be provided, on each type of CD/DVD media utilized.

f. Printouts of configuration settings for all devices.

g. Routine maintenance checklist. The routine maintenance checklist shall be arranged in a columnar format. The first column shall list all installed devices, the second column shall state the maintenance activity or state no maintenance required, the third column shall state the frequency of the maintenance activity, and the fourth column for additional comments or reference.

1.7.2 Technical Data and Computer Software

Lesson plans, operating instructions, maintenance procedures, and training data, furnished in manual format, for the training courses. The operations training shall familiarize designated government personnel with proper operation of the installed system. The maintenance training course shall provide the designated government personnel adequate knowledge required to diagnose, repair, maintain, and expand functions inherent to the system.

1.8 SPARE PARTS AND TOOLS

1.8.1 Repair Service/Replacement Parts

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

1.8.2 Interchangeable Parts

Spare parts furnished shall be directly interchangeable with the corresponding components of the installed system. Spare parts shall be suitably packaged and identified by nameplate, tagging, or stamping. Spare parts shall be delivered to the Contracting Officer at the time of the final acceptance testing.

1.8.3 Spare Parts

**NOTE: Adjust the requirements as required to meet
the Facilities needs.**

Furnish the following spare parts and accessories:

a. [Four] [_____] fuses for each fused circuit

b. [Nine] [_____] spare reams of paper for the system printer, plus sufficient paper for fire alarm acceptance tests

- c. [Three] [_____] spare printer ribbons
- d. [Three] [_____] break rods for manual stations

1.8.4 Special Tools

Software, connecting cables and proprietary equipment, necessary for the maintenance, testing, and reprogramming of the equipment shall be furnished to the Contracting Officer.

1.9 TECHNICAL DATA AND COMPUTER SOFTWARE

NOTE: Delete the entire paragraph if the local facility maintenance does not require hardware or software for maintenance of the system. The purpose of this paragraph and other in the specification are to ensure that the system is procured with the required hardware and software to maintain the system with local resources. Coordinate with the local facility maintenance to determine if this is required.

The acquisition of all technical data, data bases and computer software items that are identified herein will be accomplished strictly in accordance with the Federal Acquisition Regulation (FAR) and the Department of Defense Acquisition Regulation Supplement (DOD FARs). Those regulations, as well as the Army and Corps of Engineers implementations thereof, should also be consulted to ensure that a delivery of critical items of technical data is not inadvertently lost. Specifically, the DFAR 227-71 - Rights in Technical Data Clause, DFARS SUBPART 227.71 - RIGHTS IN TECHNICAL DATA, and DFARS SUBPART 227.72 - RIGHTS IN COMPUTER SOFTWARE, as well as any requisite software licensing agreements will be made a part of the CONTRACT CLAUSES or SPECIAL CONTRACT REQUIREMENTS. In addition, the appropriate DD Form 1423 Contract Data Requirements List, will be filled out for each distinct deliverable data item and made a part of the contract. Where necessary, a DD Form 1664, Data Item Description, will be used to explain and more fully identify the data items listed on the DD Form 1423.

It is to be noted that all of these clauses and forms are required to ensure the delivery of the data in question and that such data is obtained with the requisite rights to use by the Government. Include with the request for proposals a completed DD Form 1423, Contract Data Requirements List. This form is essential to obtain delivery of all documentation. Each deliverable will be clearly specified, both description and quantity being required.

Technical data and computer software (meaning technical data that relates

to computer software) that is specifically identified in this project, and may be defined/required in other specifications, shall be delivered, strictly in accordance with the CONTRACT CLAUSES. Data delivered shall be identified by reference to the particular specification paragraph against which it is furnished. Data to be submitted shall include complete system, equipment, and software descriptions. Descriptions shall show how the equipment will operate as a system to meet the performance requirements of this contract. The data package shall also include the following:

- (1) Identification of programmable portions of system equipment and capabilities.
- (2) Description of system revision and expansion capabilities and methods of implementation detailing both equipment and software requirements.
- (3) Provision of operational software data on all modes of programmable portions of the fire alarm and detection system.
- (4) Description of **Fire Alarm Control Panel** equipment operation.
- (5) Description of auxiliary and remote equipment operations.
- (6) Library of application software.
- (7) Operation and maintenance manuals.

1.10 KEYS

Keys and locks for equipment shall be identical. Provide not less than six keys of each type required. [All keys and locks shall be mastered to a single key as required by the local AHJ.] [Keys shall be CAT [60] [____].]

PART 2 PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENT

All fire alarm and mass notification equipment shall be listed for use under the applicable reference standards. Interfacing of Listed **UL 864** or similar approved industry listing with Mass Notification Panels listed to UL Standard 2017 or equal shall be done in a laboratory listed configuration, if the software programming features can not provide a listed interface control. If field modification such as adding equipment such as relays, then the manufacturer of the panels being same or different brand of manufacturer shall provide the installing contractor for review and confirmation by the installing contractor. The installing contractor shall as part of his submittal documents provide this information.

2.2 **SYSTEM OPERATION**

NOTE: The supply and return portions of the Style 6 loop shall not be located in the same room or shaft to ensure system reliability. They shall be separated by a sufficient distance so that a single fire will not involve both the supply and return portions of the loop. When a Style 6 SLC loop transverses fire barriers or floor level, system isolators shall be installed at the fire area

boundaries to ensure that if a ground, conductor-to-conductor short, or open occurs then the remainder of the SLC circuit shall continue to function fully.

If an addition to an existing system is required, provide the make, model number, and other pertinent information on existing components that are to operate with the new equipment. Since new interfaces will have to be compatible with the existing system or to the central fire alarm reporting system, it may be necessary to edit major items out of this specification. If a new fire alarm panel is required, it has to be compatible with the existing central fire alarm reporting system.

The Addressable Interior Fire Alarm and Mass Notification System shall be a complete, supervised, noncoded, analog/addressable fire alarm and mass notification system conforming to NFPA 72, UL 864 Ninth Edition, and UL 2017. The system shall be activated into the alarm mode by actuation of any alarm initiating device. The system shall remain in the alarm mode until the initiating device is reset and the fire alarm control panel is reset and restored to normal. The system may be placed in the alert mode by local microphones or remotely from authorized locations/users.

2.2.1 Alarm Initiating Devices

Alarm initiating devices shall be connected [to initiating device circuits (IDC), [Style B] [or] [Style D]] [to signal line circuits (SLC), Style [6] [____]] and installed in accordance with NFPA 72. [The system shall have an interconnected riser loop or network having Style [6] [____] supervision for interconnection of other FA/MNS control panels.] Alarm notification appliances shall be connected to [notification appliance circuits (NAC)] [Voice Notification System], Style Z in accordance with NFPA 72. A looped conduit system shall be provided so that if the conduit and all conductors within are severed or exposed to fire at any point, all IDC, NAC and SLC will remain functional. Should the design or building layout preclude separation then a fire rated separation shall be provided in accordance with NFPA 72. The return portion of the loop shall be remote from the supply portion of the loop. [Where the building has two stairs for egress from floors above grade, a single impairment cannot adversely affect more than one floor. Where three or more stairs are provided for egress from floors above grade, a single impairment cannot adversely affect more than 1/2 of any floor.] [Any single impairment of the system shall not affect the system on more than [one] [one-half] of any floor.] The system shall operate in the alarm mode upon actuation of any alarm initiating device. The system shall remain in the alarm mode until initiating device(s) are reset and the fire alarm control panel is manually reset and restored to normal. The conduit loop requirement is not applicable to the signal transmission link from the local panels (at the protected premises) to the Supervising Station (fire station, fire alarm central communication center). Audible, and visual appliances and systems shall comply with NFPA 72. Fire alarm system/mass notification system components requiring power, except for the control panel power supply, shall operate on 24 Volts dc.

2.2.2 Functions and Operating Features

The system shall provide the following functions and operating features:

- a. The FACP/FMCP and fire alarm and mass notification control units, if used, shall provide power, annunciation, supervision, and control for the system. Addressable systems shall be microcomputer (microprocessor or microcontroller) based with a minimum word size of eight bits with sufficient memory to perform as specified.
- b. Provide Style [B] [_____] initiating device circuits [for conductor lengths of 3 m 10 feet or less].
- c. Provide Style [6] [_____] signaling line circuits for each floor.
- d. Provide Style [6] [_____] signaling line circuits for the network.
- e. Provide Style [Z] [_____] notification appliance circuits. The visual alarm notification appliances shall have the flash rates synchronized.
- f. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.
- g. Provide an audible and visual trouble signal to activate upon a single break or open condition, or ground fault. The trouble signal shall also operate upon loss of primary power (AC) supply, absence of a battery supply, low battery voltage, or removal of alarm or supervisory panel modules. Provide a trouble alarm silence feature that shall silence the audible trouble signal, without affecting the visual indicator. After the system returns to normal operating conditions, the trouble signal shall again sound until the trouble is acknowledged. A smoke sensor in the process of being verified for the actual presence of smoke shall not initiate a trouble condition.
- h. Provide a notification appliance silencing switch, that when activated, will silence the audible signal appliance, but will not affect the visual alarm indicator, the liquid crystal display, or the automatic notification of the [fire department] [central station service]. This switch shall be overridden upon activation of a subsequent alarm.
- i. Provide alarm verification capability for smoke sensors. Alarm verification shall initially be set for [30] [_____] seconds.
- j. Provide program capability via switches in a locked portion of the FACP to bypass the automatic notification appliance circuits, [fire reporting system] [air handler shutdown] [smoke control operation] [elevator recall] [door release] [door unlocking] features. Operation of this programming shall indicate this action on the FACP display and printer output.
- k. Alarm, supervisory, and/or trouble signals shall be automatically transmitted to the [fire department] [a UL listed central station].
- l. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.

- m. The system shall be capable of being programmed from the panels keyboard. Programmed information shall be stored in non-volatile memory.
- n. The system shall be capable of operating, supervising, and/or monitoring both addressable and non-addressable alarm and supervisory devices.
- o. There shall be no limit, other than maximum system capacity, as to the number of addressable devices, that may be in alarm simultaneously.
- p. Where the fire alarm system is responsible for initiating an action in another emergency control device or system, such as [an HVAC system] [an atrium exhaust system] [a smoke control system] [an elevator system], the addressable fire alarm relay shall be within 1 m 3 feet of the emergency control device.
- q. An alarm signal shall automatically initiate the following functions:

- (1) Transmission of an alarm signal to [the fire department] [a UL listed central station].
- (2) Visual indication of the device operated on the fire alarm control panel (FACP), [video display unit (VDU),] [and on the graphic annunciator]. Indication on the graphic annunciator shall be by floor, zone or circuit, and type of device.

NOTE: Where a high-rise building in which the fire alarm system is being provided is fully sprinkler protected, the fire alarm notification appliances should operate only on the fire floor, (one/two) floor(s) above, and floor below. Where the building has some fire protection or life safety concerns or the building can be evacuated quickly, the fire alarm system should operate all notification appliances in the building upon a fire alarm. In those buildings designed for total evacuation due to fire protection or life safety concerns, design the system so that it can easily be modified when the fire protection or life safety improvements have been made to the building.

- (3) Continuous actuation of [all alarm notification appliances, except those in stairs or in elevator cabs.] [alarm notification appliances on the floor of fire alarm origin, the floor above the floor of fire alarm origin, and the floor below the floor of fire alarm origin, except those in stairs or in elevator cabs.]
- (4) Recording of the event via the system printer [and electronically in the history log of the fire control system unit].
- (5) Release of doors held open by electromagnetic devices.
- (6) Operation of the [smoke control system] [atrium exhaust system].

(7) Release of power to electric locks on doors that are part of the means of egress.

(8) Operation of a smoke sensor in an elevator lobby or other location associated with the automatic recall of elevators, shall recall the elevators in addition to other requirements of this paragraph.

(9) Operation of a duct smoke sensor shall shut down the appropriate air handler in accordance with NFPA 90A in addition to other requirements of this paragraph.

NOTE: Use this paragraph only where a sensor or
detection system is to release a special fire
extinguishing system.

(10) Operation of [_____] shall release the [_____] fire extinguishing system after a [_____]second time delay.

(11) Operation of a sprinkler waterflow switch serving an elevator machinery room or elevator shaft shall operate shunt trip circuit breaker(s) to shut down power to the elevators in accordance with ASME A17.1.

(12) Operation of an interface, that operates vibrating pagers worn by hearing-impaired occupants.

r. A supervisory signal shall automatically initiate the following functions:

(1) Visual indication of the device operated on the FACP, [VDU,] and on the graphic annunciator, and sound the audible alarm at the respective panel.

(2) Transmission of a supervisory signal to [the fire department] [a UL listed central station].

(3) Recording of the event via the system printer [and electronically in the history log of the fire control system unit].

s. A trouble condition shall automatically initiate the following functions:

(1) Visual indication of the system trouble on the FACP, [VDU,] and on the graphic annunciator, and sound the audible alarm at the respective panel.

(2) Transmission of a trouble signal to [the fire department] [a UL listed central station].

(3) Recording of the event via the system printer.

t. The maximum permissible elapsed time between the actuation of an initiating device and its indication at the FACP shall be 10 seconds.

u. The maximum elapsed time between the occurrence of the trouble condition and its indication at the FACP shall not exceed 200 seconds.

2.3 SYSTEM MONITORING

2.3.1 Valves

Each valve affecting the proper operation of a fire protection system, including automatic sprinkler control valves, standpipe control valves, sprinkler service entrance valve, valves at fire pumps, isolating valves for pressure type waterflow or supervision switches, and valves at backflow preventers, whether supplied under this contract or existing, shall be electrically monitored to ensure its proper position. Each tamper switch shall be provided with a separate address [, unless they are within the same room, then a maximum of [five] [_____] can use the same address].

2.3.2 Independent Fire Detection System

Each existing independent smoke detection subsystem, and kitchen fire extinguishing system shall be monitored both for the presence of an alarm condition and for a trouble condition. Each monitored condition shall be provided with a separate address.

2.4 MASS NOTIFICATION SYSTEM FUNCTIONS

2.4.1 Notification Appliance Network

The notification appliance network consists of audio speakers located to provide intelligible instructions at [all locations in the building] [areas as indicated on the drawings] [_____] . The Mass Notification System announcements shall take priority over all other function of the system including the audible and visual output of the fire alarm system in a normal or alarm state. All fire alarm system functions shall continue in an alarm state except for the output signals of the audible and visual notification appliances.

2.4.2 Strobes

Strobes are also provided to alert hearing-impaired occupants.

2.4.3 Text Displays

LED text displays for hearing impaired occupants.

2.4.4 Giant Voice

The Giant Voice system (if available) in the area of the building shall be activated to provide a [siren signal] [[pre-recorded] [live voice] message] .

2.4.5 Door Operation

Closure of doors held open by electromagnetic devices.

2.4.6 Voice Notification

An autonomous voice notification control unit is used to monitor and control the notification appliance network and provide consoles for local operation. Using a console, personnel in the building can initiate delivery of pre-recorded voice messages, provide live voice messages and instructions, and initiate visual strobe and (optional) textual message notification appliances. The autonomous voice notification control unit

will temporarily override audible fire alarm notification while delivering Mass Notification messages to ensure they are intelligible.

2.4.7 Base-Wide Control

If a base-wide control system for mass notification exists on the base, the autonomous control unit shall communicate with the central control unit of the base-wide system. The autonomous control unit shall receive commands/messages from the central control unit and provide status information.

2.5 OVERVOLTAGE AND SURGE PROTECTION

2.5.1 Signaling Line Circuit Surge Protection

For systems having circuits located outdoors, communications equipment shall be protected against surges induced on any signaling line circuit and shall comply with the applicable requirements of [IEEE C62.41.1](#) and [IEEE C62.41.2](#). Cables and conductors, that serve as communications links, shall have surge protection circuits installed at each end that meet the following waveform(s):

- a. A 10 microsecond by 1000 microsecond waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.
- b. An 8 microsecond by 20 microsecond waveform with a peak voltage of 1000 volts and a peak current of 500 amperes. Protection shall be provided at the equipment. Additional triple electrode gas surge protectors, rated for the application, shall be installed on each wireline circuit within 3 feet of the building cable entrance. Fuses shall not be used for surge protection.

2.5.2 Sensor Wiring Surge Protection

Digital and analog inputs and outputs shall be protected against surges induced by sensor wiring installed outdoors and as shown. The inputs and outputs shall be tested with the following waveform[s]:

- a. A 10 by 1000 microsecond waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.
- b. An 8 by 20 microsecond waveform with a peak voltage of 1000 volts and a peak current of 500 amperes. Fuses shall not be used for surge protection.

2.6 ADDRESSABLE INTERFACE DEVICES

NOTE: Remove this paragraph when not required.

The initiating device being monitored shall be configured as a [Style D][Style B] initiating device circuits. The system shall be capable of defining any module as an alarm module and report alarm trouble, loss of polling, or as a supervisory module, and reporting supervisory short, supervisory open or loss of polling such as waterflow switches, valve supervisory switches, fire pump monitoring, independent smoke detection systems, relays for output function actuation, etc. The module shall be UL or FM listed as compatible with the control panel. The monitor module

shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. Monitor module shall contain an integral LED that flashes each time the monitor module is polled. Pull stations with a monitor module in a common backbox are not required to have an LED. [Existing fire alarm system initiating device circuits shall be connected to a single module to power and supervise the circuit.]

2.7 ADDRESSABLE CONTROL MODULE

NOTE: Remove this paragraph when not required.

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

2.8 ISOLATION MODULES

NOTE: Remove this paragraph when not required.

Provide isolation modules to subdivide each signaling line circuit into groups of not more than 20 addressable devices between adjacent isolation modules.

2.9 SMOKE SENSORS

NOTE: Provide smoke sensors only in spaces where they are specifically required by UFC 3-600-01, DESIGN: FIRE PROTECTION ENGINEERING FOR FACILITIES.

Smoke detectors provided in elevator machinery rooms are to be provided per requirements of UFC 3-600-01. Coordinate with Section 14 21 13 ELECTRIC TRACTION FREIGHT ELEVATORS, Section 14 21 23 ELECTRIC TRACTION PASSENGER ELEVATORS and/or Section 14 24 00 HYDRAULIC ELEVATORS.

2.9.1 Photoelectric Smoke Sensors

Provide addressable photoelectric smoke sensors as follows:

- a. Provide analog/addressable photoelectric smoke sensors utilizing the photoelectric light scattering principle for operation in accordance with [UL 268](#). Smoke sensors shall be listed for use with the fire alarm control panel.
- b. Provide self-restoring type sensors that do not require any readjustment after actuation at the FACP to restore them to normal operation. Sensors shall be UL listed as smoke-automatic fire sensors.
- c. Components shall be rust and corrosion resistant. Vibration shall have no effect on the sensor's operation. Protect the detection chamber with a fine mesh metallic screen that prevents the entrance of insects or airborne materials. The screen shall 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 [3 m 10 feet](#)] for the sensors. The sensors shall maintain contact with their bases without the use of springs. Provide companion mounting base with screw terminals for each conductor. Terminate field wiring on the screw terminals. The sensor shall have a visual indicator to show actuation.
- e. The sensor address shall identify the particular unit, its location within the system, and its sensitivity setting. Sensors shall be of the low voltage type rated for use on a 24 VDC system.
- f. An operator at the control panel, having a proper access level, shall have the capability to manually access the following information for each initiating device.
 - (1) Primary status
 - (2) Device type
 - (3) Present average value
 - (4) Present sensitivity selected
 - (5) Sensor range (normal, dirty, etc.)

2.9.2 Ionization Type Smoke Sensors

Provide addressable ionization type smoke sensors as follows:

- a. Provide analog smoke sensors that operate on the ionization principle and are actuated by the presence of visible or invisible products of combustion. Smoke sensors shall be listed for use with the fire alarm control panel.
- b. Provide self-restoring type sensors that do not require any readjustment after actuation at the FACP to restore them to normal operation. Sensors shall be UL or FM listed as smoke-automatic fire sensors.
- c. Components shall be rust and corrosion resistant. Vibration shall have no effect on the sensor's operation. Protect the detection chamber with a fine mesh metallic screen that prevents the entrance of insects or airborne materials. The screen shall not inhibit the movement of smoke particles into the chamber.

d. Provide twist lock bases for the sensors. The sensors shall maintain contact with their bases without the use of springs. Provide companion mounting base with screw terminals for each conductor. Terminate field wiring on the screw terminals. The sensor shall have a visual indicator to show actuation.

[e. The sensor address shall identify the particular unit, its location within the system, and its sensitivity setting. Sensors shall be of the low voltage type rated for use on a 24 VDC system.]

f. An operator at the control panel, having a proper access level, shall have the capability to manually access the following information for each initiating device.

- (1) Primary status
- (2) Device type
- (3) Present average value
- (4) Present sensitivity selected
- (5) Sensor range (normal, dirty, etc.)
- (6) Sensitivity adjustments for smoke detectors.

2.9.3 Projected Beam Smoke Detectors

Detectors shall be designed for detection of abnormal smoke densities. Detectors shall consist of separate transmitter and receiver units. The transmitter unit shall emit an infrared beam to the receiver unit. When the signal at the receiver falls below a preset sensitivity, the detector shall initiate an alarm. The receiver shall contain an LED that is powered upon an alarm condition. Long-term changes to the received signal caused by environmental variations shall be automatically compensated. Detectors shall incorporate features to assure that they are operational; a trouble signal shall be initiated if the beam is obstructed, the limits of the compensation circuit are reached, or the housing cover is removed. Detectors shall have multiple sensitivity settings in order to meet UL listings for the different distances covered by the beam. In the event of beam interference for more than three seconds a trouble alarm shall be transmitted.

2.9.4 Duct Smoke Sensors

NOTE: The requirements for Duct Detectors will be coordinated with the HVAC requirements and 23 09 23.13 20 BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC, 23 09 23 DIRECT DIGITAL CONTROL FOR HVAC AND OTHER LOCAL BUILDING SYSTEMS, 28 31 74.00 20 INTERIOR FIRE DETECTION AND ALARM SYSTEM, or 28 31 63.00 20 ANALOG/ADDRESSABLE INTERIOR FIRE ALARM SYSTEM. All required duct detectors will be shown on the contract drawings.

Duct-mounted photoelectric smoke detectors shall be furnished and installed

where indicated and in accordance with NFPA 90A. Units shall consist of a smoke detector as specified in paragraph Photoelectric Detectors, mounted in a special housing fitted with duct sampling tubes. Detector circuitry shall be mounted in a metallic enclosure exterior to the duct. Detectors shall have a manual reset. Detectors shall be rated for air velocities that include air flows between [2.5 and 20] [[_____] and [_____]] m/s [500 and 4000] [[_____] and [_____]] fpm. Detectors shall be powered from the fire alarm panel. Sampling tubes shall run the full width of the duct. The duct detector package shall conform to the requirements of NFPA 90A, UL 268A, and shall be UL listed for use in air-handling systems. The control functions, operation, reset, and bypass shall be controlled from the fire alarm control panel. Lights to indicate the operation and alarm condition; and the test and reset buttons shall be visible and accessible with the unit installed and the cover in place. Detectors mounted above 1.8 m 6 feet and those mounted below 1.8 m 6 feet that cannot be easily accessed while standing on the floor, shall be provided with a remote detector indicator panel containing test and reset switches. Remote lamps and switches as well as the affected fan units shall be properly identified in etched plastic placards. Detectors shall provide for control of auxiliary contacts that provide control, interlock, and shutdown functions specified in Section [23 09 23 DIRECT DIGITAL CONTROL FOR HVAC AND OTHER LOCAL BUILDING SYSTEMS] [28 31 74.00 20 INTERIOR FIRE DETECTION AND ALARM SYSTEM] [28 31 63.00 20 ANALOG/ADDRESSABLE INTERIOR FIRE ALARM SYSTEM]. Auxiliary contacts provide for this function shall be located within 1 m 3 feet of the controlled circuit or appliance. The detectors shall be supplied by the fire alarm system manufacturer to ensure complete system compatibility.

2.9.5 Smoke Sensor Testing

Smoke sensors shall be tested in accordance with NFPA 72 and manufacturer's recommended calibrated test method. Submit smoke sensor testing procedures for approval.

2.10 THERMAL SENSORS

NOTE: Heat detectors provided in elevator machinery rooms are strictly for the warning sign in the elevator cab and shall not alarm the FACP. Coordinate with Section 14 21 13 ELECTRIC TRACTION FREIGHT ELEVATORS, Section 14 21 23 ELECTRIC TRACTION PASSENGER ELEVATORS and/or Section 14 24 00 HYDRAULIC ELEVATORS.

2.10.1 Heat Detectors

Heat detectors shall be designed for detection of fire by [fixed temperature] [combination fixed temperature and rate-of-rise principle] [rate-compensating principle]. The alarm condition shall be determined by comparing sensor value with the stored values. Heat detector spacing shall be rated in accordance with UL 521. Detectors located in areas subject to moisture, exterior atmospheric conditions, or hazardous locations [as defined by NFPA 70] [and] [as shown on drawings], shall be types approved for such locations.

2.10.1.1 Combination Fixed-Temperature and Rate-of-Rise Detectors

Detectors shall be designed for [surface][semi-flush] outlet box mounting and supported independently of wiring connections. Contacts shall be self-resetting after response to rate-of-rise principle. Under fixed temperature actuation, the detector shall have a permanent external indication that is readily visible. Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes shall operate on fixed temperature principle only. The UL 521 test rating for the fixed temperature portion shall be [[57.2] [_____] degrees C [135] [_____] degrees F][as shown]. The UL 521 test rating for the Rate-of-Rise detectors shall be rated for 15 by 15 m 50 by 50 feet.

2.10.1.2 Rate Compensating Detectors

Detectors shall be [surface][flush] mounted [vertical][horizontal] type, with outlet box supported independently of wiring connections. Detectors shall be hermetically sealed and automatically resetting. Rate Compensated detectors shall be rated for 15 by 15 m 50 by 50 feet.

2.10.1.3 Fixed Temperature Detectors

Detectors shall be designed for [surface] [semi-flush] outlet box mounting and supported independently of wiring connections. Detectors shall be designed to detect high heat. The detectors shall have a specific temperature setting of [[57.2] [_____] degrees C [135] [_____] degrees F][as shown]. The UL 521 test rating for the fixed temperature detectors shall be rated for 4.6 by 4.6 m 15 by 15 feet.

2.10.2 Heat Sensing

A moving average of the sensors heat sensing value to automatically compensate for conditions that could affect detection operations. System shall automatically maintain a constant heat sensing sensitivity from each sensor by compensating for environmental factors.

2.10.3 Self-Test Routines

Automatic self-test routines shall be performed on each sensor that will functionally check sensor sensitivity electronics and ensure the accuracy of the value being transmitted. Any sensor that fails this test shall indicate a trouble condition with the sensor location at the control panel.

2.10.4 Operator Access

An operator at the control panel, having the proper access level, shall have the capability to manually access the following information for each heat sensor:

- a. Primary status
- b. Device type
- c. Present average value
- d. Sensor range ([_____])

2.10.5 Operator Control

An operator at the control panel, having the proper access level, shall have the capability to manually control the following information for each heat sensor:

- a. Alarm detection sensitivity values
- b. Enable or disable the point/device
- c. Control sensors relay driver output

2.11 FLAME DETECTORS

NOTE: Modify these paragraphs as necessary to indicate that detectors placed in an explosive environment will be approved for use in the appropriate class, division, and group environment as defined in NFPA 70 and as shown on drawings.

For Navy projects, do not specify flame detectors without first consulting the cognizant NAVFAC FPE.

The detectors shall comply with FM P7825a. The detectors shall be sensitive to the micron range best suited for their intended use. The detectors shall operate over electrically supervised wiring circuits and the loss of power to the detector shall result in a trouble signal. A self-test feature shall be provided for each detector to be individually tested.

2.11.1 Infrared (IR) Single Frequency Flame Detector

NOTE: The single frequency IR flame detector has the advantage of a fast response and is moderately sensitive. Its disadvantages are being affected by temperature extremes and being subject to false alarms from a myriad of IR sources.

The detector shall be sensitive in the range of [_____] to [_____] micrometers only.

2.11.2 Infrared (IR) Multiple Frequency Flame Detector

NOTE: The IR multiple frequency flame detector has the advantages of a moderately fast response, moderate sensitivity, and a lower false alarm rate. Its disadvantage is being affected by temperature extremes.

The IR detector shall consist of two or more IR sensors, each selected for a different IR frequency. The primary sensor shall be sensitive in the range of [_____] to [_____] micrometers only. Secondary sensors are tuned to different IR wavelengths to null out the effect of black body radiation

to the primary sensor.

2.11.3 Ultraviolet (UV) Flame Detectors

NOTE: Ultraviolet (UV) flame detectors can be set to respond accurately to UV wavelength light produced by flame from both indoors and outdoors. UV flame detectors operate on the Geiger-Muller principle. These gas-filled vacuum tubes respond in the UV portion of the spectrum but can ignore UV radiation from the sun because the upper response range of the detector falls below the range of UV radiation that reaches the earth. Solid-state UV detectors are available, but their spectral response extends into the sun's UV range and are not recommended for external use. UV detectors have an 80 to 90 degree cone of vision. The UV detector has a fast response time and usually is not affected by rain, wind, snow, high humidity, or temperature and pressure extremes. UV units will produce false alarms if they are exposed to arc welding or X-ray and gamma radiation. They can also be blinded by oil film or smoke. UV flame detectors that are used in dirty and dusty environments should be equipped with automatic self-test and self-cleaning devices. The cleaning device uses a stream of clean air across the lens surface to minimize the build-up of contaminants.

UV flame detector shall be of the narrow band response type that operates on radiated ultraviolet energy and shall be sensitive in the range of [_____] to [_____] micrometers only. The cone of vision shall be 80 degrees or greater. Each detector shall be completely insensitive to light sources in the visible frequency range.

2.11.4 Combination UV/IR Flame Detector

NOTE: Combination UV/IR flame detectors have been used both inside and outside to detect fires, but are slower to react than individual units.

The UV/IR detector shall provide discrimination against false alarms by requiring both UV and IR flame detection before an alarm is sent. The UV sensor shall be sensitive in the range of 0.185 to 0.265 micrometers only. The IR sensor shall be sensitive in the range of [_____] to [_____] micrometers only. Detectors shall be completely insensitive to light sources in the visible frequency range.

2.12 ELECTRIC POWER

2.12.1 Primary Power

Power shall be 120 VAC service for the FACP from the [normal][emergency] AC service to the building.

2.12.2 Generator

Where any emergency generator provides a standby power supply for life safety system circuits, provide a connection from one of the circuits for the fire alarm system.

When a generator buss circuit is available for the fire alarm, mass notification, and life safety equipment, then the fire alarm control unit shall monitor the generator with the following supervisory signals:

- (a) Generator Selector Switch in a position other than automatic start
- (b) Generator Running
- (c) Low Fuel
- (d) Failure to Start
- (e) Abnormal conditions such as low oil, high temperature, and low coolant.
- (f) Low Battery
- (g) Emergency transfer in proper mode while generator running

2.13 EMERGENCY 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 shall be automatic and shall not cause transmission of a false alarm.

2.13.1 Batteries

Provide sealed, maintenance-free, [lead-calcium] [sealed lead acid] [gel cell] batteries as the source for emergency power to the FACP. Batteries shall contain suspended electrolyte. The battery system shall 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.

2.13.1.1 Capacity

NOTE: For Navy projects, use 48 hours if the building has no generator providing standby power to the fire alarm system. If such a generator exists and the FACP is powered from the generator, use 4 hours.

For Army and Air Force projects, use 72 hours if the building has no generator providing standby power to the fire alarm system. If such a generator exists and the FACP is powered from the generator, use 4 hours. Provide 15 minutes of alarm operation.

Provide the batteries with sufficient capacity to operate the system under supervisory and trouble conditions, including audible trouble signal devices for [48] [72] [_____] hours and audible and visual signal devices under alarm conditions for an additional [15] [_____] minutes.

2.13.1.2 Battery Power Calculations

- a. Verify that battery capacity exceeds supervisory and alarm power

requirements.

1). Substantiate the battery calculations for alarm, alert, and supervisory power requirements. Ampere-hour requirements for each system component and each panel component, and the battery-recharging period shall be included.

2). Provide complete battery calculations for both the alarm, alert, and supervisory power requirements. Ampere-hour requirements for each system component shall be submitted with the calculations.

3). A voltage drop calculation to indicate that sufficient voltage is available for proper operation of the system and all components, at the minimum rated voltage of the system operating on batteries.

b. For battery calculations use the following assumptions:

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. Calculate the nominal battery voltage after operation on batteries for the specified time period. Using this voltage perform a voltage drop calculation for circuit containing device and/or appliances remote from the power sources.

2.13.2 Battery Chargers

Provide a solid state, fully automatic, variable charging rate battery charger. The charger shall be capable of providing 150 percent of the connected system load and shall maintain the batteries at full charge. In the event the batteries are fully discharged (18 Volts dc), the charger shall recharge the batteries back to 95 percent of full charge within 48 hours. 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.

2.14 FIRE ALARM AND MASS NOTIFICATION CONTROL PANEL (FACP/FMCP)

**NOTE: For high-rise buildings, locate the FACP in
an emergency control center having one door opening
to the outside.**

Provide a complete control panel fully enclosed in a lockable steel enclosure as specified herein. Operations required for testing or for normal care and maintenance of the systems shall be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete control panel, the unit enclosures shall match exactly. [If more than a single unit is required, and is located in the lobby/entrance, notify the [Naval Facilities Engineering Command, [____]], Fire Protection Engineer] [Contracting Offices Designated Representative (COR)], prior to installing the equipment.] Each control unit shall provide power, supervision, control, and logic for the entire system, utilizing solid state, modular components, internally mounted and arranged for easy access. Each control unit shall be suitable for operation on a

120 volt, 60 hertz, normal building power supply. Provide each panel with supervisory functions for power failure, internal component placement, and operation. Visual indication of alarm, supervisory, or trouble initiation on the fire alarm control panel shall be by liquid crystal display or similar means with a minimum of 80 characters, that at least 32 are field changeable. The MNS Control panel shall have the capability of temporarily deactivate the fire alarm audible notification appliances while delivering voice messages. Provide conductor integrity monitoring for strobe, display, temporary deactivation of fire alarm audible notification appliances and speaker wiring. Provide secure operator console for initiating recorded messages, strobes and displays; and for delivering live voice messages. Provide capacity for at least four pre-recorded messages. Provide the ability to automatically repeat pre-recorded messages. Provide a secure microphone for delivering live messages. Provide adequate discrete outputs to temporarily deactivate fire alarm audible notification, and initiate/synchronize strobes. Provide a complete set of self-diagnostics for controller and appliance network. Provide local diagnostic information display and local diagnostic information and system event log file.

2.14.1 Cabinet

Install control panel components in cabinets large enough to accommodate all components and also to allow ample gutter space for interconnection of panels as well as field wiring. The enclosure shall be identified by an engraved laminated phenolic resin nameplate. Lettering on the nameplate shall say "Fire Alarm and Mass Notification Control Panel" and shall not be less than 25 mm one inch high. Provide prominent rigid plastic or metal identification plates for lamps, circuits, meters, fuses, and switches. The cabinet shall be provided in a sturdy steel housing, complete with back box, hinged steel door with cylinder lock, and surface mounting provisions.

2.14.2 Control Modules

Provide power and control modules to perform all functions of the FACP. Provide audible signals to indicate any alarm, supervisory, or trouble condition. The alarm signals shall be different from the trouble signal. Connect circuit conductors entering or leaving the panel to screw-type terminals with each terminal marked for identification. Locate diodes and relays, if any, on screw terminals in the FACP. Circuits operating at 24 VDC shall not operate at less than 21.6 volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10 percent of nominal voltage.

2.14.3 Silencing Switches

a. Alarm Silencing Switch: Provide an alarm silencing switch at the FACP that shall silence the audible signal but not affect the visual alarm indicator. This switch shall be overridden upon activation of a subsequent alarm.

b. Supervisory/Trouble Silencing Switch: Provide supervisory and trouble silencing switch that shall silence the audible trouble and supervisory signal, but not extinguish the visual indicator. This switch shall be overridden upon activation of a subsequent alarm, supervision, or trouble condition. Audible trouble indication must resound automatically every 24 hours after the silencing feature has been operated.

2.14.4 Non-Interfering

Power and supervise each circuit such that a signal from one device does not prevent the receipt of signals from any other device. Circuits shall be manually reset by switch from the FACP after the initiating device or devices have been restored to normal.

2.14.5 Voice Notification System

NOTE: A Voice Notification system is required to implement the Mass Notification System requirements.

Use the proper bracketed item depending upon whether the fire alarm system is to cause total evacuation upon an alarm.

The Voice Notification System shall comply with the requirements of NFPA 72 for Emergency Voice/Alarm Communications System requirements ISO 7240-16, IEC 60268-16, except as specified herein. The system shall be a [one-way][two-way] multi-channel voice notification system incorporating user selectability of a minimum 8 distinct sounds for tone signaling, and the incorporation of a voice module for delivery of prerecorded messages. Textual audible appliances shall produce a slow whoop tone for three cycles followed by a voice message that is repeated until the control panel is reset or silenced. Automatic messages shall be broadcast through speakers on appropriate floors, but not in stairs or elevator cabs. The visual strobes and audible message shall automatically be broadcast on the floor of fire alarm origin, [the floor][two floors] immediately above the floor of fire alarm origin, and the floor immediately below the floor of fire alarm origin. A live voice message shall override the automatic audible output through use of a microphone input at the control panel. When using the microphone, live messages shall be broadcast through speakers in stairs, in elevator cabs, and throughout a selected floor or floors. The system shall be capable of operating all speakers at the same time. [The Voice Notification System shall support Public Address (PA) paging for the facility.] The digitalized voice message shall consist of a non-volatile (EPROM) microprocessor based input to the amplifiers. The microprocessor shall actively interrogate circuitry, field wiring, and digital coding necessary for the immediate and accurate rebroadcasting of the stored voice data into the appropriate amplifier input. Loss of operating power, supervisory power, or any other malfunction that could render the digitalized voice module inoperative shall automatically cause the slow whoop tone to take over all functions assigned to the failed unit. The Mass Notification functions shall override the manual or automatic fire alarm notification or Public Address (PA) functions. The system shall have the capability of utilizing a remote microphone station with redundant controls of the notification system control panel. Class "A" Notification Appliance Circuits (NAC) shall be provided for the activation of strobe appliances. The activation of the NAC Circuits shall follow the operation of the speaker NAC circuits. Audio output shall be selectable for line level (600 ohms), 25, 70.7 or 100 volt output. The audio amplifier outputs shall be not greater than 100 watts RMS output. The strobe NAC Circuits shall provide at least 2 amps of 24 VDC power to operate strobes and have the ability to synchronize all strobes. A hand held microphone shall be provided and, upon activation, shall take priority over any tone signal, recorded message or PA microphone operation in progress, while maintaining the strobe NAC Circuits activation. All outputs and operational modules

shall be fully supervised with on-board diagnostics and trouble reporting circuits. Form "C" contacts shall be provided for system alarm and trouble conditions. Circuits shall be provided for operation of auxiliary appliance during trouble conditions. During a Mass Notification event the panel shall not generate nor cause any trouble alarms to be generated with the Fire Alarm system. The Control Panel for the Voice Notification System shall be independent of the Fire alarm system and shall be capable of autonomous operation. The system shall be housed in [a separate panel that contains an independent power supply and batteries, as specified above] [same panel with the fire alarm system]. Mass Notification functions shall take precedence over all other function performed by the Voice Notification System. Messages shall utilize a [male] [female] voice and shall be similar to the following:

- 1) 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on)

"May I have your attention, please. May I have your attention, please. A fire has been reported that may affect your floor. Please walk to the nearest exit and evacuate the building."
(Provide a [2] [_____] second pause.) "May I have your attention, please...(repeat the message)."

- 2) 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on)

"May I have your attention please. May I have your attention please. A fire emergency has been reported in the building. Please leave the building by the nearest exit or exit stairway. Do not use the elevators." (Provide a [2] [_____] second pause.)
"May I have your attention please..(repeat the message)."

- 3) 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on)

"Alert! This is the Mass Notification System.
There is an emergency situation.
DO NOT evacuate the building! Stay in your current location!
Stay tuned for further instructions."
(repeat message 2 times)

- 4) 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on)

"Alert, This is the Mass Notification System.
There is a chemical gas emergency.
Turn off all HVAC equipment, seal all doors and windows with wet fabric, Don protective gear.
DO NOT evacuate the building, Act now!
Listen to the MNS system for further instructions".
(repeat message 2 times)

- 5) 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on)

"Alert, this is the Mass Notification System.
There is a explosive blast risk along the South wall of your building.
Quietly move towards the north side of the building, and exit from

the north stairs.
Move away from the building heading north to the north parking area.
(repeat message 2 times).

a. The Remote Microphone station shall incorporate a Push-To-Talk (PTT) microphone, redundant controls and system status indicators of/for the system. The unit shall incorporate microphone override of any tone generation or prerecorded messages. The unit shall be fully supervised from the control panel. The housing shall contain a lock that is keyed [identical to the fire alarm system for the building] [_____].

b. Auxiliary Input Module shall be designed to be an outboard expansion module to either expand the number of optional remote microphone stations, or allow a telephone interface.

c. Remote Microphone station (PA) shall incorporate a Push-To-Talk (PTT) microphone, and controls to allow Public Address paging in the facility. The Public Address paging function shall not override any alarm or notification functions. The microphone shall be [desktop] [handheld] [_____] style.

2.14.6 Memory

Provide each control unit with non-volatile memory and logic for all functions. The use of long life batteries, capacitors, or other age-dependent devices shall not be considered as equal to non-volatile processors, PROMS, or EPROMS.

2.14.7 Field Programmability

Provide control units and control panels that are fully field programmable for control, initiation, notification, supervisory, and trouble functions of both input and output. The system program configuration shall be menu driven. System changes shall be password protected and shall be accomplished using personal computer based equipment. [Any proprietary equipment and proprietary software needed by qualified technicians to implement future changes to the fire alarm system shall be provided as part of this contract.]

2.14.8 Input/Output Modifications

The FACP shall contain features that allow the bypassing of input devices from the system or the modification of system outputs. These control features shall consist of a panel mounted keypad [and a keyboard]. Any bypass or modification to the system shall indicate a trouble condition on the FACP[, VDU] [and a printed output of the trouble condition].

2.14.9 Resetting

Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm, supervisory or trouble condition on the system still exists.

2.14.10 Instructions

Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame.

[Install the instructions on the interior of the FACP.] [Install the frame in a conspicuous location observable from the FACP.] The card shall show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory, and trouble. The instructions shall be approved by the Contracting Officer before being posted.

2.14.11 Walk Test

The FACP shall have a walk test feature. When using this feature, operation of initiating devices shall result in limited system outputs, so that the notification appliances operate for only a few seconds and the event is indicated on the system printer, but no other outputs occur.

2.14.12 History Logging

In addition to the required printer output, the control panel shall have the ability to store a minimum of 400 events in a log. These events shall be stored in a battery-protected memory and shall remain in the memory until the memory is downloaded or cleared manually. Resetting of the control panel shall not clear the memory.

2.14.13 RS-232-C Output

Each local control panel shall be capable of operating remote service type cathode ray tubes (CRTs), printers, and/or modems. The output shall be paralleled ASCII from an EIA RS-232-C connection with a baud rate of 1200 or 2400 to allow use of any commonly available CRT, printer, or modem.

2.14.14 Remote LED Text Display

NOTE: Provide remote LED Text display in locations where Hearing Impaired personnel might read instructions on the emergency. For Navy projects, the LED Text displays will be located over stairwell doors and major egress doors at the level of discharge.

An LED text display shall be provided at locations as shown on the drawings. The LED text display shall be at least 2 lines with a minimum of 20 characters per line. The size shall not exceed 400 mm length by 150 mm height by 75 mm deep 16 inches length by 6 inches height by 3 inches deep. The text display shall as a minimum meet the following requirements:

- a. Two lines of information for high priority messaging.
- b. Minimum of 20 characters per line (40 total) displayed.
- c. Text shall be no less than 13 mm 1/2 inch in height and readable from 300 to 6200 mm 1 foot to 20 feet away.
- d. 32K character memory.
- e. RS232 or RS485 serial interface included.
- f. Display shall be wall or ceiling mounted.

- g. Mounting brackets for a convenient wall/cubicle mount.
- h. During non-emergency periods, date and time shall be displayed.
- i. All programming shall be accomplished from the Mass Notification network. No user programming shall be required.

An LED text display shall be provided at locations as shown on the drawings. The LED text display shall have minimum character size of 100 mm 4-inches high and shall spell out the words "EVACUATE" and "ANNOUNCEMENT". The design of LED text display shall be such that it cannot be read when not illuminated. The LED text display shall be capable of being wall or ceiling mounted.

2.15 REMOTE FIRE ALARM CONTROL UNITS

Provide complete remote control units fully enclosed in a lockable steel enclosure as specified herein. Operations required for testing or for normal care and maintenance of the control units shall be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete control panel, the unit enclosures shall match exactly. Each control unit shall provide power, supervision, control, and logic for its portion of the entire system, utilizing solid state, modular components, internally mounted and arranged for easy access. Each control unit shall be suitable for operation on a 120 volt, 60 hertz, normal building power supply. Provide each unit with supervisory functions for power failure, internal component placement, and operation.

2.15.1 Cabinet

Install remote control unit components in cabinets large enough to accommodate components and also to allow ample gutter space for interconnection of units as well as field wiring. The enclosure shall be identified by an engraved laminated phenolic resin nameplate. Lettering on the nameplate shall be labeled "Remote Fire Alarm Control Unit" and shall not be less than one inch high. Provide prominent rigid plastic or metal identification plates for lamps, circuits, meters, fuses, and switches. The cabinet shall be provided in a sturdy steel housing, complete with back box, hinged steel door with cylinder lock, and surface mounting provisions.

2.15.2 Control Modules

Provide power and control modules to perform all functions of the remote control unit. Provide audible signals to indicate any alarm or trouble condition. The alarm signals shall be different from the trouble signal. Connect circuit conductors entering or leaving the panel to screw-type terminals with each terminal marked for identification. Locate diodes and relays, if any, on screw terminals in the remote control unit. Circuits operating at 24 VDC shall not operate at less than 21.6 volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10 percent of nominal voltage. Circuits shall be arranged so that there is 25 percent spare capacity for any circuit.

2.15.3 Silencing Switches

Provide an alarm silencing switch at the remote control unit that shall silence the audible signal but not affect the visual alarm indicator. This switch shall be overridden upon activation of a subsequent alarm. Provide trouble and supervisory silencing switch that shall silence the audible

trouble and supervisory signal, but not extinguish the visual indicator. This switch shall be overridden upon activation of a subsequent trouble or supervisory signal. Audible trouble indication must resound automatically every 24 hours after the silencing feature has been operated.

2.15.4 Non-Interfering

Power and supervise each circuit such that a signal from one device does not prevent the receipt of signals from any other device. Circuits shall be manually resettable by switch from the remote control unit after the initiating device or devices have been restored to normal.

2.15.5 Memory

Provide each control unit with non-volatile memory and logic for all functions. The use of long life batteries, capacitors, or other age-dependent devices shall not be considered as equal to non-volatile processors, PROMS, or EPROMS.

2.15.6 Field Programmability

Provide control units that are fully field programmable for control, initiating, supervisory, and trouble functions of both input and output. The system program configuration shall be menu driven. System changes shall be password protected and shall be accomplished using personal computer based equipment. [Any proprietary equipment and proprietary software needed by qualified technicians to implement future changes to the fire alarm system shall be provided as part of this contract.]

2.15.7 Input/Output Modifications

Each remote control unit shall contain features that allow the elimination of input devices from the system or the modification of system outputs. Any such modifications shall indicate a trouble condition on the remote control unit, the FACP, and a printed output of the trouble condition.

2.15.8 Resetting

Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm, supervisory, or trouble condition on the system still exists.

2.15.9 Instructions

Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a conspicuous location observable from the remote fire alarm control unit. [Install the frame in a conspicuous location observable from the remote fire alarm control unit.] The card shall show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory, and trouble. The instructions shall be approved by the Contracting Officer before being posted.

2.15.10 Walk Test

Each remote control unit shall have a walk test feature. When using this feature, operation of initiating devices shall result in limited system outputs, so that the notification appliances operate for only a few seconds

and the event is indicated on the system printer, but no other outputs occur.

2.15.11 History Logging

In addition to the required printer output, the control panel shall have the ability to store a minimum of 400 events in a log. These events shall be stored in a battery-protected memory and shall remain in the memory until the memory is downloaded or cleared manually. [Resetting of the control panel shall not clear the memory.]

2.16 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 shall be housed in a fire alarm control unit, terminal cabinet, or in the fire alarm control panel. The system shall automatically operate and control all building fire alarm speakers except those installed in the stairs and within elevator cabs. The speakers in the stairs and elevator cabs shall operate only when the microphone is used to deliver live messages. Each amplifier shall be single output channel.

2.16.1 Construction

Amplifiers shall utilize computer grade solid state components and shall 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.

2.16.2 Inputs

Each system shall be equipped with separate inputs from the tone generator, digitalized voice driver and panel mounted microphone. Microphone inputs shall be of the low impedance, balanced line type. Both microphone and tone generator input shall be operational on any amplifier.

2.16.3 Tone Generator

The tone generator shall be of the modular, plug-in type with securely attached labels to identify the component as a tone generator and to identify the specific tone it produces. The tone generator shall produce a slow whoop tone, that shall slowly ascend from low (500 hertz) to high (1200 hertz), and shall be constantly repeated until interrupted by either the digitalized voice message, the microphone input, or the alarm silence mode as specified. Each slow whoop cycle shall last approximately 4 seconds. The tone generator shall be single channel with an automatic backup generator per channel such that failure of the primary tone generator causes the backup generator to automatically take over the functions of the failed unit and also causes transfer of the common trouble relay.

2.16.4 Protection Circuits

Each amplifier shall be constantly supervised for any condition that could render the amplifier inoperable at its maximum output. Failure of any component shall cause automatic transfer to a designated backup amplifier, illumination of a visual "amplifier trouble" indicator on the control panel, appropriate logging of the condition on the system printer, and other actions for trouble conditions as specified.

2.17 VIDEO DISPLAY UNIT (VDU)

**NOTE: Contact the cognizant NAVFAC Fire Protection
Engineer to determine if a VDU is to be provided.**

a. The VDU shall be the secondary operator-to-system interface for data retrieval, alarm annunciation, commands, and programming functions. The desk mounted VDU shall consist of a LCD monitor and a keyboard. The VDU shall have a [300] [430] [_____] mm [12] [17] [_____] inch minimum [touch] screen, capable of displaying 25 lines of 80 characters each. Communications with the FACP shall be supervised. Faults shall be recorded on the printer. Power required shall be 120 VAC, 60 Hz from the same source as the fire alarm control panel.

b. To eliminate confusion during an alarm situation, the screen shall have dedicated areas for the following functions:

- (1) Alarm and returns to normal
- (2) Commands, reports, and programming
- (3) Time, day, and date

c. Full English language shall be used throughout to describe system activity and instructions. Full English language descriptors defining system points shall be 100 percent field programmable by factory trained personnel, alterable and user definable to accurately describe building areas.

d. Alarms and other changes of status shall be displayed in the screen area reserved for this information. Upon receipt of alarm, an audible alarm shall sound and the condition and point type shall flash until acknowledged by the operator. Returns to normal shall also be annunciated and shall require operator acknowledgment. The following information shall be provided in English:

- (1) Condition of device (alarm, trouble, or supervisory).
- (2) Type of device (manual pull, waterflow, etc.)
- (3) Location of device plus numerical system address.

e. The system shall have multiple levels of priority for displaying alarms to conform with **UL 864**. Priority levels shall be as follows:

- (1) Level 1 - Mass Notification
- (2) Level 2 - Fire Alarms
- (3) Level 3 - Supervisory Alarms
- (4) Level 4 - Trouble Signals

f. The system shall be provided with memory so that no alarm shall be lost. A highlighted message shall advise the operator when unacknowledged alarms are in the system.

g. Multiple levels of access shall be provided for operators and supervisors via user-defined passwords. The following functions shall be provided for each level:

(1) Operator level access functions:

- (a) Display system directory, definable by device.
- (b) Display status of an individual device.
- (c) Manual command (alarm device with an associated command shall use the same system address for both functions).
- (d) Report generation, definable by device, output on either the VDU or printer, as desired by the operator.
- (e) Activate building notification appliances.

(2) Supervisory level access functions:

- (a) Reset time and date.
- (b) Enable or disable event initiated programs, printouts, and initiators.
- (c) Enable or disable individual devices and system components.

h. The above supervisory level functions shall not require computer programming skills. Changes to system programs shall be recorded on the printer and maintained in the control panel as a trouble condition.

2.18 GRAPHIC ANNUNCIATOR

NOTE: Provide the graphic annunciator at a location convenient for fire department. It should be near the door through which they will enter the building as indicated in their pre-fire plan.

2.18.1 Annunciator Panel

Provide a graphic annunciator that indicates the building floor plan, including the locations of stairs and elevators. Stairs and elevators shall be identified by [letter][number]. Alarm circuit boundaries shall be clearly marked on the floor plan. Annunciator shall include a north arrow, [location of the fire alarm control panel,] and a "you are here" indicator. The graphic annunciator shall be [a minimum size of 1000 by 1000 mm 3 by 3 feet] [as indicated on the contract drawings].

2.18.2 Indicating Lights

Provide the graphic annunciator with individual light emitting diode (LED) indicating lights for each type of alarm and supervisory device. Provide an amber LED for indicating a system trouble condition and a separate amber LED for indicating a supervisory condition. Provide a green LED to indicate presence of power and a red LED to indicate an alarm condition. The actuation of any alarm signal shall cause the illumination of a

boundary LED, a floor LED, and a device LED. System supervisory or trouble shall cause the illumination of a trouble LED. In addition to all of these LED indicators, provide normal power and emergency power indicating LEDs. Provide a push button LED test switch. The test switch shall not require key operation. Annunciator LEDs shall only be extinguished by operation of the system reset switch on the FACP.

2.18.3 Material

Construct the graphic annunciator face plate of [smoked Plexiglas] [bronze anodize]. The face plate shall be backlit with LEDs. Control equipment and wiring shall be housed in a [recessed] [semi-recessed] [surface mounted] back box. The exposed portions of the back box shall be [chrome plated] [bronze anodize] with knockouts.

2.18.4 Programming

Where programming for the operation of the proper LEDs is accomplished by a separate software program than the software for the FACP, the software program shall not require reprogramming after loss of power. The software shall be reprogrammable in the field.

2.19 SYSTEM PRINTERS

Provide a system printer to record alarm, supervisory, and trouble conditions without loss of any signal or signals. Printout shall be by circuit, device, and function as provided in the FACP. Printer shall operate on a 120 VAC, 60 Hz power supply. The printer shall have at least [40] [80] characters per line and have a 96 ASCII character set. The printer shall have a microprocessor-controlled, bi-directional, logic seeking head capable of printing 120 characters per second. Printer shall not contain internal software that is essential for proper operation. When the FACP receives a signal, the alarm, supervisory, and trouble condition shall be printed. The printout shall include the type of signal, the circuit or device reporting, the date, and the time of the occurrence. The printer shall differentiate alarm signals from other printed indications. When the system is reset, this condition shall also be printed including the same information concerning device, location, date, and time. Provide a means to automatically print a list of existing alarm, supervisory, and trouble conditions in the system. If a printer is off-line when an alarm is received, the system shall have a buffer to retain the data and it shall be printed when the printer is restored to service. The printer shall have an indicator to alert the operator that the paper has run out.

2.20 FIREFIGHTER TELEPHONE COMMUNICATION SYSTEM

NOTE: Provide a master control station at the FACP
with remote telephone stations in each stair at each
floor landing, in each elevator lobby on each floor,
and in elevator cabs. In addition, provide them at
specific locations containing essential fire
protection equipment, such as the fire pump room and
outside the emergency generator room.

Provide a firefighter telephone system as follows:

- a. Provide a firefighter telephone communication system with complete,

common talk, closed circuits. The system shall include, but not be limited to, a master control station mounted in the fire alarm control panel, a power supply and standby battery system, and remote telephone stations.

b. Provide a master control station that shall provide power, supervision, and control for wiring, components, and circuits. The act of lifting any remote telephone hand set from its cradle shall cause both a visual and audible signal to annunciate at the master control station. Removing the hand set at the master control station and depressing a button at the remote telephone hand set shall cause the automatic silencing of the audible signal. Communication between the master control station hand set and any/or all remote hand sets shall require the depressing of a push-to-talk switch located on any/all remote hand sets. During the time that the master control hand set is removed from its cradle it shall be possible to communicate between five remote hand sets and the master control station. Hand sets shall be able to monitor any conversation in progress and join the conversation by pressing the push-to-talk button. It shall not be possible to communicate between two or more remote hand sets with the master control station hand set in its cradle. The master control station hand set shall be red in color and equipped with a 5-foot long strain-relieved coiled cord. Wiring connections shall be made to terminal strips. The master control station shall monitor wire and connections for any opens, shorts, or grounds that would render the system inoperable or unintelligible. The master control station shall be equipped with a silencing switch and ring-back feature such that any audible trouble signal can be silenced and shall be so indicated by the lighting of an amber LED. Once any trouble condition has been corrected, the amber LED shall be extinguished and the silencing switch shall sound again until the switch is restored to its original position. The master control station shall be equipped with a separate, LED annunciated switch for each telephone circuit. In addition, LEDs shall provide for the annunciation of operating and supervisory power. The loss of operating or supervisory power shall cause an audible and visual indication at the master control station and shall also cause the fire alarm trouble signal to sound on the FACP. Switches, LEDs, and controls shall be fully labeled.

c. Provide [surface] [flush] mounted remote telephone stations. Each station shall be equipped with a hinged door that is magnetically locked. Each hand set shall be permanently wired in place with a coiled cord. Each handset shall be red high-impact cyclac and shall be equipped with a push-to-talk switch that, when operated, shall signal the master control station and a switch-equipped, storage cradle.

d. Provide operating and supervising power from the same supply circuit(s) utilized for the fire alarm control panel.

2.21 **MANUAL STATIONS**

NOTE: American Disabilities Act (ADA) requires that manual alarm stations be mounted at a maximum of 1.2 m (48 inches) above finished floor (AFF) for forward reach and 1.4 m (54 inches) AFF for side reach.

Provide metal or plastic, semi-flush mounted, [single][double] action, addressable manual stations, that are not subject to operation by jarring or vibration. Stations shall 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 shall be finished in fire-engine red with molded raised lettering operating instructions of contrasting color. The use of a key or wrench shall be required to reset the station. Manual stations shall be mounted at [1220][1370][_____] mm [48][54][_____] inches. Stations shall have a separate screw terminal for each conductor.

2.22 NOTIFICATION APPLIANCES

2.22.1 Fire Alarm/Mass Notification Speakers

NOTE: Speakers are normally only used in Mass Notification Systems (MNS)/FA systems, thus the normal installation would connect the speakers to the Voice Notification System. When providing an MNS, the speakers become the fire alarm notification appliances and horns, bells, or chimes are not generally required.

Audible appliances shall conform to the applicable requirements of UL 464. Appliances shall be connected into notification appliance circuits. Audible appliances shall generate a unique audible sound from other devices provided in the building and surrounding area. Surface mounted audible appliances shall be painted [red][white][_____]. Recessed audible appliances shall be installed with a grill that is painted [red][white][_____][with a factory finish to match the surface to which it is mounted].

a. Speakers shall conform to the applicable requirements of UL 1480. Speakers shall have six different sound output levels and operate with audio line input levels of 100 Vac, 70 Vac, 7 Vac, and 25 Vac, by means of selectable tap settings. Tap settings shall include taps of 1/4, 1/2, 1, 2, and 8 watt. Speakers shall incorporate a high efficiency speaker for maximum output at minimum power across a frequency range of 400Hz to 4000Hz, and shall have a sealed back construction. Speakers shall be capable of installation on standard 100 mm 4 inch square electrical boxes. Where speakers and strobes are provided in the same location, they may be combined into a single [wall mounted] unit. All inputs shall be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the [Fire Alarm Control Panel][Voice Notification System].

b. Provide speaker mounting plates constructed of cold rolled steel having a minimum thickness of 1.519 mm 16 gauge and equipped with mounting holes and other openings as needed for a complete installation. Fabrication marks and holes shall be ground and finished to provide a smooth and neat appearance for each plate. Each plate shall be primed and painted.

2.22.2 Visual Notification Appliances

NOTE:

1. ADA requires that Visual Notification Appliances be provided in buildings and facilities in each of the following areas: restrooms, and any general usage area (e.g., meeting rooms), hallways, lobbies, and any other area for common use. The Visual Notification Appliance shall be mounted as required ADA that directs compliance with NFPA 72 (1999 or 2002 edition), except that the maximum allowable sound level of audible notification appliances complying with section 4-3.2.1 of NFPA 72 (1999 edition) shall have a sound level no more than 110 dB at the minimum hearing distance from the audible appliance. In addition, alarms in guest rooms required to provide communication features shall comply with sections 4-3 and 4-4 of NFPA 72 (1999 edition) or sections 7.4 and 7.5 of NFPA 72 (2002 edition). Shop drawings shall indicate location, dimensions, content, details, and other required information to indicate extent of complying with ADA requirements.

2. Currently NFPA 72-2002 requires "clear color" strobes for Fire Alarm Notification. NFPA 72-2002 requires the strobe shall be marked "Fire" to clearly identify the function.

For Army and Air Force projects, involving Mass Notification, a second "amber color" strobe shall be provided to indicate operation of the Mass Notification system. Strobe shall be marked "ALERT". Visual Notification Appliances that contain strobes having lens other than clear are to be derated. During shop drawing review, check manufacturer data sheets for derating factor.

For Navy Projects, involving Mass Notification, a single "clear color" strobe shall be provided. Strobe shall be marked "ALERT".

NOTE: Locate strobes wall mounted in corridors no more than 15 feet from the end of a corridor with 100 feet maximum distance between strobes. Where there is an obstruction to the viewing path in the corridors, such as a cross-corridor door or ceiling elevation change, consider the obstruction as defining a new corridor. Provide wall mounted strobes in rooms accessible to the public, such as conference rooms, restrooms, courtrooms, cafeterias, and auditoriums in accordance with NFPA 72.

Visual notification appliances shall conform to the applicable requirements of UL 1971 and conform to the Americans With Disabilities Act (ADA). Colored lens such as amber, the notification appliances shall comply with UL 1638. The manufacturer shall have the color lens tests to the full UL 1971 polar plotting criteria, voltage drop, and temperature rise as stated in 1971. [Fire Alarm Notification Appliances shall have clear high intensity optic lens, xenon flash tubes, and output white light and be marked ["Fire"]["Alert"] in red letters.] [Fire Alarm/Mass Notification

Appliances shall have [amber][clear] high intensity optic lens, xenon flash tubes, and output white light and be marked "ALERT" in red letters.] The light pattern shall be disbursed 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 shall be 1 flash per second and a minimum of [15][75] candela (actual output after derating for tinted lens) based on the [UL 1971](#) test. Strobe shall be [surface][semi-flush] mounted. [Where more than two appliances are located in the same room or corridor, provide synchronized operation.]

2.22.3 Fire Alarm Horns

NOTE: Where horns or bells are used for fire alarm notification, calculate the proper locations for these devices as detailed in "Designing Fire Alarm Audibility," that is contained in the Society of Fire Protection Engineers (SFPE) Handbook of Fire Protection Engineering. Submit the calculations at the 35 percent design review.

Provide [surface][semi-flush] mounted electronic multi-tone horns that produce a minimum of four distinct sounds, suitable for use in an electrically supervised circuit. Horns shall have a rating of 90 dBA at [3 m 10 feet](#) when tested in accordance with [UL 464](#) while emitting a slow whoop tone. Output from the horn shall be [three-pulse temporal pattern][the slow whoop tone][_____]. Where horns and strobes are provided in the same location, they may be combined into a single unit. Horns used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grilles.

2.22.4 Fire Alarm Bells

NOTE: Where horns or bells are used for fire alarm notification, calculate the proper locations for these devices as detailed in "Designing Fire Alarm Audibility," that is contained in the Society of Fire Protection Engineers (SFPE) Handbook of Fire Protection Engineering. Submit the calculations at the 35 percent design review.

Bells shall be surface mounted with the matching mounting back box [surface mounted][recessed] suitable for use in an electrically supervised circuit. Bells shall be suitable for use in an electrically supervised circuit. Bells shall be the underdome type producing a minimum output rating of [90][_____] dBA at [3 m 10 feet](#). Bells used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grilles. Single stroke, electrically operated, supervised, solenoid bells shall be used for coded applications.

2.22.5 Chimes

NOTE: Chimes are normally only used in hospitals to alert the staff about a fire emergency without arousing the patients. Sound output is low and

prevents them from being used in areas having even moderately low noise levels.

Chimes shall be electrically operated, supervised, electronic type, with an adjustable frequency of 800 to 1200 Hertz. Chimes shall have a minimum sound rating of [80] [_____] dBA at 3 m 10 feet. Chimes shall ring the bell codes, as indicated.

2.22.6 Connections

Provide screw terminals for each notification appliance. Terminals shall be designed to accept the size conductors used in this project without modification.

2.23 ENVIRONMENTAL ENCLOSURES OR GUARDS FOR INITIATING DEVICES AND NOTIFICATION APPLIANCES

Environmental enclosures shall be provided to permit Fire Alarm or Mass Notification components to be used in areas that exceed the environmental limits of the listing. The enclosure shall be listed for the device or appliance as either a manufactured part number or as a listed compatible accessory for the UL category that the component is currently listed. Guards required to deter mechanical damage shall be either a listed manufactured part or a listed accessory for the category of the initiating device or notification appliance.

2.24 VALVE MONITOR SWITCHES (TAMPER SWITCHES)

Provide a tamper switch for each fire protection system control valve. Tamper switches shall be UL listed as "Extinguishing System Attachment" for the location and type of valve supervised. The device shall contain double pole, double throw contacts. Operation of the switch shall cause a supervisory signal to be transmitted to the FACP upon not more than two complete turns of the valve wheel or a closure of 10 percent, whichever is less. Tamper switches shall be equipped with screw terminals for each conductor.

2.25 WATERFLOW DETECTORS

a. Provide vane type waterflow detectors for wet pipe sprinkler systems. The device shall contain double pole, double throw contacts. Equip the detector with a pneumatic time delay, field adjustable from 0 to 90 seconds. The time delay shall be set initially to [30] [45] [_____] seconds. The device shall be a UL listed extinguishing system attachment rated for the particular pressure and location that it is installed. Flow switches shall be equipped with screw terminals for each conductor.

b. Provide pressure type waterflow detectors for dry pipe sprinkler systems, pre-action, and deluge systems. Switch shall be equipped with equiped to provide a time delay from 0 to 90 second. The device shall contain double pole, double throw contacts. The device shall be a UL listed extinguishing system attachment rated for the particular pressure and location that it is installed. Switch shall be equipped with screw terminals for each conductor.

2.26 ELECTROMAGNETIC DOOR HOLDERS

NOTE: Provide electromagnetic door holders only for cross-corridor doors and for doors likely to be propped open once construction is complete.

Where indicated on the drawings, provide magnetic fire door hold open devices. The electromagnetic holding devices shall be designed to operate on [120 VAC] [24 VDC], and require not more than [3] [____] watts of power to develop 172 kPa 25 psi of holding force. Under normal conditions, the magnets shall attract and hold the doors open. The initiation of any fire alarm shall cause the release of the electromagnetic door holding device permitting the door to be closed by the door closer. Operation shall be fail safe with no moving parts. Electromagnetic door hold-open devices shall not be required to be held open during building power failure. The device shall be UL listed based on UL 228 tests.

2.27 INTERFACE TO THE BASE WIDE MASS NOTIFICATION NETWORK

NOTE: Provide as required for connection to a remote Central Control/Monitoring Mass Notification System Command Center.

2.27.1 Wide Area Network/Local Area Network (WAN/LAN)

The Wide Area Network/Local Area Network (WAN/LAN) Interface shall be a 10BASE-T/100BASE-TX Category 6. The ANSI/TIA/EIA 568 wiring method of the RJ-45 outlet shall be as specified in Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM. The WAN/LAN Interface shall support sensitive data at rated data transmission speeds with DES/3DES encryption, MD5 and SHA-1 hashing, RFC 2402 authentication and meet security features of FIPS 140-2 criteria. The WAN/LAN Interface shall have the following characteristics:

- a. 10BASE-T/100BASE-TX, autonegotiation
- b. WAN/LAN Connection: RJ-45
- c. Cabling: as specified in Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM
- d. Security Protocols: 168-bit 3DES, 56-bit DES, SHA-1, MD5, RFC 2402; up to 75 security associations
- e. Network protocols: TCP/IP, ISO 8802-3
- [f. Standards compliance: PC 99, WfM 1.1a/2.0, ACPI 1.0, DMI, PXE 2.0, RIS, IEEE 802.3, PCI 2.2, FIPS 140-2 (pending)]

2.27.2 Fiber Optic

The fiber optic transceiver shall be fully compatible with EIA standards for RS-232, RS-422 and RS-485 at data rates from 0 (DC) to 2.1 mbps (200 kbps for RS-232) in the low speed mode or from 10 kbps to 10 mbps in the high-speed mode. The fiber optic transceiver shall be capable of simplex

or full duplex asynchronous transmissions in both point-to-point systems and drop-and-repeat data networks. The fiber optic transceiver shall be user configurable for the protocol, speed and mode of operation required. The fiber optic transceiver shall be installed as a [stand-alone][card-cage] unit. The fiber optic transceiver shall operate on [Multi-mode][Single-mode] fiber optic cable. The fiber optic transceiver shall be supplied with [ST] [or] [FCPC] type optical connectors. Cabling: as specified in Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM.

2.27.3 Radio

Note: Receiving a new radio frequency assignment often takes a relatively long period of time. Be sure to request the frequency assignment early in the design process.

The radio transceiver shall be bi-direction and meet all the requirements of paragraph, RADIO TRANSMITTER AND INTERFACE PANELS as specified in this Specification Section. The transceiver utilized in the Mass Notification System shall be capable of the following:

- a. Communication with the Central Control/Monitoring System to provide supervision of communication link and status changes are reported by automatic and manual poll/reply/acknowledge routines.
- b. All monitored points/status changes are transmitted immediately and at programmed intervals until acknowledged by the Central Control/Monitoring System.
- c. Each transceiver shall transmits a unique identity code as part of all messages; the code is set by the user at the transceiver.

2.27.3.1 Radio Frequency Communications

Use of radio frequency-type communications systems shall comply with National Telecommunications and Information Administration (NTIA) requirements.

2.27.3.2 Licensed Radio Frequency Systems

An approved DD Form 1494 for the system is required prior to operation.

2.27.4 Telephone

A modem shall be provide for communication with the Central Control/Monitoring System. The modem shall be 56k, compatible with data mode V.90, utilizing Hayes compatible command codes. The modem shall be capable of Auto dialing a preset number based on preprogrammed events. The modem shall auto answer and provide a secure password protection system. Cabling: as specified in Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM.

2.27.5 RS-232/RS-485

The panel shall support a direct connect via RS-232 or RS-485 connections.

2.27.6 Secure Radio System

Note: Receiving a new radio frequency assignment often takes a relatively long period of time. Be sure to request the frequency assignment early in the design process.

2.27.6.1 Communications Network

The communications network provides two-way signals between central control units and autonomous control units (in individual building systems), and should include redundant (primary and backup) communication links. The system shall incorporate technology to prevent easy interruption of the radio traffic for MNS Alerting.

2.27.6.2 Radio Frequency Communications

Use of radio frequency-type communications systems shall comply with National Telecommunications and Information Administration (NTIA) requirements. The systems shall be designed to minimize the potential for interference, jamming, eavesdropping, and spoofing.

2.27.6.3 Licensed Radio Frequency Systems

An approved DD Form 1494 for the system is required prior to operation.

2.28 AUTOMATIC FIRE TRANSMITTERS

NOTE: State the make and model number of existing proprietary supervising station receiving equipment. The choice of code transmitter, or radio transmitter depends upon the type of existing fire reporting system at the activity. When telegraphic systems exist, use code transmitter. Determine the type of activity reporting system (i.e., positive non interfering or shunt). In most cases a local energy-tripping device will be required. The facility Fire Dept. or Engineering office should be contacted to determine the type and amount of data to be supervised (monitored), i.e. -type: separate or common transmission of alarm, supervisory, and trouble type signals; -amount: all points, all zones, or the combined premises. Verify that existing monitoring equipment has sufficient capacity to support the additional premises or that it can be expanded as necessary to accommodate the new fire alarm system. Identify existing components.

2.28.1 Telegraphic Transmitter

Provide transmitter of the electric motor-driven or pre-wound spring mechanism type that shall transmit not less than four rounds of code. When motor-driven transmitters are provided, the motor shall be connected to a supervised circuit in a control panel. Provide metallic or rigid plastic code number plates on the exterior face of transmitters. Transmitters

shall be designed to provide the same features as the fire alarm boxes for electrically supervised, coded positive noninterfering type and shall have the ability to transmit signals on grounded or open circuits. Activation of box when a single open fault is present on exterior fire alarm circuit shall have box to idle for one complete round only, then immediately transmit four complete code rounds via the box earth ground connection. Transmitter shall have a local energy type auxiliary tripping device. Code wheel shall be metallic and box code shall be as directed by the Contracting Officer. Wiring shall be extended to the indicated telephone terminating location [for future connection by other] [and connected to specific twisted pair cable identified by the COR in the field]. One new [_____] -pair [shielded] [non-shielded] twisted-pair cable shall be extended to the Supervising Station and connected to existing terminating equipment.

2.28.2 Radio Transmitter and Interface Panels

Transmitters shall be compatible with proprietary supervising station receiving equipment. Each radio alarm transmitter shall be the manufacturer's recognized commercial product, completely assembled, wired, factory tested, and delivered ready for installation and operation. Transmitters shall be provided in accordance with applicable portions of NFPA 72, Federal Communications Commission (FCC) 47 CFR 90 and Federal Communications Commission (FCC) 47 CFR 15. Transmitter electronics module shall be contained within the physical housing as an integral, removable assembly. The proprietary supervising station receiving equipment is [_____] and the transceiver shall be fully compatible with this equipment. At the contractors option, and if UL or FM listed, the transmitter may be housed in the same panel as the fire alarm control panel. The transmitter shall be Narrowband radio, with FCC certification for narrowband operation and meets the requirements of the NTIA (National Telecommunications and Information Administration) Manual of Regulations and Procedures for Federal Frequency Management.

a. Operation: Each transmitter shall operate from 120-volt ac power. In the event of 120-volt ac power loss, the transmitter shall automatically switch to battery operation. Switchover shall be accomplished with no interruption of protective service, and shall automatically transmit a trouble message. Upon restoration of ac power, transfer back to normal ac power supply shall also be automatic.

b. Battery Power: Transmitter standby battery capacity shall provide sufficient power to operate the transmitter in a normal standby status for a minimum of 72 hours and be capable of transmitting alarms during that period.

c. Transmitter housing shall be NEMA Type 1. The housing shall contain a lock that is keyed [identical to the fire alarm system for the building] [identical to radio alarm transmitter housings on the base]. Radio alarm transmitter housing shall be factory painted with a suitable priming coat and not less than two coats of a hard, durable weatherproof enamel.

d. Antenna shall be [omnidirectional, coaxial, halfwave dipole antennas] [_____] for radio alarm transmitters with a driving point impedance to match transmitter output. The antenna and antenna mounts shall be corrosion resistant and designed to withstand wind velocities of 161 km/h. 100 mph. Antennas shall not be mounted to any portion of the building roofing system. Protect the antenna from physical damage.

2.28.3 Digital Alarm Communicator Transmitter (DACT)

Provide DACT that is compatible with the existing supervising station fire alarm system. Transmitter shall have a means to transmit alarm, supervisory, and trouble conditions via a single transmitter. Transmitter shall have a source of power for operation that conforms to NFPA 72. Transmitter shall be capable of initiating a test signal daily at any selected time. Transmitter shall be arranged to seize telephone circuits in accordance with NFPA 72.

2.28.4 Master Fire Alarm Boxes

Master fire alarm boxes shall be of the coded, [shunt][positive] noninterfering type with succession features having a [shunt][local energy] type auxiliary tripping device, and of the prewound, open-door, pull-lever type. Mechanism shall be housed in a weatherproof cottage shell type of housing with metallic or rigid plastic code number plate mounted on the exterior face of the cottage shell. Operation of the actuating pull lever shall cause the box to transmit four complete rounds of code to gongs, recorders, and other devices on the same circuit. Driving springs shall have the capability to transmit not less than eight complete four-round groups of code before being rewound. Boxes shall be designed for operation of 100 milliamperes dc, but with capability of full operation of 70 milliamperes and up to 120 milliamperes. Activation of box when a single open fault is present on exterior fire alarm circuit shall have box to idle for one complete round only, then immediately transmit four complete code rounds via the box earth ground connection. Each box shall be equipped with manual signaling key, telephone jack, silent test device, and box shunt device. Box shall be [[wall-][pole-][pedestal-]mounted][as indicated] with center of box 1220 mm48 inches above grade, and provided with lighting fixture. Mounting bolts, brackets, fastenings, and conduit shall be copper alloy, cadmium, or zinc-coated steel. Code wheel shall be metallic and box code shall be as directed. Electrically powered master fire alarm boxes shall have standby sealed, lead calcium battery capacity for a minimum of 72 hours and be capable of transmitting alarms during that period.

2.28.5 Signals to Be Transmitted to the Base Receiving Station

The following signals shall be sent to the base receiving station:

- a. Sprinkler water flow
- b. Manual pull stations
- c. Smoke detectors
- d. Duct smoke detectors
- e. Sleeping room smoke detectors
- f. Heat detectors
- g. Fire Extinguishing System
- h. Sprinkler valve supervision
- i. Fire pump running

- j. Fire pump supervision
- k. Water supply level and temperature
- l. Combustion Engine Drive Fire Pump Running
 - (1) Selector Switch in position than automatic
 - (2) Engine Over-speed
 - (3) Low Fuel
 - (4) Low Battery
 - (5) Engine Trouble (Low Oil, Over temp, etc)

2.29 NAMEPLATES

Major components of equipment shall have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing Contractor's name and address, and the contract number provided on a new plate permanently affixed to the item or equipment. Major components include, but are not limited to, the following:

- a. FACPs
- b. Automatic transmitter
- c. Printer

Furnish to obtain approval by the Contracting Officer before installation. Obtain approval by the Contracting Officer for installation locations. Nameplates shall be etched metal or plastic, permanently attached by screws to panels or adjacent walls.

2.30 WIRING

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

2.30.1 Alarm Wiring

The SLC wiring shall be [fiber optic] [or] [copper] cable in accordance with the manufacturers requirements. Copper signaling line circuits and initiating device circuit field wiring shall be No. [14] [16] [_____] AWG size conductors at a minimum. Notification appliance circuit conductors, that contain audible alarm devices, [other than speakers,] shall be solid copper No. 14 AWG size conductors at a minimum. [Speaker circuits shall be copper No. [16] [_____] AWG size conductors at a minimum.] [Firefighter telephone circuits shall be No. [16] [18] [_____] AWG size conductors as a minimum.] Wire size shall be sufficient to prevent voltage drop problems. Circuits operating at 24 VDC shall not operate at less than 21.6 volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10 percent of nominal voltage. Power wiring, operating at 120 VAC minimum, shall be a minimum No. 12 AWG solid copper having similar insulation.

2.30.2 Wiring to Station Telegraphic Fire Alarm Circuit

Wiring from the master fire alarm box to the station telegraphic fire alarm circuit shall be a two-conductor No. [12] [10] [_____] AWG type UF cable [in conduit].

PART 3 EXECUTION

3.1 INSTALLATION OF FIRE ALARM INITIATING AND INDICATING DEVICES

a. FACP/FMCP: Locate the FACP/FMCP [where indicated on the drawings] [_____] . [Recess] [Semi-recess] [Surface mount] the enclosure with the top of the cabinet 2 m 6 feet above the finished floor or center the cabinet at [1.5] [_____] m [5] [_____] feet, whichever is lower. Conductor terminations shall be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection shall be permanently mounted in the FACP.

b. Manual Stations: Locate manual stations [as required by NFPA 101 IEC 60268, Part 16, and ASA S3.2 and NFPA 72] [where shown on the drawings] [_____] . Mount stations so that their operating handles are 1220 mm 4 feet above the finished floor. Mount stations so they are located no farther than [1.5] [_____] m [5] [_____] feet from the exit door they serve, measured horizontally.

c. Notification Appliance Devices: Locate notification appliance devices [as required by NFPA 72] [where shown on the drawings] . Mount assemblies on walls 2.3 m 90 inches above the finished floor or 150 mm 6 inches below the ceiling whichever is lower. [Ceiling mounted speakers shall conform to NFPA 72].

d. Smoke and Heat Sensors: Locate sensors [as required by NFPA 72 and their listings] [as shown on the drawings] on a 100 mm 4 inch mounting box. Sensors located on the ceiling shall be installed not less than 100 mm 4 inches from a side wall to the near edge. Those located on the wall shall have the top of the sensor at least 100 mm 4 inches below the ceiling, but not more than 300 mm 12 inches below the ceiling. In raised floor spaces, the smoke sensors shall be installed to protect 21 square meters 225 square feet per sensor. Install smoke sensors no closer than 1.5 m 5 feet from air handling supply outlets.

e. Graphic Annunciator: Locate the graphic annunciator as shown on the drawings. Surface mount the panel, with the top of the panel 2 m 6 feet above the finished floor or center the panel at [1.5] [_____] m [5] [_____] feet, whichever is lower.

f. Water Flow Detectors and Tamper Switches: Locate water flow detectors and tamper switches [where shown on the drawings] [at each supervised] [sprinkler valve station.]

g. Firefighter Telephones: Locate wall mounted in each stair at each floor landing, in each elevator lobby, and in each elevator cab 1220 mm 4 feet above the finished floor.

h. The modification of any fire alarm system and the procedures shall comply with the requirements of NFPA 241.

3.2 SYSTEM FIELD WIRING

3.2.1 Wiring within Cabinets, Enclosures, Boxes, Junction Boxes, and Fittings

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 shall be connected to terminal blocks. Mark each terminal in accordance with the [wiring diagrams](#) of the system. Make connections with approved pressure type terminal blocks, that are securely mounted. The use of wire nuts or similar devices shall be prohibited. Wiring shall conform to [NFPA 70](#).

3.2.2 Terminal Cabinets

**NOTE: Provide terminal cabinets on each floor where
the fire alarm system supply riser is located and
where the fire alarm return riser is located.**

Provide a terminal cabinet at the base of any circuit riser, on each floor at each riser, and where indicated on the drawings. Terminal size shall be appropriate for the size of the wiring to be connected. Conductor terminations shall be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection shall be permanently mounted in the terminal cabinet. Minimum size is [200 mm by 200 mm 8 inches by 8 inches](#).

3.2.3 Alarm Wiring

**NOTE: Do not penetrate SCIF perimeters with copper
signal line circuits. SCIF penetrations should be
either fiber optic cable or IDC. IDC circuits
penetrating the SCIF shall be filtered.**

Provide all wiring in rigid metal conduit or intermediate metal conduit. Voltages shall not be mixed in any junction box, housing, or device, except those containing power supplies and control relays. Electrical metallic tubing conduit is acceptable in dry locations not enclosed in concrete or where not subject to mechanical damage. Conceal conduit in finished areas of new construction and wherever practicable in existing construction. The use of flexible conduit not exceeding a [\[2\] \[\] m \[6\] \[\] foot](#) length shall be permitted in initiating device circuits. Run conduit or tubing concealed unless specifically shown otherwise on the drawings. Shielded wiring shall be utilized where recommended by the manufacturer. For shielded wiring, the shield shall be grounded at only one point, that shall be in or adjacent to the FACP. Pigtail or T-tap connections to signal line circuits, initiating device circuits, supervisory alarm circuits, and notification appliance circuits are prohibited. [T-tapping using screw terminal blocks is allowed for Style 5 addressable systems.] Color coding is required for circuits and shall be maintained throughout the circuit. Conductors used for the same functions shall be similarly color coded. Wiring shall conform to [NFPA 70](#).

3.2.4 Conductor Terminations

Labeling of conductors at terminal blocks in terminal cabinets, FACP, and remote fire alarm control units shall be provided at each conductor connection. Each conductor or cable shall have a shrink-wrap label to provide a unique and specific designation. Each terminal cabinet, FACP, and fire alarm control unit shall contain a laminated drawing that indicates each conductor, its label, circuit, and terminal. The laminated drawing shall be neat, using 12 point lettering minimum size, and mounted within each cabinet, panel, or unit so that it does not interfere with the wiring or terminals. Maintain existing color code scheme where connecting to existing equipment.

3.3 DISCONNECTION AND REMOVAL OF EXISTING SYSTEM

NOTE: Contact the Contracting Officer, Base Fire Prevention Office, and/or Base Maintenance Personnel to determine what action is appropriate for the salvaging of existing fire alarm equipment.

Existing fire alarm equipment shall be maintained fully operational until the new equipment has been tested and accepted by the Contracting Officer. As new equipment is installed, it shall be labeled "NOT IN SERVICE" until the new equipment is accepted. Once the new system is completed, tested, and accepted by the Government, it shall be placed in service and connected to the station fire alarm system. New equipment shall have tags removed and the existing equipment shall be tagged "NOT IN SERVICE" until removed from the building.

- a. After acceptance of the new system by the Contracting Officer, existing equipment not connected to the new system shall be removed, unused exposed conduit shall be removed, and damaged surfaces shall be restored. The material shall be removed from the site and disposed of by the Contractor.
- b. Disconnect and remove the existing fire alarm and smoke detection systems where indicated and elsewhere in the specification.
- c. Fire alarm control panels and fire alarm devices disconnected and removed shall be turned over to the Contracting Officer.
- d. Properly dispose of fire alarm outlet and junction boxes, wiring, conduit, supports, and other such items.

3.4 CONNECTION OF NEW SYSTEM

The following new system connections shall be made during the last phase of construction, at the beginning of the preliminary tests. New system connections shall include:

- a. Connection of new control modules to existing magnetically held smoke door (hold-open) devices.
- b. Connection of new elevator recall smoke sensors to existing wiring and conduit.
- c. Connection of new system transmitter to existing base fire

reporting system.

Once these connections are made, system shall be left energized and new audio/visual devices deactivated. Report immediately to the Contracting Officer, coordination and field problems resulting from the connection of the above components.

3.5 FIRESTOPPING

Provide firestopping for holes at conduit penetrations through floor slabs, fire rated walls, partitions with fire rated doors, corridor walls, and vertical service shafts in accordance with Section 07 84 00 FIRESTOPPING.

3.6 PAINTING

Paint exposed electrical, fire alarm conduit, and surface metal raceway to match adjacent finishes in exposed areas. Paint [junction boxes][conduit] [and] [surface metal raceways] red in unfinished areas. Painting shall comply with Section 09 90 00 PAINTS AND COATINGS.

3.7 FIELD QUALITY CONTROL

NOTE: Listed tests are minimum required.
Coordinate with the local Authority Having
Jurisdiction (AHJ) for minimum requirements in
excess of the NFPA 72 minimums or those recommend
below. If additional tests are required, such tests
must be added to the list.

3.7.1 Testing Procedures

Detailed test procedures, prepared and signed by a Registered Professional Engineer or a NICET Level [3][4] Fire Alarm Technician, and signed by representative of the installing company, for the fire detection and alarm system [60][_____] days prior to performing system tests. Detailed test procedures shall 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, Guard's Tour equipment, and transient (surge) suppressors. Test procedures shall include sequence of testing, time estimate for each test, and sample test data forms. The test data forms shall be in a check-off format (pass/fail with space to add applicable test data) and shall be used for the preliminary testing and the acceptance testing. The test data forms shall record the test results and shall:

1. Identify the NFPA Class and Style of all Initiating Device Circuits (IDC), Notification Appliance Circuits (NAC), Voice Notification System, and Signaling Line Circuits (SLC).
2. Identify each test required by NFPA 72 Test Methods and required test herein to be performed on each component, and describe how this test shall be performed.
3. 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.

4. Identify all test equipment and personnel required to perform each test (including equipment necessary for testing smoke detectors using real smoke).

5. 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.

3.7.2 Tests Stages

a. Preliminary Testing: Conduct preliminary tests to ensure that devices and circuits are functioning properly. Tests shall meet the requirements of paragraph entitled "Minimum System Tests." After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that panel functions were tested and operated properly. The letter shall include the names and titles of the witnesses to the preliminary tests. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.

b. Request for Formal Inspection and Tests: When tests have been completed and corrections made, submit a signed, dated certificate with a request for formal inspection and tests to the [Naval Facilities Engineering Command, [____], Fire Protection Engineer] [Contracting Offices Designated Representative (COR)].

c. Final Testing: Notify the Contracting Officer in writing when the system is ready for final acceptance testing. Submit request for test at least 15 calendar days prior to the test date. The tests shall be performed in accordance with the approved test procedures in the presence of the Contracting Officer. The Contractor shall furnish instruments and personnel required for the tests. A final acceptance test will not be scheduled until the operation and maintenance (O&M) manuals are furnished to the Contracting Officer and the following are provided at the job site:

- (1) The systems manufacturer's technical representative
- (2) Marked-up red line drawings of the system as actually installed
- (3) Megger test results
- (4) Loop resistance test results
- (5) Complete program printout including input/output addresses

The final tests shall be witnessed by the [Naval Facilities Engineering Command, [____], Fire Protection Engineer] [Contracting Offices Designated Representative (COR)]. At this time, any and all required tests shall be repeated at their discretion. Following acceptance of the system, **as-built drawings** and O&M manuals shall be delivered to the Contracting Officer for review and acceptance. [In existing buildings, the transfer of devices

from the existing system to the new system and the permission to begin demolition of the old fire alarm system will not be permitted until the as-built drawings and O&M manuals are received.]

3.7.3 Minimum System Tests

Test the system in accordance with the procedures outlined in [NFPA 72](#), [ISO 7240-16](#), [IEC 60268-16](#). The required tests are as follows:

- a. Megger Tests: After wiring has been installed, and prior to making any connections to panels or devices, wiring shall be megger tested for insulation resistance, grounds, and/or shorts. Conductors with 300 volt rated insulation shall be tested at a minimum of 250 VDC. Conductors with 600 volt rated insulation shall be tested at a minimum of 500 VDC. The tests shall be witnessed by the Contracting Officer and test results recorded for use at the final acceptance test.
- b. 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 shall be witnessed by the Contracting Officer and test results recorded for use at the final acceptance test.
- c. Verify the absence of unwanted voltages between circuit conductors and ground. The tests shall be accomplished at the preliminary test with results available at the final system test.
- d. Verify that the control unit is in the normal condition as detailed in the manufacturer's O&M manual.
- e. Test each initiating and indicating device and circuit for proper operation and response at the control unit. Smoke sensors shall be tested in accordance with manufacturer's recommended calibrated test method. Use of magnets is prohibited. Testing of duct smoke detectors shall comply with the requirements of [NFPA 72](#).
- f. Test the system for specified functions in accordance with the contract drawings and specifications and the manufacturer's O&M manual.
- g. 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.
- h. Determine that the system is operable under trouble conditions as specified.
- i. Visually inspect wiring.
- j. Test the battery charger and batteries.
- k. Verify that software control and data files have been entered or programmed into the FACP. Hard copy records of the software shall be provided to the Contracting Officer.
- l. Verify that red-line drawings are accurate.
- m. Measure the current in circuits to ensure there is the calculated spare capacity for the circuits.

- n. Measure voltage readings for circuits to ensure that voltage drop is not excessive.
- o. Disconnect the verification feature for smoke sensors during tests to minimize the amount of smoke needed to activate the sensor. Testing of smoke sensors shall be conducted using real smoke. The use of canned smoke is prohibited.
- p. Measure the voltage drop at the most remote appliance (based on wire length) on each notification appliance circuit.
- q. Audibility Intelligibility testing of the Voice Evacuation Notification System shall be accomplished iaw NFPA 72 for Voice Evacuation Systems, IEC 60268-16, and ASA S3.2.
- r. Opening the circuit at not less than [all] [[10%] [25%] [50%] of] alarm initiating devices and notification appliances to test the wiring supervisory feature.
- s. The contractor shall demonstrate modem communications with remote sites as specified by the COR. Dial in capability shall also, be demonstrated, using specified security.
- t. The contractor shall demonstrate fiber optic communications with remote sites as specified by the COR. Dial in capability shall also, be demonstrated, using specified security.

3.8 INSTRUCTION OF GOVERNMENT EMPLOYEES

Equipment manufacturer shall provide [1] [3] [___] days on site [and 5 days of technical training to the Government at the manufacturing facility.] Training shall allow for classroom instruction as well as individual hands on programming, troubleshooting and diagnostics exercises. [Room and board costs shall be included for two Government personnel.] [Factory] training shall occur within [6] [12] [_____] months of system acceptance.

3.8.1 Instructor

Include in the project the services of an instructor, who shall have received specific training from the manufacturer for the training of other persons regarding the inspection, testing, and maintenance of the system provided. The instructor shall train the Government employees designated by the Contracting Officer, in the care, adjustment, maintenance, and operation of the fire alarm [and fire detection] system.

3.8.2 Qualifications

Each instructor shall be thoroughly familiar with all parts of this installation. The instructor shall be trained in operating theory as well as in practical O&M work.

3.8.3 Required Instruction Time

Provide [8] [16] [_____] hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and times as are selected by the Contracting Officer. The instruction may be divided into two or more periods at the discretion of the Contracting Officer. The training shall allow for rescheduling for unforeseen maintenance and/or fire department responses.

-- End of Section --