**SECTION 28 31 00**

FIRE DETECTION AND ALARM

#### BASED ON DFD MASTER ELECTRICAL SPEC DATED 03/01/23

This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is currently written. The Division of Facilities Development expects changes and comments from you.

Notes to Specifier:

Pay special attention to items in italic typeface. Fire alarm system options are identified within brackets. These and other items must be added to or deleted, as the project requires. All text in red shall be deleted from the specifications.

Make sure the unit prices are included in the Bid Form. A list of unit prices is included in the FA guidelines. Edit it to fit the project and include in the Bid Form.

The following instructions are to be followed when the project involves extensions and/or revisions to an existing fire alarm.

*When the project involves extensions and/or revisions to an existing fire alarm, the A/E should follow these instructions. Failure to do so will result in rejecting the review documents and entering low scores in WisBuild:*

1. *Include Class 1 Notice in this spec section and in front-end spec section, page A-1.*
2. *Provide information about the existing panel such as manufacturer name and model number.*
3. *Show the location of the existing fire alarm panel on the drawing.*
4. *Delete all specifications related to operation if there is no change in the operation of the existing system.*
5. *Delete all specifications related to the fire alarm panel and annunciator panel if they are existing to remain.*
6. *Delete all specifications related to fire alarm devices and specify each device by manufacturer name and catalog number.*

Included are the following topics:

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# PART 1 - GENERAL

# SCOPE

The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations associated with the installation of the Fire Alarm System as shown on the drawings and as herein specified. [This system shall incorporate a Mass Notification System. The mass notification and fire alarm functions shall be combined into one system.]

When the project involves extensions and/or revisions to an existing fire alarm system, include the class 1 notice as noted below and in the front-end specs on page A-2.

*[CLASS 1 NOTICE:*

*Notice is hereby given in accordance with Section 16.855(10), Wisconsin Statutes, that the Division believes it is in the best interests of the State to contract the following work from only one source, without the usual statutory procedures. Refer to the* ***DESCRIPTION OF WORK*** *heading below for more information.]*

**DESCRIPTION OF WORK**

[Start Description of Work here.]

Describe the work in detail.

Notes to A/E:

***MASS NOTIFICATION SYSTEMS: When a Mass Notification System (MNS) is incorporated into the Fire Alarm System, the same strobes used to alert occupants of a FIRE ALARM shall also be used for MNS functions. Amber strobes are no longer used for MNS systems. Strobes shall be located just as they would for FIRE ALARM systems. When an MNS is incorporated into a Fire Alarm system, ALL strobes shall be marked “ALERT” instead of “FIRE”.***

***Also, LED Textual Display Signs shall be provided in locations where Hearing Impaired personnel might read instructions on the emergency. For DMA projects, the Text displays shall be located over stairwell doors and major egress doors at the level of discharge.***

[MASS NOTIFICATION SYSTEM: Incorporate a Mass Notification System (MNS) into the Fire Alarm system. The same strobes used to alert occupants of a FIRE ALARM shall also be used for MNS functions. ALL Strobes shall be marked “ALERT” instead of “FIRE”.

Provide LED Textual Display Signs for Mass Notification at locations as indicated on the plans. Provide equipment to initiate voice messages over the Fire Alarm/MNS system, and to initiate messages to be displayed on the Textual Display Signs.]

The Fire Alarm System shall consist of the following, unless a different design is submitted and approved:

* Fire Alarm Control Panel (FACP) as shown on plans.
* Fire Alarm Annunciator Panel(s) (FAAP) as shown on the plans
* [In-building Fire Command Center (FCC) as shown on the plans]
* [Remote Fire Command Center (RFCC) as noted on the plans]

The Fire Alarm System shall be configured as a local protective signaling system, as defined in NFPA-72, and shall use/incorporate the following features, as a minimum:

The latest intelligent analog, addressable technology (detectors/sensors and modular panel equipment) currently available from the manufacturer.

A Single-Channel, selective [non-selective], One-Way Voice Communications (EVAC) System - This EVAC System shall be designed to Automatically Generate particular tones and shall allow properly trained personnel to make manual announcements to the entire building or the selected areas (as applicable).

Non-Coded, Speaker-type Audible Notification Appliances.

Select if applicable.

The existing campus-wide fire alarm system is manufactured by *[INSERT NAME OF MANUFACTURER]*.

*[INSERT NAME OF MANUFACTURER]* equipment is used only to establish quality and performance. Equipment by other Manufacturers is equally acceptable provided it meets or exceeds the listed requirements of these specifications.

Interface the FACP via compatible fiber optic cabling routed to the existing *[INSERT NAME OF MANUFACTURER]* RFCC located in the *[INSERT LOCATION)*. THIS contractor is responsible for furnishing and installing fiber optic cabling in accordance with specification section 27 10 00 Structured Cabling.

The existing RFCC shall provide [annunciation,] [control of individual points,] [and paging] on the [*INSERT NAME OF BUILDING]* fire alarm control panel.

Accomplish these functions by interfacing to the existing campus RFCC, OR by installing at the [*INSERT NAME OF BUILDING]* a new RFCC capable of being expanded for future system additions. It is the Contractor's responsibility to ensure the existing fiber is adequate, and/or to provide new fiber optic cable with fiber pathways (conduits, duct bank, etc.) as required between the new FACP and the existing/new RFCC.

Manufacturers other than *[INSERT NAME OF MANUFACTURER]* shall provide a fire alarm network command center panel (RFCC) capable of, but not limited to, the following:

Annunciation of each device and location in the building in this project

Remote resetting and silencing of the building fire alarm control panel if approved by the authority having jurisdiction.

The RFCC shall maintain an event log, service logs, and status logs.

Annunciation of tornado warning from this RFCC location

One-way voice communication to give special evacuation instructions to the building(s) in this project.

Allow temporary sensitivity adjustment of devices.

UL and NFPA listed for use with and be manufactured by the same manufacturer of the fire alarm system being provided in the building(s) in this project.”

Network Connections, Data, Audio, and Signaling Line Circuits, which functionally link together multiple panels or Transponders shall be wired in an NFPA Style 6 (Class A) arrangement.

Initiating Device Circuits (IDCs) shall be limited to short runs from Monitor Modules to the connected device, unless specifically stated otherwise herein, and shall be configured as NFPA Style B (Class B), with individual zone supervision.

Notification Appliance Circuits (NACs) shall be configured as NFPA Style Y (Class “B”). Audible NACs serving Speakers shall be installed using shielded cable, such that the speakers do not generate unwanted noises, due to crosstalk with other circuits.

Data Circuits to Annunciators shall be configured as NFPA Style 4 (Class “B”). All annunciators shall be fully supervised.

# RELATED WORK

The work covered by this section of the specifications shall be coordinated with the related work as specified elsewhere under the following project sections:

Section 01 74 19 – Construction Waste Management

Section 01 91 01 or 01 91 02 – Commissioning Process

Section 07 84 00 – Fire Stopping

Section 26 05 00 – Common Work Results for Electrical

Section 26 05 02 – Electrical Demolition

Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cable

Section 26 05 26 – Grounding and Bonding for Electrical Systems

Section 26 05 29 – Hangers and Supports for Electrical Systems

Section 26 05 33 – Raceway and Boxes for Electrical Systems

Section 26 05 36 – Cable Trays for Electrical Systems

Section 26 05 53 – Identifications for Electrical Systems

Section 26 27 26 – Wiring Devices

Section 27 10 00 – Structured Cabling

Section 28 05 37 – Emergency Responder Radio Coverage System

Section 28 08 00 – Commissioning of Electronic Safety and Security

# REGULATORY REQUIREMENTS

The complete installation shall conform to the applicable sections of the latest edition of the following Codes and Standards:

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

NFPA 70 National Electrical Code (NEC) generally, and Article 760 in particular

NFPA 72 National Fire Alarm Code

NFPA 101 Life Safety Code

IBC International Building Code

IFC International Fire Code

IMC International Mechanical Code

STATE OF WISCONSIN – DEPARTMENT OF SAFETY AND PROFESSIONAL SERVICES (DSPS)

SPS 361.30 Plan Review and Approval

NATIONAL ELECTRICAL MANUFACTURER’S ASSOCIATION (NEMA)

UNDERWRITERS’ LABORATORIES, INC. (UL)

UL 38 Manual Signaling Boxes for Fire Alarm Systems

UL 217 Smoke Alarms

UL 268 Smoke Detectors for Fire Alarm Systems

UL 464 Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories

UL 497B Protectors for Data Communications and Fire-Alarm Circuits

UL 521 Heat Detectors for Fire Protective Signaling Systems

UL 864 Control Units and Accessories for Fire Alarm Systems

UL 1480 Speakers for Fire Alarm and Signaling Systems, Including Accessories

UL 1481 Power Supplies for Fire-Protective Signaling Systems

UL 1971 Signaling Devices for the Hearing Impaired

UL 2572 Mass Notification Systems

US ARMY CORPS of ENGINEERING

UFGS 28 31 76 Interior Fire Alarm and Mass Notification System, Addressable

**MANUFACTURER PROVIDED SERVICES**

A manufacturer-trained service technician shall provide the following installation supervision. This Techni­cian shall be certified by the equipment manufacturer and shall have a minimum of two (2) years of service experience in the fire alarm industry.

The technician's name shall appear on equipment submittals and a letter of certification from the fire alarm manufacturer shall be sent to the project engineer. The manufacturer's service technician shall be responsible for the following items:

Pre‑installation visit to the job site to review equipment submittals and verify method by which the system should be wired.

Periodic job site visits to verify installation and wiring of system, and to perform any partial system programming – required to permit portions of the existing system to be removed.

Upon completion of wiring, final connections shall be made under the supervision of this technician, and final checkout and certification of the system.

At the time of final checkout, technician shall give operational instructions to the Owner and/or his representative on the system.

All job site visits shall be dated and documented in writing and signed by the Electrical Contractor. Any discrepancy shall be noted on this document and a copy kept in the system job folder that shall be available to the Project Engineer any time during the project.

# QUALITY ASSURANCE

Unless specifically stated otherwise, each and all items of the fire alarm system shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the UL label.

Notification Appliances may be products of a single, different manufacturer – provided that the Primary Equipment Provider or Manufacturer provides written documentation of compatibility and agrees to assume any and all responsibility for compatibility with the Control Equipment.

In addition to previously listed UL standards, all control equipment shall be listed under the following UL Standards:

UOJZ UL category UOJZ as a single control unit. Partial listing shall NOT be acceptable.

# QUALIFICATIONS

All equipment shall be supplied by a firm, which specializes in fire alarm and smoke detection systems with a minimum of five (5) years-documented experience. The company shall be an authorized distributor of the proposed equipment.

All work shall be performed by a licensed contractor, who is regularly engaged in the installation and servicing of fire alarm systems. Proof of five (5) years documented experience and of factory authorization to furnish and install the equipment proposed shall be furnished prior to contract award, if required by Division of Facilities Development.

Contractor shall be located within three (3) hours of travel time or less from the site of this project.

# SUBMITTALS

Under the provisions of Section 26 05 00 and Division 1, submit the following for approval prior to ordering any equipment in accordance with requirements of Division 1, General Conditions. Submit a total of ten (10) sets.

Copies of CAD Files (AutoCAD, latest version) for the Fire Alarm floor plans will be made available to the successful bidder for preparation of the required shop drawings and as-builts.

REQUIRED SUBMITTAL MATERIALS

The following items, and any additional items required per Section 26 05 00, shall be included within the submittal package:

Although they may be submitted under separate cover, Submittal Brochures / Booklets / Binders and Shop Drawings shall be submitted together and shall be treated as a complete set.

COVER SHEET

The submittals shall contain a cover sheet, which shall include the following information:

Submittal Date

Specification Section(s)

Electrical Contractor (Contact Name, name, address, and telephone number)

Project Name, Project City, Project State, and Project Address.

TABS AND TABLE OF CONTENTS

The Table of Contents shall appear immediately behind the Cover Sheet and shall contain a complete listing of all tabs contained within the binder / booklet.

Tabbed index sheets shall be inserted into each of the binders, such that each binder is clearly sub-divided into sections. Tabbed sections shall be provided, at minimum, for the following:

One section for each building – All submittal data, which applies to any particular building, shall be located within the tabbed section for the corresponding building. All submittal data within each “building” section shall appear in the same order.

One section for manufacturer’s data sheets – divided into sub-sections for the following:

Panel Equipment (Panels, Panel Components / Modules, Printers, Annunciators, etc.)

Addressable Field Devices (Initiating and Control / Monitoring / Isolation)

Non-Addressable Field Devices (Initiating Devices, relays, etc.)

Notification Appliances

Fire-Fighter Communications Equipment if applicable

EQUIPMENT LIST

A complete equipment list of all components, including the following: Quantity, Manufacturer, Part Number, and Description. If the supplier uses different part numbers from those of the actual manufacturer, the actual manufacturer and part numbers as they appear – marked on the shipping box / packages, shall also be identified on this list.

Each Equipment List shall include a complete listing of the modules, components, and software included for each modular FIRE Alarm Control Panel, Network Panel, Transponder, Outboard Gear Panel or Annunciator. Such items shall be listed in a manner that clearly indicates that such items are parts of / components of a larger unit. Simply stating a single part number and description for such panels shall be unacceptable.

A separate list shall be included for each section, with items grouped by system.

For projects involving multiple systems, separate equipment lists shall be provided - one for each system.

Spare Parts shall also be listed separately and shall be identified clearly as “Spare Equipment”.

PRODUCT DATA

Manufacturer's product data sheets, and equipment description of all system components. These data sheets shall be highlighted or suitably marked, so that included items and options are indicated. On data sheets that include multiple products, products that are not used shall be crossed out.

Product Data Sheets shall be organized, in order, corresponding to the first occurrence of the corresponding item on the equipment list.

SEQUENCE OF OPERATION

Note to A/E: If the system is existing-to-remain, edit the following two sentences as appropriate and delete the remaining Sequence of Operation text.

[The existing Sequence of Operation shall remain. Add [Elevator Recall] to the Sequence of Operation to accommodate the new [elevator(s)].]

Provide a complete sequence of operations of all functions of the system. This sequence of operation shall be custom created for this project.

In order to satisfy this submittal requirement, it shall be acceptable to include copies of the “Operation” portions of the specifications, including any applicable schedules / other supplementary information. Copied specification pages shall be marked and highlighted, where the programmed operation will differ from the specified operation. Copied specification pages shall be marked “no changes”, where no significant deviation will occur. Other acceptable alternatives shall include written narratives, organized in a logical manner, and Matrix Charts.

Where Matrix Charts are provided, such charts shall be organized and labeled clearly, and shall incorporate suitable levels of detail (refer to NFPA-72 (2007) **A.10.6.2.3(9)** for an example of an acceptable matrix chart). The Leftmost column of the Matrix Chart shall include groupings of initiating devices and other function switches. The Topmost Row shall include groupings of notification appliances and output devices.

BATTERY CALCULATIONS

These calculations shall clearly illustrate both the Standby and Alarm loads, due to the various field devices and panel components / modules. It is generally recommended to submit such calculations in a “spreadsheet” format. These calculations shall include any reserve / additional capacity, as required elsewhere within these specifications. Final results shall indicate both the minimum battery capacity required and the capacity actually provided.

AMPLIFIER CAPACITY CALCULATIONS

For all speakers plus all required spare capacity.

ADDRESSABLE DEVICE / DESCRIPTOR LIST - Prior to programming the system, submit a chart or printout, listing every system address provided for purposes of alarm initiation, status monitoring, supervised signaling, and auxiliary controls. This printout shall include the corresponding device type and field programmable “custom labels”, as they will be displayed on the New System – at the FACP and Local Annunciator. The addresses listed within this document shall directly correspond to the addresses marked on the submitted floor plan drawings. This list will be modified as needed by the Owner and returned to the contractor for final programming into the system.

NAC WIRE DROP CALCULATIONS

Calculations shall be provided for all Notification Appliance Circuits (NAC) in the building. It is recommended that this calculation should follow a “spreadsheet” format, and should clearly indicate the following:

The name of the circuit

Point of origin of the circuit

Complete list of all devices served by the circuit, including location and type of each device.

Alarm Current Draw for each device, at the applied voltage.

Applied Voltage (Based on anticipated battery voltage after specified stand-by & alarm operation).

Acceptable Operating Voltage for each type of device on circuit.

Calculated Voltage at each device on circuit.

These calculations should mathematically prove that all Notification Appliances on the circuit will receive acceptable power for proper operation, under “worst-case-scenario” conditions.

SHOP DRAWINGS

All submitted drawings shall be created using AutoCAD, and shall be coordinated so that terminal numbering, circuit designation and equipment or device designations are the same on all drawings. All drawings must be submitted and approved by the engineer before ordering or fabrication starts, but such approval will not waive any specification requirements unless specifically stated. DFD shall provide copies of the floor plan drawings, in AutoCAD, to the successful bidder.

Each and every sheet of the Shop Drawings shall be clearly and prominently identified as “SHOP DRAWINGS – PREPARED BY: [*INSERT NAME OF CONTRACTOR FIRM PREPARING THE SHOP DRAWING*]”. The name and company logo for the Electrical Contractor should be added to the title block in each sheet, and a revision date shall be inserted on each sheet.

The submitted Shop Drawings shall include the following types of drawings:

PROJECT-SPECIFIC DRAWINGS

Project-Specific Drawings. These drawings shall include the following:

SYSTEM RISER DRAWING

A separate riser drawing shall be furnished for each system. Each System Riser shall illustrate all fire alarm circuits, which serve the facility, and shall incorporate the following information, in a clear, concise format:

Point of origin of each circuit (usually a Panel, or a Module within a panel)

Circuit type and labeling

Area served by each circuit

Wire / cable type and size

Locations of Panelboards where primary system power is obtained

The following information for each Field Device:

Device Type

Circuit(s) to which device is connected

Locations of any End-Of-Line Resistor (EOLR)

(And the circuit terminated by any such EOLR)

BLOCK DIAGRAMS

Showing layout and operation of the entire system.

FLOOR PLANS

These drawings shall consist of edited versions of the Contract Documents, which shall include the following information:

Fire Department Response Location(s)

Annunciator Location(s)

Panel Location(s)

Device Addresses - The addresses shown on these drawings shall directly correspond to the chart or printout, as specified previously, which spells out specific information about each device, including the field programmable “custom label”.

TYPICAL DEVICE / MODULE WIRING DETAILS

Component and module wiring diagrams – intended to illustrate terminations and wiring connections to each typical Field Device (Detectors, Notification Appliances, etc.), and each typical panel component / module utilized within the system. This set of drawings shall only include diagrams for modules and components which are actually used in the provided system(s).

These drawings shall incorporate clear labeling / nomenclature, which shall clearly indicate the corresponding field device or module, to which it corresponds.

OMISSION OF ANY OF THE ABOVE MATERIALS FROM THE SUBMITTALS SHALL RESULT IN AN IMMEDIATE REJECTION OF THE SUBMITTALS FOR THIS PROJECT. If the Contractor has any questions concerning the preparation of these materials, please contact the Engineer.

**PLAN REVIEW FOR FIRE ALARM SYSTEMS**

In accordance with Wis. Admin. Code § SPS 361.30, the State of Wisconsin has adopted the component review of all Fire Protection Systems for buildings that require plan submittal effective January 1, 2012.

Exceptions to required review will only be as follows:

<https://dsps.wi.gov/Documents/Programs/FireSuppressAlarm/FireAlarmSubmittalGuidelines.pdf>

Projects involving the alteration or addition of 20 or fewer devices to an existing fire alarm system do not need to be submitted. A “device” includes both detection devices and notification appliances. This includes, but is not limited to, all the following: fire alarm control panels, power supply panels, annunciators, horns, strobes, combination horn/strobes, speakers, combination speaker/strobes, smoke detectors, heat detectors, pull stations, and door holders. Relay modules or monitoring modules are not considered alarm devices.

**Note:** Replacement fire alarm control panels must be listed for use with all the existing devices installed on the fire alarm system.

For the purpose of plan review requirements, detection or monitoring systems which are not connected to the building fire alarm system (e.g., smoke detection in an unoccupied storage facility with off-site monitoring, sprinkler system monitoring or elevator recall operations in a building without a fire alarm system), are not required to be submitted for review.

Projects where only single- and multiple-station smoke alarms are required.

Hospitals, Nursing Homes, CBRF and Hospice buildings (reviewed by DHS).

DSPS retains jurisdiction for plan review and inspection for all State-owned buildings with the exception of the City of Madison. City of Madison will conduct inspections of State-owned buildings in the City of Madison jurisdiction. Submit copy of DSPS approval letter with City of Madison Fire Department Work permit if applicable.

<https://www.cityofmadison.com/fire/documents/2019%20MASTER%20PLAN%20REVIEW%20PERMIT%20APPLICATION.pdf>

Per SPS 302.10, plan review fees shall be **doubled** for projects where the installation, erection,

or construction was initiated without the required DSPS approval.

CONTRACTOR’S RESPONSIBILITY

The Electrical Contractor shall determine if DSPS plan review or permitting is required for the project in accordance with Wis. Admin. Code and DSPS requirements. The Electrical Contractor or delegated sub-contractor is also responsible for preparing and submitting required documentation and fees for DSPS Fire Alarm plan review and permitting (if applicable).

1. Department of Safety and Professional Services approval is required prior to the start of fire alarm system construction. The contractor shall prepare and submit the required documents in a timely fashion to meet this requirement. If the contractor starts fire alarm system construction before approval is given by the Department of Safety and Professional Services, the contractor is responsible for all additional fees required by the Department of Safety and Professional Services.
2. Initially, prepare one set of the Department of Safety and Professional Services fire alarm submittals and send it to the A/E for approval before proceeding with actual submittal to DSPS.
3. Contractor shall follow DFD’s AutoCAD standards when preparing fire alarm shop drawings, using information consistent with the project’s construction drawings.
4. After obtaining A/E approval to proceed with the Department of Safety and Professional Services fire alarm submittal, prepare four (4) sets of the fire alarm shop drawings as approved by the A/E that will be sent to the Department of Safety and Professional Services by the contractor. These shop drawings shall be stamped, signed and dated by a Wisconsin registered architect, professional engineer or electrical designer taking responsibility for the shop drawings. Signing and sealing shall comply with SPS 361.31(1). Note that each shop drawing copy must be stamped, signed and dated unless there is a drawing index sheet, in which case only the four index sheets need to be stamped, signed and dated. Where the submitter is both the designer and installer of the fire alarm system, a signature only will suffice [Ch. 443.14(6), Stats.]. It shall be an original signature and date.
5. Prepare one bound booklet of the fire alarm system device cut sheets and all calculations (indicating device power calculations, voltage drop calculations and battery calculations). These booklets do not need to be stamped, signed or dated.
6. Prepare a letter of transmittal listing all items being sent to the Department of Safety and Professional Services. Copy the A/E on the letter of transmittal only.
7. Complete the Application for Review, Buildings, HVAC, Fire and Components – SBD-118 form.
8. Calculate the SDB-118 submittal fee; write a check for the appropriate amount, payable to Safety and Professional Services.
9. Schedule a plan review date with Department of Safety and Professional Services, Division of Safety and Buildings by visiting these websites and completing the online request form.

# PROJECT RECORD DRAWINGS

Installing Electrical Contractor shall submit to the Architect/Engineer for approval the as-built drawings for the entire work done under this project prior to final payment.

Work shall be done on AutoCAD using the contract drawings provided to the Contractor by DFD in the form of AutoCAD files. A hard copy of same shall also be submitted.

These drawings shall show:

Locations and addresses of Initiation Devices, Notification Appliances, isolation devices, status-monitoring devices, supervised signaling devices, and auxiliary control devices. All these devices shall be shown as connected to system wiring.

Circuit and Address information for each field device listed above.

Conduit layout.

Number/size/type of conductors in each conduit run

Riser diagrams

Location of end-of-line devices

Riser diagrams shall be specific for this project, and shall include location of emergency 120VAC panel, panel designation and circuit number used to feed each fire alarm panel. Also, indicate if panel is backed up by an emergency generator.

Riser diagrams shall include locations (room or area number) of notification, initiating, end-of-line devices and addresses for all addressable field devices.

Also see requirements in Division 1, General Conditions.

# OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

1. A material guide, which shall contain the replacement part numbers and description of all components used. If this information is included in an instruction section for any of the equipment, it will not be necessary to duplicate the list. In either case, the parts list shall be associated with its respective chassis, modules or kit wherein it is found. A total listing of parts without such grouping will not be acceptable.
2. Catalog data or literature
3. Manufacturer's operating instructions.
4. Manufacturer's maintenance instructions
5. Installation instructions
6. Name, address and telephone number of sources for parts (i.e., keys, guards, etc.) not supplied by the Fire Alarm Manufacturer
7. Copies of all approved shop drawings
8. An updated copy of the submitted sequence of operation, revised to reflect any implemented changes.
9. ***[A/E and commissioning provider to define detailed operation and maintenance data requirements for equipment specifications added to this section.]***

# PRODUCT DELIVERY, STORAGE AND HANDLING

Receive equipment at job site. Verify applicable components and quantity delivered.

Handle equipment to prevent internal components' damage and breakage, as well as denting and scoring of enclosure finish.

Do not install damaged equipment.

Store equipment in a clean, dry space and protect from dirt, fumes, water, and construction debris and physical damage. Make arrangements with the Owner at the pre-construction meeting for storage of equipment on the premises.

# SPARE PARTS

Contractor shall provide the following spare parts in quantities shown:

Insert quantity in place of question marks.

Quantity : Type of Device

(?) Photoelectric smoke detectors

(?) Heat detectors

(?) Smoke and heat detector bases – “standard” 2-Wire Type

(?) Monitor Module (of each type utilized in this project)

(?) Control Modules

(?) Duct detectors with housing, head, remote test station, and sample tubes

(?) Ceiling-Mount Speaker Units

(?) Ceiling-Mount multi-candela Speaker/strobe Units

(?) Smoke detector Guards A/E: Include for prison facilities

(?) Wall mounted multi-candela Speaker/strobe Units

(?) Multi-candela Strobe-Only Units

(?) Pull Stations

(?) Mini horns A/E: Include for Student Housing facilities

(?) 120 Vac smoke detectors

(?) 120 Vac smoke detectors with ADA strobe

(?) System Detector base with sounder

# SUPERVISION

The system shall report a TROUBLE condition when any supervised circuit becomes disarranged, disconnected, or is manually disabled or overridden. Each supervised circuit shall be independently protected for short-circuit conditions and shall be arranged so that faults on any one circuit do not prevent the proper operation of any other circuit in the system.

The following devices/circuits shall be supervised, as a minimum:

ALL communication links.

ALL Signaling Line Circuits

ALL Initiating Device Circuits.

All sprinkler flow and tamper switches.

ALL Notification Appliance Circuits.

Auxiliary manual control circuits.

Manual control switches for off normal position

Remote Control Relays / Control Modules.

Primary, AC Incoming power to the system.

The system's batteries.

System Expansion Modules

Auxiliary module LED's.

The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.

Each independently supervised circuit shall include a discrete LCD readout, to indicate disarrangement conditions per circuit.

# POWER REQUIREMENTS

Primary 120 VAC power, to all Fire Alarm equipment shall consist of dedicated branch circuits. These circuits shall be of a 3-conductor type, including a suitably sized green ground wire – SHARED NEUTRALS AND CONDUIT GROUNDS SHALL BE UNACCEPTABLE.

The fire alarm equipment shall be connected to separate dedicated 120V, 20A, branch circuit from the building emergency panel. The branch circuit shall not be supplied through ground-fault circuit-interrupters or arc-fault circuit-interrupters.

The location of the fire alarm branch circuit overcurrent protective device (circuit breaker) shall be permanently identified at the fire alarm equipment using engraved labels per spec section 26 05 53. An example of such identification follows: “Powered from room LL300.” Underneath this engraved label, provide a machine-generated label indicating the panel and circuit number, such as “Circuit ELA-2”. Labels shall have red lettering on white background or vice-versa.

The fire alarm branch circuit shall be secured in the “ON” position using a **red** circuit breaker handle clamp to prevent accidentally de-energizing the power to the fire alarm equipment. The circuit breaker shall be accessible only to qualified personal and shall be identified as "FIRE ALARM CIRCUIT" on a machine-generated label on the panel dead front. Label shall have red lettering on white background or vice-versa. The circuit breaker shall NOT be painted red. The red circuit breaker handle clamp shall serve as the red identification required by NEC 760.41(B).

All fire alarm power supplies, as well as any other supplemental power supplies, shall be installed in compliance with NFPA-70 – National Electrical Code (Latest Edition).

Where the new control panel is to remain at same location as the existing panel, the contractor may re-use the existing branch circuit, if it meets the previously stated requirements stated above.

The control panel shall include 120 VAC electrical power surge and transient protection. If problems are anticipated, due to electrical transients associated with periodic generator testing, then the fire alarm equipment supplier shall provide suitable power filtering / suppression equipment, as recommended by the equipment manufacturer.

The system shall include sufficient back-up battery capacity to operate the entire system as follows, upon loss of normal 120 VAC power: Determine if emergency generator is present and select one of the options below:

For panels connected to Dedicated Emergency Power (Generator) Branch Circuits:

The Panel and associated devices shall operate in a normal (non-Alarm) mode for a period of 12 Hours. After the 12-Hour normal period has expired, sufficient capacity shall remain, such that the panel and associated devices shall operate in an Alarm mode (All Speakers EVAC) for a period of 15 minutes.

For panels which are not connected to Dedicated Emergency Power (no Generator) Branch Circuits:

The Panel and associated devices shall operate in a normal (non-Alarm) mode for a period of 24 Hours. After the 24-Hour normal period has expired, sufficient capacity shall remain, such that the panel and associated devices shall operate in an Alarm mode (All Speakers EVAC) for a period of 15 minutes.

The panel shall include a power-limited, filtered and regulated battery charger. The charger shall charge a fully discharged battery to 70% in 12 hours. The panel shall monitor for AC fail / disconnect, low/no battery and high battery and shall distinctly display or annunciator any abnormality. The main panel power supply shall include sufficient power to power all connected field devices and an additional 25% spare power for future additions without the need to add additional boards or booster power supplies. The charger shall be designed specifically for, or shall be properly configured for the provided batteries, which shall be of one of the following types:

Sealed, Immobilized Electrolyte Lead-Acid type (“Gel-Cells”) – Types which require fluid level maintenance, or which vent significant amounts of Hydrogen shall be unacceptable.

Nickel-Cadmium (Ni-Cad) batteries.

All batteries used in conjunction with the fire alarm system shall be installed in accordance with NFPA-70 – National Electrical Code (Latest Edition).

If these batteries are not located within or immediately adjacent to the fire alarm equipment, the location of such batteries shall be clearly indicated within the fire alarm equipment served by them, and the batteries and their enclosure shall be clearly marked as “FIRE ALARM”

All external circuits requiring system-operating power shall be 24VDC and shall be individually supervised and fused at the control panel.

Select the following if an In-Building Fire Command Center is required.

[Where Fire Command Center panels operate on 24 VDC and receive their operating power from the FACP or from a Transponder, separate, isolated and protected wire runs shall be provided from the source panel to each such remote panel. This DC power wiring shall be arranged such that an open or short on the wiring to any one panel shall not prevent proper operation of any other panel.]

**PART 2 - PRODUCTS**

# ENCLOSUREs

All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component.

Cabinet shall be equipped with locks and transparent door panel providing tamper proof enclosure yet allowing full view of the various lights and controls as required above.

# multiplex/intelligent FIRE ALARM CONTROL PANEL

Provide Multiplex/Intelligent Fire Alarm Control Panel(s) (FACPs) within the building(s) as indicated on the plans. Each building shall be provided with a minimum of one (1) Fire Alarm Control Panel (FACP), as shown on the project drawings.

Fire Alarm Control Panel(s) shall be modular and expandable with solid-state, microprocessor-based electronics. It shall display through the front viewing window only those primary controls and displays essential to operation during a fire alarm condition.

# The fire alarm system shall allow for loading and editing special instructions and operating sequences as required. Software programming shall allow for full flexibility for selective input/output control functions based on the Boolean programming functions AND, OR, NOT, as well as timing and special coded operations. The system shall be able to use all of the programming functions above in combination with any number of inputs and outputs. The systems shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.

Fire Alarm Control Panel(s) shall provide the following as standards:

Analog Addressable or Intelligent Addressable Detection, supporting the following:

Drift compensation

Sensitivity display in %

Sensitivity adjustment

Day/night sensitivity adjustment

Auto Detector test to meet NFPA 72

Alarm verification with tally counter

Maintenance alerts

Provide the number of Signaling Line Circuits (SLCs) required for the specified quantity of addressable field devices and peripherals, plus one (1) spare loop (SLC) for each five (5) active loops. Each active loop shall include 10% spare capacity, or a minimum of 10 additional devices.

Provide the number of Speaker Circuits for Emergency Voice/Alarm Communications Systems (EVACS) required for the specified quantity of speakers plus one (1) spare circuit for each ten (10) active circuits. Each active circuit shall include 25% spare capacity.

Provide the number of Visual Notification Appliance Circuits (Strobe NACs) required for the specified quantity of strobes plus one (1) spare circuit for each ten (10) active circuits. Each active circuit shall include 25% spare capacity, or a minimum of (4) 110 cd devices that can be added in the future.

80-character liquid crystal display.

Printer interface

History log file with a minimum of 800 events

Field programmability

Silent walk test

The multiplex/intelligent system shall provide the ability to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history.

The LCD shall display the following information relative to the abnormal condition of a point in the system prior to acknowledgement:

40 characters for:

Point address and loop number (i.e., 555-L5)

Type of device (i.e., smoke sensor, pull station, water-flow)

Point status (i.e., alarm, trouble)

40 characters for:

Custom location label (i.e., 4th Floor - Room 444)

Keyboards or keypads shall not be required to operate the system during fire alarm conditions.

The following software functions shall be provided, from the built-in system keyboard / display:

Setting of time and date

LED testing

Alarm, trouble, and abnormal condition listing

Enabling and disabling of each monitor point separately

Activation and deactivation of each control point separately

Changing operator access levels

Walk Test enable / disable

Running diagnostic functions

Displaying historical logs

Point listing

The following hardware control switches/functions shall be provided within the main panel enclosure:

Acknowledge alarm or trouble

Silence alarm or trouble

Reset system after alarm

Connect/disconnect Central Monitoring tie

Provide manual evacuation (drill)

Provide manual Mass Notification message activation for each of the threat event messages (if Mass Notification is specified)

Provide manual audio selection switches (if select voice is specified)

Provide manual selection of indoor or outdoor speakers

Bypass elevator interface

Bypass AHU / Fan Interface

Bypass door holders

(2) Future programmable switches

Switches mentioned above but not applicable to this building shall still be provided in the stated quantity. These unused switches shall not be initially programmed and would be labeled “Unused”.

STATUS INDICATORS AND DISPLAYS

A local audible device shall sound during Alarm, Trouble or Supervisory conditions. This audible device shall also sound during each key-press to provide audible feedback to ensure that the key has been pressed properly.

The 2-line by 40-character liquid crystal display shall be backlit for enhanced readability.

A cursor shall be visible on the LCD when entering information.

Scrolling through menu options or lists shall be accomplished in a self-directing manner in which prompting messages shall direct the user.

led SUPERVISION

All slave modules LEDs shall be supervised for burnout or disarrangement.

ACKNOWLEDGMENT

Two methods of acknowledgment for each abnormal condition shall be provided. One may be chosen depending on the NFPA requirements.

First method - Acknowledge one event at a time from an unacknowledged list of events:

Pressing the appropriate acknowledge button shall display the first unacknowledged condition in the appropriate list (either alarm, supervisory or trouble), and require another acknowledge button. Press to acknowledge only the displayed point.

After all points have been acknowledged, the LEDs shall glow steadily and the Sonalert will be silenced. The total number of alarms, supervisory and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be indicated by an end of list message "END of LIST".

Second method- Pressing the appropriate acknowledge button shall globally acknowledge all points.

SILENCING

If an alarm condition exists and the "Alarm Silence" button is pressed, all alarm audio notifications appliances shall cease operation. All visual notification appliances shall continue to flash until the system is reset. See ALARM SEQUENCE to see how visual alarms are stopped.

If trouble conditions exist in the system and the "Trouble Silence" button has been pressed, the aural trouble signal shall cease, but shall resound at time intervals to act as a reminder that the fire alarm system is not in a normal operating mode. Both the time interval and the trouble reminder signal shall be programmable to suit the Owner's application.

RESET

The SYSTEM RESET button shall be used to return the system to its normal state after an alarm condition has been remedied.

Should the Alarm Silence Inhibit function be active, the system shall ignore all key presses. An indication of enabling and disabling the inhibit state shall be provided as feedback to the operator.

BYPASS FUNCTIONS

Provide a switch for each item as shown below. Switches not applicable to this building would be provided but left unprogrammed and labeled and unused.

Bypass Switches shall be configured such that whenever any bypass function is active, a Trouble status condition shall be reported by the system, per the Trouble Sequence. The trouble message shall indicate the active function(s). Bypass LEDs or textual LCD message shall be configured such that LED/LCD message corresponding to the active function(s) shall illuminate/illustrate and shall remain lit/displayed until the associated bypass function is de-activated (until the system is restored to normal operating status). Switches and LED/LCD message shall be provided for the following functions:

Central Monitoring bypass – When this bypass function is active; reporting of various status conditions to the reporting system shall be disabled.

Elevator Interface bypass – When this bypass function is active; actuation of the Control Modules or Supervised Relays, which interface to the Elevator Controls and to the Shunt-Trip Circuit Breaker(s) shall be prevented.

HVAC Fan Interface bypass – When this bypass function is active; actuation of the Control Modules or Supervised Relays, which interface to the AHU / Fan starters / Temperature Controls, and to any Smoke Dampers shall be prevented. (Smoke Control System bypass shall be accomplished via the separate, previously specified manual controls).

Door Holder Release bypass – When this bypass function is active, actuation of the Control Modules or Relays, which cause release of the Door Holders, shall be prevented.

ACCESS TO OPERATOR FUNCTIONS

The following Operator Function Access Restrictions shall be adhered to as closely as possible. Where system limitations do not allow for the restrictions to be configured exactly as listed, alternate methods will be considered, and shall be brought to the attention of the Engineer prior to bidding:

ACCESS LEVEL 1 – BASIC OPERATOR FUNCTIONS

ACKNOWLEDGE – allows Basic Operators to acknowledge ALARM, TROUBLE, and SUPERVISORY conditions, and to view the lists / logs associated with these functions.

SIGNAL SILENCE – allows Basic Operators to silence the audible signals. The system shall not permit signals to be silenced during “alarm silence inhibit mode” (if “Inhibit Mode” is utilized).

SYSTEM RESET – allows Basic Operators to Reset the Fire Alarm System. The "System Reset" button shall be used to return the system to its normal state after an alarm condition has been remedied. The LCD display shall step the user through the reset process with simple English language messages.

ACCESS LEVEL 2 – HIGH SECURITY FUNCTIONS

Changes to the linkage of Operator Functions to Access Level / Pass-Code Profiles may affect the ability of individuals to access required functions. Because of this, access to this linking function shall also be appropriately secured.

ACCESS LEVEL 3 – OTHER FUNCTIONS

These functions shall include, but shall not be limited to:

Enable / Disable Points

Perform “Override” Functions / Features

Generate Hard-Copy, Printed Reports

Add / Delete / Change Pass codes, and associated links to system features

Set / Change System Clock

Set / Change Sensitivity of Detectors

Clear History Logs

POINT LISTING

All points list by address

Monitor point list

Signal/speaker list

Auxiliary control list

Feedback point list

HISTORY LOGGING

The system shall be capable of logging and storing the last 800 events (alarm & trouble) in a history log. These events shall be stored in a battery protected random access memory.

The following historical alarm/trouble log events shall be stored:

Alarms

Alarm Acknowledgment

Alarm Silence

System Reset

Alarm Historical log cleared

Trouble conditions

Supervisory alarms

Trouble acknowledgment

Supervisory acknowledgment

Alarm Verification tallies

Walk Test results

Trouble Historical log cleared

SILENT WALK TEST WITH HISTORY LOGGING

The system shall be capable of being tested by one person. While in testing mode the alarm activation of an alarm-initiating device shall be silently logged as an alarm condition in the historical data file. The panel shall automatically reset itself after the logging of the alarm.

The momentary disconnection of an initiating or indicating device circuit shall be silently logged as a trouble condition in the historical data file. The panel shall automatically reset itself after logging of the trouble condition.

Should the silent walk-test feature be on for an inappropriate amount of time (30 minutes max.) it shall revert to the normal mode automatically.

The panel shall have the capability of dividing the system into distinctive walk test groups, a minimum of (8) groups.

Should an alarm condition occur from an active point, not in walk test mode, it shall perform operations described above.

After testing is considered complete, testing data may be retrieved from the system in chronological order to ensure device/circuit activation.

# Watch-Dog Timers

The system shall include independent "Watch-Dog" timers to detect and report failure of any microprocessor circuit, memory, or software.

FIELD PROGRAMMING

The system shall be fully programmable, configurable, and expandable in the field without the need for special tools or PROM programmers and shall not require replacement of memory IC's. All programming may be accomplished through the standard control panel keyboard or a keyboard at the printer, or the use of a PC. All programs shall be stored in non-volatile memory.

All programming or reprogramming shall be done by the supplier at no charge until the owner accepts the system.

SOFTWARE MODIFICATIONS

The system shall be capable of being programmed by means of a Field Configuration Program (FCP) allowing programming to be downloaded via portable computer from any node on the network.

Provide the services of a factory trained and authorized Technician to perform all system software modifications, upgrades, or changes. Response time of the Technician to the site shall not exceed 4 hours.

Should the Owner have a factory trained and authorized technician on staff, provide all hardware, software, programming tools, access codes, and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones, and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

If the system access code is either a hardware key or a software key, the Contractor/Vendor shall provide the proper key to meet the above requirements."

TERMINAL/PRINTER INTERFACE

Fire Alarm Control Panel shall be capable of operating remote Command Center and printers.

Each output shall be ASCII, from an EIA RS-232-C serial data connection with an adjustable baud rate.

A minimum of one such RS-232 port shall be provided.

Each RS-232-C port shall be capable of being configured for either a CRT or a printer.

One such port shall be configured for a supervised connection to the Fire Alarm System printer.

One such port shall be configured for non-supervised connection to the CRT or Laptop.

SIGNALING LINE CIRCUITS:

The system must provide communications with intelligent addressable initiating and control devices individually. These devices shall be individually annunciated at the control panel [and FAAP] [and RFCC]. Annunciation shall include the following conditions for each point:

Alarm

Trouble

Open

Short

Device missing/failed

All intelligent addressable initiation and control devices shall have the capability of being disabled or enabled individually.

Systems that require factory pre-programming or EPROMs to add or delete devices shall be unacceptable.

The communication format must be a completely digital poll/response protocol to allow t-tapping of the Signaling Line Circuit wiring. Systems that do not utilize full digital transmission protocol are not acceptable.

# OPERATION: multiplex/intelligent FIRE ALARM SYSTEM

# STATUS CONDITION PRIORITY

Manual Mass Notification voice messages (prerecorded or live) shall have the highest priority.

FIRE alarm status conditions shall have second highest priority.

Supervisory status conditions shall have the third highest priority.

Trouble status conditions shall have the lowest priority.

STAND-BY MODE

Under normal condition the front panel shall display a "System is Normal" message and the current time and date

# system response

The time delay between the FIRE alarm activation of an initiating device and the automatic activation of the Notification Appliances and the annunciation of the alarm status condition at the FACP, FAAP, FCC, and RFCC shall not exceed 5 seconds.

For response-time purposes, the manual actuation of an Audio Control Switch - associated with the one-way voice communications system - shall be instantaneous and shall be treated as if it were manual alarm activation.

# ALARM SEQUENCE

The following events are not required to occur in the stated order. However, ALL automatic responses must be initiated within the time interval allotted by UL and NFPA codes and standards.

This “FIRE alarm sequence” shall be initiated upon receipt of one of the following, valid FIRE alarm status conditions:

### Actuation of any Manual Pull Station, any Fire Protective Sprinkler System, any other Automatic Fire Suppression System, from any Smoke Detector, any Heat Detector, and any Beam-type Smoke or Flame Detectors.

The system alarm operation, subsequent to the activation of any of the conditions listed above, shall be as follows:

The EVAC System shall automatically initiate “EVAC” Mode. All audible notification appliances (Speakers) [within the building] [within the affected Notification Area(s)] shall sound, using a sequence that is compliant with NFPA-72, including an Alert Tone and a Digital Voice Message. The Alert Tone and Digital Message shall be repeated a minimum of three times and shall continue to be repeated until the Audible Notification Appliances are silenced, or until a Manual Announcement is Made, or until the system is Reset.

All visual notification appliances [within the building] [or within the affected Notification Area(s)] shall flash continuously until the system is [acknowledged] [reset].

Any subsequent alarm shall reactivate the alarm audible [and visual] notification appliances [within the building] [within the affected Notification Area(s)].

All doors normally held open by door control devices [within the building] [within the affected Notification Area(s)] shall release.

[Alarm outputs connected to the facility reporting system shall be activated.]

The system Alarm LED shall flash on the FACP [and the FAAP] [and at the FCC], [and at the RFCC], until the alarm has been acknowledged. Once acknowledged, this same LED shall latch on.

A subsequent alarm received from another device shall flash the system alarm LED on the FACP [and the FAAP], [and at the FCC], [and at the RFCC]. The LCD display shall show the new alarm information.

A pulsing alarm tone shall occur within the FACP [and the FAAP] [and at the FCC], [and at the RFCC] until the event has been acknowledged.

The system shall have a single key that will allow the operator to display all alarms, troubles, and supervisory service conditions including the time and date of each occurrence.

A programmed Alarm Message shall appear on the FACP [and the FAAP] [and at the FCC], [and at the RFCC] LCD displays. These field programmable messages shall be revised, as directed by the Owner, during shop drawing review. The alarm shall be displayed on an 80-character LCD display as follows:

40 characters for:

Point address and loop number

Type of device

Point status

40 characters for:

Custom location label

AUTOMATIC ALARM VERIFICATION

The initial Alarm activation of any system smoke detector shall initiate an alarm verification operation whereby the panel will reset the activated detector and wait for a second alarm activation. If, after (20) seconds and within (30) seconds after resetting, a second alarm is reported from the same or any other smoke detector, the system shall process the alarm as described previously. If no second alarm occurs within (30) seconds, the system shall resume normal operation. The alarm verification shall operate only on single smoke detector alarm. Other activated initiating devices or multiple smoke detector alarms shall be processed and reported immediately.

The alarm verification operation shall be selectable by device or by group for addressable detectors and by IDC for non-addressable smoke detectors. Automatic Alarm Verification shall be enabled for all smoke detectors [including resident room smoke detectors if they are connected to the fire alarm system].

SELF-TEST AND AUTOMATIC DRIFT COMPENSATION

The control panel shall continuously perform an automatic self-test routine on each Smoke Detector, which will functionally check detector electronics and ensure the accuracy of the values being transmitted to the control panel. Any detector that fails this test shall indicate a "*SELF TEST FAILED*" trouble condition with the detector location at the control panel.

All Intelligent Addressable Smoke Detectors used on this project shall incorporate automatic drift compensation / automatic sensitivity monitoring and adjustment, as described within the “definitions” portion of this specification section.

OPERATOR INTERFACE / MAINTENANCE FEATURES FOR AUTOMATIC SMOKE DETECTION

An operator at the control panel shall have the capability to manually access the following information for each detector:

Primary status

Device type

Present average value

Present sensitivity value selected

Peak detection values

Detector range (normal, dirty, etc.)

Values shall be in "percent of smoke obscuration" format so that no interpretation is required by the operator.

An operator at the control panel shall have the capability to manually control the following for each detector:

Clear peak detection values

Enable or disable the detector

Clear verification tally

Establish alarm sensitivity

Control a detector's relay driver output

It shall be possible to program the control panel to automatically change the sensitivity settings of each detector based on time-of-day and day-of-week.

The control panel shall clear a “Detector dirty” trouble after a detector has been removed from its base cleaned and replaced.

# elevator recall

After any elevator lobby, machine room, or shaft smoke detector alarm is verified, it shall, in addition to the operations listed in the “FIRE alarm sequence”, cause Phase I Emergency Recall Operation according to the following sequence:

If the alarmed detector is located on any floor other than the designated level of egress, an Addressable Control Module or a supervised remote relay shall be actuated. This Control Module / Relay shall be located within three feet of the elevator controls and shall cause the associated cabs to be recalled to the designated recall floor.

If the alarmed detector is located on the designated level of egress, an Addressable Control Module or a supervised remote relay shall be actuated. This Control Module / Relay shall be located within three feet of the elevator controls and shall cause the associated cabs to be recalled to the alternate recall floor.

If the alarmed detector is located within the shaft, or within the machine room, an Addressable Control Module or a supervised remote relay shall be actuated. This Control Module / Relay shall be located within three feet of the elevator controls and shall cause the “Fire Hat Lamp” at the associated Fire Service Control Station provided by Elevator Contractor / Owner to Flash. This lamp illuminates steadily, in response to elevator lobby recall conditions.

ELEVATOR SHUNT TRIP

The intended function of elevator Shunt-Trip operation is to disable power to the Elevator prior to Elevator Shaft or Machine Room Sprinkler Actuation.

Elevator shaft and Machine Room Heat Detectors shall be configured as follows:

Detectors shall be configured for FIXED TEMPERATURE-ONLY OPERATION.

Detectors shall have a lower actuation temperature than the sprinkler heads within the shaft and machine room. The EC shall coordinate this information with the Fire Protection Contractor. Detector shall be installed within 2 feet from the sprinkler head.

Detectors shall have a lower response-time index than the sprinkler heads within the shaft and machine room. The EC shall coordinate this information with the Fire Protection Contractor.

If the alarmed heat detector is located within the elevator shaft, or within the machine room, an Addressable Control Module or a supervised remote relay shall be actuated. This Control Module / Relay shall be located within three feet of the shunt-trip circuit breaker and shall interrupt power to the elevator. If the elevator is hydraulic, a second Control Module Contract shall allow elevator auxiliary power to lower the elevator to the proper level. Aux. power, if needed, shall be furnished by the elevator contractor.

The Power Source, which is used to actuate each elevator shunt-trip circuit breaker, shall be individually supervised by the FACP.

# ahu SYSTEM INTERFACE

Duct Smoke Detectors and Addressable Control Modules or Supervised Remote Relays shall be provided as follows: Duct Smoke Detectors shall be installed in compliance with the manufacturer’s recommendations. Each Addressable Control Module or Supervised Remote Relay for AHU and / or Fan shutdown shall be installed within 3 feet of the Temperature Control Panel to which it is connected. The Division 26 EC shall provide all wiring and terminations required for shutdown of the specified AHUs / Fans.

The Addressable Control Modules or Supervised Remote Relays provided for this purpose shall be provided with DPDT output contacts. One SPDT set of the DPDT contacts shall be utilized for the specified shutdown function. The second SPDT set of the DPDT contacts shall be available for connection to the temperature controls, to indicate that unit shutdown – due to Duct Smoke – has occurred.

The FACP shall interface to the Building Automation System (BAS), Temperature Control Panel(s), Smoke Control System, or individual Air Handling Unit (AHU) air handling/energy management system controllers, which in turns shall perform automatic function as specified in the applicable sections of Division 23.

An override feature / control switch shall be provided which shall prevent shutdown of AHUs when this function is active.

All such AHUs / Fans shall remain shut down until a valid System Reset occurs.

Select if applicable:

# sprinkler system INTERFACE

The FACP shall have a dedicated supervisory service LED and a dedicated supervisory service acknowledge switch.

The activation of any standpipe or sprinkler valve supervisory (tamper) switch shall activate the system supervisory service audible signal and illuminate the LED at the control panel [and FAAP] [and the RFCC]. The panel shall provide differentiation between valve tamper activation and opens and/or grounds on the initiation circuit wiring.

Pressing the supervisory service acknowledge key will silence the supervisory audible signal while maintaining the supervisory service LED “ON” indicating the abnormal condition.

Restoring the valve to the normal position shall automatically reset the tamper indication.

The activation of any Flow Switch shall initiate an alarm condition.

Select if applicable:

# sprinkler PRE-ACTION system INTERFACE

The FACP shall have a dedicated supervisory service LED and a dedicated supervisory service acknowledge switch.

The activation of any Trouble, Supervisory, or Alarm on the Sprinkler Pre-Action panel shall likewise activate the same Trouble, Supervisory, or Alarm condition on the FACP.

Pressing the supervisory service acknowledge key will silence the supervisory audible signal while maintaining the supervisory service LED “ON” indicating the abnormal condition.

Restoring the Pre-Action panel to the normal condition shall automatically reset the Trouble or Supervisory indication on the FACP. Alarm conditions will have to be manually reset.

Select if applicable:

# FIRE PUMP and booster pump SUPERVISORY SERVICE

The control panel shall have a dedicated supervisory service LED and a dedicated supervisory service acknowledge switch.

The Fire and Booster Pumps shall be monitored for the following items:

1. Fire Pump – Loss of Power
2. Fire Pump – Phase Reversal
3. Fire Pump – Running. This shall initiate an alarm condition on the FACP.
4. Booster Pump – Running

Activation of any above shall activate the system supervisory service audible signal and illuminate the LED at the control panel and all remote and annunciator panels (as applicable).

Pressing the supervisory service acknowledge key will silence the supervisory audible signal while maintaining the supervisory service LED “ON” indicating the abnormal condition.

Restoring any of these items to normal operation shall automatically reset the supervisory service to normal operation.

Select if applicable:

# EMERGENCY RESPONDER RADIO COVERAGE SYSTEM SUPERVISORY SERVICE

Refer to spec section 28 05 37 Emergency Responder Radio Coverage System for additional information.

The FACP shall have a dedicated supervisory service LED and a dedicated supervisory service acknowledge switch for the Emergency Responder Radio Coverage System (ERRCS).

The Emergency Responder Radio Coverage System (ERRCS) shall be monitored by a listed fire alarm control panel. Automatic supervisory signals shall include the following:

1. Loss of normal AC power supply.
2. System battery charger(s) failure.
3. Malfunction of the donor antenna(s).
4. Failure of active RF-emitting device(s).
5. Low-battery capacity at 70-percent reduction of operating capacity.
6. Failure of critical system components.
7. The communications link between the fire alarm system and the emergency responder radio enhancement system.

Pressing the supervisory service acknowledge key will silence the supervisory audible signal while maintaining the supervisory service LED “ON” indicating the abnormal condition.

Restoring the conditions indicated by the signals listed above to their normal condition shall automatically reset the abnormal indication.

## TROUBLE SEQUENCE

Disarrangement, disconnection, Power Failure, or malfunction of any supervised feature(s) / components of the System shall cause actuation of the following sequence of events:

A SYSTEM TROUBLE or POINT TROUBLE status condition shall be both audibly and visually indicated at the fire Alarm Control Panel (FACP) [and FAAP] [and at the FCC], [and the RFCC] in a way which differentiates the TROUBLE status clearly from an ALARM. Audible indication shall cease once the TROUBLE has been acknowledged.

In addition, a programmed message, similar in nature to the ALARM “Custom Labels”, shall appear on the FACP [and FAAP] [and at the FCC], [and the RFCC]. (Default messages, if TROUBLE Detector / Sensor / Module Point Messages are associated with ALARM messages, shall be acceptable.)

A “Trouble Reminder” Feature, which causes the FACP to re-sound the TROUBLE indicators when System / Point TROUBLE conditions remain on the system, shall be enabled, and shall be set to re-sound every twelve (12) hours.

Subsequent Troubles shall cause the FACP [and FAAP] [and at the FCC], [and the RFCC] TROUBLE LEDs and sounders to re-sound, along with the “Custom Label” and other information related to the “new” TROUBLE condition.

# MANUAL DRILL

A manual evacuation (drill) switch shall be provided to operate the FIRE alarm indicating appliances without causing other control circuits to be activated.

MANUAL MASS NOTIFICATION

Manual mass notification switches shall be provided to operate the prerecorded voice messages, ALERT indicating appliances (strobes), and Textual Display Signs without causing other control circuits to be activated.

# Led AND LCD Test

Activation of the Lamp Test switch shall turn on all LED indicators, LCD display, and the local sounder and then return to the previous condition.

# System Diagnosis

The system shall include special software to detect, diagnose and report failures and isolate such failures to a printed circuit board level.

# silent WALK TEST WITH HISTORY LOGGING

The actuation of the "Walk Test" switch/program at the control panel shall activate the "Walk Test" mode of the system, which shall cause the following to occur:

The Output Contacts, which provide the interface to the Fire Alarm System Reporting shall be bypassed.

Control relay functions shall be bypassed, such as door holders, elevator capture, fan shut down, etc.

The audio and visual circuits shall be bypassed.

The control panel shall show a trouble condition.

The alarm activation of any initiation device shall be silently logged as an alarm condition in the historical data file. The panel shall automatically reset itself after the logging of the alarm.

Any momentary opening of an initiating or indicating appliance circuit shall be silently logged as a trouble condition in the historical data file.

The panel shall automatically reset itself after logging of the trouble condition.

If the system becomes inactive for a period of longer than 10 minutes the panel shall default to normal fire alarm functions.

It shall not be required to manually restart or reboot the fire alarm panel after a silent walk test is completed.

**CENTRAL MONITORING**

The new Fire Alarm System shall be interfaced to the following systems utilizing [existing] [new] [copper] [multi-mode fiber optic], [single-mode fiber optic] [dialer] connection, for remote reporting of the various conditions listed below: Select available options:

[To the Owner-provided Security System. See below for required relay outputs] Indicate name of system.

[To an offsite commercial supervising station. See below for required relay outputs] Indicate name of system.

[To the existing Facility Management System. See below for required relay outputs] Indicate name of system.

The interface between the reporting system(s) listed above and the new Fire Alarm System shall be configured as follows:

Required relay (contact) outputs:

FIRE Alarm: This contact shall actuate in response to any FIRE Alarm status condition, other than Sprinkler Water Flow.

Water Flow Alarm: This contact shall actuate only in response to FIRE Alarm status Conditions, which are due to Sprinkler Water Flow.

Supervisory: This contact shall actuate in response to actuation of any initiating device programed as Supervisory.

System Trouble: This contact shall actuate in response to the occurrence of any Trouble status condition on the Fire Alarm System.

Select the following if there is an intelligent network system with or without one-way voice. Edit to fit scope.

The FIRE alarm panel shall also be connected to the existing intelligent/voice communications network [Indicate name of system].

The interface between the existing reporting system and the new Fire Alarm System shall be configured as follows:

Point by point annunciation.

Voice communications selection by building

Voice communications selection of outdoor speakers only of each building

Voice communications selection by outdoor speaker zones on the network

The Contractor installing the Fire Alarm Systems shall be responsible for coordination of the Fire Alarm System connections to these system(s), for all wiring and conduit between these system(s), and for all terminations at the Fire Alarm end of such interface wiring. All such wiring, raceway, and terminations shall be included per the Base Bid.

# ONE-WAY VOICE COMMUNICATION SUB-SYSTEM

The FACP shall be provided with an Integrated, One-way Emergency Voice Communications (EVAC) sub-system. This EVAC sub-system shall be configured as a single-channel sub-system, with automatic and manual operation as specified within the “Operation” section of this specification section.

The Tone Generators, Microphones, Audio Controls, Selector Switches, LEDs, Amplifiers, and Speaker-Type NACs, which make up this sub-system shall all be modular components of the Fire Alarm Control Panel and shall be listed by UL as modular components of the FACP. The Tone Generator and Audio Controls may share the same “system bus” as the other FACP components. The Primary Microphone and Audio Controls will be built-into the FACP. [A Remote Microphone and Remote Audio Controls shall be built into each [FAAP] [and FCC], [and RFCC]].

FACP on-board diagnostics shall be configured to assist in the identification of individual module faults. Also, the EVAC components may share the FACP Power Supplies and Batteries.

Each microphone shall be a dynamic communication type with a frequency range of 200 Hz to 4000 Hz and shall be equipped with a self-winding five-foot coiled cable. An LED indicator shall be provided to indicate microphone push-to-talk button has been pressed and speaker circuits are ready for transmission. All Microphones shall be supervised for disconnection.

Audio control switches shall be furnished to provide manual controls of all audio functions. These switches and associated LED indicators shall be supervised for disarrangement or failure.

Audio power amplifiers shall be furnished with self-contained filtered 24VDC power supply, transformer and amplifier monitoring circuits. Amplifiers shall provide a 25 or 70 VRMS output with a frequency response of 4,000Hz to 14,000Hz. Minimum amplifier sizes shall be determined as follows:

Provide a minimum of: 1 Watt for each Speaker

Provide a minimum of: 10% Additional Amplifier Capacity

The Fire Alarm System shall include back-up amplifiers within each Amplifier-Equipped FACP or Amplifier-Equipped Remote Equipment Cabinet. When amplifiers are distributed throughout the building in the NAC supply panels, at minimum a back-up amplifier shall be provided for each group of amplifiers within the same equipment closet. These back-up amplifiers shall be configured such that upon failure of any other Fire Alarm Audio Power Amplifier:

A back-up amplifier shall be automatically routed into the signal path, such that the back-up amplifier shall functionally replace the failed amplifier.

A Trouble event shall be logged by the Fire Alarm System. This Trouble event shall indicate that an amplifier failure has occurred. If the system contains multiple amplifiers, the Trouble event message shall indicate which specific amplifier has failed.

Speaker circuits shall be capable of supplying audio signals at 25 or 70 VRMS supplied by the system amplifiers. Supervision for open, short, or ground fault conditions shall be provided. Individual and distinct trouble indications shall be provided for each fault.

Speaker-type Notification Appliance Circuits for this project shall be distributed as follows:

List speaker circuits and their locations. Each stair and elevator shall have their own circuits.

TONES FOR ONE-WAY EMERGENCY VOICE SUB-SYSTEM

The Alert Tone and Digital Voice Message utilized by Automatic Mode shall be compliant with the latest NFPA-72. The Tone and Message shall be selected by the Owner and Engineer.

The Main Alert tone shall be the temporal code pattern. This temporal pattern shall be compliant with the latest ANSI standards, currently S3.41, and as described in the latest NFPA-72.

Voice message scriptS FOR ONE-WAY EMERGENCY VOICE SUB-SYSTEM

Contractor shall coordinate with the owner to provide up to sixteen (16) voice messages similar to the following examples:

Fire Alarm:

May I have your attention please. May I have your attention please. There has been a fire emergency reported in this building. While this is being verified, please proceed calmly to nearest exit and leave the building immediately. Do not use the elevators, use stairwells. All handicapped occupants shall use the building evacuation plan.

Attention. Attention. The fire alarm system has been activated. Ensure you have your identification, evacuate the building and report to your assigned rally point. Remain outside the building and be alert for further instructions.

High rise message:

Attention Please. The signal tone you have just heard indicated a report of an alarm emergency in this building. If your floor evacuation signal sounds after this message, walk to the nearest stairway and leave the floor. While the report is being verified, occupants on the other floors should await further instruction.

Tornado Watch:

Attention. Attention. The National Weather Service has issued a tornado watch for our area. All section marshals please review your evacuation routes and rally locations with your personnel. Be alert for further instructions.

Tornado Watch Cancellation:

Attention. Attention. The National Weather Service has cancelled the current tornado watch for our area. You may resume normal activities.

Tornado Warning:

Attention. Attention. The National Weather Service has issued a tornado warning for our area. All personnel are directed to leave your offices, close the doors behind you and proceed to the nearest tornado shelter immediately.

Attention. Attention. The National Weather Service has issued a tornado warning for our area. A tornado warning means that a tornado has been sighted on the ground. Take immediate action to take cover.

Tornado Warning Cancellation:

Attention. Attention. The National Weather Service has cancelled the current tornado warning for our area. Personnel may now return to their work locations. A tornado watch may still be in effect, please be alert for further instructions.

All Clear:

Attention. Attention. The current emergency situation has now been cleared. Resume normal activities.

Provide example scripts for other potential situations, such as: Active Shooter, Gas Leak, Hazardous Materials, Flooding, Severe Weather, Shelter-in-Place, Suspicious Package, etc.

All messages should be set to repeat twice.

# OPERATION: ONE-WAY VOICE COMMUNICATIONS

The One-Way Voice Communications sub-system shall function as an Emergency Voice Area Communications (EVAC) System, as defined within NFPA-72. This system shall be equipped with a Single-Channel, [selective] [non-selective] EVAC sub-system.

[As a Non-Selective EVAC system, any message being broadcast shall always be broadcast to the entire facility]

[As a Selective EVAC system, any message being broadcast shall always be broadcast to the selected areas only].

Where exterior speaker/strobes are provided, there shall be a way to select them separately from interior speaker/strobes.

The One-Way Voice Communications System, as specified for this project, is intended to perform two primary types of functions:

AUTOMATIC FIRE ALARM FUNCTION SUMMARY

In the event of a FIRE Alarm, this system shall automatically generate an Alert Tone and Digital Voice Message and shall automatically broadcast and repeat this tone throughout [the building] [pre-selected Notification Areas]. This function is intended to notify the occupants that they need to leave the [building] [affected areas].

MANUAL VOICE FUNCTION SUMMARY

The intended purpose of the voice capabilities of the system are to provide an approved means for manually providing live voice instructions for fire evacuation, and for other Emergency notifications.

Initiation of live voice announcements from microphones on the FACP, FAAP, FCC or RFCC shall not automatically place the fire alarm system in ALERT priority mode. A supervised manual switch shall be provided to enter the ALERT mode.

The new fire Alarm System shall be provided with suitable means to generate Manual EVAC messages from the following locations:

From the Master EVAC microphone, located within or adjacent to the FACP or the FCC.

[From a Remote EVAC microphone, located within each of the Remote Fire Command Centers (RFCC).]

[From a Remote EVAC microphone, located within each of the FAAP].

The FACP, [and FAAP] [and FCC] [and the RFCC] shall be equipped with programmed Control Switches and LEDs or LCD textual message for all manually selectable functions. These switches and LEDs shall be clearly labeled, in order to indicate the functions associated with them or the status conditions, which they indicate.

Such switches and LEDs shall be configured for selection of the various modes. Whenever a Voice Sub-System Mode and / or a Notification Area is manually selected, LEDs located adjacent to the control switches shall illuminate in a distinctive manner, and a Trouble status condition shall be logged by the system. The Trouble status condition shall remain until all control switches are manually or automatically reset to their normal positions.

These LEDs shall be provided in order to indicate which mode is currently active, [to indicate which Notification Areas are currently selected], and to remind the system operator to return the switches to the normal position when use of the Voice Sub-System is no longer required.

Only one FACP, FAAP, FCC, or RFCC location shall be in control at any given time. “In-Use” Status LEDs shall be provided with all panels to indicate another location is “In-Use” and that Voice Communication operation at that location is not available.

In conjunction with the two primary functions of this sub-system, and because this system is intended to provide [selective manual] [all call] functions, the system shall provide a minimum of the following Modes of operation:

EVACUATION (FIRE CONDITIONS) - AUTOMATIC MODE

In most cases, the One-Way Voice Communications sub-system shall function automatically as a tone generator and Digital Message Generator. Whenever Automatic EVAC Mode is triggered by an ALARM condition, the system shall function according to the system programming. The Fire Alarm System shall be programmed such that this Mode shall ALWAYS be accompanied by simultaneous operation of ALL visible notification appliance Circuits, within the active Notification Areas.

The actual sequence, signal tone, and digital voice message utilized by Automatic Mode shall be compliant with the latest edition of NFPA-72

The sequence shall include a back-up tone generator, which operates in compliance with the latest edition of NFPA-72 in the event of failure of the primary tone / message generator.

Pressing the “Signal Silence” switch, at either the FACP [or FAAP] [or FCC] shall cause the audible [and visual] notification appliances to cease operation.

All visual notification appliances shall continue to flash until the system is [acknowledged] [reset].

MANUAL EVACUATION (DRILL CONDITIONS) – ALL SPEAKERS MODE

This mode shall only be initiated manually. Manual Evacuation mode shall be initiated by means of programmed Control Switches and LEDs or LCD textual message. The switches and LEDs shall be appropriately labeled, in order to indicate their function.

Actuation of this mode shall not require the existence of a FIRE alarm status condition. This mode may be used for other Emergency Evacuation Notifications.

Whenever “Manual Evacuation – All Speakers” Mode is selected, the following shall occur:

The Audio Sub-System shall broadcast the evacuation tone or ALERT message through all audible notification appliances and shall actuate all the FIRE alarm visual notification appliances or the ALERT visual notification appliances depending on the condition.

If a FIRE alarm status condition does not exist, re-setting the notification appliances shall be accomplished by setting all switches back to the normal (inactive) positions and / or by resetting the system.

If a FIRE alarm Status condition occurs while “EVACUATION - MANUAL MODE” is active, all other required actions – such as AHU shutdown and Door Holder release, shall be initiated.

MANUAL TALK MODE (USING THE MICROPHONE) – ALL SPEAKERS

This mode shall only be initiated manually. This mode shall be initiated by means of programmed Control Switches, LEDs or LCD textual message and a microphone. The switches and LEDs shall be appropriately labeled, in order to indicate their function.

Actuation of this mode shall not require the existence of a FIRE alarm status condition. This mode may be used for other Emergency Evacuation Notifications.

Whenever “Manual Talk – All Speakers” Mode is selected, and pressing the push to talk button on the microphone, the following shall occur:

An Alert / Warning Tone shall be broadcast through all system speakers for approximately two seconds. The purpose of this tone is to warn occupants that a manual voice message is about to be announced. At the end of this Alert / Warning Tone, messages spoken into the system microphone shall be broadcast through all audible notification appliances.

Depending on the selected switch, either all the FIRE alarm visual notification appliances or all the ALERT visual notification appliances, shall be activated upon selection of this mode, and shall remain in operation until this mode is de-activated.

[All Horn-Type Notification Appliances and Sounder Bases, located within Resident Rooms, (including ADA-Equipped rooms) shall cease operation upon selection of this mode, and shall remain silent until this mode is de-activated.]

If a FIRE alarm status condition does not exist, re-setting the notification appliances shall be accomplished by setting all switches back to the normal (inactive) positions and / or by resetting the system.

If a FIRE alarm Status condition occurs while “Manual Talk – All Speakers” Mode is active, all other required actions – such as AHU shutdown and Door Holder release, shall be initiated.

If “Manual Talk – All Speakers” Mode is initiated during a FIRE alarm status condition, ALL FIRE alarm visible notification appliances shall continue to flash, until the system is [acknowledged] [reset].

MANUAL TALK MODE (USING THE MICROPHONE) – SELECTED SPEAKERS

This mode shall only be initiated manually. This mode shall be initiated by means of programmed Control Switches and LEDs or LCD textual message and a microphone. The switches and LEDs shall be appropriately labeled, in order to indicate their function.

Actuation of this mode shall not require the existence of a FIRE alarm status condition. This mode may be used for other Emergency Evacuation Notifications.

Whenever “Manual Talk – Selected Speakers” Mode is selected, and pressing the push to talk button on the microphone, the following shall occur:

An Alert / Warning Tone shall be broadcast through system selected speakers only for approximately two seconds. The purpose of this tone is to warn occupants that a manual voice message is about to be announced. At the end of this Alert / Warning Tone, messages spoken into the system microphone shall be broadcast through all selected audible notification appliances.

Depending on the selected switch, either the FIRE alarm visual notification appliances or the ALERT visual notification appliances in the selected areas only shall be activated upon selection of this mode and shall remain in operation until this mode is de-activated.

[All Horn-Type Notification Appliances and Sounder Bases, located within Resident Rooms, (including ADA-Equipped rooms) shall cease operation upon selection of this mode, and shall remain silent until this mode is de-activated.]

If a FIRE alarm status condition does not exist, re-setting the notification appliances shall be accomplished by setting all switches back to the normal (inactive) positions and / or by resetting the system.

If a FIRE alarm Status condition occurs while “Manual Talk – Selected Speakers” Mode is active, all other required actions – such as AHU shutdown and Door Holder release, shall be initiated.

If “Manual Talk – Selected Speakers” Mode is initiated during a FIRE alarm status condition, All FIRE alarm visible notification appliances shall continue to flash in the affected areas, until the system is silenced.

“DEAD-MAN” TONE

The system shall automatically default to the Automatic Evacuation Mode and shall broadcast the evacuation tone to the entire facility (tone generator / temporal pattern) if a manual talk mode is selected during an ALARM mode or an ALARM condition occurs while the manual talk mode was selected, and the microphone becomes inactive for more than one (1) minute.

Two-Way Fire Fighter Communication Systems are required in high rise buildings, unless the AHJ agrees to their omission. If omitted, an Emergency Responder Radio Coverage System for the fire department radios shall be provided. Select if applicable:

# tWO-WAY FIRE FIGHTER COMMUNICATION SYSTEM

The addressable system circuits shall be supervised, so that a trouble condition activates an audible and visible signal at the FACP, FAAP, FCC and RFCC. A switch that silences the audible signal shall light a trouble LED. During standby (non-use) condition, the system shall remain in the supervisory mode to prevent unauthorized use and to report any trouble conditions.

All two-way voice communications shall be supervised and shall be integral with the fire alarm system.

Provide switches that enable the activation of phone circuits, acknowledging and silencing signals. All control switches shall be behind a locked door.

An addressable master telephone control module shall be furnished to provide processing of all two-way communication functions. This module shall include:

An audible sonalert for call-in

A trouble silence switch with ring-back

Trouble indication and supervising monitor circuit

Selection switches and LEDs for remote hands-sets and jacks

Master telephone handset

A black master telephone handset with flexible-coiled self-winding five- (5) foot cord shall be provided and recessed within a protective panel-mounted enclosure at the command center. This enclosure shall also provide motherboard locations for the phone control and flasher/busy tone oscillator.

Provide one (1) line (talk) circuit for each remote jack or handset. Line (talk) circuit modules shall be furnished to electrically supervise for shorts, opens and grounds of circuit wiring. Each line module shall contain a "Call" and "Trouble" indication and, a two-position switch to enable two-way voice communication between remote and master phones.

Provide Emergency Phone Jacks as shown on the plans. Each jack shall be mounted on a stainless-steel single gang plate with the words "FIRE FIGHTERS' TELEPHONE" screened on each.

Provide Emergency Phone handset as shown on the plans. Each handset shall be mounted inside locked cabinets with break glass insert. The door shall bear a handset symbol and the words "FIRE FIGHTERS' TELEPHONE" and "TO OPEN, USE KEY OR BREAK GLASS". Emergency phones handsets shall be constructed of black Cycolac® type T thermal ABS material and be equipped with an armored cable.

Provide Emergency Phone Jacks for installation in each elevator car by an elevator contractor. Required wiring from elevator controls to each elevator car shall be furnished and installed by an elevator contractor. Owner shall coordinate work between the Electrical Contractor and the elevator contractor or company.

Provide (?) plug-able Emergency Phone handsets within a storage cabinet with break glass insert near the fire Alarm Control Panel. Plug-able handsets shall be equipped with flexible-coiled self-winding five-foot (5’) cord.

Select if applicable:

# OPERATION: TWO-WAY FIRE FIGHTER COMMUNICATIONS

The act of plugging a handset into an emergency phone jack or removal of any phone from its normal hook position shall cause the appropriate phone location LED to flash and a distinctive audible device to sound at the control panel. A ring signal tone shall be heard in the handset until the call has been answered.

By lifting the master phone handset at the FACP or FAAP, or FCC or RFCC, the operator is automatically connected to the selected firefighter's emergency telephone for private communications.

Acknowledging the proper phone circuit shall silence the pulsing tone and cause the phone location LED to stop flashing and remain on.

At any time, other firefighters' telephones may be selected at the FACP or FAAP, or FCC or RFCC to join in the conversation.

Attempting to use a subsequent phone on the same circuit shall not cause the pulsing tone to activate if any two-way communications are already established. Any new circuits activated shall, however, cause their discrete phone circuit LEDs to flash until acknowledged.

The Fire Phones shall provide the capacity to handle simultaneous use of multiple remote phones.

The act of unplugging all handsets in use and replacement of all remote phones to their normal hook position and returning all the related circuit acknowledgment switches to the normal position shall cause the restoration of all normal supervisory functions. If any remote phone is not hung up or unplugged, then the appropriate phone zone indicator LED shall flash, and the pulsing tone shall resume at the control panel.

When combined with one-way voice communications it should at the discretion of the person at the control panel to permit remote paging from any fire fighters remote phone location via the system speakers as manually selected at the main controls.

Remote Master Telephone in the FCC or RFCC or FAAP when provided shall duplicate the fire fighters telephone capability of the main fire alarm control panel.

Master Telephones shall be capable of communicating to one another or to any remote fire fighters phone jack or phone station.

# FIRE ALARM ANNUNCIATOR PANEL

Provide and install Fire Alarm Annunciator Panel(s) (FAAPs) where shown on the plans.

The panel shall incorporate an alphanumeric LCD display, which shall functionally duplicate the FACP display, and have the same controls and switches as the FACP.

ANNUNCIATION FEATURES

The Annunciator portion of the panel shall consist of the standard, compact-size LCD alphanumeric display, as manufactured by the Fire Alarm System Manufacturer. This unit shall mimic the display assembly of the FACP, and shall incorporate the following features:

LCD Display

Multi-function, integrated sounder – duplicates the FACP sounder

LEDs for:

Power (Green)

Fire Alarm (Red)

[Resident Unit/Dorm Room Smoke Detection / Priority 2 Alarm]

Supervisory (Amber or Orange) [May also be used for Resident Unit/Dorm Room Smoke Detection]

Trouble (Yellow)

Secured Switches (Secured under keyed door, or enabled via key switch) for:

Acknowledge

Signal Silence

System Reset

EVAC SUB-SYSTEM FEATURES

In addition to the Annunciation features listed above the FAAP panel shall incorporate additional features - for control of the EVAC sub-system.

The additional features included in these panels shall be as follows:

A Microphone

Audio Control/Activation Switches identical to those found in the FACP.

Audio Status LEDs or LCD textual messages identical to those found in the FACP.

A locked panel access door. This door shall include a viewing port, which shall allow the LCD Display, and all indicator LEDs to be seen, without need to open the door. The door shall be secured by means of a key, which shall be identical to the key used to gain access to the FACP enclosure. When the panel access door is unlocked, trained personnel shall be able to access the Microphone and any other required Operator Interface Switches.

GENERAL REQUIREMENTS

FAAP shall incorporate the following features:

Mar-resistant painted enamel or a stainless-steel finish.

FAAP Panel shall communicate with the Fire Alarm Control Panel by means of a supervised serial data link, as well as any required audio buss connections. The operating power shall be 24VDC and shall be fused at the control panel. LED annunciators and point-wired (non-serial) annunciators are not considered equal and shall be unacceptable.

All wiring between the FAAP panel and the fire alarm control panel shall be supervised for opens, grounds and shorts.

Under normal operating conditions, the LCD display shall indicate the time, date and "SYSTEM IS NORMAL" label.

During abnormal conditions, the LCD shall operate in the same manner as the FACP LCD Display.

**FIRE COMMAND CENTER**

Fire Command Center (FCC) shall indicate receipt of each signal both audibly and visibly.

FCC shall include the following:

Means for silencing the audible indication of alarm, supervisory, and trouble signals shall be provided and shall be arranged so that subsequent signals shall re-sound.

An audible and visible indication shall be provided upon restoration of the system after receipt of any signal.

Event logs, service logs, and status logs.

Touch screen Color LCD monitor, control unit such as a PC, keyboard, mouse, and printer.

Graphic display of floor plans of the building.

Control panel that incorporates the following:

A microphone

Switches for selection of speaker zones in the building

List speaker zone descriptions below:

Switches for:

Acknowledge

Signal Silence

System Reset

Two-Way handset where Two-Way fire fighters’ telephones are provided

Control switches for Two-Way fire fighters’ telephones

List Fire Fighter telephone locations below:

**REMOTE FIRE COMMAND CENTER**

Remote Fire Command Center (RFCC) shall indicate receipt of each signal both audibly and visibly.

RFCC shall include the following:

Means for silencing the audible indication of alarm, supervisory, and trouble signals shall be provided and shall be arranged so that subsequent signals shall re-sound.

An audible and visible indication shall be provided upon restoration of the system after receipt of any signal.

Event logs, service logs, and status logs

Touch screen Color LCD monitor, control unit such as a PC, keyboard, mouse, and printer

Graphic display of floor plans of all buildings on the network

Control panel that incorporates the following:

A microphone

Switches for selection of speaker zones in an individual building or group of buildings on the network

List speaker zone descriptions below:

Switches for selection of outdoor speakers only by zones or buildings

List speaker zone descriptions below:

Switches for:

Acknowledge

Signal Silence

System Reset

Two-Way handset where Two-Way fire fighters’ telephones are provided

Control switches for Two-Way fire fighters’ telephones

List switches and insert descriptions below:

Remote resetting and silencing of any building’s fire alarm control panel **is permitted only if approved** by the authority having jurisdiction.

**NAC BOOSTER PANELS**

NAC Booster Panels (Remote Power Supplies) shall be individually supervised. Interconnecting NAC Booster Panels in a manner which prevents identification of individual panel TROUBLE conditions shall not be approved. NAC Booster Panels shall be wired to dedicated Emergency Power Branch Circuits where available.

If NAC Booster Panels are needed at locations other than those identified on the construction drawings, the Electrical Contractor shall obtain approval for their proposed installation locations. At such locations, the EC shall provide any required circuit breakers, associated power wiring, and local smoke detection at the approved location. Power shall be obtained from the nearest available emergency panel. The cost of such equipment and installation shall be included within the base Electrical Bid.

# Multiplex/intelligent Initiating DEVICES

All devices shall be supervised for trouble conditions. The system control panel shall be capable of displaying the type of trouble condition (open, short, device missing/failed). Failure of a device shall not hinder the operation of other system devices.

device identification

Each intelligent device must be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address shall not be acceptable.

Device addressing schemes which use permanently imbedded electronically-identifiable “serial number” which is similar to the address imbedded within Personal Computer Network Interface Cards shall be acceptable.

Fire Alarm Systems utilizing hand-held or briefcase-style programming tools, which are used to electronically assign addresses and/or programming parameters to devices shall be acceptable. However, one such programmer tool shall be provided to the Owner at no additional cost.

The address along with the loop number and end-of-line device if present shall be indicated, and be visible from the ground, on the device in the field using machine generated marking. Contractor shall provide a sample of such labeling scheme before using it.

End-of Line devices shall also be identified by means of permanent, machine generated label, affixed to the device.

Device identification schemes that do not use uniquely set addresses but rely on electrical position along the communication channel are unacceptable. These systems cannot accommodate t tapping and the addition of an intelligent device between existing devices requires re-programming all existing devices beyond added device.

The system must verify that proper type device is in place and matches the desired software configuration.

intelligent DETECTORS - general

Smoke and heat detectors must be approved by the State Engineer prior to installation.

Each detector shall incorporate the following features:

LED(s), which shall flash to indicate communication with the Fire Alarm System, and which also illuminate in a steady manner when the detector is in an alarm status

A means to allow field function testing of the detector

A low-profile design / shape

An insect screen

Voltage and RF transient suppression techniques, in order to minimize false alarms

Smoke detectors shall communicate the actual smoke chamber values to the system control panel.

Smoke detectors shall be listed for sensitivity testing from the control panel. Sensitivity test results shall be logged and downloaded to a printer.

The detectors shall be plug-in units, which mount to a common base, and shall be UL 268 approved.

Each detector shall be compatible with the fire alarm panel and shall obtain its operating power from the SLC, to which it is connected. (Where relay or sounder-equipped bases are used, it shall be acceptable to require a separate 24 VDC or NAC connection.) Each detector shall be reset by actuating the control panel reset switch.

If field conditions so require the smoke detection devices shall not be installed until the construction is completed.

intelligent Detector bases

Bases shall be suitable for either smoke or heat detector mounting.

Either the base or the head shall contain electronic circuits that communicate the detector's status (normal, alarm, sensitivity status, trouble, etc.) to the control panel over two wires. The same two wires shall also provide power to the base and detector. Contacts between the base and head shall be of the bifurcated type using spring-type, self-wiping contacts.

The base shall be lockable. The locking feature must be field-removable when not required.

Upon removal of the detector's head, a trouble signal shall be transmitted to the control panel.

The detector base shall be sealed against rear airflow entry.

Each detector's base or head shall contain LED(s), which shall flash when the detector is being scanned by the control panel. The LED(s) shall turn on steady when the detector is in an alarm condition.

intelligent PHOTOELECTRIC SMOKE DETECTORS

The detectors shall contain no radioactive material.

Detectors shall be of the solid-state photoelectric type and shall operate on the light scattering photodiode principle using a pulsed infrared LED light.

intelligent THERMAL DETECTORS

The detectors shall be a combination rate-of-rise and fixed temperature 135 F unless noted.

Detectors shall sense within a temperature range of 32 F to 158 F. The control panel shall be capable of sensing either a set point of 135 F, or a rate-of-rise of 15 degrees F per minute for fire sensing.

MULTI-CRITERIA DETECTORS

The Intelligent multi-criteria detector shall have advanced software to continuously sample the air in an environment and adjust its detection parameters and alarm threshold accordingly. It shall do this automatically, without user intervention.

Detector shall incorporate either thermal and photoelectric technologies or thermal, photoelectric and carbon monoxide technologies.

Detector shall have on-board microprocessor and advanced software that focuses on rejecting nuisance alarms.

intelligent DUCT SMOKE DETECTORS

Duct detectors shall be of the photoelectric type specified above. It shall be possible to alarm the duct detector by using a remote or local test switch.

For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housings front cover.

Detector shall include remote keyed test switch and alarm LED indicator.

In mechanical rooms, alarm LED indicators and test switches for duct detectors shall be grouped on a stainless-steel cover plate mounted adjacent to the main mechanical room door. Each LED/switch shall be labeled with the detectors loop and address. A floor plan of the room showing the detectors and addresses shall be located adjacent to the cover plate. Provide Plexiglas cover over the plan.

CARBON MONOXIDE DETECTORS

Carbon monoxide detector shall be listed to Underwriters Laboratories UL 2075 for Gas and Vapor Detectors and Sensors. The detector shall be equipped with a sounder and a trouble relay. The detector’s base shall be mountable to a single-gang electrical box. Wiring connections shall be made by means screws. The detector shall provide dual color LED indication that blinks to indicate normal standby, alarm, or end-of-life. When the sensor supervision is in a trouble condition, the detector shall send a trouble signal to the panel. The detector shall provide a means to test CO gas entry into the CO sensing cell. The detector shall provide this with a test mode that accepts CO gas from a test agent and alarms immediately upon sensing CO entry.

Carbon monoxide alarm signals shall be displayed as SUPERVISORY signals on the fire alarm system displays.

SMOKE/HEAT DETECTOR GUARDS

Smoke/heat detector guard shall be of two-piece construction perforated metal for ease of installation and maintenance of equipment once installed and shall have the following properties:

Constructed of 16-gauge perforated steel with 3/16" diameter on 1/4" staggered centers

Welded on all sides with reinforcement for a solid unit construction

Painted with white epoxy coating

Dimensions I.D. 7 1/2" x 7 1/2" x 4" deep

Shall have provisions for electrical conduit

Shall have tamper-proof screws

ADDRESSABLE MANUAL STATIONS

Manual stations shall contain circuits that communicate the station's status (alarm, normal or trouble) to the control panel over two wires, which also provide power to the manual stations. The address shall be field programmable on the station.

Select either single-action or double-action.

Manual stations shall be [single-action] [double-action] type, constructed of metal or of high impact, red Lexan with raised white lettering and a smooth high gloss finish.

Station shall mechanically latch upon operation and remain so until manually reset by means of a key common to all system locks. Stations that require Allen wrenches or special tools to reset them shall not be accepted.

Manual stations shall be fitted with screw terminals or wire leads for field wire attachment.

Select the following if applicable.

[MANUAL STATION RE-LOCATORS]

Where new Manual Stations are to be installed at or near existing rough-in locations, and where such Manual Stations need to be lowered, the use of “Pull Station Re-Locators” shall be permitted, subject to review of a sample device by the Owner. These units shall be equivalent to Simplex Model 2099-9830 (equivalent model by Space Age Electronics) or EST Model RR-32RL. When installed, these units produce a neat, trim, integrated appearance.]

Select if the project is in a prison. Delete non-applicable specs above.

[Manual pull stations shall be of the institutional key-operated type only. They shall be made of metal with tamper proof screws. Stations shall be labeled as “FIRE ALARM”].

INTERFACE MODULES - GENERAL

If external power to Addressable Interface Modules is required, such power shall be 24VDC, and shall be derived from a supervised fire alarm power supply.

Addressable Interface Modules may be provided in either a Class B or Class A supervision version.

In the Class B version, the wiring shall be supervised by an end-of-line device.

In the Class A version, the wiring shall be looped back through a separate conduit/route and connected to the module to allow continual operation of the controlled devices even if the wiring sustains a single break.

The interface modules shall be supervised and uniquely identified by the control panel. Device identification shall be transmitted to the control panel for processing according to the program instructions.

INTERFACE MODULES - SUPERVISED CONTROL

Supervised Control Modules shall be utilized where needed, for control of Notification Appliances.

For Notification Appliances, speakers, and other device control with Class B or Class A wiring supervision, the interface module shall provide a double-pole/double-throw relay output, with supervision.

These interface modules shall communicate the supervised wiring status (normal, trouble) to the fire alarm control panel and shall receive from the fire alarm control panel a command to transfer the relay.

INTERFACE MODULES - SUPERVISED MONITORING

Addressable Monitor Modules shall be suited for monitoring of water-flow, valve tamper, fire Suppression Control Panels, and other non-intelligent detectors and systems.

Addressable Monitor Modules shall be provided in any needed configuration, and may be used to interface any of the following initiation devices to a Signaling Line Circuit, as follows:

Conventional 2-wire smoke detectors, including providing suitable power to the IDC.

Normally Open, dry contact type devices - with class B or class A wiring supervision:

These interface modules shall communicate the Initiating Device Circuit status (normal, alarm, trouble) to the control panel.

Interface ModuleS - non-supervised control

This interface module shall provide double-pole/double-throw relay switching for loads up to 120VAC. It shall contain easily replaceable 2-amp fuses, one on each common leg of the relay.

# fault isolator module (FIM)

The system shall employ Fault Isolator Modules (FIM) on the Signaling Line Circuits. These FIM units shall be utilized in order to isolate portions of SLCs, in the event of short circuit conditions. The SLC segment protected by each FIM shall be separated from the SLC in a manner such that a single short-circuit condition may not affect more than 25 Addressable Field Devices / Detectors, which are served by the isolated SLC segment.

The FIM shall be located as close as practical to the point where the isolated SLC sub-circuit branches and shall also be located at an accessible location.

# conventional Initiating devices

NON-ADDRESSABLE HEAT DETECTORS

Non-Addressable Heat Detectors shall of the fixed temp type and only to be used at locations where the ambient conditions are unsuitable for Analog Addressable units, or where the required operation (set point / response index, etc.) cannot be achieved with Analog Addressable units. Where used, these devices shall be UL listed for their intended purpose. These heat detectors do not have to be made by the same manufacturer supplying the other fire alarm equipment for the project.

PROJECTED BEAM TYPE SMOKE DETECTORS

The Projected Beam Type Smoke Detectors shall be listed per UL 268 and shall functionally interface to the FACP as a standard, 4-wire type smoke detector.

The Projected Beam Type Smoke Detectors shall incorporate built-in "aiming-aid" features, such as optical sights or indicator LEDs. Where additional wiring or particular configurations are recommended by the manufacturer, in order to take advantage of built-in aiming features, such wiring or configurations shall be provided.

Installation methods utilized with these units shall be in strict compliance with the manufacturer’s instructions.

A Remote Test Station shall be supplied for each TX / RX pair.

Power to each TX / RX pair shall be supervised, by means of either built-in Trouble relay outputs at each detector, or by means of end-of-line relays at each detector. Such Trouble Relay outputs and / or end-of line relays shall be connected to the IDC which monitors each TX / RX pair in a manner, such that Trouble conditions indicated by such relays / outputs do not prevent the transmission of an Alarm over the IDC.

Each TX / RX pair shall be individually monitored for Alarm status conditions, via addressable Monitor Modules, or via dedicated IDC circuits.

Each TX / RX pair shall be individually monitored for Trouble status conditions.

SPRINKLER WATERFLOW SWITCHES – wet systems

Waterflow switches shall be individually monitored, via individual IDCs, Monitor Modules, or Mini Monitor Modules. The point corresponding to each Waterflow switch shall be programmed such that when activated, the suitable FIRE Alarm sequence shall be initiated.

If the flow switch incorporates an internal “cover tamper switch”, which actuates whenever the flow switch assembly cover is removed, the Trouble sequence shall be initiated in response to the removal of this cover.

SPRINKLER VALVE TAMPER SWITCHES – wet systems

Tamper switches shall be individually monitored by individual IDCs, Monitor Modules, or Mini Monitor Modules (Where two Valves, with Tamper Switches, are provided on both sides of a backflow preventer / double check valve assembly, such tamper switches may be monitored as a single point). The point corresponding to each Tamper Switch shall be programmed such that whenever the valve is partially closed, the Supervisory sequence shall be initiated.

If the tamper switch incorporates an internal “cover tamper switch”, which actuates whenever the flow switch assembly cover is removed, the Trouble sequence shall be initiated in response to the removal of this cover.

DOOR HOLDERS

Magnetic door holders shall have an approximate holding force of 25 lbs. (minimum) (recommended 35 lbs.)

The door portion shall have a stainless steel pivotal mounted armature with shock absorbing nylon bearing.

Unit shall be capable of being either surface, flush, or semi-flush mounted as required.

Power for 24 v dc door holders shall be independent and separate from the main power supply of the fire alarm panel.

Select the following if applicable:

[When reusing existing 120VAC type door holders, the new power shall be obtained from the nearest emergency power source where available. If no emergency power, the power shall be obtained from the un-switched lighting circuit serving the immediate area.

**audio VISUAL notification APPLIANCES**

SPEAKERS

Speakers shall have vandal resistant metal or Lexan white housing or grills with field adjustable output taps ranging from 1/4 watt to 2 watts. Speakers selected for this project shall produce a Sound Pressure Level, at the 1 watt tap of at least 82 dBA at 10 feet – as tested per UL Standard 1480. Speakers shall have sealed backs to protect the phenolic impregnated cone.

SUPERVISED HORN LOUDSPEAKERS

Supervised horn loudspeakers shall be equipped with a compression driver providing up to 15-Watt RMS power handling capability.

Horn loudspeakers when installed outdoors, shall be of the weather-resistant metal construction to provide protection against water, humidity, vermin, and corrosion.

The mounting bracket allows directional sound dispersion via the vertical and the horizontal positioning. Provisions shall include for surface or strap mounting for the installation to pillars and I-beams.

Horn loudspeakers shall include 25/70/100V transformer with adjustable 7-position Watt/ impedance selection switch.

Select the following if applicable: [HORNS

Horns shall have vandal resistant metal or Lexan white housing or grills. Horns shall be polarized and shall be compatible with the 24 VDC NACs provided by the control panel and/or NAC Booster Panels/Supervised Control Modules. Each horn assembly shall include separate wire leads for in/out wiring for each leg of the associated signal circuit.

Horns shall be UL 464 listed and shall meet the audible characteristics as defined in NFPA 72.]

Select the following if applicable: [MINI HORNS

Mini horn units shall be piezo-electric, and white in color operating on 24 volts DC, and shall have in-out terminal or wire leads. Horns shall be UL 464 listed and shall meet the audible characteristics as defined in NFPA 72. The units shall be fitted with tamper proof screws on single gang, flush mounted in new construction, and surface mounted on Wiremold type box in retrofitting installations.]

STROBES

ALL strobes, and the strobe portion of audible/strobe combination units, shall be of the Xenon type. All strobes shall have clear lenses.

FIRE alarm strobes shall be labeled “FIRE”. When used in conjunction with Mass Notification Systems, ALL strobes shall be labeled “ALERT”.

ALL strobes shall be designed for synchronized flash operation at one flash per second (1 Hz) minimum over the device's listed input voltage range. Strobes shall be synchronized such that all strobe units within the building shall flash simultaneously (As a minimum, all devices on each floor shall flash simultaneously, with flash timing within the limits established by current UL standards.).

**[SLEEPING AREA AUDIBLE REQUIREMENTS**

Where audible appliances are installed to provide signals for sleeping areas, they shall have a sound level of at least 75 dBA measured at the pillow level in the area required to be served by the system using the A-weighted scale (dBA).

If any barrier, such as a door, curtain, or retractable partition, is located between the notification appliance and the pillow, the sound pressure level shall be measured with the barrier placed between the appliance and the pillow.

Audible appliances provided for the sleeping areas to awaken occupants shall produce a low frequency alarm signal that complies with the following:

1. The alarm signal shall be a square wave or provide equivalent awakening ability.
2. The waveform shall have a fundamental frequency of 520 Hz + 10 percent.
3. The notification equipment shall be listed for producing the low frequency waveform.]

If Animal Care Areas are part of the project, coordinate the notification requirements with the User Group:

**[ANIMAL CARE AREAS**

Where notification appliances are installed in Animal Care Areas, the notification appliances shall have the following properties:

Audible appliances shall produce a “slow whoop” alarm signal that is less disturbing to the animals and shall comply with the following:

1. The Slow Whoop is characterized by a frequency sweep between 875 and 4000 Hz, and each sweep shall last approximately 2 seconds.
2. The notification equipment shall be listed for producing the frequency sweep.

Visual Strobes: Strobes in the Animal Care Areas shall have **RED** lenses.]

**[MASS NOTIFICATION SYSTEM**

GENERAL

The mass notification and fire alarm functions shall be combined into one system.

Visual Notification Appliances (strobes) shall be marked “Alert” in lieu of “Fire”. The strobes shall be activated in conjunction with voice messages over the mass notification or the fire alarm system.

Light-emitting diode (LED)-type Textual Display Signs shall be installed for the new mass notification system and the fire alarm system (if present). These text signs shall be activated in conjunction with fire alarm system activation or voice messages over the combined mass notification/fire alarm system.

[Wide Area MNS: Provide High Power Speaker Arrays (HPSAs) arranged in such a manner to provide intelligible voice and audible tone communications throughout the exterior notification zone. Where required by the emergency response plan, specific warning tones shall be provided.]

Priority: Mass notification voice and display messages shall take priority over Fire Alarm System voice and display messages.

TEXTUAL DISPLAY SIGNS

***Consult with Agency to determine which type of Textual Display Sign is desired, then select one of the following two paragraphs.***

Textual display signs shall be LED type and approximately 400 mm long X 150 mm high X 75 mm deep (16 inches long by 6 inches high by 3 inches deep) with a height necessary to meet the requirements of NFPA 72. The text display must spell out the word "EVACUATE" or "ANNOUNCEMENT" as appropriate. The design of text display must be such that it cannot be read when not illuminated.

Textual display signs shall be two-line LED scrolling type with a height necessary to meet the requirements of NFPA 72. The text display shall spell out the word "EVACUATE" or "ANNOUNCEMENT" and the remainder of the emergency instructions as appropriate. The design of text display must be such that it cannot be read when not illuminated. LED scrolling text displays must meet the following requirements at a minimum:

1. Two lines of information for high priority messaging.
2. Minimum of 13 characters per line (26 total) displayed.
3. Text must be no less than height requirements and color/contrast requirements of NFPA 72.
4. 28K character memory, approximately 80 messages.
5. Display must be wall or ceiling mounted.
6. [Mounting brackets for a convenient wall/cubicle mount.]
7. During non-emergency periods, display date and time.
8. Provide power supplies to power the displays.
9. Interface: Provide signs with RS485 and Ethernet communications interfaces.
10. The Fire Alarm/MNS system must interface with the textual display sign control panel to activate the proper message.
11. Programming: Include programming of the Textual Display Signs. Consult with owner regarding which messages they want displayed. Messages may include warnings regarding:
    * 1. Natural hazards – Geological events
      2. Natural hazards – Meteorological events
      3. Natural hazards – Biological events
      4. Human caused – Accidental events
      5. Human caused – Intentional events
      6. Technological – Caused events

Battery Backup: Provide Textual Display Signs with sufficient battery backup to operate the signs for 60 minutes after loss of AC power. Provide cabinet(s) for the batteries.

Fire Alarm System Monitoring and Control of MNS:

1. Provide Fire Alarm System Monitor Modules to monitor the Textual Display power supplies and the MNS line supervisor modules.
2. Provide Fire Alarm System Control Modules to trigger up to 16 pre-programmed messages.**]**

Select the following if applicable:

**[SMOKE DETECTORS WITHIN RESIDENT UNITS/DORM ROOMS:**

Smoke Detectors utilized within resident units/dorm rooms shall be self-contained, non-addressable units, which shall operate on 120 VAC 60 Hz. Each of these detectors shall incorporate an internal, replaceable or rechargeable battery for use as a backup power source. The battery shall be supervised for low power or missing battery - such conditions shall cause a distinctive, periodic audible sound, which shall continue until the battery is replaced.

NOTE: THESE DETECTORS SHALL NOT BE INTERCONNECTED WITH THE FIRE ALARM SYSTEM.

The detector shall utilize a light-scattering, photo-electronic sensing mechanism. The sensing chamber shall be protected by means of an insect-resistant screen. The detector shall be designed for a nominal sensitivity of 2.5 percent obscuration.

A built-in test switch shall electronically simulate the presence of smoke and test all detector functions. A built-in power-on indicator light shall glow or blink when the detector is receiving AC power. The detector shall incorporate an integral electronic alarm horn that has a minimum audible output of 93 dBA at 10 feet.

The detector shall be designed to allow the interconnection of multiple detectors within a dwelling unit, such that if one or more detectors sense a Resident Unit Alarm condition, the sounders within all detectors within the affected resident unit shall sound simultaneously.

The detector shall be listed to UL 217.

In addition to the integral sounder, smoke detectors installed within ADA resident units/dorm rooms shall incorporate an integral strobe, which shall be listed for a minimum Visual Output of 177 Candela, per UL Standard 1971. This strobe shall flash in response to the sensing of smoke and shall flash and reset in the same manner as the integral sounder. This integral strobe shall flash at a rate of approximately one flash per second.]

# PRINTERS

A printer shall be provided adjacent to the fire alarm control panel as shown on the plans.

Printer shall be a desktop 80-column, impact dot matrix printer shall provide a hard copy record of system events.

The printer shall receive English language text from the control panel in industry standard ASCII format via an EIA RS-232-C connection.

All printed information shall include time, date, status, point number, label, and the device type identifier.

The printer shall have the following features:

120 VAC input power

180 characters per second printing speed

3 kilobytes buffer capacity

Cartridge type ribbon

Friction feed for cut forms

Tractor feed for continuous 9 1/2" wide pin-to-pin fanfold paper

UL 864 listed (UOXX)

Contractor shall supply one box of 2,300 (minimum) continuous-feed Sheets, 9 1/2" x 11", 20 Lb., Clean Edge, White Bond computer paper suitable for use the supplied printer.

Contractor shall supply a dust-proof lockable cabinet with a see-through front cover to house the printer. Key shall be same as FIRE alarm control panel.

**SPECIAL DEVICES**

tools/keys

Contractor shall provide two (2) keys per pull station. Keys shall be identical and usable in all keyways associated with this project – including, but not limited to Manual Pull Stations, the FACP, [and FAAP] [and RFCC] Panel(s).

Provide one device programmer tool and case for fire alarm systems utilizing hand-held or briefcase-style programming tools used to electronically assign addressees and/or programming parameters.

PART 3 - EXECUTION

# GENERAL

The complete installation shall be done in a neat, workmanlike manner in accordance with the applicable requirements of NFPA 70 - Article 760 and the manufacturer's recommendations.

Smoke detectors shall not be mounted until the construction is completed unless they are covered with plastic bags or fitted covers immediately after installation to maintain cleanliness. Remove plastic bags or fitted covers from smoke detectors after final construction cleaning is complete.

Clean All Equipment:

Vacuum inside of fire alarm panels, NAC panels, etc.

Loosen attached particles and vacuum them away.

Wipe all surfaces with a clean, dry, lint free rag.

Re-vacuum inside surfaces as directed by the DFD Construction Representative or Inspector.

# RACEWAYS

NOTE: ALL FIRE ALARM SYSTEM WIRING SHALL BE INSTALLED WITHIN METALLIC CONDUIT.

All wiring shall be in a conduit system separate from other building wiring. See Section 26 05 33 – Raceway and Boxes for Electrical Systems for specifications.

All wiring shall be in minimum ½" steel raceway.

40% fill factor shall be applied to all conduit sizes.

The contractor shall size conduit and boxes by circular mil size of each cable in each conduit or box. The circular mil sizing can be found on the manufacture's spec sheet, then use the NEC codebook to make calculation to follow NEC Chapter 9 Tables and Annex C for box and conduit fill.

The contractor is encouraged to use red conduit for fire alarm systems.

There shall be no sharp edges with installed materials.

Use only identified conduit entries or request approval for other penetrations in cabinets; (certain areas require clear space for interior components / batteries). Cabinet shall be grounded to either a cold water pipe or grounding rod.

Existing conduit and surface metal raceway that is ½” in size or larger may be reused if found to have adequate space provided that it only serves the fire Alarm system and doesn’t contain any AC wiring. All existing conduit that is reused MUST be brought up to the current State of Wisconsin Electrical Code and Approved for usage by the Engineer prior to work being done.

# CONDUCTORS

All wire and cable associated with this system shall be as required by the equipment manufacturer. The following information is intended for estimating purposes only. However, the minimum wire gauges and colors specified shall be strictly adhered to. All cable shall be installed as per NEC Article 760.

All cables and wires #14 AWG and larger shall be stranded.

Fire alarm wiring shall be held in place at the device box, by means of a two-screw connector, (do not use squeeze or crimp type connectors).

All wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, disarrangement of any components, any open circuits or grounds in the system, an audible and visual trouble signal shall be activated until the system is restored to normal.

All conductors shall be color-coded. Coding shall be consistent throughout the facility. Green wire shall be used only for equipment ground.

Each FIRE Alarm Control Panel, [Annunciator Panel], [Fire Command Center], [and Remote FIRE Command Center] shall be connected to separate dedicated branch circuit from the building emergency panel, maximum 20 amperes. Circuit shall be labeled as "FIRE ALARM". The fire alarm branch circuit shall be secured in the “ON” position using a **red** circuit breaker handle clamp to prevent accidentally de-energizing the power to the fire alarm equipment.

Power wiring for FIRE Alarm Control Panel, [Annunciator Panel], [and Remote FIRE Command Center] shall be #12 AWG.

FIRE Alarm Control Panel, [Annunciator Panel], [Fire Command Center], [and Remote FIRE Command Center] shall have #6 AWG green equipment ground wire.

Fire alarm risers, notification appliance circuits and interconnections to remote panels (per NFPA 72) shall have a minimum 2Hr fire alarm rating. All notification appliance circuits shall be protected from the fire alarm panel of origination to the signaling zone they serve.

Where fire alarm circuits enter or leave a building, additional transient 75 to 90-volt gas tube protection shall be provided for each conductor.

Leave 8-inch wire tails at each device box and 36-inch wire tails at the fire Alarm Control Panel [and Remote Annunciator Panel(s)], [Fire Command Center], [and Remote FIRE Command Center].

Cable for Intelligent detector Loops shall be 18 to 12 AWG twisted pair with a shield jacket or per manufacturers recommendations installed in ½" conduit. Shield continuity must be maintained and connected to earth ground only at the control panel.

SLC wiring must not be in the same conduit with AC power wiring or other high current circuits. T-taps or branch circuit connections are allowed for all class B SLCs.

Cable for RS-232C devices (CRT, PRINTER) shall be dual pair twisted- shielded.

Cable for RS-485 devices (Remote Annunciators) shall be twisted-shielded pair (Belden 9841 or equivalent) for the data signal. Power wiring shall be 12 AWG.

All splices or connections shall be made within approved junction boxes and with approved fittings. Boxes shall be red and labeled "FIRE ALARM SYSTEM" or “FA” by decal or other approved markings.

Speaker and strobe circuits shall have separate conductors and shall operate independently of each other.

[Mini horn wiring shall be #14 AWG minimum.]

Speaker wiring shall be #18 AWG twisted-shielded cable or per manufacturers recommendations.

Strobe wiring shall be #14 AWG minimum.

Tray cable is not acceptable for use as fire alarm system wiring installed in conduit.

# DEVICE MOUNTING

Unless otherwise noted on the drawings, plans, specifications or by the Architect or Engineer; the recommended mounting heights, and requirements are as follows:

fire alarm control panels

Mount control panels such that all visual indicators and controls are located at 60 inches above floor level.

Annunciator/remote FIRE COMMAND CENTER PANELS

Mount FAAP/FCC/RFCC panels such that all visual indicators and controls are located at 60 inches above floor level.

VISUAL AND AUDIO/VISUAL NOTIFICATION APPLIANCES

In Public-Mode Areas, as defined within NFPA 72, install flush, semi-flush or surface between 80 inches and 96 inches or 6 inches below finished ceiling or at 80 inches from the bottom of the device to the highest level of the finished floor. No devices protruding 4 inches or more shall be installed lower than 80 inches. If these requirements are not achievable, consult with the Engineer before installation.

Audio/visual devices may be installed on the ceilings only where indicated, or where approved in writing by the Engineer. (In such cases, these devices shall be installed in accordance with current NFPA 72 standards). Audio/visual devices installed on ceilings shall have white grills.

Except as noted in the previous paragraph, all audio/visual devices shall be wall-mounted at the same height throughout the facility.

Spacing of speakers shall not exceed 25 feet on center. Strobes spacing shall be in accordance with NFPA 72.

For surface mounting, use manufacture-supplied back boxes and trim plates, which shall be painted Red or off White, and shall contain no visible conduit knock-outs. Mark each device with its circuit number.

manual stations

The operable part of the manual stations shall be installed not less than 3 ½ ft. (42") and not more than 4 ft. (48”) above finished floor. All Manual Stations shall be in unobstructed locations. Mark the unit’s address on the inside and outside of housing.

All manual pull stations shall be installed at the same height throughout the facility.

For surface mounting, use manufacture-supplied back boxes and trim plates. Back boxes shall be painted Red or Off-White and shall contain no visible conduit knock-outs. Mark each device with its loop and address.

During the installation of the new fire alarm systems, new pull stations should be covered or identified as not being operable so building occupants will not be confused as to which fire alarm pull station should be pulled during an alarm condition. Likewise, after the new system is installed, tested and accepted, the existing pull stations should be identified as not being operable (or permanently removed as soon as possible).

heat and smoke Detectors

The location of detectors shown on the plans is schematic only. The detectors must be located according to code requirements.

Surface mounted detectors shall be installed using back boxes equal to the base’s size. Standard octagon and square boxes are not acceptable.

Detectors should be located on the highest part of a smooth ceiling so that the edge of the detector is no closer than 4 inches from a sidewall. Ceilings with beams, joists or soffits that exceed 8 inches in depth require special planning and closer spacing.

If it is necessary to mount a detector upon a sidewall, the top of the detector (the sensing chamber portion of the device) shall be located no closer than 4 inches from the ceiling and no further away than 12 inches.

Smoke detectors should be installed to favor the air flow towards return openings and not located closer than 3 feet from air supply diffusers which could dilute smoke before it reaches the detector. No detectors shall be installed in direct airflow.

Duct smoke detector installation to be by this contractor and should be installed in the locations shown on the mechanical and electrical plans.  Ensure that the duct smoke detectors are in serviceable locations.  Consult with the mechanical designer for alternate locations if these are shown in non-serviceable locations.  When locations on mechanical plans are not available, install in locations called for that provide accessibility for service.  For duct smoke detectors that are associated with shaft smoke dampers, ensure the sampling tubes protruding into the duct are located within five feet of the smoke damper and there are no air inlets or outlets between the sampling tubes and the damper.  Do not install within four feet of a fan discharge.

Heat and smoke detectors should be located near the center of the open area which they are protecting, thus providing coverage generally for 15-foot radius for heat and smoke detectors. Questionable locations shall be verified with Architect or Engineer before installation takes place.

Heat and smoke detectors, both Intelligent and non-addressable, shall be installed in accordance with their UL Listed Spacing. The quantity of Heat and smoke detectors depicted on the drawings is based on the 900 square foot per detector rule. If detectors with significantly different spacing requirements are selected by the Fire Alarm equipment provider/contractor, then additional detectors, if required, shall be provided at no additional cost to the project.

# IDENTIFICATION

Attach the label containing the address and SLC designation to:

Each addressable detector. Label shall be visible and readable from the floor, 3/16” minimum character size (¼” is recommended).

Each manual pull station. Label shall be placed on the top part.

Each Addressable Module. Label shall be attached to the faceplate.

Label shall consist of black writing on white or clear background.

All fire alarm boxes shall be painted red and labeled "Fire Alarm" or “FA”. When red conduit is used for the fire alarm system installation, there is no need to paint the boxes. Non-factory device boxes shall also be painted red.

All circuits must be labeled with the name of circuit and the area being served by the circuit.

Wire/cable splices in junction boxes shall be labeled indicating where the wire/cable is coming from and where it is going.

All conductors terminated in control panels, annunciator panels and extension panels shall be labeled.

All audio-visual devices shall be labeled by each circuit and the order of the device on that circuit such as “Circuit No. 2, strobe No. 05 of 10”.

All labels shall be permanent, and be machine generated. NO HANDWRITTEN OR NON-PERMANENT LABELS SHALL BE ALLOWED. Submit a sample for approval before using any labeling schemes.

Label size shall be appropriate for the conductor or cable size(s) and design. All labels to be used shall be self-laminating, white/transparent vinyl and be wrapped around the cable (sheath). Flag type labels are not allowed. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminate over the full extent of the printed area of the label.

Adhesive type labels not permitted except for phase and wire identification.

# TESTING

Before proceeding with any testing, all persons, facilities and building occupants who receive alarms or trouble signals shall be notified by the contractor to prevent unnecessary response or building occupant distress. At the conclusion of testing, those previously notified shall be notified that testing has been concluded.

The manufacturer's authorized representative shall provide on-site supervision of installation of the complete fire alarm system installation, perform a complete functional test of the system, and submit a written report to the Contractor attesting to the proper operation of the completed system prior to final inspection.

Contractor shall pre-test every device in the system before the system is considered ready for final inspection.

The completed and pre-tested fire alarm system shall be fully tested in accordance with NFPA-72 by the Contractor in the presence of the Engineer, DFD representative, Owner's representative, the local Fire Marshal and Authorized Commercial Building Inspector.

The Engineer or his authorized representative may suspend or discontinue the tests at any time performance is considered unsatisfactory. Resumption of testing will cover untested elements and any replaced elements. The contractor shall furnish all test personnel, test instruments and equipment of the accuracy necessary to perform the test. Arrangements for testing must be made with the DFD representative and the Engineer at least two weeks before the proposed testing date.

Upon the completion of a successful test, and prior to the final request for payment the Contractor shall:

Certify the system to the Owner in writing.

Complete the NFPA 72 record of completion form.

Provide as-built and O&M manuals.

Provide a signed statement that the Owner had received the specified system operation and maintenance training and indicated spare parts.

# *final payment will not be processed unless these documents are complete and on-hand.*

# WARRANTY

The Contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of two (2) years from the date of substantial completion of the project.

At the end of the project, the Contractor shall post the warranty period along with the company’s name and telephone number inside the fire alarm panel.

Any occupied facility shall not be without a UL and an NFPA approved and fully operational fire alarm system for a period longer than two (2) hours. Emergency response shall be provided within two (2) hours of the notification, to the contractor, of the failure of the system to perform operationally per UL and NFPA standards. Non-emergency service calls shall be responded to within twenty-four (24) hours of the notification to the contractor.

Emergency situations may include, but not limited to:

System can’t be acknowledged or reset

System is non-responsive to commands

System in non-responsive to actuated alarm devices

Malfunction of notification/initiating circuit(s)

System going into alarm/trouble without indicating the source

System is dead (no power), etc.

Repairs and/or replacement arising from emergency situations shall be completed within twenty-four (24) hours of the time of notification. Other than emergency, actual repairs and /or replacement shall be provided within seventy-two (72) hours of the time of notification during normal working hours, Monday through Friday, excluding holidays. If the repairs involve parts that are not shelve items and require lead time, the contractor shall inform the Owner within twenty-four (24) hours from the time of notification of the exact time when the repairs will be completed.

If repair and/or replacement cannot be made within the prescribed time, then other means and methods of protection shall be provided to ensure the safety of the building’s occupants during which time the system is not in compliance with the standards. This may involve up to and include hiring Owner approved qualified personnel to stand a fire watch, all at the contractor's expense.

Warranty service for the equipment shall be provided by the system supplier's factory trained representative. Further, Warranty shall include all parts, labor, and necessary travel.

# training

All training provided for agency shall comply with the format, general content requirements and submission guidelines specified under Section 01 91 01, or 01 91 02. Keep both section numbers here.

The Contractor through his/her supplier shall provide, as part of this contract, training on the system operation for owner, the Architect/Engineer, and fire department personnel. The training shall consist of the following sessions:

Two (insert number hours for each session)-hour sessions for the purpose of training personnel who will need to operate the system – primarily, Level 1 and Level 2 system operators / users.

A single (insert number hours for each session)-hour session for the purpose of training personnel who will need to administrate and maintain the system. This training session shall familiarize these “power-users” with High-Level functions and shall also familiarize Electrical Department personnel with an overview of the as-built drawings and equipment configuration / basic troubleshooting.

All training sessions shall be coordinated and scheduled by the Contractor and shall be conducted at a time to be stipulated by the owner. All training and other indoctrination shall be completed prior to final inspection.

The contractor shall record all training and instructional sessions on an Agency-approved video format. Provide a video file for each system and label for the system demonstrated and turnover to the Owner.

Training shall not take place until all systems are 100% operational as determined by the Owner. The purpose of training is to fully prepare the facility maintenance staff for complete operational responsibility of the fire alarm system.

The facility maintenance staff shall be fully trained and be given the capability by the product Vendor and installing Contractor to modify, to program, to fully repair, to service, and to maintain the system after (and if desired, during) the warranty period.

The above training shall include, but not be limited to, providing and reviewing all programming software, access codes, and licenses that allow the Owner to add or to delete any points (i.e.: The mapping of devices), and to change a heat detector to a smoke detector. To meet this requirement, provide the necessary configuration and/or access code (hardware and/or software key). If the Vendor cannot meet this requirement, the product is not acceptable.

# SPECIAL CONSIDERATIONS

Contractor shall refer to Division 1, General Requirements, “SPECIAL SITE CONDITIONS".

Select the following if the project involves existing fire alarm systems.

[The contractor must maintain the existing fire alarm system operational during the construction period. During periods of construction where dust or dirt may contaminate the existing detectors, the contractor shall cover the detectors to avoid nuisance alarms and trouble-calls.

Individual zones and/or devices of the existing fire alarm system can be bypassed by the contractor during construction under the following requirements:

The Superintendent of Buildings and Grounds is notified of which zones and/or devices are inoperative and for how long in writing, hand delivered.

The contractor covers all manual-pull stations that are not active and post temporary fire alarm notification procedures next to each inactive manual-pull station.

Ensure the fire alarm system is fully operational before leaving the job site].

**CONSTRUCTION VERIFICATION**

Contractor is responsible for utilizing the construction verification checklists supplied under specification Section 28 08 00 in accordance with the procedures defined for construction verification in Section 01 91 01 or 01 91 02. Keep both section numbers here.

END OF SECTION