SECTION 28 3176 - FIRE ALARM/EMERGENCY COMMUNICATION SYSTEM

*******GENERAL NOTES*****

PART 1 - GENERAL

1.1 REFERENCES

A. The publications listed below form a part of this specification section to the extent referenced. The publications are referred to within the text by the basic designation only. Use the latest edition, unless noted otherwise.

B. ACOUSTICAL SOCIETY OF AMERICA (ASA)

1. ASA S3.2, (2009, R2014) Method for Measuring the Intelligibility of Speech Over Communication Systems (ASA 85)

C. ARCHITECTURAL BARRIERS ACT (ABA)

1. Architectural Barriers Act Accessibility Standard (ABAAS)

D. ASME INTERNATIONAL (ASME)

1. ASME A17.1, Safety Code for Elevators and Escalators

E. FM GLOBAL (FM)

1. FM Approval Guide

F. GENERAL SERVICES ADMINISTRATION

1. PBS-P100, GSA Facilities Standards for the Public Buildings Service.
2. PBS-P140, Child Care Center Design Guide
3. PBS Standard for PBS Cad Deliverables.

G. INTERNATIONAL CODE COUNCIL (ICC)

1. International Building Code® (IBC)
2. International Fire Code® (IFC)

H. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1. NFPA 4, Standard for Integrated Fire Protection and Life Safety System Testing
2. NFPA 70, National Electrical Code®
3. NFPA 72, National Fire Alarm and Signaling Code®
4. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems
5. NFPA 170, Standard for Fire Safety and Emergency Symbols
6. NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations

I. UNDERWRITERS LABORATORIES (UL)

1. UL 228, Door Closers and Holding Devices

2. UL 268, Smoke Detectors for Fire Protective Signaling Systems
3. UL 268A, Smoke Detectors for Duct Application
4. UL 464, Audible Signal Appliances
5. UL 497B, Protectors for Data Communications and Fire-Alarm Circuits
6. UL 521, Heat Detectors for Fire Protective Signaling Systems
7. UL 864, Control Units and Accessories for Fire Alarm Systems
8. UL 1449, Surge Protective Devices
9. UL 1480, Speakers for Fire Alarm, Emergency, and Commercial and Professional Use
10. UL 1481, Power Supplies for Fire Protective Signaling Systems
11. UL 1711, Amplifiers for Fire Protective Signaling Systems
12. UL 1638, Safety Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories
13. UL 2017, General Purpose Signaling Devices and Systems
14. UL 2075, Gas and Vapor Detectors and Sensors
15. UL Fire Protection Equipment Directory

1.2 NOTICE TO BIDDERS

A. Before submittal of bid, examine all drawings, specification, addenda, alternatives, special conditions, and all other bidding documents of all sections of this project, verifying all governing conditions at the site, and become fully informed as to the extent and character of the work required, as well as its relation to other work in the building. Submittal of a bid is an agreement to all requirements of the contract documents and no consideration will be granted for any claimed misunderstanding thereof.

B. Submittal of a bid is deemed a representation by the bidder that the contractor is qualified in all respects to properly perform the work for which he is bidding and has experience with similar work. Bidders are deemed to be aware, based on their background and experience, of materials which may be required in the discharge of their responsibilities, even though unspecified.

C. Where any code or standard referenced in this specification section refers to the Building Official, Fire Code Official, or Authority Having Jurisdiction for any fire protection or life safety interpretation or enforcement requirement, this refers to the GSA Regional Fire Protection Engineer.

D. References made in this specification section to the GSA Regional Fire Protection Engineer must be coordinated through the Contracting Officer's Representative (COR). The GSA Regional Fire Protection Engineer, or their designated representative, will review and approve all submittals noted in this specification section.

E. "Approved", as used in this specification section, means approved by the GSA Regional Fire Protection Engineer or their designated representative.

1.3 SUMMARY

A. Provide a new, complete, networked addressable fire alarm emergency communication system as described herein and on the contract drawings. The system must Include wiring, raceways

pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm and supervisory signal devices, alarm notification appliances, supervising station fire alarm system transmitter, elevator landing communication systems, and other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described.

B. Provide equipment, materials, installation, workmanship, inspection, and testing in strict accordance with the provisions of PBS-P100, NFPA 70, NFPA 72, NFPA 90A, NFPA 13, and NFPA 101, except as modified herein. The system layout on the Contract Drawings shows the intent of coverage and devices/equipment are shown in suggested locations. Final quantity, system layout and coordination are the responsibility of the Contractor.

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

1. Identification of programmable portions of system equipment and capabilities.
2. Description of system revisions and expansion capabilities and methods of implementation detailing both equipment and software requirements.
3. Provision of operational software data on all modes of programmable portions of the fire alarm and detection system.
4. Description of fire alarm control unit equipment operation.
5. Description of auxiliary and remote equipment operation.
6. Description of cybersecurity provisions.
7. Library of application software.
8. Operation and maintenance manuals.

D. Keys and locks for equipment must be identical. Provide not less than six keys of each type required. Master all keys and locks to a single key.

E. Fire Protection Quality Control (FPQC). Services of the FPQC must include:

*******NOTE*****

2. Provide a letter, signed by the FPQC, documenting that the submittal package has been reviewed and noting any outstanding comments.
3. Visit the project site during the installation as needed to verify the fire alarm system is being installed in accordance with approved shop drawings and this specification section.
4. Submit a written report for each site visit that includes a summary of current work activities and certification of compliance with project requirements.
5. The report must be submitted within 5 business days of the site visit to the GSA project manager for distribution and review.
6. Witness preliminary functional performance testing and perform a final installation review.

F. All system components must be listed for their intended use and must be compatible with the system and its components. Where the term “listed” appears in this specification section, it means UL-listed (UL Fire Protection Equipment Directory), FM-approved (FM App Guide), or listed by a nationally recognized testing laboratory (NRTL). The omission of these terms under the description of any item of equipment described must not be construed as waiving the requirement for listing or approval. All listings or approvals must be based on an existing ANSI, FM or UL published standard.

1.4 SUBMITTALS

A. Installation of the system is not permitted until qualifications, shop drawings, calculations and product data have been submitted and approved.

B. Qualifications: Submit one electronic copy in pdf format of the following, no later than 30 calendar days prior to shop drawing submittal, in accordance with the General Conditions of the Contract.

1. Certifications and qualifications for contractor and key personnel as noted in 1.5 QUALITY ASSURANCE.
2. Documentation must identify the location of three systems installed by the proposed installer which are comparable to the system specified. Contractor must certify, in writing, that each of the three installed systems has performed satisfactorily, in the manner intended, for a period of not less than 6 months.
3. Contractor qualifications must include key personnel contact information (i.e., project manager, designer, superintendent), previous similar project history, duration of experience, licenses, and any other relevant documentation.

C. Installation Documents: Submit three copies and electronic copy in pdf format of the following, no later than 21 days prior to the start of system installation, in accordance with the General Conditions of the Contract. Drawings, unless noted otherwise, must be no smaller than 22-inch by 34-inch.

1. Shop Drawings (Working Plans): Detailed drawings must be in accordance with the requirements prescribed in NFPA 72 and NFPA 170 for Working Plans and comply with PBS Standard for PBS Cad Deliverables. Drawings must include plan and elevation views which establish that the equipment will fit the allotted spaces with clearance for installation and maintenance. Each set of drawings must include the following:

a. System Layout: Plan view drawing showing equipment/device locations, terminal cabinet locations, junction boxes, other related equipment, conduit routing, wire counts, circuit identification in each circuit, and circuit and conduit layouts for all floors. Note any locations of exposed or surface-mounted conduit or backboxes. Drawings for systems requiring voice intelligibility must indicate all acoustically distinguishable spaces (ADS). Riser locations must be shown on drawings for confirmation of survivability requirements in PBS P100. All devices shown on plans and riser diagram must include device addresses. Drawings must comply with the requirements of NFPA 170.

b. Wiring Diagrams: Point-to-point wiring diagrams showing the points of connection and terminals used for electrical field connections in the system, including interconnections between equipment or systems that are supervised or controlled by the system. Diagrams must show connections from field devices to the Fire Alarm Control Unit (FACU) and remote fire control units, initiating circuits, switches, relays, and terminals. Provide complete riser diagrams indicating the wiring sequence of devices and their connection to the control equipment.

c. Sequence of operation, in matrix format, that describes how the system responds during an alarm, supervisory, and trouble condition. The description must include fire alarm control unit LEDs, audible and visible indications, initiating devices, notification appliances, and auxiliary functions (such as elevator recall, HVAC fan unit shutdown, SECURITY INTERFACE, carbon monoxide detectors, and smoke control system operation). The description must provide sufficient information so that the exact function of each installed device and appliance is known.

d. System Operation: A complete list of device addresses and corresponding messages.

e. Voice Message Matrix: Show the specific distribution of audio on each floor for fire alarm operations by providing an input/output matrix. The matrix must incorporate the following information:

   1) Fire alarm input from each floor with resulting output of fire alarm audio for each floor of the building. Floors with identical message output schemes may be shown together in the matrix. (for example, Input: Fire alarm activation for floors 7-26)
   2) Floor numbers listed in the matrix must be listed sequentially so that the matrix shows how the messages are distributed for partial evacuation or relocation.
   3) Exclusion of elevator cars and exit stairways from automatic messages. Manual audio selection switches must be provided for each exit stairway and elevator car.
   4) A listing of all messages being provided for this fire alarm system by message designator.
   5) The matrix must clearly show the pre-tone, pre-recorded message, and post-tone for all messages used.

f. Notification Appliances/Initiating Devices: Data on each circuit to indicate that there is at least 25 percent spare capacity for notification appliances and 25 percent spare capacity for initiating devices. Annotate data for each circuit on the drawings.

g. Amplifiers: Data to indicate that amplifiers have sufficient capacity to simultaneously drive all notification loudspeakers plus 25 percent spare capacity. Annotate data for each circuit on the drawings.

2. Product Data: Annotated catalog data showing manufacturer's name, model, and catalog number for all equipment and components to be considered for the project, as well as standby and alarm current for all initiation and notification appliances to verify calculations.

a. Fire alarm control unit (FACU), including manufacturers discontinuation dated or first manufactured date. See paragraph "Materials and Equipment".
b. Terminal cabinets
c. Manual fire alarm boxes
d. Batteries
e. Battery charger
f. Smoke detectors
g. Heat detectors
h. Carbon monoxide detectors
i. Wiring and cable
j. Notification appliances
k. Addressable interface devices
l. LCD (Remote) annunciator
m. Digital Alarm Communicator Transmitter (DACT)
n. Amplifiers
o. Tone generators
p. Digitized voice generators
q. Electromagnetic door hold-open devices
r. Line voltage surge protective devices
s. Auxiliary power (booster) panels
t. Two-way communication system
u. Remote call stations
v. Firestopping
w. Document and Records Cabinet

3. Calculations: Submit battery calculations as required in paragraph Battery Power Calculations. Submit a voltage drop calculation to indicate that sufficient voltage is available for proper operation of the system and all components, at a minimum rated voltage of the system operating on batteries.

D. Schedule: Provide a schedule indicating the delivery dates of equipment to be supplied; installation sequence; time frame and the total amount of on-site technical assistance time (in man-hours per phase) that the supplier of the equipment has included in their bid to comply with the requirements of this specification section.

E. Equipment List: Provide an equipment list identifying the type, quantity, make and model number of each piece of equipment to be provided under this submittal. The equipment list must include the type, quantity, make, and model of spare equipment. Types and quantities of equipment submitted must coincide with the types and quantities of equipment used in the

battery calculations and those shown on the shop drawings. A final equipment list must be submitted with the Operating and Maintenance (O&M) manual.

F. NFPA 241 – Construction Safety Plan: A construction / demolition fire safety plan must be developed in accordance with NFPA 241. The fire safety plan must, at a minimum, provide details on the methods for maintaining fire safety during the project and for addressing all time periods in which the existing fire alarm system is impaired as defined by NFPA 72.

G. Test Procedures: Submit detailed test procedures, prepared, and signed by the qualified test personnel for the detection and alarm system, 30 days prior to performing system tests. Detailed test procedures must be developed in accordance with NFPA 4 and list all components of the installed system such as initiating devices and circuits, notification appliances and circuits, signaling line devices and circuits, control devices/equipment, batteries, transmitting and receiving equipment, power sources/supply, annunciators, interface equipment, and transient (surge) protective devices. Test procedures must include sequence of testing, time estimate for each test, and sample test data forms. The test data form must be in a check-off format (pass/fail with space to add applicable test data, like the form in NFPA 72) and must be used for the preliminary testing and the acceptance testing. The test data forms must record the test results and must:

1. Identify the NFPA class of all initiating device circuits (IDC), notification appliance circuits (NAC), voice notification system circuits (audio), and signaling line circuits (SLC).
2. Identify each test required by NFPA 72 in “Test Methods” section and describe how this test must be performed.
3. Identify each component and circuit as to the type, location within the facility, and unique identity within the installed system.
4. Provide floor plan sheets showing each component location, test location, and alphanumeric identity.
5. Identify all test equipment and personnel required to perform each test (including equipment necessary for testing smoke detectors and carbon monoxide detectors).
6. Provide space to identify the date and time of each test. Provide space to identify the names and signatures of the individuals conducting and witnessing each test.

H. Test Reports: Submit three copies and one electronic copy in pdf format of the NFPA 72 Record of Completion and Inspection and Testing forms. Submit preliminary test reports as indicated in the paragraph “Preliminary Tests”. Submit final test reports with As-built drawings.

I. Redline As-Built Drawings: Maintain a separate set of approved submittal drawings of the overall system, redline marked-up to indicate as-built conditions, on site in a document storage cabinet. These drawings must be always in a current condition and must be made available for review immediately upon request during normal working hours. Redline drawings must be scanned (in color) to .pdf format and submitted a minimum of 7 calendar days prior to the final acceptance test of the system.

J. As-Built Drawings: Submit three copies and one electronic copy in pdf format, of as-built drawings and schematics no later than 14 calendar days after the final acceptance test. Variations from approved shop drawings, for whatever reason, including those occasioned by modifications, change orders, optional materials, or required for coordination between trades

must be indicated in sufficient detail to accurately reflect the as-built conditions. The drawings must include the following, at a minimum:

1. Complete wiring diagrams showing connections between devices and equipment, both factory and field wired
2. Riser diagram and drawings showing the as-built locations of devices and equipment
3. The system as installed, including deviations from both the project drawings and the approved shop drawings

K. Operation and Maintenance Data: Furnish three hard copies and one electronic copy in pdf format for the project specific operation and maintenance manual no later than 14 calendar days after the final acceptance test of the system. The operation and maintenance manual must be a single volume indexed in booklet form. Manuals must be submitted and approved prior to on-site training. In addition to items specified in Division 01 Section 017823 "Operation and Maintenance Data", the manuals must include the following documents and information at a minimum:

1. A general description of the design and operation of the system.
2. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. A copy of the design drawings in 11 x 17-inch format, folded neatly within the binder.
4. All applicable product installation sheets annotated, as necessary.
5. Step-by-step procedures required for system startup, operation, and shutdown.
6. The manufacturer's name, model number, service manual, parts list, and complete description of equipment and their basic operating features.
7. Maintenance manual listing routine maintenance procedures, possible breakdowns, and repairs, troubleshooting guide, and system warranty information.
8. Complete procedures for system revision and expansion, detailing both equipment and software requirements.
9. Software delivered for this project must be original software from the manufacturer provided on electronic media, no copies.
10. Printouts of configuration settings for all devices.
11. Routine maintenance checklist. The routine maintenance checklist must be arranged in columnar format. The first column must list all installed devices, the second column must state the maintenance activity or state not maintenance required, the third column must state the frequency of the maintenance activity, and the fourth column for additional comments or reference.

L. Training Documentation: Provide in manual format, lesson plans, operating instructions, maintenance procedures, and training data for the training courses. The operations training must familiarize the personnel designated by the Contracting Officer's Representative with the proper operation of the installed system. The maintenance training course must provide the designated personnel adequate knowledge required to diagnose, repair, maintain, and expand functions inherent to the system.

M. **[**Training Video: All training sessions must be video recorded by the contractor. Within **[___][**7**][**14**]** calendar days from the completion of all training sessions, the contractor must provide the Contracting Officer's Representative with an edited "draft" version of the recorded

training session. GSA will review the submission and provide Contractor with review comments. Within **[___][7][**14**]** calendar days from receipt of GSA's comments, the Contractor must provide the Contracting Officer's Representative with two first generation edited final versions of the recorded training session. The training session must be on media able to be viewed by any computer using a USB connection.

1. The video must begin by showing (white background with a block style font in black) the training title (General Overview or FACU Operation), building name, location, project title and number, and date of video production as well as the Fire Alarm/Voice communication system manufacturer and model number(s).
2. The video must conclude by showing a slide (white background with a block style black font) indicating "THE END".**]**

1.2 QUALITY ASSURANCE

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

B. Qualifications - Contractor: The Contractor must be a licensed Contractor in possession of a valid fire alarm Contractor's license. The Contractor must have a minimum of 5 years of experience in the installation of addressable fire alarm/emergency communication systems in similar facilities.

C. Qualifications - Design Services: Shop (working) drawings and calculations must be prepared under the direction of and signed by a qualified registered professional engineer or NICET Level IV in Fire Alarm Systems. For the purposes of this specification section, a qualified engineer is defined as an individual meeting one of the following conditions:

1. A registered professional engineer having passed the NCEES examination in fire protection engineering.

D. Qualifications - Fire Protection Quality Control (FPQC): A qualified engineer must supervise the installation, inspection, and any testing of the system.

E. Qualifications - Supervisor/Foreman: Fire alarm technician with a minimum of 6 years of appropriate (journeyman level) experience in fire alarm installation. A supervisor/foreman must be always on-site when work is being performed. The supervisor/foreman is permitted to perform installation tasks (i.e. working foreman). The supervisor/foreman must be factory-trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

F. Qualifications - Technician: Fire alarm technicians with a minimum of 4 years of experience can be utilized to assist in the installation and termination of fire alarm devices, cabinets, and control units. The fire alarm technicians installing the equipment must be factory-trained in the installation and adjustment of the equipment specified herein and on the drawings.

G. Qualifications - Installer: Fire alarm installer with a minimum of 2 years of experience is permitted to assist in the installation of fire alarm devices, cabinets, and control units. An electrician is permitted to install wire, cable, conduit, and backboxes for the fire alarm system.

H. Qualifications - Test Personnel: Fire alarm technicians with a minimum of 8 years of experience must be utilized to test and certify the installation of the fire alarm devices, cabinet, and control units. The fire alarm technicians testing the equipment must be factory-trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.

I. Project Superintendent: The Contractor, or Subcontractor, must provide one full-time, on-site staff member designated as the "Project Superintendent". The duties of the Project Superintendent are to supervise execution of all aspects of this specification, including safety on the job site as described in the "Accident Prevention Clause" of the general provisions of the Occupational Safety and Health (OSH) Act of 1970. That clause incorporates into the contract, by reference, the Secretary of Labor's OSH Standards (29 CFR Part 1926). Refer to Section 01 35 26 – Safety & Health for additional requirements. The Project Superintendent must be thoroughly familiar with all contract obligations and must have authority to make all contractual decisions within the scope of the contract.

1. The Project Superintendent must be responsible for making sure that quality control review has been performed on all submittals prior to the submission to the Contracting Officer's Representative OR Project Manager. The Project Superintendent must also be responsible for ensuring that all submittals are accurate, complete, and fully coordinated. Delegation of these duties does not remove the project superintendent from these responsibilities.

1.6 VERIFYING ACTUAL FIELD CONDITIONS

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

B. The Contractor must become familiar with all details of the work, verify all dimensions in the field including depth of all beams or similar ceiling obstructions throughout all floors or altered areas in existing buildings, and must advise the Contracting Officer's Representative of any discrepancy before performing the work.

C. Where core drilling is used, the wall or floor must be tested for potential obstructions prior to drilling.

1.7 COORDINATION OF TRADES

A. The contract documents are not intended to serve as coordinated construction drawings showing all minor adjustments in locations required for a fully coordinated installation that respects the work of all trades.

A. Conduit offsets, fittings, and any other accessories required must be furnished as required to provide a complete installation and to eliminate interference with other construction. Fire alarm devices must be coordinated with lights, HVAC diffusers, and other items installed in the ceiling or walls.

B. Field drilling and cutting of holes in structural decks, roofs, walls, etc. required for work under this specification section must be coordinated through various trades in their respective materials. All such drilling, cutting, and reinforcing costs must be borne by the Contractor.

C. Due to the type of installation, a fixed sequence of construction is required to properly install the complete systems. It must be the responsibility of the Contractor to coordinate, protect, and schedule his work with other trades in accordance with the construction sequence.

1.8 EXISTING FIRE ALARM SYSTEM

*******NOTE*****

D. A phased replacement approach requires that the existing fire alarm system be in full operational order, as outlined below, and that the design professionals incorporate an approved fire protection impairment plan into the design documents.

1. A phased replacement approach must only be permitted in buildings protected throughout with an automatic sprinkler system under the following conditions:

   a. The sprinkler system must be in service and remain in service for the duration of the fire alarm replacement project.
   b. The sprinkler system must be monitored by the existing fire alarm system until switched over per the phased plan.
   c. The sprinkler system must not have any deficiencies that require repairs or upgrades. If deficiencies exist, they must be resolved prior to a phased fire alarm replacement project.

2. A phased replacement approach must only be permitted if the existing fire alarm system is in a trouble-free state with no grounds, opens, shorts, or defective devices.
3. All wiring in the existing fire alarm system must be in raceway.
4. The existing riser Signaling Line Circuits (SLC) must be installed in a code compliant fashion and the number of conductors in the existing SLC risers must be sufficient to accommodate separation and reconfiguration of floor device circuits for networked Fire Alarm Control Units (FACUs).
5. New riser SLC circuits and terminal boxes must be installed in a manner that accommodates a cut-over of each floor's devices to a networked FACU.
6. 120VAC cable or wiring must not be present in the same raceway as Signaling Line Circuits or loudspeaker circuits in the existing system. A phased replacement approach must not occur if this condition exists within the existing fire alarm system.
7. A phase replacement approach is not permitted if additional strobes, loudspeakers, or combination loudspeaker/strobes are required or if existing NAC devices need to be relocated.
8. For a phased replacement approach, loudspeaker circuits on each floor must be capable of being transferred to an amplifier serving each floor. Likewise, strobe circuits on each floor must be capable of being transferred to a NAC power supply serving each floor.
9. New and existing FACUs must be integrated to assure proper notification of the entire building during regular business hours regardless of the progress of the project.
10. All functions required by this specification must operate and be maintained in full operational condition during normally occupied hours for this building.

E. Any phased replacement approach must be done under the strict guidelines of a fire protection impairment plan to assure that fire protection is maintained 24 hours a day, 7 days a week, for 365 days a year. Work to replace fire alarm components does not excuse the contractor from maintaining full fire protection within the facility. The fire protection impairment plan must comply with the following:

1. The plan must comply with the latest edition of the IBC section for Safeguarding Construction.
2. The plan must comply with Section 01 35 25, Fire Prevention and Protection in Construction, Alteration, and Demolition Projects.

3. An organized program of inspection of sprinkler and standpipe systems must be included within the plan to assure the operation and availability of both before any fire protection is impaired for work during the phased replacement project.
4. Fire watches assigned as a part of any impairment plan must be trained and have documentation of hands-on fire extinguisher training within the previous twelve months. Likewise, they must be trained on how to sound the alarm within the building during any impairment and to independently notify the public fire department of a fire emergency within the building. All fire watch personnel must have a direct means of communication with the project superintendent.
5. Hot work or open flames must not be permitted within the building during the fire protection impairment.

F. All parts of the existing fire alarm system including the devices and control unit, raceway, wire and wiring related materials must be properly disposed of off-site by the Contractor.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect equipment delivered and placed in storage from the weather, excessive humidity, temperature variation, dirt and dust, and other contaminants in accordance with manufacturer's instructions.

B. Coordinate the proposed storage arrangement and location with the Contracting Officer's Representative.

C. Deliver and store products in shipping containers/boxes, with labeling in place.

1.10 WASTE REMOVAL

A. At the conclusion of each day's work, clean up and stockpile on site all waste, debris, and trash, which may have accumulated during the day as a result of work by the Contractor and of his presence on the job. Remove all waste, debris, and trash from the building at the end of each day's work.

1.11 EXTRA MATERIALS

A. Repair Service/Replacement Parts: During warranty period, the service technician must be on-site within 24 hours after notification. All repairs must be completed within 48 hours of arrival on-site.

B. Interchangeable Parts: Spare parts furnished must be directly interchangeable with the corresponding components of the installed system. Spare parts must be suitably packaged and identified by nameplate, tagging, or stamping. Spare parts must be delivered to the Contracting Officer's Representative at the time of final acceptance testing.

C. Spare Parts: Furnish the following spare parts and accessories:

1. Four (4) of each initiating device and notification appliance installed.
2. Surge protective devices: Two low voltage, one telephone or ethernet, and one 120 VAC surge protective devices.
3. Two (2) of each addressable control module, relay module and monitor module installed.
4. Keys: A minimum of six sets of keys must be provided and appropriately identified.

D. Special Tools: Software, connecting cables, and proprietary equipment necessary for the maintenance, testing, and reprogramming of equipment must be furnished to the Contracting Officer's Representative.

E. Spare Parts Cabinet: A metal, locking cabinet, no less than 22 gage steel in black baked-on enamel must be provided and installed by the Contractor, adjacent to the main FACU or another location as directed by the Contracting Officer's Representative. The cabinet must be sized to hold all spare parts and one copy of the O&M manual and training manual. An inventory list must be made of all items to be kept inside the cabinet. Include on the list the number of all spare parts and keys to be provided. Give inventory list to the Contracting Officer's Representative during acceptance of the fire alarm system for verification of items in the cabinet. The Contracting Officer's Representative will sign off on the list when all items on the list appear in the cabinet. The cabinet must be provided with a permanent label stating, "FIRE ALARM SYSTEM SPARE PARTS".

F. Documentation Cabinet: A wall-mounted, metal, locking cabinet, no less than 22 gage steel, must be provided and installed adjacent to the main FACU or another location as directed by the Contracting Officer's Representative. Cabinet must be sized to fit all system record documentation. The cabinet must be prominently and permanently labeled "SYSTEM RECORD DOCUMENTS".

1.12 WARRANTY

A. Warranty and Guarantees: The contractor must comply with the requirements of FAR 52.246-21 Warranty of Construction. Final Acceptance includes, but is not limited to, successful final acceptance testing, the receipt of approved as-built drawings and the receipt of approved operation and maintenance manuals.

B. The contractor must furnish evidence that there is an experienced and effective service organization that carries a stock of repair parts for the system in order to readily effect repairs throughout the warranty period. Should the contractor fail to comply with the service requirements of this specification section, the Government may make the necessary repairs and back charge the contractor without any loss of warranty or guarantee as provided by the contract documents.

C. The contractor must provide a service organization, during the warranty period, that has an established office, which has been in existence for a minimum of 5 years and is so located where the response to the project site can occur within 2 hours or less. The service organization must be available 24 hours a day, 7 days a week for repairs during the construction and subsequent warranty period.

1.13 DOCUMENT SECURITY

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submitted to the Contracting Officer's representative. The system, method, or device must be approved for the intended purpose prior to being utilized. Systems, methods, or devices that are submitted for review after construction of the fire alarm system begins, may be summarily rejected due to contractual considerations or technical considerations.

2.3 SYSTEM OPERATIONS

A. The fire alarm/emergency communication system must be a complete, supervised, non-coded, networked, addressable fire alarm system conforming to PBS-P100, NFPA 72, UL 864, and UL 2017. The system must be activated into the alarm mode by actuation of any alarm initiating device. The system must remain in alarm mode until the initiating device is reset and the control unit is reset and restored to normal.

B. Functions and Operating Features: The system must provide the following functions and operating features:

1. The FACU must provide power, annunciation, supervision, and control for the system. Addressable systems must be microcomputer (microprocessor or microcontroller) based with a minimum word size of eight bits with sufficient memory to perform as specified.
2. Provide Class B initiating device circuits.
3. Provide Class B signaling line circuits for each floor.

*******NOTE*****

8. Pathway Survivability must be Level 1 for circuits as detailed on the drawings.

*******NOTE*****

16. The system must be capable of operating, supervising, and/or monitoring both addressable and non-addressable alarm and supervisory devices.
17. Where the fire alarm system is responsible for initiating an action in another emergency control device or system, such as an HVAC system, an elevator system or door unlocking, the relay or control module must be located within 3 feet of the component controlling the emergency control function, where the control circuit is not configured as a Class D circuit. For door unlocking, the component controlling the emergency control function is the door lock, not the central security panel.
18. An alarm signal must automatically initiate the following functions:

    a. Visual indication of the device operated on the fire alarm control unit, **[**and **]**on the annunciator**[**, and visual display unit (VDU)**]**.
    b. Transmission of an alarm signal **[**via point ID **]**to the remote supervising station**[** and US Marshal Service remote FACU**]**.
    c. Continuous actuation of alarm notification appliances.
    d. Recording of the event electronically in the history log of the FACU.
    e. Release of **[**door locks**][**turnstiles**][**door hold open devices**]**.
    f. **[**Operation of a smoke detector in an elevator lobby or other location associated with the automatic recall of elevators, must recall the elevators in addition to other requirements of this paragraph.**]**
    g. **[**Operation of a heat detector or waterflow switch serving an elevator machine room, top of shaft, or elevator must operate shunt trip circuit breaker(s) to shut down power to the elevators in accordance with ASME A17.1.**]**

19. A supervisory signal must automatically initiate the following functions:

    a. Visual indication of the device operated on the fire alarm control unit, **[**and **]**on the annunciator**[**, and visual display unit (VDU),**]** and sound an audible signal at the respective control unit.
    b. Transmission of a supervisory signal **[**via point ID **]**to the remote supervising station**[** and US Marshal Service remote FACU**]**.
    c. Recording of the event electronically in the history log of the FACU.
    d. Operation of a duct smoke detector must shut down the appropriate air handler in accordance with NFPA 90A in addition to other requirements of this paragraph and as allowed by NFPA 72. The relay or control module must remain latched until reset of the FACU.

20. A trouble condition must automatically initiate the following functions:

    a. Visual indication of the system trouble on the fire alarm control unit, **[**and **]**on the annunciator**[**, and visual display unit (VDU),**]** and sound an audible signal at the respective control unit.
    b. Transmission of a trouble signal **[**via point ID **]**to the remote supervising station**[** and US Marshal Service remote FACU**]**.
    c. Recording of the event electronically in the history log of the FACU.

21. The maximum permissible elapsed time between actuation of an initiating device and its indication at the FACU is 10 seconds.

22. The maximum elapsed time between the occurrence of the trouble condition and its indication at the FACU is 200 seconds.

2.4 FIRE ALARM CONTROL UNIT (FACU)

A. Provide a complete control unit fully enclosed in a lockable steel cabinet as specified herein. Operations required for testing or for normal care and maintenance of the system must be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete control unit, the cabinets must match.

1. Each control unit must provide power, supervision, control, and logic for the entire system, utilizing solid-state, modular components, internally mounted and arranged for easy access. Each control unit must be suitable for operation on a 120 VAC, 60 hertz, normal building power supply. Provide each control unit with supervisory functions for power failure, internal component placement, and operation.
2. Visual indication of alarm, supervisory, or trouble initiation on the fire alarm control unit must be by liquid crystal display or similar means with a minimum of 80 characters which are field programmable. Larger screens or touchscreens are acceptable if approved.
3. Provide secure operator console for initiating recorded messages, strobes, and displays, and for delivering live voice messages. Provide the ability to automatically repeat prerecorded messages. Provide a secure microphone for delivering live messages. Provide adequate discrete outputs to temporarily deactivate fire alarm audible notification and initiate/synchronize strobes. Provide local diagnostic information display and local diagnostic information and system event log file.
4. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control unit.
5. Provide an audible and visible trouble signal to activate upon a single break or open condition, or ground fault. The trouble signal must also operate upon loss of primary power (AC) supply, absence of a battery supply, low battery voltage, or removal of alarm or supervisory modules. Provide a trouble alarm silence feature that must silence the audible trouble signal, without affecting the visual indicator. After the system returns to normal operating conditions, the trouble signal must again sound until the trouble is acknowledged. A smoke detector in the process of being verified for the actual presence of smoke must not initiate a trouble condition.
6. Provide program capability via switches in a locked portion of the FACU to bypass the automatic notification appliance circuits, air handler shutdown**,** smoke control operation door hold-open release**,** door unlocking, electrically-controlled turnstiles, and elevator recall features. Operation of this programming must indicate this action on the FACU display.
7. Provide alarm verification capability for smoke detectors. Alarm verification must initially be set for 0 seconds.
8. The system must be capable of performing enable/disable functions for devices (points, addresses) from the control unit’s keypad. Programmed information must be stored in non-volatile memory.

B. Cabinet: Install control unit components in cabinets large enough to accommodate all components and also to allow ample gutter space for interconnection of units as well as field

wiring. The enclosure must be identified by an etched metal or plastic nameplate. Lettering on the nameplate must say “Fire Alarm Control Unit” and must not be less than 1-inch high. Provide prominent rigid plastic or metal identification plates for lamps, circuits, meters, fuses, and switches. The cabinet must be provided in a sturdy steel housing, complete with backbox, hinged steel door with cylinder lock, and surface mounting provisions. Cabinet(s) must be located within a minimum 100-square foot room with a minimum dimension of 8 feet and separated from the remainder of the building with 1-hour fire barriers.

C. Wiring: Connect circuit conductors entering or leaving the control unit to screw-type terminals with each terminal marked for identification. Locate diodes and resistors, if any, on screw terminals in the FACU. Circuits operating at 24 VDC must not operate at less than the UL-listed voltage at the detector or appliance connected. Circuits operating at any other voltage must not have a voltage drop exceeding 10 percent of normal voltage.

D. Silencing Switches:

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

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

F. Audible Notification System: The audible notification system must comply with the requirements of PBS-P100 and NFPA 72 for emergency voice/alarm communications, except as specified herein. The system must be a one-way multi-channel voice notification system incorporating use selectability of a minimum of eight distinct sounds for tone signaling, and the incorporation of a voice module for delivery of prerecorded messages. Audible appliances must produce a temporal 3 tone for three cycles followed by a voice message that is repeated until the control unit is reset or silenced. For activation of a carbon monoxide detector, audible appliances must produce a temporal 4 tone for three cycles followed by a voice message that is repeated until the control unit is reset or silenced. Automatic messages must be broadcast through loudspeakers throughout the building/facility. A live voice message must override the automatic audible output through use of a microphone input at the control unit.

1. When using the microphone, live messages must be broadcast throughout a selected floor or floors or all call. All call must include all elevator cars and exit stairways. The system must be capable of operating all loudspeakers at the same time. The microprocessor must actively interrogate circuitry, field wiring, and digital coding necessary for the immediate and accurate rebroadcasting of the stored voice data into the appropriate amplifier input. Loss of operating power, supervisory power, or any other

malfunction that could render the digitalized voice module inoperative must automatically cause the code 3 temporal tone to take over all functions assigned to the failed unit in the event an alarm is activated.

G. Voice Messages

1. **[**Partial Evacuation/Relocation Scenario: A partial evacuation / relocation scenario must be utilized, and the voice messages must be distributed as follows:

   a. The "Fire Zone" message must be broadcast through loudspeakers on the floor of alarm origin, the floor immediately above the floor of alarm origin, and the floor immediately below the floor of alarm origin, excluding elevator cars and exit stairways. In addition, the visual alarm notification circuit(s) must be activated on all floors receiving the "Fire Zone" message. A "first floor" alarm must transmit a "Fire Zone" message to all below grade floors. Any "basement level" alarm must transmit a "Fire Zone" message to all below grade floors in addition to the first floor.
   b. The "Fire Zone Message" must be provided by the GSA Regional Fire Protection Engineer and must be utilized without changes.
   c. For alarms originating from the sixth floor or above, the message provided must be:
      1) "May I have your attention, please! A fire has been reported which may affect your floor. Please walk to the nearest exit, walk down three floors, re-enter the building, walk onto the floor, and await further instructions. Please do not use the elevators."

   d. For alarms originating from the fifth floor or below, the message provided must be:
      1) "May I have your attention, please! A fire has been reported which may affect your floor. Please walk to the nearest exit and leave the building. Please do not use the elevators."

   e. The "Safe Area Zone" message must be simultaneously broadcast to all other building floors. However, the visual alarm notification circuits must not be activated on these floors. The "Safe Area Zone" message must activate for two complete rounds and silence automatically. After five minutes, the "Safe Area Zone" message must automatically start and activate for two complete rounds and silence again. This sequence must be repeated until the fire alarm system is reset, or the audible silence switch is activated on the FACU. In the event a subsequent fire alarm is received at the fire alarm control unit by a floor that was previously receiving a "Safe Area Zone" message, this floor, the floor above and the floor below must automatically revert to perform the actions for a "Fire Zone" message.
   f. The "Safe Area Zone" message provided must be:
      1) "May I have your attention, please! A fire has been reported in another area of the building. You are in a safe area. Please stay in your work area and await further instructions. Please do not use the elevators."**]**

2. **[**FULL BUILDING EVACUATION: A full building evacuation scenario must be utilized. All strobes must be activated, and the voice messages must be distributed as follows:

a. The “Fire Zone” message must be broadcast through loudspeakers throughout all floors of the building excluding the stairways and elevator cars. The “Fire Zone Message” provided must be:
   1) “May I have your attention, please! A fire has been reported which may affect your floor. Please walk to the nearest exit and leave the building. Please do not use the elevators.”**]**

H. Visual Notification System: Notification appliance circuits (NAC) must be provided for the activation of strobe appliances. The activation of the visual NAC circuits must follow the operation of the audible NAC circuits. The strobe NAC circuits must provide at least 2 amps of 24 VDC power to operate strobes and have the ability to synchronize all strobes.

I. Outputs and Operational Modules: All outputs and operational modules must be fully supervised with on-board diagnostics and trouble reporting circuits. Provide form C contacts for system alarm and trouble conditions. Provide circuits for operation of auxiliary appliances during trouble conditions.

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

K. Field Programmability: Provide control units that are fully field programmable for control, initiation, notification, supervisory, and trouble functions of both input and output. The system program configuration must be menu driven. System changes must be password protected and must be accomplished using personal computer-based equipment.

L. Input/Output Modifications: The FACU must contain features that allow the bypassing of input devices from the system or the modification of system outputs. These control features must consist of a control unit mounted keyboard. Any bypass or modification to the system must indicate a trouble condition on the FACU.

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

N. History Logging: The control unit must have the ability to store a minimum of 400 events in a log. These events must be stored in a battery-protected memory and must remain in the memory until the memory is downloaded or cleared manually. Resetting the control unit must not clear the memory.

O. Access: Access and control of the operating program must be restricted to proper personnel designated by the Contracting Officer’s Representative.

   1. The control unit must have a minimum of two security levels. Each level must have individual passwords. Illegal access attempts must be rejected by the system and must be displayed and recorded in the history file with time and date.
   2. The “First” security level must be the lowest security level and must only allow access to the system status levels and lists and must not impair system operation.

2.5 AMPLIFIERS, PRE-AMPLIFIERS, TONE GENERATORS

*******NOTE*****

*******NOTE*****

c. Manual command (alarm device with an associated command must use the same system address for both functions).
d. Report generation, definable by device, output on either the VDU or printer, as desired by the operator.
e. Activate building notification appliances.

2. Supervisory Level Access Functions

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

I. The above supervisory level functions must not require computer- programming skills. All changes to system programs must be recorded on the printer and maintained in the control panel as a trouble condition.

J. **[**Where an existing location for the VDU is not present, or if the existing furniture is not suitable for this application, provide a new desk/stand appropriate for the space to keep the VDU upon. Provide a new office chair with a back and casters for use with the desk and VDU.**]**

K. **[**Touch Screen Video Display Unit. Provide a Touch Screen VDU in compliance with the requirements for the fire alarm control unit video display unit, and in compliance with these additional requirements for a touch screen VDU (Typically for complex buildings such as high rises, large footprint buildings, multiple building campuses, special applications, etc.).

1. Provide a touch screen video display unit in the **[**Fire Command Center**][**fire alarm control unit room**]**. The touch screen VDU must communicate with the fire alarm control unit and must include color graphics that are identical to those used on the touch screen annunciator if one is present. The touch screen VDU must contain control functions software that operates in the identical manner as the main FACU. The requirements of the touch screen annunciator must be:

a. The touch screen VDU must require no more than four wires on the communication loop (two for communication, two for supervision) and two additional wires for power.
b. The touch screen VDU must have current CAD drawings of each level of the building and all fire alarm initiating devices must be correctly located on those drawings.
c. Each initiating device must indicate green for normal operation, yellow for trouble or off normal, and red for alarm on the drawing display when such a device is being displayed.
d. The display must allow for zoom out to full floor view or zoom in to individual device location.
e. There must be a toggle button on screen for all drawing levels that allow instant migration to the floor above or the floor below the floor currently being displayed on screen.
f. The touch screen VDU must be powered from the same conditioned sources as the FACU and must have emergency power provided.

g. Access to control functions for this VDU must be physically secured against access from unauthorized persons. Typically, this VDU will be behind a locked door for the Fire Command Center.

h. The touch screen unit must display English language text as the first screen after an initiating device is activated. Alarm messages must be distinctly different than all other messages on the system.

i. There must be an on-screen button which takes a person from the English language text message directly to the drawing which indicates the exact location of the alarm device activated. The display must automatically zoom into the area of the alarm device activated. Likewise, there must be an on-screen toggle which takes a person from a drawing back to the text message(s).

j. The video display must be 19 inches (500mm) diagonally or larger. Provide flat screen technology to avoid large protrusions or unnecessary use of space in the fire command room.

k. The video display must always display date and local time.**]**

2.8 DIGITAL ALARM COMMUNICATOR TRANSMITTER (DACT)

*******NOTE*****

permanent external indication which is readily visible. The UL 521 test rating of the fixed temperature portion must be 135 degrees F. The UL 521 test rating of the rate-of-rise detectors must be rated for 50 by 50 feet.

2.10 SMOKE DETECTORS

A. Photoelectric Smoke Detectors: Provide addressable photoelectric smoke detectors as follows:

1. Provide addressable photoelectric smoke detectors utilizing the photoelectric light scattering principle for operation in accordance with UL 268. Smoke detectors must be listed for use with the fire alarm control unit.
2. Provide self-restoring type detectors that do not require any re-adjustment after actuation at the FACU to restore them to normal operations.
3. Components must be rust and corrosion resistant. Vibration must have no effect on the detector's operation. Protect the detection chamber with a fine mesh metallic screen that prevents the entrance of insects or airborne materials. The screen must not inhibit the movement of smoke particles into the chamber.
4. Provide twist lock bases for detectors. The detectors must maintain contact with their bases without the use of springs. Provide a companion mounting base with screw terminals for each conductor. Terminate field wiring on screw terminals. The detector must have a visual indicator to show actuation.
5. **[**Dwelling unit smoke detectors must be provided with sounder bases. Sounder bases must be low frequency and produce a minimum of 90 dBA at 10 feet.**]**
6. The detector address must identify the particular unit, its location within the system, and its sensitivity setting. Detectors must be of the low voltage type rated for use on a 24 VDC system.
7. An operator at the control unit, having the proper access level, must have the capability to manually access the following information for each initiating device.

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Detector range (normal, dirty, etc.)

B. Duct Smoke Detectors: Comply with UL268A. Duct-mounted photoelectric smoke detectors must be furnished and installed where indicated and in accordance with NFPA 90A. Units must consist of a smoke detector as specified in paragraph Photoelectric Smoke Detectors, mounted in a special housing fitted with duct sampling tubes. Detector circuitry must be mounted in an enclosure exterior to the duct. Detectors must have a manual reset. Detectors must be rated for air velocities that include air flow between 500 and 4000 fpm. Detectors must be powered from the FACU.

2.11 CARBON MONOXIDE DETECTORS

A. Carbon monoxide detectors must comply with UL 2075 and be listed for connection to the fire alarm system. Detector must include an adapter plate for outlet box mounting. Detector must

provide alarm and trouble contacts and send a trouble signal when nearing end-of-life, power supply problems or internal faults. Detector must be testable by introducing test carbon monoxide into the sensing cell

2.12 ADDRESSABLE INTERFACE DEVICES

A. The system must be capable of defining any module as an alarm module and report alarm, trouble, loss of polling, or as a supervisory module, and reporting supervisory short, supervisory open, or loss of polling such as waterflow switches, valve supervisory switches, relays for outADut function actuation, etc. The monitor module must provide address setting means compatible with the control unit's SLC supervision and store an internal identifying code. Monitor modules must contain an integral LED that flashes each time the monitor module is polled and is visible through the device cover plate. Manual fire alarm boxes with a monitor module in a common backbox are not required to have an LED.

2.13 ADDRESSABLE CONTROL MODULE

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

2.14 ISOLATION MODULE

*******NOTE*****

E. After the wiring fault is repaired, the fault isolation modules must test the lines and automatically restore the connection.

2.15 MANUAL FIRE ALARM BOXES

A. Provide metal or plastic, semi-flush-mounted, double-action, addressable manual fire alarm boxes, which are not subject to operation by jarring or vibration. Fire alarm boxes must be equipped with screw terminals for each conductor. Fire alarm boxes that require the replacement of any portion of the device after activation are not permitted. Fire alarm boxes must be finished in fire engine red with molded raised white lettering operating instructions of contrasting color in English. The fire alarm boxes must mechanically latch after operation with a key or wrench reset feature. Fire alarm boxes must have a separate screw terminal for each conductor.

B. Manual fire alarm boxes installed in public areas located on the ground floor of a building must be equipped with an UL listed protective cover with a built-in warning horn that sounds when cover is lifted to gain access to the pull station.

2.16 NOTIFICATION APPLIANCES

*******NOTE*****

must be ground and finished to provide a smooth and neat appearance for each plate. Each plate must be primed and painted.

3. Loudspeakers must utilize screw terminals for terminations of all field wiring.
4. Loudspeakers used for acoustically challenging locations must be able to produce frequencies between 200 Hz and 10,000 Hz.

B. Fire Alarm Horns: Horns must conform to the applicable requirements of UL 464. Horns must be semi-flush-mounted with matching mounting backbox. Horns must produce a sound rating of at least 85 dBA at 10 feet. Horns used in exterior locations must be specifically listed for outdoor use and be provided with metal housing and protective grilles.

*******NOTE*****

D. Power supplies and any additional isolation equipment used must be permanently mounted in a fire alarm system cabinet and so located so that it may be reached and serviced by a person standing on the floor. Placement of the cabinet must be coordinated with the Contracting Officer's Representative**.**

2.18 REMOTE DEDICATED AMPLIFICATION (RDA)

A. Install the remote dedicated amplifier inside the secure area. The audio to the amplifier must be fed from a dedicated circuit. The amplifier must be sized to assume the entire load of the loudspeakers in the secure area plus an additional 25 percent spare power capacity for future expansion. Amplifier must comply with UL 1711

B. The amplifiers must be intelligent so that they reside on the existing addressable loop. The RDA must have the capability to be programmed to operate independently. The amplifiers must be housed in a separate enclosure and must be provided with a back-up amplifier and standby power. The loss of the loudspeaker (audio) circuit serving the RDA amplifier must cause a "trouble" condition on the RDA and the building. If an "alarm" occurs while the loudspeaker (audio) circuit is in "trouble" a back-up "alarm" tone must be generated to secure area served.

2.19 REMOTE SIGNAL MODULE (RSM)

A. Provide an addressable signal module inside the secure area that will use an existing loudspeaker circuit as the audio input to the module. The module must physically isolate the secure area loudspeakers from the existing loudspeaker circuits when the voice fire alarm system is not in alarm. The module must provide supervision of the secure area loudspeakers and report any abnormal conditions to the fire alarm control unit via the SLC. When an alarm condition or voice paging event occurs, the signal module must connect the loudspeaker/audio circuit secure area loudspeakers and a LED must light on the remote signal module (indicating that the secure loudspeaker circuit has been activated). The signal module must be rated and designed to accommodate the load of the secure area loudspeakers plus 25 percent specified spare capacity.

B. Each intelligent single input signal module must provide one supervised Class B loudspeaker circuit. The single input signal module must support the following operations: Audible/Visible signal power selector (polarized 24 Vdc @ 2 amps; or 25 volt audio (50 watts) or 70-volt audio (35 watts).

C. No more than two RSM's may be installed on any one audio (loudspeaker circuit). No more than 16 loudspeakers are permitted on each RSM circuit. Fire alarm loudspeakers conforming to this specification section must be used on the RSM circuits.

2.20 DIODE BLOCKING

A. The use of diode blocking in loudspeaker circuit privacy applications, where two diodes are connected in parallel in the loudspeaker line, is not an acceptable security application.

2.21 ELECTROMAGNETIC DOOR HOLD-OPEN DEVICES

A. Provide where shown on the drawings. Comply with UL 228. The armature portion must be mounted on the door and must have an adjusting crew for setting the angle of the contact plate. Mount the electromagnetic release on the wall or in a wall recess behind the door, except where no wall, then mount on floor. Total projection of the door holder release must not exceed 4 inches. Door holders must be powered by the fire alarm system (supervised 24 VDC) or building power (120 VAC).

2.22 PRIMARY ELECTRIC POWER

A. Power must be 120 VAC service for the FACU from the emergency or normal AC service to the building in accordance with NFPA 72. Coordinate with regional fire protection engineer on the use of existing fire alarm 120 VAC circuits.

2.23 SECONDARY POWER SUPPLY

A. Provide for system operation in the event of primary power source failure. Transfer from normal to auxiliary (secondary) power or restoration from auxiliary to normal power must be automatic and must not cause transmission of a false alarm.

B. Batteries: Provide sealed, maintenance-free, lead-acid batteries as the source for emergency power to the FACU. Batteries must contain suspended electrolyte. The battery system must be maintained in a fully charged condition by means of a solid-state battery charger.

1. Capacity, Fire Alarm System: Battery size must have sufficient capacity to operate the fire alarm system under supervisory and trouble conditions, including audible trouble signal devices for 24 hours and audible and visual signal devices under alarm conditions for an additional 15 minutes.
2. Battery Power Calculations: Verify that battery capacity exceeds supervisory and alarm power requirements. Substantiate the battery calculations for alarm, alert, and supervisory power requirements. Include ampere-hour requirements for each system component and each control unit component, and compliance with UL 864. Provide complete battery calculations for the alarm, alert, and supervisory power requirements. Include a 1.2 derating factor in all calculations.
3. For battery calculations use the following assumptions: Assume a starting voltage of 24 VDC for starting the calculations to size the batteries. Calculate the required amp-hours for the specified standby time, and then calculate the required amp-hours for the specified alarm time. Calculate the nominal battery voltage after operation on batteries for the specified time period.

C. Battery Chargers: Provide a solid-state, fully automatic, variable charging rate battery charger. The charger must be capable of providing 120 percent of the connected system load and must maintain the batteries at full charge. In the event the batteries are fully discharged (20.4 VDC), the charger must recharge the batteries back to 95 percent of full charge within 48 hours after a single discharge cycle as described in paragraph Capacity above.

2.24 SURGE PROTECTIVE DEVICES

A. Line voltage surge protective devices must be provided to suppress all voltage transients which might damage fire alarm system control unit components. The surge protective device must wire in series to the power supply of the protected equipment with screw terminations. Line voltage surge arrester must be installed directly adjacent to the power panel where the FACU breaker is located.

B. Line voltage surge protective devices for nominal 120 VAC must be UL 1449 listed with a maximum 500 volt suppression level and have a maximum response time of 5 nanoseconds. The surge protective device must feature multi-stage construction and be provided with a long-life indicator lamp (either light emitting diode or neon) which extinguishes upon failure of protected components. Any unit fusing must be externally accessible.

C. Surge protective device for nominal 24 VAC and for ethernet connection, must be UL 497B listed and have a maximum response time of 1-nanosecond. The surge protective device must feature multi-stage construction and be self-resetting. The surge protective device must be base and plug style. The base assembly must have screw terminals for fire alarm wiring or RJ45 connection for ethernet wiring. The base assembly must accept a “plug-in” surge protective module.

D. All surge protective devices (SPD) must be the standard product of a single manufacturer.

2.25 WIRING

A. Alarm Wiring: SLC and IDC wiring must be copper cable (solid or stranded) in accordance with the manufacturer’s requirements. Copper signaling line circuits and initiating device circuit field wiring must be No. 18 AWG size twisted conductors at a minimum. Notification appliance circuits (NAC) must be copper twisted cable and sized based on voltage calculations and manufacturer’s recommendations. NAC must be minimum No. 16 AWG. Shielded cable must be provided in accordance with manufacturer’s recommendations. Wire size must be sufficient to prevent voltage drop below manufacture’s recommendations. Power wiring, operating at 120 VAC minimum, must be a minimum of No. 12 AWG solid copper having similar insulation. Acceptable power-limited cables are FPL, FPLR, or FPLP as appropriate with red colored covering. Non-power-limited cables must comply with NFPA 70.

B. Network Wiring: Wiring between FACUs and remote FACUs must be copper cable or fiber optic in accordance with the manufacturer’s recommendations.

C. Use larger wire sizes when recommended by the manufacturer, based on actual system configurations. Wire size must be sufficient to prevent voltage drop problems. Circuits operating at any voltage must not have a voltage drop exceeding 10 percent of nominal voltage.

2.26 ENVIRONMENTAL ENCLOSURES OR GAURDS

A. Environmental enclosures must be provided to permit fire alarm components to be used in areas that exceed the environmental limits of the listing. The enclosure must be listed for the device or appliance as either a manufactured part number or as a listed compatible accessory for the

UL category that the component is currently listed. Guards required to deter mechanical damage must be either a listed manufactured part or a listed accessory for the category of the initiating device or notification appliance.

2.27 TWO-WAY COMMUNICATION SYSTEM

A. Listed as a system

B. Primary power must meet the requirements of the paragraph entitled “Primary Electrical Power”.

C. Secondary power must meet the requirements of NFPA 72 and the paragraph entitled “Secondary Power Supply”.

D. Master Control Station

1. Surface or Flush-mounted.
2. Ability to identify the specific location of each active Remote Call Station.

E. Remote Call Station

1. Flush-mounted.
2. Addressable device with integral push button.
3. Handsfree microphone and speaker.
4. Emit an audible tone when a call that it has initiated is received at the master station.

F. Wiring

1. Wiring and pathway survivability between the Master Control Station and the Remote Call Stations shall meet the requirements of this Specification section for wiring and pathway survivability of Signaling Line Circuits (match scope).

PART 3 - EXECUTION

3.1 DEVICE/EQUIPMENT INSTALLATION

A. FACU: Locate the FACU where indicated on the drawings. Mount the enclosure semi-flush, with the top of the cabinet 6 feet above the finished floor or center the cabinet at 4 feet, whichever is lower. Conductor terminations must be labeled with a heat shrink tube label.

B. Manual Fire alarm boxes: Locate manual fire alarm boxes as required by NFPA 72, IBC/IFC, and as modified by this paragraph.

1. Mount fire alarm boxes so that their operating handles are 4 feet above the finished floor.
2. Mount fire alarm boxes so they are located no farther than 5 feet from the exterior door they serve, measured horizontally.

3. Provide manual fire alarm boxes throughout the building, even where the building is protected throughout with an automatic sprinkler system.
4. Manual fire alarm boxes installed in public areas located on the ground floor of a building must be equipped with a listed protective cover with a built-in warning horn that sounds when cover is lifted to gain access to the pull station.

C. Notification Appliances: Locate notification appliances as required by NFPA 72 and IBC/IFC and as modified by this paragraph. Notification appliance circuits must not be installed in the same raceway with signaling line circuits.

1. Loudspeakers

a. Provide loudspeakers in all normally occupied rooms and spaces unless an engineering analysis demonstrates adequate sound levels will be achieved without appliances in each room or space. Loudspeakers shall be designed to be tapped at a ¼ Watt.
b. Loudspeakers must be installed in elevator cars and exit stairways; however, they must only be activated to broadcast live voice messages. The automatic voice messages must be broadcast through the fire alarm loudspeakers on the appropriate floors, but not in exit stairways or elevator cars.
c. Sensitive Compartmented Information Facility (SCIF): Loudspeakers must be self-amplified or remote dedicated amplification must be provided. Audio circuits are not permitted to penetrate the SCIF enclosure.
d. The Contractor must install a sufficient number of loudspeakers and adjust the tap settings to minimize the effects of reverberation and other interference in atria, large spaces with ceilings more than 14 feet above finished floor, or other unique acoustically distinguishable spaces,
e. Loudspeakers must be installed no higher than 14 feet above the finished floor.

2. Visible Notification Appliances

a. Unless the project includes a new fire alarm system or a complete replacement of an existing fire alarm system, visible notification appliances are not required to be installed in areas where visible notification appliances do not currently exist or where noncompliant existing visible notification appliances currently exist. This requirement does not preclude the addition of new visible notification appliances to existing fire alarm systems that contain existing compliant visible notification appliances.
b. Visible notification appliances must be installed only in public and common areas. For the purposes of this requirement, visible notification appliances are not required to be installed in individual offices. Public and common areas include, but are not limited to, public restrooms, reception areas, building core areas, conference rooms, and open office areas.
c. Visible notification appliances are not permitted to be installed in exit enclosures/stairways.

D. Heat Detectors: Locate detectors as required by NFPA 72, IBC/IFC, and their listing on a 4-inch backbox. Install heat detectors not less than 4 inches from a side wall to the near edge. Heat

detectors located on the wall must have the top of the detector at least 4 inches below the ceiling, but no more than 12 inches below the ceiling.

E. Smoke Detectors: Locate detectors as required by NFPA 72, IBC/IFC, and as modified by this paragraph. Smoke detectors are permitted to be on the wall no lower than 12 inches from the ceiling with no minimum distance from the ceiling. Install smoke detectors no closer than 5 feet from air-handling supply outlets.

1. Area smoke detectors must not be installed in any of the following rooms: mechanical equipment rooms, electrical rooms, telephone closets, and sprinklered emergency generator rooms.
2. Smoke detection appropriate for the application must be installed in each of the following: uninterruptible power service rooms, main electric rooms, transformer vaults, telephone exchanges, and information technology equipment rooms as required by PBS-P100. When smoke detection is installed in rooms having high voltage equipment, the smoke detection must not be installed directly above the high voltage equipment.
3. Smoke detectors used solely to initiate elevator recall must initiate an alarm signal, unless specifically approved to initiate a supervisory signal.
4. Smoke detectors located at doors for the exclusive operation of automatic door release must initiate an alarm signal, unless specifically approved to initiate a supervisory signal.
5. Smoke detection must be provided throughout Child Care Centers in accordance with GSA PBS-P140.

F. Duct Smoke Detectors: Duct smoke detectors and associated operations must be provided as outlined in NFPA 90A.

1. Sampling tubes must run the full width of the duct. The control functions, operation, reset, and bypass must be controlled from the FACU.
2. Lights to indicate the operation and alarm condition, and the test and reset buttons must be visible and accessible with the unit installed and the cover in place.
3. Remote indicators must be provided where required by NFPA 72 and these must be provided with key-operated test and reset switches.
4. Remote lamps and switches as well as the affected fan units must be properly identified in etched plastic placards.

G. Carbon Monoxide Detectors: Locate detectors as required by NFPA 72 and 720, IBC/IFC, and their listing on a 4-inch backbox.

H. Addressable Interface Devices: Must be mounted in a junction box or in a locked cabinet.

I. Remote Annunciator: Locate the remote annunciator as shown on the drawings. All fire alarm systems must have at least one remote annunciator located in plain view within 25 feet of the primary fire department entrance to the building. Flush-mount the unit with the top 6 feet above the finished floor or center the unit at 4 feet, whichever is lower.

J. DACT: Provide all equipment, programming, software, etc., to accomplish these functions and transmit alarm, supervisory and trouble point ID signals.

K. End of Line Device: End of line (EOL) devices must be provided as required by the manufacturer's wiring installation manual. End of line devices must reside with the last device on each circuit and must not be extended to some other junction box. The last device on each circuit and the end of line device must not be installed in secure spaces or difficult to access spaces such as vaults, judge's chambers, court rooms, confined spaces, private offices, detention facilities, commercial kitchens, or secured office spaces. End of line devices must be in public spaces accessible to fire alarm technicians. Each fire alarm device housing an end of line device must be marked with approved labeling to show "EOL" and the circuit for the EOL.

L. Master Call Station

1. Locate as indicated on the drawings.
2. Flush mount the enclosure with the center of the cabinet at 4 feet.
3. Conductor terminations must be labeled with a heat shrink tube label.

M. Remote Call Station

1. Locate as indicated on the drawings.
2. Flush mount the enclosure with the push to talk button 4 feet above the finished floor.

N. Instructions: Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the instructions on the wall adjacent to the FACU. The card must show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions; normal, alarm, supervisory, and trouble. The instructions must be approved before being posted.

3.2 SYSTEM MONITORING

A. Valves: Each valve affecting proper operation of a fire protection system, including automatic sprinkler control valves, standpipe control valves, sprinkler service entrance valve, and valves at backflow preventers must be electrically monitored to ensure its proper position. Provide each tamper switch with a separate address.

B. Electric Fire Pump: The fire pump system must be monitored by the fire alarm system for the following conditions: fire pump running, loss of phase, alternate power source, alternate power isolating switch open, and phase reversal. Each condition must be provided with a separate address.

C. Diesel Fire Pump: The fire pump system must be monitored by the fire alarm system for the following conditions: fire pump running, control main switch not in auto, and controller/engine trouble.

D. Fire Suppression Releasing System: The fire suppression releasing system must be monitored by the fire alarm system for the following conditions: system activation, supervisory, and trouble. Each condition must be provided with a separate address.

E. Emergency Generators: Generators must be monitored by the fire alarm system for the following supervisory conditions: generator running, generator fault, generator in non-automatic position.

F. Emergency Radio Communication Enhancement System (ERCES): ERCES must be monitored by the fire alarm system for the following conditions: loss of normal AC power supply, battery charger(s) failure, malfunction of the donor antenna(s), failure of active RF-emitting device(s), low-battery capacity at 70% reduction of operating capacity, failure of critical system components, failure of the communications link between the FACU and the ERCES and oscillation of active RF-emitting devices.

3.3 SYSTEM FIELD WIRING

A. Wiring within Cabinets, Enclosures, and Boxes: Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure, or cabinet. Conductors that are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting, or junction box must be connected to screw-type terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. The use of wire nuts or similar devices is prohibited. Wiring must conform to NFPA 70.

B. Terminal Cabinets: Provide steel terminal cabinets with locking, hinge mounted doors in which terminal strips are securely mounted. Terminal size must be appropriate for the size of the wiring to be connected. Minimum size is 8 inches by 8 inches. Only screw-type terminals are permitted. Terminal cabinets must be installed on each floor at the supply riser, and where indicated on the drawings.

C. Alarm Wiring: Voltages must not be mixed in any junction box, housing, or device, except those containing power supplies and control relays. For shielded wiring, ground the shield at only one point that is in or adjacent to the FACU. Pigtail or T-tap connections to signal line circuits, supervisory alarm circuits, and notification appliance circuits are prohibited. Color coding is required for circuits and must be maintained throughout the circuit. Conductors used for the same function must be similarly color coded.

D. Conduit: Install all conductors in rigid metal conduit or electrical-metallic tubing with a minimum diameter of ¾-inch. Provide all new conduit unless specifically noted otherwise on the drawings. Electrical metallic tubing must use steel compression type fittings and couplings. The use of flexible metal conduit not exceeding a 6-foot length is permitted for connection to initiating devices and notification appliances. Run conduit or tubing (rigid, IMC, EMT, FMC, etc., as permitted by NFPA 72 and NFPA 70) concealed unless specifically indicated otherwise on the drawings. Conduit may be exposed in unfinished mechanical/electrical rooms, basement, mezzanine, and penthouse levels.

E. Conductor Terminations: Labeling of conductors at terminal blocks in terminal cabinets and at the FACU must be provided at each conductor connection. Each conductor or cable must have a heat shrink-wrap label to provide a unique and specific designation. Each terminal cabinet, FACU, NAC panel and remote FACU must contain a laminated drawing that indicates each conductor, its label, circuit, and terminal. The laminated drawing must be neat, using 12-point

lettering minimum size, and mounted within each cabinet, panel, or unit so that it does not interfere with the wiring or terminals.

F. The conductors for the notification appliance circuits must not be installed in the same raceway as the conductors for the signaling line circuits unless permitted by NFPA 70.

G. Exposed raceways must be run parallel and perpendicular to the walls and ceilings. Wherever practical, exposed raceways must be run on the ceiling as close as possible to a wall or as high as possible on a wall. Where exposed raceways must cross under a structural beam or rib, they must be run down on one side of the beam or rib, across its bottom, and up to the ceiling on the other side of the beam or rib. No spanning from beam to beam or rib to rib must be permitted. The use of a raceway body on one side of a beam or rib is permitted provided it is accessible. The method and location of all exposed raceways must be approved prior to start of any installation work.

H. Circuit disconnecting means (circuit breaker) must have a red marking, be lockable, accessible only to authorized personnel, and identified as “FIRE ALARM CIRCUIT CONTROL”. The location of the circuit disconnecting means must be permanently identified on a nameplate installed on the inside of the FACU.

I. All fire alarm wiring (SLC, IDC and NAC) must be provided with a surge suppression device within 3 feet of the location where it leaves or enters the building. Surge suppression devices must be installed in an enclosure where they are subject to damage.

3.4 FIRESTOPPING

A. Provide firestopping for holes at conduit penetrations through fire-rated assemblies in accordance with Section 07 84 00 Firestopping.

3.5 PAINTING AND LABELING

A. Exposed conduit: In finished areas, paint exposed electrical conduit (serving fire alarm equipment), fire alarm conduit, surface metal raceways, junction boxes, and electrical boxes to match adjacent finishes. The inside cover of the junction box must be identified as “Fire Alarm” and the conduit must have painted red bands ¾-inch wide at 10-foot centers and at each side of a floor, wall, or ceiling penetration.

B. Concealed conduit: All concealed conduit, junction boxes and back boxes must be factory painted red.

C. Addressable device labeling: Each addressable device must be labeled with permanent labels indicating the device’s digital address.

D. Labeling adhere to the following requirements:

1. A font size of 22-point.
2. Labels shall utilize black letters on a white with enough contrast to be easily legible.

3. Both sides of the base for ceiling-mounted devices.

E. Single ½-inch labeling must be placed on the following devices:

1. Manual fire alarm boxes; state the digital address of the device. Mount the label at the top of the manual fire alarm box.
2. Detector bases; two sides with ½-inch (12 mm) labels. Labels must have the digital address on each.
3. Where a single detector is in a room, with 10 feet or less of depth from the door to the opposite wall and 100 square feet or less of floor area, only one label must be required on the detector in the most visible location from the floor.
4. Duct detector housings labels must each have the digital address, as well as the air handling unit number or designation and type of duct served (e.g., supply, return, transfer, exhaust).
5. Addressable interface devices with each device's digital address.
6. End of line devices must additionally have the term "EOL" on their label if the digital address indicates the circuit the EOL is on. If the digital address does not indicate the circuit for the EOL, then a separate label with "EOL" and the circuit designator must be applied to the device exclusive of the device's digital address label.
7. Remote alarm indicators must have the location of the detector and the area protected by the detector prominently indicated at the remote alarm indicator by a permanently attached placard or other approved means. Remote supervisory indicators must be clearly labeled to indicate both their function and any device or equipment associated with each detector (e.g., air handling unit number or designation and type of duct served).

3.6 MOCKUPS FOR AUDIBLE VOICE INTELLIGIBILITY IN ACOUSTICALLY DISTINGUISHABLE SPACE

*******NOTE*****

E. The contractor must demonstrate the proposed optimal configuration for sound pressure level and intelligibility proposed for the specific condition and location for final installation. Mockups must verify acceptability of the systems and demonstrate aesthetic effects of material installation.

F. Where the mockup fails to produce the intended results, alternate plans must be developed by the contractor and retested until the system performs as required. This work is to be performed by the Contractor at no additional cost to the Government.

3.7 PRELIMINARY TESTS

A. The contractor must conduct preliminary tests to ensure that all devices and circuits are functioning properly. Test the system in accordance with the requirements of NFPA 4 and NFPA 72.

B. The contractor and FPQC must be in attendance at preliminary testing to make necessary adjustments. After preliminary tests are complete, and any necessary corrections made and retested, submit a signed letter that the installation is complete, compliant with the specification and fully operable. The letter must include the names and titles of the witnesses to the preliminary tests. Final acceptance testing will not be performed until after the connections to the building fire alarm system are complete. Submit a request for a test at least 15 calendar days prior to the requested test date. Provide, with the letter, all completion documentation in accordance with NFPA 72 and the test reports noted below.

   a. Redline shop drawings provided in electronic format (.pdf).
   b. Audibility test results with marked-up test floor plans.
   c. Complete program printout including input/output addresses.
   d. Intelligibility test results with marked-up floor plans.

C. Minimum System Tests. The required tests are as follows:

   1. Verify the absence of unwanted voltages between circuit conductors and ground. The tests must be accomplished at the preliminary test with results available at the final acceptance test.
   2. Verify that the control unit is in the normal condition as detailed in the manufacturer’s O&M manual.
   3. Test each initiating device and notification appliance and circuit for proper operation with response at the control unit.
   4. Disconnect the verification feature for smoke detectors during tests to minimize the amount of smoke needed to activate the detector.
   5. Smoke detectors must be tested in accordance with the manufacturer's recommended test method. Use of magnets is prohibited.
   6. Testing of duct smoke detectors must comply with the requirements of NFPA 72 and include pressure differential measurements in accordance with the manufacturer’s recommendations. Pressure differential test results must be included in the Test Report.
   7. Verify receipt of all point ID signals at the remote supervising station.
   8. Test the system for specified functions in accordance with the contract drawings and specification and the manufacturer’s O&M manual.

9. Test both primary and secondary power. Verify, by test, the secondary power can operate the system for the time period and in the manner specified.
10. Determine that the system is operable under trouble conditions as specified.
11. Visually inspect wiring for compliance with applicable circuit class.
12. Test battery charger and batteries.
13. Verify that software control and data files have been entered or programmed into the FACU. Hard copy records of the software must be provided to the Contracting Officer's Representative.
14. Verify that red-line drawings are accurate.
15. Measure the voltage drop at the most remote audible notification appliance (based on wire length) on each notification appliance circuit.
16. Open each SLC, IDC and NAC circuit to test the wiring supervisory feature.
17. Audibility Tests: Test all notification appliances to ensure sound pressure levels from audible notification appliances are a minimum of 15 dBA over ambient (ambient is 55 dBA for office spaces) with a maximum of 110 dBA in any occupiable area. The provisions for audible notification (audibility and intelligibility) must be met with doors, fire shutters, movable partitions, and similar devices closed.
18. DACT Specific Tests: The following specific tests must be performed for any DACT utilizing the GSA IP network and/or GSM as a means of transmission. These tests are in addition to any required DACT testing required per NFPA 72.

    a. Prior to testing:
        1) Verify contractor has completed form GSA 1260-22B "Security Resolution Certificate for Fire Alarm Communicators".
        2) Verify that the descriptors at FACU for signals received from the DACT are not generic in nature (e.g., cellular dialer AC fail).
        3) Verify that the Ethernet cable installed from the FACU to the cellular (GSM) communicator(s) has been installed in rigid metal conduit or electrical-metallic tubing with a minimum diameter of 3/4-inch to protect against any physical or mechanical damage.
        4) Verify any changes to encryption did not cause any issues with FACU by causing a trouble signal and determining which specific equipment (i.e., DACT or fire alarm control panel) is causing the trouble condition (account # for DACT and account # for fire alarm control panel).
        5) Verify that the AES 256 encryption on the DACT and the encryption at the receiver at the supervising station matches.

    b. With the DACT in standby mode, verify the successful status of LEDs display indications on the DACT for normal operations, cellular signal strength and trouble.

    c. AC Failure (If DACT is not integral to FACU)
        1) Remove AC power from the DACT
        2) Verify the successful transmission of a Trouble signal (must distinguish from fire alarm trouble) at the FACU within 200 seconds.
        3) Verify the successful transmission of the power failure trouble signal (must distinguish from fire alarm trouble) at supervising station.
        4) Verify Indication of DACT Trouble on FACU display

d. Battery Backup (If DACT is not integral to FACU)
   1) Disconnect Battery from the DACT
   2) Verify the successful transmission of a Trouble signal (must distinguish from fire alarm trouble) at the FACU.
   3) Verify the successful transmission of the battery missing trouble signal (must distinguish from fire alarm trouble) at supervising station.
   4) Verify indication of DACT Trouble on FACU Display

e. Primary and alternate signal loss Test with Transmission of Fire Alarm Signals Individually (i.e., alarm, trouble & supervisory) to the Supervising station
   1) Remove both antennas from the primary DACT.
   2) To verify Cellular transmission failure, the signal strength light must either be red or no light.
   3) Verify successful transmission of a trouble signal to the FACU.
   4) Verify successful transmission of a trouble signal to the supervising station.
   5) Verify successful transmission of fire alarm signals individually (contact ID transmission for each signal) to the FACU.
   6) Verify successful transmission of fire alarm signals individually (contact ID transmission for each signal) to the supervising station via the alternate cellular pathway communicator.
   7) Verify indication of DACT trouble on FACU Display.
   8) Repeat for alternate pathway.

19. Intelligibility Tests: Intelligibility testing of the system must be accomplished in accordance with NFPA 72 for Emergency Communication Systems, and ASA S3.2. Intelligibility requirements:

    a. Verify intelligibility by measurement after installation.
    b. Ensure that an STI value greater than the required minimum value is provided in each area where building occupants typically could be found. The minimum required STI value 0.7.
    c. Areas of the building provided with hard wall and ceiling surfaces (such as metal or concrete) that are found to cause excessive sound reflections may be permitted to have an STI value less than the minimum required value if approved by the GSA Regional Fire Protection Engineer, and if building occupants in these areas can determine that a voice signal is being broadcast and they must walk no more than 33 feet to find a location with at least the minimum required STI value within the same area.
    d. Areas of the building where occupants are not expected to be normally present are permitted to have an STI value less than the minimum required value if personnel can determine that a voice signal is being broadcast and they just walk no more than 50 feet to a location with at least the minimum required STI value within the same area.
    e. Take measurements near the head level applicable for most personnel in the space under normal conditions (e.g., standing, sitting, sleeping, as appropriate).

f. The distance the occupant must walk to a location meeting the minimum required STI value must be measured on the floor from any point subject to occupancy with less than the minimum required STI value; curving around any corners or obstructions with a 12-inch clearance therefrom; terminating directly below the location where the minimum required STI value has been obtained.
g. Use commercially available test instrumentation to measure intelligibility. Use the mean value of at least three readings to compute the intelligibility score at each test locations.

20. Two-way communication system

a. Test each remote call station to ensure proper annunciation at the master control station.
b. Verify proper receipt and annunciation of each remote call station at the master control station.
c. Verify two-way communication from remote call station to master control station and vice-versa is audible and able to be understood.

3.8 FINAL ACCEPTANCE TEST

A. The contractor must ensure that representatives of all installing contractors, manufacturers, designers, GSA associates, and tenants necessary to perform any and all testing are present for the final acceptance testing. Any delays or additional costs in testing or repeated testing necessary to complete this requirement because representatives were not on site for testing is not the responsibility of the Government.

B. Final acceptance testing must be coordinated and performed by the contractor, in the presence of the Contracting Officer's Representative and the GSA Regional Fire Protection Engineer, or their designated representative. The test must not be conducted until all parties agree on the scheduled test date. The contractor must provide all the necessary personnel and equipment to conduct the tests.

C. Any and all required tests noted in the paragraph "Preliminary Test" must be repeated at the discretion of the GSA Regional Fire Protection Engineer, or their designated representative.

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

1. Any such repeated tests as required by the Government must be done at no additional expense to the Government.
2. Repeated testing expenses must be borne by the contractor and include but not be limited to, contractor's direct and indirect expenses for repeating the testing, travel and professional expenses for GSA fire protection engineers, technicians, contracting officers, contracting officer's representatives, project managers and facility managers, or their designated representatives, and any other expense necessary to repeat final acceptance testing as required by this contract.

E. The contractor must perform all testing in occupied facilities at times of day that present the lowest impact and disruption to Government business and activities. Coordinate all testing in occupied buildings with the Facility Manager to ensure that fire alarm system testing does not interrupt Government operations. This may require extensive after hours or weekend work to perform such testing.

F. Damage done to the facility from improper testing is the responsibility of the contractor and is not an acceptable reason for schedule delays or additional costs to the Government.

G. Upon satisfactory completion of the tests, the contractor must leave the system in proper working order.

H. Warranty: Except as otherwise expressly provided in the contract documents, the contractor must guarantee all work to be free of all defects of workmanship and materials for the warranty period after final acceptance of the work by the Contracting Officer's Representative. Include service directory with telephone numbers for 24-hour emergency service.

3.9 TRAINING

A. Instructor: Training must be performed by an instructor, manufacturer trained regarding the inspection, testing and maintenance of the system installed. The instructor must train the Government employees designated by the **[**Contracting Officer's Representative**] [**Project Manager**]**, in the care, adjustment, maintenance, and operation of the fire detection and alarm system.

B. Required Instruction Time: Provide **[**4**][**8**]** hours of instruction after final acceptance of the system. The instruction must be given during regular working hours on such dates and times as selected by the Contracting Officer's Representative. The instruction may be divided into two or more periods at the discretion of the Contracting Officer's Representative.

C. General Overview: This portion of the training is primarily for building personnel who are arriving at the main Fire Alarm panel during the initial stages of an incident; these persons may include the Facility Manager(s), building security staff/guards, and/or building operating engineers. Training must, at a minimum, include the following:

1. Actions to take upon receiving a fire alarm, supervisory alarm, or trouble signal (i.e., how to acknowledge, reset, silence building alarms, silence local panel alarms).
2. How the system will automatically respond based on the various types of devices installed throughout the building such as, but not necessarily limited to: manual fire alarm boxes, sprinkler activation, elevator lobby and machine room smoke detectors, HVAC duct smoke detectors, kitchen hood extinguishing systems, sprinkler control valve tamper switches and fire pump monitoring signals.
3. Operation of the voice communication system and how it is incorporated into the fire alarm system. Operation must include manual voice paging announcements, all-call, selective areas (floors), overriding automatic messages and use of pre-announcement tones.
4. **[**Operation and capabilities of the firefighter's phone system.**]**

5. **[**Operation of the Video Display Unit and any touch screen or other software driven display works and the capabilities of these features. Video recording must clearly show operation of the video display unit, changes in displays based upon receipt of signals and how to locate devices in alarm, supervisory or trouble conditions.**]**

D. **[**FACU Operation: This portion of the training is primarily for building operating engineers/technicians. Training must, at a minimum, include the following:

1. Operation of the override/bypass switches which are programmed into the panel (elevator recall bypass, HVAC shutdown bypass, etc.) and the procedure to activate and deactivate such switches.
2. Thorough description of the LCD display touch screen system, the procedures to navigate through the various built-in menus, and instruction on how to print reports and other capabilities of the LCD display screen system.
3. **[**Procedures to use the VDU to perform the functions of the fire alarm control unit including, but not limited to, disable/reenable devices/points, perform smoke detector sensitivity testing, print status logs, and print device program listing.**]**
4. When a qualified fire alarm system technician is required to be utilized to perform repair/diagnosis of problems that should not be remedied by in-house personnel.
5. Type of periodic required inspection, testing and maintenance that is required to be performed by qualified personnel based on the requirements of NFPA 72 and the manufacturer's recommendations.
6. A brief overview of the submitted Operation & Maintenance manuals and how they should be used by building maintenance personnel.
7. System programming is not to be included in this training**.]**

E. **[**Two-way Communication System: This portion of the training is primarily for building personnel who may be located at the receiving unit for the two-way communication system; these persons may include the Facility Manager(s), building security staff/guards, and/or building operating engineers. Training must, at a minimum, include the following:

1. Action to be taken at the main receiving station when the call box is activated.

END OF SECTION **[**28 3176**][**28 3164**]**