

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>			1. CONTRACT ID CODE	PAGE 1 OF 1 PAGES
2. AMENDMENT/MODIFICATION NO 02	3. EFFECTIVE DATE 05/21/09	4. REQUISITION/PURCHASE RFO NO	5. PROJECT NO (if applicable)	
6. ISSUED BY National Aeronautics and Space Administration Ames Research Center Moffett Field, CA 94035-1000		7. ADMINISTERED BY (if other than Item 6)		
8. NAME AND ADDRESS OF CONTRACTOR (No Street county State and ZIP Code)			(4)	9A. AMENDMENT OF SOLICITATION NO NNA09273580R
			XX	9B. DATED (SEE ITEM 11) 05/08/09
				10A. MODIFICATION OF CONTRACT/ORDER NO.
				10B. DATED (SEE ITEM 13)
CODE	FACILITY CODE			

**11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS**

The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers  is extended,  is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning one (1) copy of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATA SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and data specified.

12. ACCOUNTING AND APPROPRIATION DATA (if required)

**13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.**

(4)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT/ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER: Specify type of modification and authority)

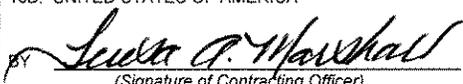
E. IMPORTANT: Contractor  is not,  is required to sign this document and return \_\_\_ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Subj: Collaborative Support Facility, Building N232 at NASA Ames Research Center, Moffett Field, CA

Technical changes and/or alterations are hereby issued with this amendment.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)	
		Teresa A. Marshall	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
(Signature of person authorized to sign)		 (Signature of Contracting Officer)	5/21/09

1. Refer to Spec. Section 013300 paragraph 2.1 C 3 and 017823 paragraph 2.1 A 1. concerning submittal requirements. Submit five copies of all technical submittals. Two copies will be returned with approval or comments for action. Four copies of all approved O&M Manuals will be required. All copies are to be 'original' documents from the originator of the document. All copies will be retained by the Government. Two electronic CDs of all O&M are to be submitted and will be retained by the government. The Contractor is to submit an outline of all O&M manuals/materials for approval, prior to submittal of the manuals.

2. Refer to Spec. Section 1.7 D 5. Delete existing requirement and replace with: Flushing of concrete trucks will be performed to restrict the dumping of concrete waste on Government property. All concrete waste is to be collected and disposed of "off site".

3. Refer to untitled and un-numbered drawing showing "Geothermal Piping, Site Plan". This is drawing numbered M-140 as identified on the left side margin.

All utilities passing from the east side of Bushnell Road, under Bushnell Road, must be routed north of the location shown to avoid damage to the existing historical trees and tree root structure. These utilities may also be routed south of the historical Liquid Amber tree after removal of the juniper ground cover and removal of one large diadar cedar. A traffic plan will be needed to maintain the traffic on Bushnell while the utilities are installed and until the pavement is re-established.

4. Refer to drawing A232-0800-E140, titled Electrical Power and Communications Site Plan. All utilities passing under Arnold Avenue are to be installed during non-working days (holidays or weekends) to allow this road to be in service for normal weekday traffic. All utilities passing under Bush Circle are to be installed such that traffic can be channel around the work in a safe manner. The Contractor is to submit a traffic plan prior to this work being performed.

5. Refer to drawing A232-0800-C201, titled Site Plan, and to the attached areal view titled "Alternate Staging Area." The attached sketch identifies a grassed area north of Building 25, bordering on Bushnell Road. This area can be used by the Contractor for a laydown area for equipment and materials. At the end of use, this area must be restored to its pre-use condition; landscaping and irrigation system must be restored. The adjacent paved area must be kept clear for through traffic and traffic controls on Bushnell Road must be established and maintained by the Contractor.

6. Construction Power Option. Refer to drawing A232-0800-E110. Add the following:

A maximum of 350 amperes or equivalent of 300KVA is available to the Contractor during the N232 construction. Obtain the power at the main electrical panel MDP, which is located outdoor of Child Care facility, N270. The Contractor is to install a 350 amperes, 480 volts 3 phase bolted-on type circuit breaker with ground fault interrupter in the SPACE of panel MDP. After the project done, all breakers are to be left in place and marked as SPARE for future use. This power is to be routed through a common underground duct to the construction site, under Arnold Ave. After the work, all conductors are to be removed, and the remaining conduit marked "spare."

7. Pathways for controls systems. Refer to drawing A232-0800-M114, drawing Notes 1 & 2; and drawings M 501, M502. Add to drawing A232-0800-E002. Conduit and field devices are not necessarily shown on the electrical drawings. The Contractor is to coordinate the work and provide conduit to contain all signal pathways between field devices and control panels to assure a complete and functioning system. Circuits of like type and characteristics can be combined in common conduit; a 3/4" conduit is a minimum size; fill to be per appropriate code or manufacture's recommendation. The Contractor is to maintain record drawings showing all field devices and the routing of power and signal pathways.

8. Refer to Spec. Section 221316- Sanitary Waste & Vent Piping. Modify this section as follows:

- 1- Para. 2.7 D: Type K is required.
- 2- Para. 3.11 B: delete line items 3, 4, 5, & 6.
- 3- Para 3.11 C: delete line item 3, & 4.
- 4- Para. 3.11 D: delete line item 1, 2, 3, 4.
- 5- Para. 3.11 D: change copper type to Tyle L.
- 6- Para. 3.11 E: delete line item 3.
- 7- Para. 3.11 F: delete line items 2, & 3.
- 8- Para 3.11 G: delete line item 2.
- 9- Para. 3.11 H: delete line item 2.
- 10- Para. 3.11 I: delete line item 2, & 3.

9. Refer to Sepc. Section 221413- Facility Storm Drainage Piping

- 1- Para. 2.4: delete Section.
- 2- Para. 2.5: delete Section.
- 3- Para. 3.11: B.2 & 3: delete line items.

10. Refer to Spec. Section 223300- Electric, Domestic-Water Heaters (incl. Solar Systems)

- 1- Para. 2.3 : delete reference to heat exchangers.
- 2- Para. 2.3 C: delete paragraph.
- 3- Para. 2.3 F: delete paragraph.
- 4- Para. 3.6 Demonstration: add: and solar energy system.

11. Refer to Spec. Section 011100 paragraph 1.7 A 3 and drawing A232-0800-C381. In response to questions raised at the May 19<sup>th</sup> site walk on site access: NASA security passes are required for all personnel working on site within the Ames Research Center campus. Once the Contractor has installed the project security fence and the project site is separated from the ARC campus, badges will not be required for access to the construction site outside the ARC campus. For work inside the ARC campus and when the separation fence is removed, at the end of the project, security badges will be required.

12. Not used.

13. Drawing C304 – The 8" SD located in the bioswale at the south side of the West Courtyard should be revised to show 63 LF of 8" UD in the bioswale area and 16 LF of 8" SD under the concrete paver path to the Garden Room.

14. Drawing C401 –

- a. Correct the callout for the 8" UD at the south edge of the west courtyard per item 1 above.
  - b. The 8" UD located in the bioswale on the east side of the West Courtyard has a cleanout at the upstream end.
15. Drawing L554 –
- a. The irrigation storage tank is located in the landform area. The manhole shall be located at the highpoint of the berm, approximately 2.5 feet above existing grade.
  - b. Provide concrete deadmen on each side of the tank. Assume the worst case groundwater elevation is 5 feet below existing grade for designing the size of the concrete deadmen.
16. Drawing A101 – Add the following sheet note to this drawing:
- “Where multiple layers of GWB are required on the same side of a partition, the Contractor may substitute one layer of Sound Insulating Type gypsum board for the first two layers of GWB. The Sound Insulating Type gypsum board shall be installed in accordance with the manufacturer’s written instructions for noise rated assemblies.”
17. Drawing A105 – In the Interior Finish/Color Legend, delete the wall panel type WFP-2 for Government Furnished Reclaimed Wood. In the Room Finish Schedule on Drawing A105, Substitute Finish Type P-1, wherever WFP-2 is specified.
18. Drawing A251 – On the north side of the building, between column lines 5 & 6, the key note callout shown as 5.8 should be changed to 8.8.
19. Drawing A631 – In Detail 5/A631, the partition type for the entire east wall of Room 115 shall be partition type 1F.
20. Drawing A705 – The work shown on this drawing shall be included in Option Item #2.
21. Drawing S005 – In Detail 2/S005, the callout for the material under the gravel layer shall be changed from “24” Non-Expansive Soil” to “24” Non-Expansive Fill”.
22. Drawing S008 – In Detail 8/S008, the size of the L4 member shall be L4”x4”x5/16”.
23. Drawing S501 –
- a. In Details 14/S501 and 16/S501, The size of the fillet weld between the brace members and the gusset plates should be reduced to a 5/16”.
  - b. In Detail 10/S501 the weld between the pipe brace and the W Beam shall be a ¼” fillet weld all around.
24. Drawing M402 – In Detail 9/M402, the 4-foot square concrete box shall be reduced to a 2-foot square concrete box. Detail Notes 6, 7, and 9 shall be revised as follows:
6. 24”x 24” Aluminum checker plate cover. Paint exterior surface green to match adjacent lawn.

7. 4" baserock compacted to 95%.

9. Install valve box 1" above grade.

All other Detail Notes are unchanged.

25. Drawing M402 - Detail 3/M402 shall be revised to add Detail Note 8 as follows:

"8. Follow requirements of Detail 2/C902 for trench backfill in paved areas and roadways."

26. Drawing M402 – In Detail 7/M402, the callout for Detail 15/S003 is incorrect. This detail callout shall be revised to 4/S005 & 7/S005.

27. Drawing E431 – Delete the text of Plan Note 5 and replace it with the following:

"Provide two ¾" conduit penetrations spaced at 6" o.c. at roof level. Locate conduits 18 inches from the inside face of the parapet wall. Run conduits down to second floor underfloor level and down to first floor Room 107 for future CCTV cameras. Mount a 12"x12"x 6" weatherproof enclosure on top of the two conduits approximately 6" above the finished roof surface to allow for roof flashing. Anchor conduits to metal roof deck to provide rigid support for enclosure. Provide pull rope in each conduit"

28. Drawings E511, E512, E521, and E522 – Delete the text of Plan Note 2 and replace it with the following:

"4" x 18" wire basket cable tray mounted to floor. Butt splice tray at column lines as shown with maximum gap of 3". See Detail 1/E908."

29. Drawings E511 and E521 – Delete the text of Plan Note 5 and replace it with the following:

"PVC conduits under slab. See Structural Drawings."

30. Specification Section 092900 – Delete paragraph 3.3, C.5. and replace it with the following:

"At partition walls requiring more than one layer of gypsum board on the same side of the wall, the Contractor may substitute a single layer of Sound Insulating Type gypsum board for the first and second layers of gypsum board. The Sound Insulating Type gypsum board shall be installed in accordance with the manufacturer's written instructions for noise rated assemblies."

31. Specification Section 000110 – On page 6, under the heading Division 27, delete specification section 275116, Mass Notification for Personnel.

32. Specification Section 211313 – The title of paragraph 2.11F should be changed from "Valve Supervisory Switch" to "Post-Indicator Valve Supervisory Switch".

33. Specification Section 211313 – Paragraph 3.9B should be revised to read: “Sleeves are not required for core drilled holes and when passing through gypsum wallboard.”

34. Specification Section 283111 – Delete this specification Section dated April 27, 2009 in its entirety and replace it with the attached REVISED version of Specification Section 283111, dated May 21, 2009.

N 232:  
Alternate  
Staging Area

N241

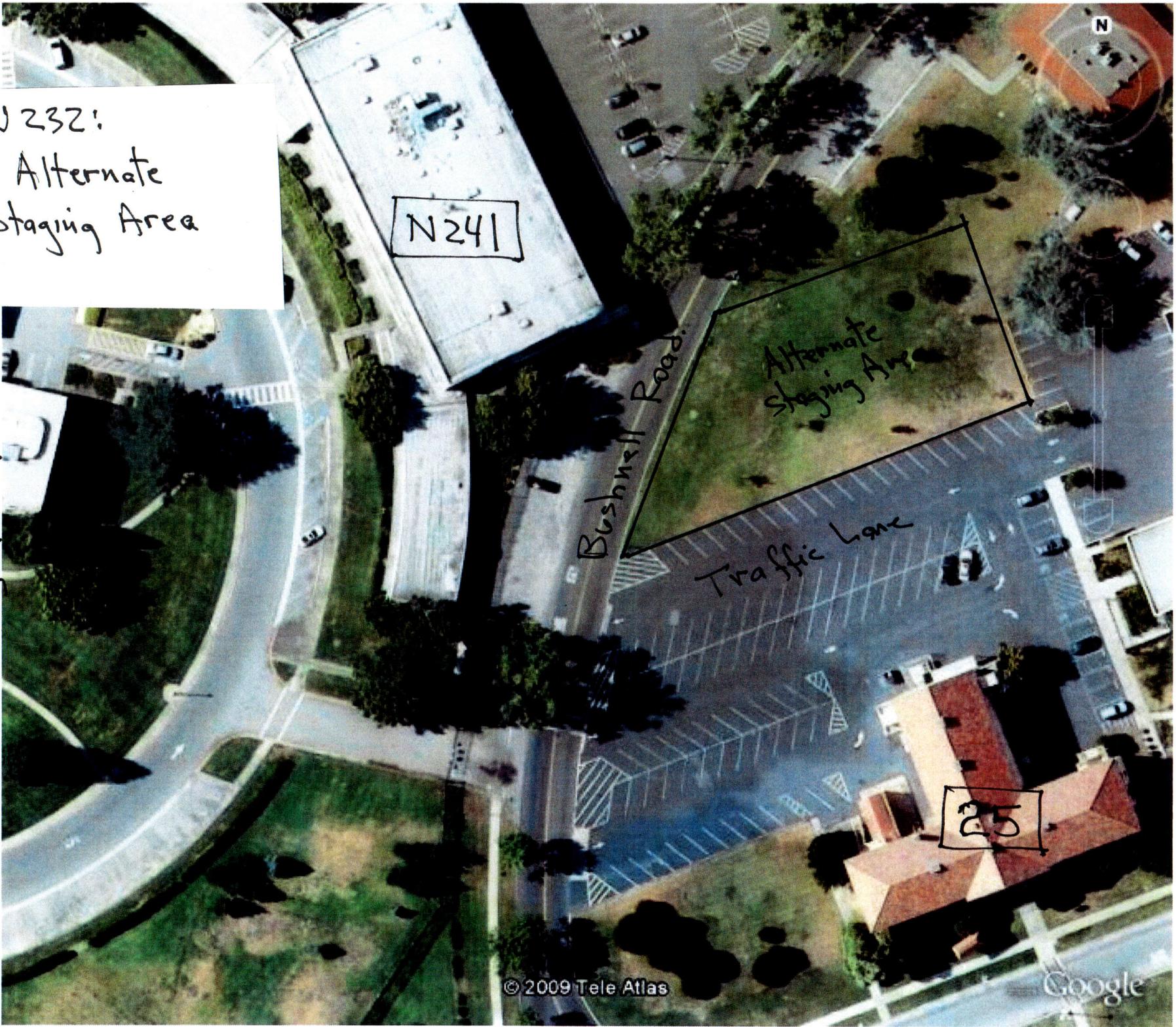
Bushnell Road

Traffic Lane

Alternate  
Staging Area

25

May 13, 2009



## SECTION 283111 - ADDRESSABLE FIRE-ALARM SYSTEM

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 ALTERNATE SYSTEMS

- A. Basis of Design fire alarm system indicated on Drawings and in Specifications meets NASA Fire Marshal approval requirements. Alternate systems or products meeting specified performance criteria will be considered for approval, however, alternate systems or products are deferred approval items that require approval by the NASA FIRE MARSHAL prior to incorporation in the Work. Cost of design and submission to NASA FIRE MARSHAL is responsibility of Contractor. Contractor shall allow 11 weeks for initial NASA FIRE MARSHAL review. Subsequent reviews may be required if initial submittal is not approved. Contractor shall schedule activities and approvals accordingly and no additional Contract Time will be given to Contractor as a result of such submittal and approval.

#### 1.3 SUMMARY

- A. This Section provides requirements for protective signaling fire alarm/mass notification system. System shall provide control for supervisory fire detection and alarm throughout building, and sprinkler functions.
  - 1. System consists of fire alarm control panel, remote annunciator panels, associated detection monitoring and signaling devices, as well as connections for auxiliary functions such as suppression system monitoring, as described in Contract Documents. Contract Documents indicate general arrangement of system and are not to be considered complete design. Make complete operable system based on descriptions of systems and components provided. Detailed Shop Drawings are required to be submitted and approved prior to purchase of equipment.
  - 2. Actuation of signal initiating device shall cause alarm signals to sound continuously and light the appropriate LED signs throughout building until actuating device is restored to normal and control panel reset or control panel manual silence switch is used. Actuation of smoke detector in elevator lobby shall initiate alarm, custom message, and shall initiate Emergency Elevator Re-Call operation required by ASME A17.1. Activation of elevator lobby or elevator machine room smoke detector (except ground floor) shall recall elevator to its primary position. Activation of ground floor elevator lobby detector shall recall elevator to its secondary position.
  - 3. System shall include integrated mass notification system with appropriate notification devices (pre-recorded and live messages) and priority.

B. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Remote annunciator.
7. Addressable interface devices.
8. Multifunction communications panel (ACU)
9. Mass notification transceiver BT-XM
10. Lightning arrestor with enclosure
11. BSA-1 VHF 136-174 MHz omnidirectional antenna with mounting hardware for roof position, ground clamp, and coaxial cable sealant.
12. Monaco radio transceivers.
13. BTX relay board with 8 onboard Form C relays for triggering pre-recorded messages via relay.
14. BTX zone expansion backplane supporting 2 zones cards.
15. BT-XF fire zone expansion card providing 4 zone inputs and 8 relay driver outputs.
16. Mass Notification appliances including LED signage.
17. Magnetic Door holder.

1.4 DEFINITIONS

- A. NASA FIRE MARSHAL: Fire Authority.
- B. LED: Light-emitting diode.
- C. NICET: National Institute for Certification in Engineering Technologies.

1.5 SYSTEM DESCRIPTION

- A. Noncoded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

1.6 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
  1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

## 1.7 SYSTEM OPERATION

- A. Circuit Supervision: Provide system with “Style D” wiring for initiating device circuits, such as addressable loops, and “Style Z” wiring for signaling line circuits.
- B. Operation (General):
  - 1. Actuation of signal initiating device shall cause alarm signals to sound continuously throughout building until actuating device is restored to normal and control panel reset or control panel manual silence switch is used.
  - 2. In addition, system shall be capable of performing following functions:
    - a. Indicate system hardware or wiring failure by type and location on display.
    - b. Automatic return to normal operating mode from operator initiated mode.
    - c. Incoming alarms override other modes of operation.
    - d. Capable of handling 400 addressable devices.
    - e. Field programmable and configurable.
    - f. Provide system operation as identified on operation sequence and matrix indicated on Drawings.
- C. Alarm Detection: When fire condition is detected by one or more initiating devices, system shall perform following functions immediately:
  - 1. Activate applicable system alarm LED on annunciation panels.
  - 2. Activate audible device in annunciator panels.
  - 3. Indicate device address red alarm light and custom location message on LCD on FACP.
  - 4. Indicate zone, floor, and type of device on annunciator panel.
  - 5. Cause relay contacts to change state and/or panel outputs to occur at FACP for sending signal to off site monitoring location (if needed for future).
  - 6. Activate alarm signals in building.
  - 7. Provide system operation as identified on operation sequence and matrix indicated on Drawings.
  - 8. Release magnetic door holders.

## 1.8 SUBMITTALS

- A. General Submittal Requirements:
  - 1. Submittals shall be approved NASA FIRE MARSHAL as well as by Contracting Officer/Project Engineer.
  - 2. Shop Drawings shall be prepared by persons with the following qualifications:
    - a. Trained and certified by manufacturer in fire-alarm system design.
    - b. NICET-certified fire-alarm technician, Level IV minimum.
    - c. Licensed or certified by authorities having jurisdiction.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
  2. Include voltage drop calculations for notification appliance circuits.
  3. Include battery-size calculations.
  4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
  5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
  6. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.
- D. Qualification Data: For qualified Installer.
- E. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- F. Field quality-control reports.
- G. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "O&M Manuals and Warranty of Construction," include the following:
1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
  2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
  3. Record copy of site-specific software.
  4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
    - a. Frequency of testing of installed components.
    - b. Frequency of inspection of installed components.
    - c. Requirements and recommendations related to results of maintenance.
    - d. Manufacturer's user training manuals.
  5. Manufacturer's required maintenance related to system warranty requirements.
  6. Abbreviated operating instructions for mounting at fire-alarm control unit.
  7. Copy of NFPA 25.

## 1.9 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.
- C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in 2007 California Electrical Code (CEC) and other Project requirements, by a qualified testing agency, and marked for intended location and application.
- E. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

## 1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed but no fewer than 1 unit.
  - 2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed but no fewer than 1 unit.
  - 3. Smoke Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than 1 unit of each type.
  - 4. Detector Bases: Quantity equal to 5 percent of amount of each type installed but no fewer than 1 unit of each type.
  - 5. Keys and Tools: One extra set for access to locked and tamper-proofed components.
  - 6. Audible and Visual Notification Appliances: Four of each type installed.
  - 7. Fuses: Two of each type installed in the system.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. All fire alarm equipment shall be the product of single manufacturer, Pyrotronics, Simplex or Edwards Systems Technology (ETS).
  - 2. Alternate fire alarm system manufacturers must be submitted and approved prior to acceptance. Complete Contractor Shop Drawings and submittals shall be required.

## 2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems (see Article 1.6 of this Section and Drawings):
1. Manual stations.
  2. Heat detectors.
  3. Smoke detectors.
  4. Duct smoke detectors.
  5. Verified automatic alarm operation of smoke detectors.
  6. Automatic sprinkler system water flow.
  7. Heat detectors in elevator shaft and pit.
- B. Supervisory signal initiation shall be by one or more of the following devices and actions:
1. Valve supervisory switch.
  2. Elevator shunt-trip supervision.
- C. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
  2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
  3. Loss of primary power at fire-alarm control unit.
  4. Ground or a single break in fire-alarm control unit internal circuits.
  5. Abnormal ac voltage at fire-alarm control unit.
  6. Break in standby battery circuitry.
  7. Failure of battery charging.
  8. Abnormal position of any switch at fire-alarm control unit or annunciator.
- D. System Trouble and Supervisory Signal Actions: Initiate notification signal and annunciate at fire-alarm control unit.

## 2.3 FIRE-ALARM CONTROL UNIT

- A. General Requirements for Fire-Alarm Control Unit:
1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.
    - a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
    - b. Include a real-time clock for time annotation of events on the event recorder and printer.
  2. Addressable initiation devices that communicate device identity and status.
    - a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.

- b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
  3. Addressable control circuits for operation of mechanical equipment.
- B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
  1. Annunciator and Display: Liquid-crystal type, 3 line(s) of 80 characters, minimum.
  2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.
- C. Circuits:
  1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.
    - a. Initiating Device Circuits: Style D.
    - b. Notification Appliance Circuits: Style Z.
    - c. Signaling Line Circuits: Style 6.
    - d. Install no more than 50 addressable devices on each signaling line circuit.
  2. Serial Interfaces: Two RS-232 ports for printers.
- D. Smoke-Alarm Verification:
  1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
  2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
  3. Record events by the system printer.
  4. Sound general alarm if the alarm is verified.
  5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.
- E. Notification Appliance Circuit: Operation shall sound in an approved pattern.
- F. Elevator Recall:
  1. Smoke detectors at the following locations shall initiate automatic elevator recall.
    - a. Elevator lobby detectors except the lobby detector on the designated floor.
    - b. Smoke detector in elevator machine room.
    - c. Heat detector in elevator hoistway pit.
  2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
  3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

- a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.
- G. Door Controls: Door hold-open devices that are controlled by smoke detectors shall be connected to fire alarm system.
- H. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and capability to print out the final adjusted values on a system printer.
- I. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals shall be powered by 24-V dc source.
  1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
- J. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch. Provide batteries capacities for voice mass notification alarm systems per NFPA 72. The secondary power source shall be for 24 hours quiescent and 15 minutes in alarm or emergency under maximum load.
  1. Batteries: Sealed lead calcium.
- K. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

## 2.4 MANUAL FIRE-ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
  1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
  2. Station Reset: Key- or wrench-operated switch.

## 2.5 SYSTEM SMOKE DETECTORS

- A. General Requirements for System Smoke Detectors:
  1. Comply with UL 268; operating at 24-V dc, nominal.
  2. Detectors shall be two-wire type.

3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
6. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
  - a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
  - b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
  - c. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Provide addressable analog type duct smoke detector (photoelectric type) assembly complete with housing, sample tube and auxiliary (DPDT) contacts. Duct type smoke detectors with properly sized sampling tubes shall be furnished and installed where indicated and as otherwise required in accordance with NFPA and manufacturer's requirements. Upon activation of duct detector, associated HVAC unit shall shut down automatically through operation properly rated of relay contacts at detector and alarm condition shall be received at FACP. If detector is for fire/smoke damper operation, associated damper shall close upon detector activation via relay contacts of detector unit. Smoke detection and control functions for HVAC units shall have highest priority over all other HVAC control modes. For duct detectors provided to be installed above drop ceiling, remote alarm indicating lamp shall be provided and flush mounted in ceiling directly below detector.
2. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
3. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.

- c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).
4. Weatherproof Duct Housing Enclosure (when located on building exterior): NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
  5. Each sensor shall have multiple levels of detection sensitivity.
  6. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
  7. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

## 2.6 HEAT DETECTORS

- A. General Requirements for Heat Detectors: Comply with UL 521. Restorable.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
  1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
  2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F
  1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
  2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

## 2.7 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as necessary, equipped for mounting as indicated and with screw terminals for system connections.
  1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as necessary and with screw terminals for system connections.
- B. Speakers: High efficiency sound output, dual voltage (25/70VRMS), field selectable taps from 1/8 to 2 watts, across frequency range of 400 to 4000 Hz with provision for housing the operating mechanism behind a grille. Comply with UL 464. UL listed under Standard 1480. Speaker/strobes also UL listed under Standard 1971.
- C. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.

1. Rated Light Output:
    - a. 15/30/75/110 cd, selectable in the field.
  2. Mounting: Wall mounted unless otherwise indicated.
  3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
  4. Flashing shall be in a temporal pattern, synchronized with other units.
  5. Strobe Leads: Factory connected to screw terminals.
  6. Mounting Faceplate: Factory finished red.
- D. Notification signs over exit doors. Notification signs should be two message type: "Announcement" and "Evacuate". The LEMD Emergency Message Display shall be an LED illuminated text sign designed to comply with UFC requirements for mass notification systems. Signs shall be located over exit doors.

## 2.8 REMOTE ANNUNCIATOR

- A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including microphone, acknowledging, silencing, resetting, and testing.
1. Mounting: Flush cabinet, NEMA 250, Type 1.
- B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals. Provide microphone and system description with zones corresponding to the fire alarm control panel.
- C. Graphic Annunciator Panels:
1. Provide annunciator panels with graphic and tabulated displays as indicated on Drawings.
  2. Enclosure: Provide enclosure of welded steel construction and capable of being flush or surface mounted. Panel shall have hinged front door with lock and key. Size enclosure to meet system requirements and as indicated on Drawings.
  3. Graphic Display: silkscreen graphics display on clear plexiglass window. Graphics colors shall be white on black background.
  4. Indicators: Provide LED indicators.
  5. Graphic Annunciator Construction: Provide graphic annunciator that is microprocessor driven. Upon activation of addressable device, annunciator shall light corresponding indicator. Connect annunciators to fire alarm control panel as required by manufacturer.
  6. Test Button: Provide test button in face of panel which, when depressed, will show indicator LEDs are functioning.

## 2.9 ADDRESSABLE INTERFACE DEVICE (APMM)

- A. APMM shall monitor normally open contact configuration. This module shall provide output signal, with each poll of device, to CCU identifying current status of addressable device.

1. Output signal shall distinguish following circuit conditions:
  - a. Normal (open contact).
  - b. Short circuit (closed contact).
  - c. Open circuit (field wire break).
2. Provide means to set individual address.

#### 2.10 ADDRESSABLE DRY CONTACT MONITOR MODULE

- A. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.
- B. IDC zone shall be suitable for Style D or Style B operation. Provide LED that shall flash under normal conditions, indicating that monitor module is operational and in regular communication with control panel.
- C. For difficult to reach areas, monitor module shall be available in miniature package and shall be no larger than 2-3/4 by 1-1/4 by 1/2 inches. This version need not include Style D or LED.

#### 2.11 ADDRESSABLE CONTROL MODULE

- A. Provide addressable control modules to supervise and control operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances.
- B. Control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation.
- C. Provide audio/visual power by separate supervised power circuit from main fire alarm control panel or from supervised UL listed remote power supply.
- D. Control module shall be suitable for pilot duty applications and rated for minimum 0.6 amps at 30 VDC.
- E. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall and to circuit-breaker shunt trip for power shutdown.

#### 2.12 DEVICE GUARDS

- A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
  1. Factory fabricated and furnished by manufacturer of device.
  2. Finish: Paint of color to match the protected device.

## 2.13 MAGNETIC DOOR HOLDERS

- A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
  - 1. Electromagnet: Requires no more than 3 W to develop 25-lb (111-N) holding force.
  - 2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
  - 3. Rating: 24-V ac or dc.
  - 4. Rating: 120-V ac.
- B. Material and Finish: match door hardware.

## 2.14 FIRE ALARM TRANSMITTER

- A. Fire Alarm Transmitter shall be Monaco as indicated on the one-line diagram.

## PART 3 - EXECUTION

### 3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 for installation of fire-alarm equipment.
- B. Wiring shall be installed in metallic conduit. Identify conduit at 20'-0" intervals with red tape. Junction boxes shall be painted red or labeled "fire alarm"
- C. Wire conductors for fire detectors and alarm systems shall be installed in accordance with California Electrical Code (CEC). Conductors shall not be installed in conduit, junction boxes, or outlet boxes with conductors of lighting and power systems. Sum of cross-sectional area of individual conductors shall not exceed 40 percent of interior cross-sectional area of conduit. Fire detection and alarm conduit shall not be less than 3/4 inch. For addressable loop circuits, utilize twisted shielded pair. Approved wire #14 AWG minimum. Wire for audible and visual output circuits shall be #12 AWG minimum. Wiring must be color coded and labeled. Other wire to be of type recommended by fire alarm equipment manufacturer.
- D. Install #14 AWG twisted pair cable with shield jacket for SLC loops. Maintain shield continuity and connect to earth ground only at control panel. Do not route intelligent detector wiring adjacent to, or in same conduit with audio-visual power wiring, 120/240 VAC power wiring, or other high current circuits.
- E. Power wiring shall be #12 AWG.
- F. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.
  - 1. Comply with requirements for seismic-restraint devices specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

- G. Smoke- or Heat-Detector Spacing (Quantity of devices indicated on Drawings shall be considered minimum):
  - 1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
  - 2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
  - 3. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
  - 4. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.
- H. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
- I. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.
- J. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- K. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.
- L. Device Location-Indicating Lights: Locate in public space near the device they monitor.

### 3.2 CONNECTIONS

- A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
  - 1. Smoke dampers in air ducts of designated air-conditioning duct systems.
  - 2. Alarm-initiating connection to elevator recall system and components.
  - 3. Supervisory connections at valve supervisory switches.
  - 4. Supervisory connections at elevator shunt trip breaker.
  - 5. Magnetic door holders.

### 3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

### 3.4 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

### 3.5 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.
- B. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
  - 1. Visual Inspection: Conduct visual inspection prior to testing.
    - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
    - b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
  - 2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
  - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
  - 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
  - 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
  - 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
- D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- E. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

- H. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.
- I. System Inspection during Warranty Period: Provide 2 inspections of each system during warranty period. Inspection/testing shall be performed in accordance with NFPA 72 requirements. Conduct first inspection at end of 6 months and second at end of 12 months. Determine proper working order of system during inspection. Include complete check-out of control and alarm system.

### 3.6 SYSTEM SERVICE

- A. Complete system service shall be included for entire warranty period (minimum of 1 year from date of system final acceptance from AHJ). Service shall be provided in accordance with code (including NFPA 72) and manufacturer's requirements.

### 3.7 TRAINING

- A. Prior to final acceptance, provide 2 four hour sessions of operation training and trouble-shooting to Owner's personnel. Include in each training session emergency procedures, system control panel operation, trouble procedures, and safety requirements. Include in each session, complete demonstration of system. Submit training material. Conduct training with manufacturer's qualified instructor. Equipment installers are not acceptable.

END OF SECTION 283111