

December 16, 2015

**ADDENDUM NO. 5
to the
Iowa Department of Transportation
For: Proposal
Ames Complex Fire System Replacement
Letting Date: January 13 ,2016**

Notice To Bidders:

This Addendum is issued to incorporate the following additions, deletions, corrections, and/or clarifications to the terms or specifications and shall hereby be considered a part of the final contract documents. This Addendum shall supersede, modify and/or change all statements to the contrary in the bid proposal and shall take precedence over previous terms or specifications.

Change:

Specification Revisions:

SECTION 28 3111

Paragraph 1.2.A.9 – Shop drawings shall be prepared by persons with Nicet Level IV Certification.

- a. REVISE paragraph to read “Digital Alarm Communicator Transmitter (DACT) for the control panel located in the Admin Building. The DACT shall report Alarm, Trouble, And Supervisory signals for each building (three points per building).”

Revised Drawings:

SHEET E3.02

Control module for the door holder interface with the fire alarm system

SHEET E3.04

Heat detectors, one to each elevator shaft and elevator penthouse

SHEET E3.08

Control modules for door holders

SHEET E3.09

Control modules for elevator recall. Provide number required to interface with fire alarm system

SHEET E3.11

Smoke detector in open office level 2

SHEET E3.12

Control module for smoke damper interface with fire alarm system

SHEET E3.16

Control module for door holder interface with fire alarm system

SHEET E3.17

Control module for door holder interface with the fire alarm system

DELETIONS:

SHEET E5.00

Delete all telephone lines to control panels EXCEPT for the Admin control panel

All Bidders must sign and return this Addendum for the bid opportunity referenced above. Failure to do so may subject the Bidder to disqualification. If a bid response has already been submitted, this Addendum shall be signed and emailed or faxed to the Purchasing Section prior to the scheduled Letting Date.

Company Name *(please print)*

Date

Signature

Sincerely,

Jody McNaughton, Purchasing Agent III
Phone No. 515-239-1298 Fax No. 515-239-1538
Jody.McNaughton@dot.iowa.gov

SECTION 28 3100
FIRE DETECTION GRAPHICAL MONITORING SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. This specification includes the furnishing, installation, connection, and testing of a PC based graphical facilities monitoring system; including Underwriters Laboratories (UL) listed application software and hardware complete and ready for operation.
- B. The system shall comply with requirements of NFPA Standard No. 72 for Proprietary Signaling System Receiving Unit except as modified and supplemented by this specification.
- C. The system and associated equipment as specified herein shall be manufactured by a single manufacturer.

1.2 REFERENCE STANDARDS

- A. NFPA No. 70 - National Electric Code (NEC).
- B. NFPA No. 72 - National Fire Alarm Code; including Chapter 24 - Emergency Communications Systems (ECS) with voluntary Mass Notification System (MNS).
- C. UL No. 50 - Cabinets and Boxes.
- D. UL No. 294 - Access Control System Units.
- E. UL No. 864 - Control Units for Fire Protective Signaling Systems.
- F. UL No. 1481 - Power Supplies for Fire Protective Signaling Systems.
- G. Local and State Building Codes.
- H. All requirements of the Authority Having Jurisdiction (AHJ).
- I. ULC Control Units for Fire Alarm Systems

1.3 SUMMARY

- A. A PC based graphical facilities monitoring system shall be installed in accordance to the project specifications and drawings.
- B. The PC based graphical facilities monitoring system shall include, but not be limited to, touch screen monitor, one or more PC based graphical workstations, all input/output devices, network communications media, control equipment, auxiliary control devices, power supplies, and wire / fiber optic media as shown on the drawings and specified herein.
- C. A supervised interface to fire alarm control panels shall be made.
- D. The system shall monitor and control various fire, security, and other facility information.
- E. The system shall include an interface to digital alarm communicator receivers for wide area network monitoring.
- F. The system shall include a device that allows remote viewing of the system via the Internet or an intranet.
- G. The system shall include a redundant interface for networks for survivability.

- H. The system shall allow a mixture of different technologies and manufacturers' equipment to operate on the same network and provide the operator with a consistent look and operation for all monitored equipment.
- I. The system shall support a variety of topologies and media and shall provide an industry standard open architecture transport layer protocol.
- J. Using standard RS-232 ports on existing and future monitoring and control systems used by the facility, the system shall connect to and interpret status change data transmitted from the ports and provide graphic annunciation, control, history logging and reporting as specified herein.
- K. The system shall be electrically supervised and monitor the integrity of all conductors.
- L. The system shall include a Pager/Modem function that will provide selective paging such that instructions may be issued to an individual building or to two or more buildings in combination.
- M. The system shall provide E-Mail functions capability to send system information via an email server to an email account.
- N. The system shall only be used for broadcast of pre-recorded emergency messages or special instruction through remote microphone stations located at each of the two system workstations (one remote station in the Admin Building and one in the South Wing).
- O. Interconnection of the fire alarm system to the phone and building paging systems is not required.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Wiring diagrams indicating all wiring for each item of equipment and the interconnections between the items of equipment and complete wiring point-to-point diagrams.
- D. General Submittal Requirements:
 - 1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
 - a. Drawings submitted to the state for review shall be organized with one building per submittal form. The system network diagram and campus plan shall be included with submittal for the Admin Building.
 - 2. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. NICET-certified fire-alarm technician, Level IV minimum.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 7800 "Closeout Submittals," 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.
- B. Record Documents.
1. Provide record documents in accordance with Division 01.
 2. Record documents shall include electronic copies of all building floor plans, campus site plans and network diagrams on CD, USB flash drive or other media acceptable to the owner. Coordinate with owner for format of plans and diagrams (e.g. PDF, DXF, etc.)
- C. Software and Firmware Operational Documentation:
1. Software operating and upgrade manuals.
 2. Program Software Backup: On magnetic media or compact disk, complete with data files.
 3. Device address list.
 4. Printout of software application and graphic screens.

1.7 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.8 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 Graphical Monitoring System and Components: Obtain system from single source from single manufacturer.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- F. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.

1.9 PROJECT CONDITIONS

- A. Interruption of Existing Graphical Monitoring Service: Do not interrupt graphical monitoring service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
 1. Notify Owner no fewer than two days in advance of proposed interruption of graphical monitoring service.
 2. Do not proceed with interruption of fire-alarm service without Owner's written permission.

1.10 SEQUENCING AND SCHEDULING

- A. Existing Graphical Monitoring Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.
- B. Equipment Removal: After acceptance of new graphical monitoring system, remove existing disconnected equipment and wiring.
- C. Owner to coordinate any work with the current provider needed to reprogram the existing system while the new equipment is being installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. NOTIFIER; a Honeywell company. The basis of this specification is the ONYX system.
 2. Siemens Building Technologies, Inc.; Fire Safety Division.
 3. SimplexGrinnell LP; a Tyco International company.

2.2 WORKSTATION

- A. The system shall operate on no less than an IBM compatible UL listed Intel Dual Core processor operating at 2.16 GHz on the Microsoft Windows platform.
- B. The workstation shall have: no less than 3.2 Gigabytes of RAM, two hard drives with no less than 160 Gigabytes of storage space, a minimum of 64 megabytes of video RAM, a CD-R/W for system backup, internal supervisory CPU watchdog board with audible annunciator, 100 Base-T Ethernet NIC card, a 104 key keyboard, and a mouse type pointing device with a center wheel.

- C. The workstation shall come equipped with all necessary gateway modules to allow connection to the network(s) it monitors as standard equipment. All workstations shall support Ethernet communications when multiple workstations are required.
- D. The workstation shall support an SVGA monitor and be supplied with a flat touch screen monitor.
- E. The computer shall be capable of networking to additional computers and these computers shall be capable of operating as workstations and/or gateways for local area or wide area networks.
- F. Alarm annunciation shall appear on all workstations and may be silenced at each local workstation.
 - 1. Only one workstation and operator shall be in command of the system for global alarm acknowledgement at any time.

2.3 WORKSTATION PERFORMANCE

- A. The network will interface and report the individually monitored system's status via a user-friendly Graphical User Interface (GUI) based software workstation.
- B. The software shall operate under Microsoft Windows as manufactured by Microsoft Corporation.
- C. The GUI based software must be capable of graphically representing each facility being monitored with floor plans and icons depicting the actual locations of the various systems; and / or sensors' locations as well as view the system events in text mode.
- D. The software shall use a 1024 pixels X 768 pixels GUI display capable of showing a large primary floor plan display, a key map representative of a larger view of the primary display and its relationship to the facility being monitored, the current operator, number of fire, supervisory, pre-alarms, troubles, and security events within the network as well as outstanding events and acknowledged events.
- E. The software shall have the capacity of at least 1,000 screens / floor plans or as dictated by hard drive space and installed VIDEO and RAM memory for efficient operation.
- F. The workstation shall have the ability to support graphic printing of all data including graphical floor plans, system activity, history, and guidance text. A Windows® compatible printer shall be supported for the graphics and report printer options.
- G. The workstation software shall permit automatic navigation to the screen containing an icon that represents the system or sensor in the event of an off-normal condition.
- H. The system/sensor icon shall indicate the type of off-normal condition, flash, and change to the color associated with the off-normal condition (e.g., RED for ALARM and YELLOW for TROUBLE).
- I. The software shall allow the attachment of text (TXT) files, sound (WAV) files, image (BMP) files, and video (AVI) files to each system or sensor icon allowing additional information to be provided to the system operator for responding to the off-normal condition. The software must have the ability for an attachment for each major event type per device.
- J. The software shall allow the importation of externally developed floor plans in Windows Metafile (WMF), JPEG (JPG), Graphics Interchange Format (GIF) and Bitmap (BMP) format.

- K. The software shall provide automatic navigation to the screen containing the icon of any system or sensor when an event is initially annunciated. In addition, operator navigation to screens containing outstanding events shall be accomplished by "clicking on" the event from either the acknowledged or unacknowledged event.
- L. History Manager. The software shall contain a History Manager, which shall record all system events with a time and date stamp as well as the current system operator's name.
 - 1. The system shall provide the ability to store all off-normal events experienced by the various sub-systems that are monitored by the system.
 - 2. All events shall be recorded with a time and date stamp and the system operator shall be provided with the ability to log a pre-defined response or a custom comment for each off-normal event and have that comment stored in the history file with the time, date and operator name.
 - 3. Provide for the ability to conduct searches and generate subsequent reports, based on all events for a single system / device address, a specific node, a specific type of off-normal condition and date range (mm/dd/yy to mm/dd/yy) or combinations of these search parameters. The number of entries in the history file that match the determined search criteria will be displayed.
 - 4. The History Manager shall signal a need to back-up the history file at 100,000 events and then remind the operator at intervals of 100 events thereafter.
 - 5. It shall be possible to pre-select data fields for reporting and then saving the report as a template. It shall also be possible to schedule the pre-defined report to print at a designated time.
 - 6. The History Manager shall provide the operator the ability to select the number of days to back-up history.
- M. Alarm Monitoring. The system shall provide for continuous monitoring of all off-normal conditions regardless of the current activity displayed on the screen.
 - 1. If an operator is viewing the history of a sub-system and an alarm condition should occur, the system shall automatically navigate to the graphic screen showing the area where the off-normal event is occurring.
 - 2. The system shall prioritize all off-normal events as defined by National Fire Alarm Code® 72 into the following categories: fire alarms, troubles, supervisory alarms, pre-alarms and security alarms.
 - 3. The system shall display a running count of all events by type in an alarm summary window. The alarm summary window shall include at least five counters, defaulted to Alarm, Pre-Alarm, Trouble, Security, and Supervisory events.
 - 4. The system shall show a running list of all unacknowledged events and acknowledged events and allow the system operator to acknowledge an event by "double-clicking" on that event in the Unacknowledged Events box. The Unacknowledged and Acknowledged Events boxes shall contain an abbreviated description of the off-normal condition.
 - 5. The details of the condition may be viewed by selecting event in the unacknowledged events box.
 - 6. The system shall allow the attachment of user-definable text files, image files, video files, and sound files to each device / system monitored (for every event state) in order to facilitate the operators and response personnel's response to the off-normal condition.

7. The system shall record all events to the system's hard drive. A minimum of 100,000 events may be stored.
- N. Reports & Logs:
1. The system shall provide for the ability to generate reports based on system history.
 2. The system shall allow the system operator to enter custom comments up to 255 characters for each event and have those comments recorded in the system's history file.
- O. Boolean Logic
1. An automated event response application shall be provided to automatically perform actions across the entire system based on network activity.
 2. The event response application shall allow event responses (actions) based on predefined user conditions using simplified Boolean logic.
 3. Actions shall be configured to be executed immediately or timed as required.
- P. Control Aspects of System Software
1. The system shall have the ability to monitor and control connected fire alarm control panels.
 2. The Gateway interfaces shall have the ability to be constructed in a redundant configuration with either two Echelon Gateway computers monitoring the same nodes, two NFN Gateway computers monitoring the same nodes, or by having multiple Embedded Gateways on the same network, monitored by multiple workstation clients.
 3. The system shall provide for the direct control of all outputs associated with Input / Output dry contact relay points on Network Input/Output Nodes (NIONs).
 4. The system shall have the ability to control and program a sub-system of fire alarm panels through a terminal mode window (ASCII terminal type connection) interface to microprocessor-based sub-systems via an RS 232 serial NION if available as an ancillary feature.
 5. Discrete I/O NION interfaces allow the system operator to initiate a change of state for the associated dry contacts.
 6. A scheduling utility shall be included with the workstation to configure the I/O points on these NIONs for automated activate/deactivate, and Arm/Disarm (depending on device type) status.
 7. The system shall provide a gateway interface for direct connections to the network of fire alarm control panels.
 8. The gateway will:
 - a. Serves as a bridge between an workstations and the network, and it uses that workstation as the primary reporting station for the network.
 - b. Translates panel and device data into data that can be interpreted by the workstation software application
 - c. Monitor the networks.

9. The workstation shall provide configuration utilities for monitoring and control profiles. These profiles shall be user definable for distribution of monitoring and control allowances for operators per workstation.
 10. Under no condition shall any sub-system be required to rely on the network for any data processing required to perform its particular function. Each individual sub-system shall be in effect "stand-alone" as to insure its continued operation should a disruption in communication with the system be experienced.
- Q. The software shall be password protected and provide for the definition of security profiles for operator access control.
 - R. The software shall contain provision for defining monitoring profiles of pre-selected NIONs for monitoring. This shall include provision for status types within the selected NODES.
 - S. The software shall contain provision for defining control profiles of pre-selected NIONs for control.
 1. The system administrator shall be provided means to select which signals can be controlled by selected Workstation.
 - T. The software shall support sending real-time off-normal event notifications to designated alpha-numeric pagers.
 - U. The software shall support sending real-time off-normal event notifications to designated email addresses.
 - V. The software shall support live voice paging for mass notification to the voice evacuation.
 - W. The PC based graphical facilities monitoring system shall include a configuration tool that provides the following features:
 1. Allows operators the ability to create and edit graphics
 2. Set up gateway connections and define their nodes
 3. Set system operating mode
 4. Add and edit objects on screens
 5. Configure colors and sounds for the status classes

2.4 PRINTER

- A. Support one or more Windows® compatible printers to be located and connected at each workstation for graphics and report printing.
- B. Support one 80-column dot matrix tractor feed industrial grade printer for event and date-stamped printouts of off-normal events and status changes. No printer is required.

2.5 MONITORING NETWORK

- A. The monitoring network shall consist of a network based on proven peer-to-peer technology and support standard and high speed cards.

- B. The network consisting of the standard cards shall have the ability to use multi-mode fiber optic cable, wire (twisted pair copper media in a style 4 or style 7 configuration), or combination wire/fiber communications with support of up to 103 nodes with a data communications rate of 312,500 BPS.
 - 1. Wire networks shall support 12 AWG, 1 Pair Shielded to 24 AWG, 4 Pair Unshielded following the manufacturer's guidelines.
 - 2. Fiber optic networks shall support 62.5/125 μ m cable (8dB limit) or 50/125 μ m cable (4.2dB limit).
 - 3. Wire to fiber conversion cards.
- C. The network consisting of the high speed cards shall have the ability to use fiber optic cable (both multi-mode and single-mode), wire (twisted pair copper media in a style 4 or style 7 configuration), or combination wire/fiber communications with support of up to 200 nodes with a data communications rate of 12MB (wire) or 100MB (fiber).
 - 1. Wire networks shall support 12 AWG, 1 Pair Shielded to 24 AWG, 4 Pair Unshielded following the manufacturer's guidelines.
 - 2. Fiber optic networks shall support 62.5/125 μ m cable (10dB limit), 50/125 μ m cable (6.5dB limit), or 9/125 μ m cable (30dB limit).
 - 3. Wire to fiber conversion cards.
- D. All underground network cabling shall be fiber optic. Use of wire for these connections will not be acceptable.

2.6 INTEGRATION NETWORK

- A. The integration network shall be capable of monitoring a minimum of 100 nodes (NIONs and routers) on a gateway consisting of, but not limited to:
 - 1. Intelligent or conventional fire alarm control panels.
 - 2. Competitor's intelligent or conventional fire alarm control panels.
- B. Local area networks shall consist of a free topology network using twisted pair copper media in a bus, star, or T-tap at 78 Kilo baud. Transmit/receive twin fiber (multi-mode 62.5/125 μ m) strand FT-10 point-to-point shall be available. Wide area networks shall be supported by the use of network expansion routers.
 - 1. Free topology (FT-10 style) wire network run allows multiple T-taps within a 1,500-foot (457.2 m) radius; 8,000 foot (2438.4 m) point-to-point using twisted pair; or 6,000-foot (1828.8 m) bus topology.
 - 2. Free topology (FT-10 style) fiber network can also use fiber-optic cabling that operates at 78.5 Kbaud.
- C. Provide routers, repeaters or bridges where required to increase distance, alter network configuration or change media or to extend to remote facilities over alternate communications media including UL listed dial-up PSTN telephone, leased line, multi-mode fiber or Ethernet connectivity.
 - 1. Dial-up units shall dial a local number and stay connected. Upon loss of carrier, a supervisory alarm shall be indicated at the workstation and the units shall automatically dial the number to re-connect.

2. Network expansion routers shall support public switched telephone circuits, two-wire or four-wire leased lines, and CAT5 Ethernet networks.
- D. Network interface software shall be by the same manufacturer as the hardware portion of this specification.
- E. The integration network shall utilize Network Input / Output Nodes (NIONs) to interface between the individual panels' systems to be monitored by the integration network. The NIONs shall act as a translator from the panel communications protocol to the integration network protocol as well as serve as a transceiver from the building system panel to the integration network.
1. NIONs shall be available in configurations that will allow transparent communications via RS-232 serial data ports with intelligent fire alarm control panels, security systems, and CCTV systems.
 2. NIONs shall be available in configurations that will allow monitoring of dry contacts, switched voltages, conventional security devices, access control panels, and conventional fire alarm control panels using scheduled, automated, and manual control.
 3. NIONs shall be UL listed to Standard 864 and 1076 and be provided with their own enclosure or be available in chassis mount configurations.
 4. NIONs shall operate at 24 VDC and obtain their power from the monitored control panel or a UL listed battery backed auxiliary power supply. All terminals shall be transient protected to 2400V and LEDs shall be provided for status, service and diagnostics.
- F. Digital Alarm Communicator Receiver Network
1. The system shall provide a digital alarm communicator receiver (DACR) gateway with a RS-232 interface to the digital alarm communicator receivers for wide area event reporting.
 2. Each gateway shall support up to 10 digital alarm communicator receivers for alarm and trouble information from reporting devices.
- G. Remote Access System Network
1. The web server shall be a web-based device that allows remote viewing of the system via the Internet or intranet.
 2. The interface will allow users to view the history of FACP, event status, device properties, and other information based on access permission defined by the system administrator.
 3. The web server will utilize an IP-based wire Ethernet connection when interfacing to the Internet/intranet.
 4. The web server shall be compatible with the following types of networks:
 - a. DACR
 - b. Card Access
 5. The web server shall provide the following features:
 - a. Support 10 simultaneous users
 - b. Employee standard IP over an Ethernet connection
 - c. Support up to 128 user accounts

- d. Provide built-in password security and user access records
 - e. Send up to 50 e-mails in response to any system event
- H. Workstation Network:
- 1. Computers shall be networked using Ethernet supporting the use of TCP/IP protocol for local area systems.
 - 2. The network shall be capable of supporting multiple clients (e.g., workstations, configuration applications, and automated response applications), Echelon Gateway, NFN Gateway, High Speed NFN Gateway, and ninety-nine (50) Embedded Gateways.
 - 3. A UL listed Ethernet Hub must be supplied for connection of multiple workstations, gateways, clients, and/or network printers.
 - 4. System shall be UL listed to communicate between clients and gateways over a business computer network (shared IP).

PART 3 EXECUTION

3.1 GENERAL

- A. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring & fiber optic diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Refer to the riser/connection diagram for all specific system installation / termination / wiring data.

3.2 CONDUIT AND WIRE

- A. Conduit shall be in accordance with the National Electrical Code (NEC), local and state requirements.
- B. All 120 volt power and control wiring shall be installed in conduit or raceway. Where single conductors (THHN/THWN e.g.) are used for control wiring these shall also be installed in conduit or raceway.
- C. Low voltage cabling (50 volts or less) may be installed without protection where concealed above accessible ceilings. Where low voltage cabling installed above inaccessible ceilings, in walls, underground, or where subject to damage such as in mechanical rooms all cabling shall be installed in conduit or raceway.
- D. Cable must be separated from any open conductors of power, or class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors.
- E. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
- F. Conduit shall not enter the control equipment, or any other remotely mounted control panel equipment or back-boxes, except where conduit entry is specified by the FACP manufacturer.
- G. All system wiring and cabling shall be new.
- H. Wiring & fiber optics shall be in accordance with local, state and national codes and as recommended by the manufacturer of the fire alarm system. Number and size of conductors & fiber optics shall be as recommended by the fire alarm system manufacturer.

- I. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system except as specified herein.
- J. All communication wire to nodes or to computers shall consist of minimum manufacturer's recommendations and approved wire specification supporting speeds of 78Kps to 10mB/sec communications.

3.3 TERMINAL BOXES, JUNCTION BOXES, AND CABINETS

- A. All boxes and cabinets shall be UL listed for their use and purpose.
- B. The PC based workstations shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FACILITIES MONITORING SYSTEM. PC workstation power wiring shall be 12 AWG and grounded securely to either a cold water pipe or grounding rod. Where required, a UL 864 listed UPS system shall be provided.

3.4 SYSTEM SETUP & CONFIGURATION

- A. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes.
- B. The factory trained technician shall install initial data and artwork at each workstation including:
 - 1. Distribution of monitoring, control and security profiles as requested by owner.
 - 2. Area diagrams, floor plans, key maps and screen titles.
 - 3. Auto-navigation criteria.
 - 4. Guidance text as provided by owner.

3.5 FINAL INSPECTION

- A. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the system function properly in every respect.

3.6 INSTRUCTION/TRAINING

- A. During the commissioning phase of the fire alarm and graphical monitoring systems installation, and at such time as acceptable performance of the overall system's hardware and software has been established, provide on-site operator instruction to the Owner's personnel including electricians and selected office staff.
- B. On-site operator instruction shall be provided during normal working hours and shall be performed by a factory trained and certified representative familiar with the overall system.
- C. At a time mutually agreed upon during the system commissioning phase as stated above, provide 8 hours of instruction to the Owner's designated personnel.
- D. Provide hands on demonstration of the operation of all system components and the entire system including description of intended use with respect to the functions specified and user-level program changes.
- E. Provide, at the time of instruction, three copies of Owner's operation and maintenance manuals, custom-prepared for this project by the system installer/vendor, which shall be used in addition to the instruction; each copy of the Owner's manual shall be bound in a three-ring binder, labeled with the name and address of the project.

END OF SECTION

SECTION 28 3111
DIGITAL, 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.
- B. Section 28 3100 - Fire Detection Graphical Monitoring System - Monitoring system located at proprietary supervising station located at the east entry of the Admin Building and on the second floor of South Wing.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-alarm control unit.
 - 2. Manual fire-alarm boxes.
 - 3. System smoke detectors.
 - 4. Heat detectors.
 - 5. Notification appliances for voice evacuation and mass notification.
 - 6. Magnetic door holders.
 - 7. Remote annunciator.
 - 8. Addressable interface device.
 - 9. Digital Alarm Communicator Transmitter (DACT) for the control panel located in the Admin Building. The DACT shall report Alarm, Trouble, and Supervisory signals for each building (three points per building).
 - 10. Weatherproof strobes for individual building alarm indication to fire responders.
 - 11. Weatherproof exterior mounted speakers for mass notification only. Wide area mass notification is not required.

1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. NICET: National Institute for Certification in Engineering Technologies.

1.4 SYSTEM DESCRIPTION

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. 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.
- C. General Submittal Requirements:
 - 1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
 - a. Drawings submitted to the state for review shall be organized with one building per submittal form. The system network diagram and campus plan shall be included with submittal for the Admin Building.
 - 2. Shop Drawings shall be prepared under the supervision of persons with the following qualifications:
 - a. NICET-certified fire-alarm technician, Level IV minimum.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," 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.
- B. Record Documents.
1. Provide record documents in accordance with Division 01.
 2. Record documents shall include electronic copies of all building floor plans, campus site plans and network diagrams on CD, USB flash drive or other media acceptable to the owner. Coordinate with owner for format of plans and diagrams (e.g. PDF, DXF, etc.)
- C. Software and Firmware Operational Documentation:
1. Software operating and upgrade manuals.
 2. Program Software Backup: On magnetic media or compact disk, complete with data files.
 3. Device address list.
 4. Printout of software application and graphic screens.

1.8 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 NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- F. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.

1.9 PROJECT CONDITIONS

- A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of fire-alarm service.
 - 2. Do not proceed with interruption of fire-alarm service without Owner's written permission.

1.10 SEQUENCING AND SCHEDULING

- A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.
- B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.
- C. Owner to coordinate any work with the current provider needed to reprogram the existing system while the new equipment is being installed.

1.11 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 - 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. NOTIFIER; a Honeywell company.
 - 2. Siemens Building Technologies, Inc.; Fire Safety Division.
 - 3. SimplexGrinnell LP; a Tyco International company.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices:
 - 1. Manual stations.
 - 2. Heat detectors.
 - 3. Flame detectors.

4. Smoke detectors.
 5. Automatic sprinkler system water flow.
- B. Fire-alarm signal shall initiate the following actions:
1. Continuously operate alarm notification appliances.
 2. Identify alarm at supervising station, fire-alarm control unit and remote annunciators.
 3. Transmit an alarm signal to the remote alarm receiving station.
 4. Unlock electric door locks in designated egress paths.
 5. Release fire and smoke doors held open by magnetic door holders.
 6. Activate voice/alarm communication system.
 7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
 8. Close smoke dampers in air ducts of designated air-conditioning duct systems.
 9. Recall elevators to primary or alternate recall floors.
 10. Activate emergency shutoffs for gas and fuel supplies.
 11. Record events in the system memory.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
1. Valve supervisory switch.
- D. 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.
- E. System Trouble and Supervisory Signal Actions: annunciate at supervising stations, fire-alarm control unit and remote annunciators.

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.
 - 2. Addressable initiation devices that communicate device identity and status.
- 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.
- 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 2.
- D. Notification Appliance Circuit: Operation shall sound in per requirements of NFPA 72.
- E. 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.
 - 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.
- F. 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.
- G. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

- H. 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.
- I. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
 - 1. Batteries: Sealed lead calcium.
- J. 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. Double-action mechanism requiring two actions to initiate an alarm, breaking-glass or plastic-rod 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 four-wire type.
 - 3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
 - 4. 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.
 - 5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
 - 6. Integral Visual-Indicating Light: LED type indicating detector has operated.
 - 7. 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. 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. Duct Smoke Detectors: Photoelectric type complying with UL 268A.
 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.
 3. Each sensor shall have multiple levels of detection sensitivity.
 4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
 5. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.6 HEAT DETECTORS

- A. General Requirements for Heat Detectors: Comply with UL 521.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.
 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C).
 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.

2.7 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.
- B. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "ALERT" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
 1. Rated Light Output:
 - a. 15/30/75/110 cd, selectable in the field for interior locations.
 - b. 185 cd for exterior mounted building alarm applications.
 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.
- C. Voice/Tone Notification Appliances:
1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
 2. High-Range Units: Rated 2 to 15 W.
 3. Low-Range Units: Rated 1 to 2 W.
 4. Mounting: Flush.
 5. Matching Transformers: Tap range matched to acoustical environment of speaker location.
- D. Exterior notification horn speakers
1. Weatherproof
 2. Rated Power: 15 watts
 3. Voice Coil Impedance: 8 Ohms
 4. Sound Dispersion: 110 Degrees
 5. Frequency Response: 375 - 14,000Hz at full rated output
 6. Sound Pressure Level: 117 dB on axis at one meter

2.8 MAGNETIC DOOR HOLDERS

- A. Retain existing door holders and provide new relays for releasing function.

2.9 DOORS WITH ACCESS CONTROL:

- A. Electromagnetic/Electronic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from. Determine interface requirements to maintain existing functions and provide necessary equipment.

2.10 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 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.

2.11 ADDRESSABLE INTERFACE DEVICE

- A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

2.12 DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.
- B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture one telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.
- C. Local functions and display at the digital alarm communicator transmitter shall include the following:
 - 1. Verification that both telephone lines are available.
 - 2. Programming device.
 - 3. LED display.
- D. Digital data transmission shall include the following:
 - 1. Address of the alarm-initiating device.
 - 2. Address of the supervisory signal.
 - 3. Address of the trouble-initiating device.
 - 4. Loss of ac supply or loss of power.
 - 5. Communication bus failure.
- E. Secondary Power: Integral rechargeable battery and automatic charger.
- F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.13 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.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 for installation of fire-alarm equipment.
- B. Equipment Mounting: Install fire-alarm control unit on concrete base with tops of cabinets not more than 72 inches (1830 mm) above the finished floor. Comply with requirements for concrete base specified in Section 03 3000 "Cast-in-Place Concrete."
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.

2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 3. Install anchor bolts to elevations required for proper attachment to supported equipment.
- C. Smoke- or Heat-Detector Spacing:
1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
 2. Smooth ceiling spacing shall not exceed 30 feet (9 m).
 3. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.
 4. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.
- D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
- E. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.
- F. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- G. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.
- H. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- I. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.
- J. Annunciator: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.

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 (1 m) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
1. Supervisory connections at valve supervisory switches.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "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. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. 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.
- D. 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.
 - 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 visible appliances for the public operating mode according to manufacturer's written instructions.
 - 5. 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.
- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

3.6 INSTRUCTION/TRAINING

- A. During the commissioning phase of the fire alarm and graphical monitoring systems installation, and at such time as acceptable performance of the overall system's hardware and software has been established, provide on-site operator instruction to the Owner's personnel including electricians and selected office staff.
- B. On-site operator instruction shall be provided during normal working hours and shall be performed by a factory trained and certified representative familiar with the overall system.
- C. At a time mutually agreed upon during the system commissioning phase as stated above, provide 8 hours of instruction to the Owner's designated personnel.
- D. Provide hands on demonstration of the operation of all system components and the entire system including description of intended use with respect to the functions specified and user-level program changes.
- E. Provide, at the time of instruction, three copies of Owner's operation and maintenance manuals, custom-prepared for this project by the system installer/vendor, which shall be used in addition to the instruction; each copy of the Owner's manual shall be bound in a three-ring binder, labeled with the name and address of the project.

END OF SECTION