SECTION 061209

FIRE ALARM AND DETECTION SYSTEMS

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\*\* NOTE TO SPECIFIER \*\* Bosch Security Systems; security and life safety systems.  
 .  
 This section is based on the products of Bosch Security Systems, which is located at:  
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Web: [www.boschsecurity.us](http://www.boschsecurity.us)   
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 Bosch Security Systems, Inc. works closely with an extensive network of certified dealers and integrators to design dependable security and life safety solutions for the market. Our broad portfolio of products and systems for video surveillance, access control, and intrusion and fire detection are used by major schools and universities, government agencies, correctional facilities, retail stores, casinos and in many other commercial environments throughout North America.  
   
 Our significant investment in research and development is unsurpassed in the security industry and enables us to regularly update our existing products and introduce new technologies. These advancements are continually recognized by the market. For example, the products we manufacture for networked video systems have won 11 awards in the last three years. Our solution for integrating building security and management systems across an enterprise has been implemented by various Fortune 500 companies and can facilitate centralized management of an organization's assets. Testing by independent certified regulatory compliance organizations verifies updates to our intrusion and fire systems extend beyond minimum compliance requirements. And, while technological innovation is important, we ensure that new product development addresses all the concerns paramount in the world of security and life safety today, including performance, quality, and ease of installation, maintenance and use.  
   
 For more than 100 years, the Bosch name has stood for quality and reliability. We are there for our customers during all crucial phases of a project: before, during and after the sale.  
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1. GENERAL
   1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* FPA 1000-V2 Product. Delete items below not required for project.

* + 1. The contractor shall furnish and install a complete 24 VDC, electrically supervised, analog addressable fire alarm system as specified herein and indicated on the drawings. The system shall include but not be limited to all control panels, power supplies, initiating devices, audible and visual notification appliances, alarm devices, and all accessories required to provide a complete operating fire alarm system.
       1. System cabinet.
       2. Power supply.
       3. One SLC loop, plus one optional SLC loop.
       4. 4 x 20 character LCD annunciator.
       5. Dedicated LED Displays for Fire alarm, Gas alarm, trouble.
       6. Programming keypad.
       7. Up to 508 detectors/pull stations/modules
       8. Up to 254 analog sounder bases totaling 508 addressable points.
       9. Up to 8 panels may be networked with a total of 2000 points.
       10. Built in dual line Digital Communicator.
       11. Built in web server for IP communication for alarm transmitting with full single, double, and backup reporting and programming.
       12. Associated peripheral devices.
       13. Batteries.
       14. Wiring.
       15. Conduit.
  1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 05500 - Miscellaneous Metal Fabrications: Supporting structure.
    2. Division 16 - Electrical: Wiring, conduit, disconnects and connection to power supply and control devices.
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. National Electric Code, Article 760.
    2. National Fire Protection Association Standards:
       1. NFPA 70 - National Electrical Code.
       2. NFPA 72 - National Fire Alarm Code.
       3. NFPA 101 - Life Safety Code.
    3. Local and State Building Codes:
       1. BOCA, National Building Code, Mechanical Code, Fire Prevention Code.
    4. Local Authorities Having Jurisdiction (AHJ).
    5. Underwriters Laboratories, Inc.:
       1. Equipment shall be approved by Underwriters Laboratories, Inc. for its intended purpose, listed as power limited by Underwriters Laboratories, Inc., for the following standards as applicable.
       2. UL 864 9th Editions UOJZ - Control units for Fire Protective Signaling Systems: Local Signaling Unit. Central Station Signaling Protected Premises Unit. Remote Signaling Protected Premises Unit. Auxiliary System Control Unit.
       3. UL 268 - Smoke Detectors for Fire Protective Signaling Systems.
       4. UL 268A - Smoke Detectors for Duct Applications.
       5. UL 217 - Smoke Detectors for Single Stations.
       6. UL 521 - Heat Detectors for Fire Protective Signaling Systems.
       7. UL 228 - Door Holders for Fire Protective Signaling Systems.
       8. UL 464 - Audible Signaling appliances.
       9. UL 1638 - Visual Signaling appliances.
       10. UL 38 - Manually Activated Signaling Boxes.
       11. UL 346 - Water flow indicators for Fire Protective Signaling Systems.
       12. UL 1481 - Power Supplies for Fire Protective Signaling Systems.
    6. Americans with Disabilities Act (ADA):
       1. All visual notification appliances and manual pull stations shall comply with the requirements of the Americans with Disabilities Act.
    7. California State Fire Marshal (CSFM)
       1. 71650801:177.
    8. New York City's Materials and Equipment Acceptance system (NYC-MEA):
       1. MEA 12‑92‑E Vol. VII (Conventional version only, addressable pending).
  1. REGULATORY REQUIREMENTS
     1. Listings:
        1. All fire alarm system equipment shall be listed for its intended purpose and be compatibility listed to assure the integrity of the complete system.
  2. SUBMITTALS
     1. Submit under provisions of Section 01300.
     2. Product Data: Manufacturer's data sheets on each product to be used, including:
        1. Submit required documentation within thirty calendar days after award of the purchase order. Indicated in the document will be the type, size, rating, style, catalog number, manufacturers' names, photos, and /or catalog data sheets for all items proposed to meet these specifications. The proposed equipment shall be subject to the approval of the Architect/Engineer and no equipment shall be ordered or installed on the premises without that approval.
     3. Shop Drawings: Indicate dimensions and required tolerances, connection details, anchorage spacing, installation details, and special conditions.
        1. Submittal of shop drawings shall contain at least three copies of original manufacturer specification and installation instruction sheets. Subsequent information may be copies. All equipment and devices on the shop drawings to be furnished under this contract shall be clearly marked in the specification sheets.
     4. Qualification Submittals:
        1. Supplier's qualifications shall be submitted indicating years in business, service policies, warranty definitions, NICET certification, and completion of factory training program and a list of similar installations.
        2. Contractor qualifications shall be supplied indicating years in business and prior experience with installations that include the type of equipment that is to be supplied.
        3. The contractor shall provide hourly Service Rates, performed by a technician for this installed Life Safety System with the submittal. These hourly service rates shall be guaranteed for a 1-year period.
     5. Contract Close-out Submittals:
        1. Deliver two copies of the following to the owner's representative within thirty days of system acceptance. The closeout submittals shall include:
           1. Installation and Programming manuals for the installed Life Safety System.
           2. Point to point diagrams of the entire Life Safety System as installed. This shall include all connected smoke detectors and addressable field modules.
        2. All drawings shall reflect device address as verified in the presence of the engineer and/or end user.
  3. QUALITY ASSURANCE
     1. Manufacturers/Distributors Services:
        1. The following supervision shall be provided by an authorized factory trained service technician from the dealer of the fire alarm equipment. The technician shall have a minimum of two years of service experience in the fire alarm industry. The technician shall have the appropriate state licenses where applicable. The technician's name shall appear on equipment submittals. The technician shall be responsible for the following items:
           1. A pre installation visit to the job site to review equipment submittals and to verify the method by which the system is to be wired.
           2. During the installation the technician shall be on site or make periodic visits to verify installation and wiring of the system. He shall also supervise the completion of conduit rough, wires pulled into conduit and wiring rough, and ready for trim.
           3. Upon completion of wiring, final checkout and certification of the system shall be made under the supervision of this technician.
           4. At the time of the formal checkout, technician shall give operational instructions to the owner and/or his representative on the system.
     2. Installer Qualifications: Company experienced in manufacturer's products and certified by the manufacturer.
  4. DELIVERY, STORAGE, AND HANDLING
     1. Store products in manufacturer's unopened packaging until ready for installation.
     2. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
  5. PROJECT CONDITIONS
     1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
  6. WARRANTY
     1. Warrant all materials, installation and workmanship for a three year period, unless otherwise specified. A copy of the manufacturer's warranty shall be provided with the close out documentation.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: Bosch Security Systems, which is located at: 130 Perinton Pkwy.; Fairport, NY 14450; Toll Free Tel: 800-289-0096; Tel: 585-223-4060; Email: [request info (presales.support@us.bosch.com)](http://admin.arcat.com/users.pl?action=UserEmail&company=Bosch%20Security%20Systems&coid=44833&rep=&fax=&message=RE:%20Spec%20Question%20(13850bss):%20%20&mf=); Web: [www.boschsecurity.us](http://www.boschsecurity.us)

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
    2. Requests for substitutions will be considered in accordance with provisions of Section 01600.
    3. Products:
       1. The Life Safety System requirements shall be conformed to in their entirety to ensure that the installed and programmed Life Safety System will accommodate all of the requirements and operations required by the building owner. Any specified item or operational feature not specifically addressed prior to the bid date will be required to be met without exception.
       2. Submission of product purported to be equal to those specified herein will be considered as possible substitutes only when all of the following requirements have been met:
          1. Any deviation from the equipment, operations, methods, design or other criteria specified herein shall be submitted in detail to the specifying Architect or Engineer a minimum of ten working days prior to the scheduled submission of bids. Each deviation from the operation detailed in these specifications shall be documented in detail, including page number and section number, which lists the system function for which the substitution is being proposed.
          2. A complete list of such substituted products with three copies of working drawings thereof shall be submitted to the approved Architect and/or Consulting Engineer not less than ten working days prior to the scheduled submission of bids.
          3. The contractor or substitute bidder shall functionally demonstrate that the proposed substitute products are in fact equal in quality and performance to those specified herein.
    4. General Equipment and Materials Requirements:
       1. All equipment furnished for this project shall be new and unused. All components shall be designed for uninterrupted duty. All equipment, materials, accessories, devices and other facilities required or as noted on the contract drawings shall be best suited for the intended use and shall be provided by a single manufacturer. If any of the equipment provided is by different manufacturers, then that equipment shall be "Listed" as to its compatibility by Underwriters Laboratories (UL), if such compatibility is required by UL standards.
    5. Design Intent:
       1. It is the contractor's responsibility to meet the entire intent of these specifications.
       2. Deviations from the specified items shall be at the risk of the contractor until the date of final acceptance by the architect, engineer, and owner's representative.
       3. All costs for removal, relocation, or replacement of a substituted item shall be at the risk of the contractor.

\*\* NOTE TO SPECIFIER \*\* FPA-1000 Product. Delete if not required.

* 1. GENERAL DESCRIPTION
     1. Control Panel:
        1. The Fire Alarm Control Panel (FACP) shall be the Bosch FPA-1000-V2 analog addressable control panel. The FACP shall have a 5.5 amp power supply capable of supporting a maximum battery capacity of 40 Ah.
        2. The FACP shall be capable of supporting two (2) Signaling Line Circuits (SLC) configurable as two Class B Style 4 or one Class A Style 6 or 7, one (1) Networking card (FPE-1000-NE/-NW/-NF), and one (1) City Tie card (FPE-1000-CITY).
        3. Each SLC shall be capable of supporting up to 254 detectors/pull stations/ modules. Up to 127 analog sounder bases may be used with a host detector, for a total of 254 addressable points per SLC. Systems that are not capable of this SLC capacity shall not be acceptable.
        4. The panel shall have a built in 4 x 20 character LCD annunciator/keypad with the capability of having an additional eight supervised remote annunciators/keypads connected in the field. The LCD annunciator/keypads shall have additional dedicated LEDs for fire alarm, gas alarm and trouble.
        5. The FACP shall have a built in UL approved digital communicator. The communicator shall transmit in Modem IIIa2, SIA, CID.
        6. The FACP shall have a built in IP communication and interface for alarm signaling transmitting. The Web Server shall transmit in Modem IIIa2, SIA, CID. The server shall allow local and remote up/downloading of system operating options, event history, and detector sensitivity data for addressable detectors. System requiring proprietary software to access system operating system and perform these functions shall not be permitted.
        7. The FACP shall have three onboard programmable Form C relays with default operation for common Fire alarm, common trouble, and common supervisory.
        8. The FACP shall have two onboard Class A (Style Z) or Class B (Style Y) programmable Notification Appliance Circuits rated at 2.5 amps/24 V.
        9. Class A or B configuration on both IDC and NAC devices shall not require adaptors.
        10. The main communication bus (options bus) shall be capable of Class A or Class B configuration with a total bus length of 5900 feet (1798 m).
        11. The FACP shall be programmable for Sandwich Alarm which allows the planned evacuation of a building. The fire floor will first go into alarm and then at the expiration of a programmable timer the floor above and floor below will go into alarm. At the expiration of the timer again the whole building will be notified.
        12. The FACP shall be programmable for Dual Zone alarm. This will prevent an alarm unless two detectors in the same zone go into alarm or a manual station alarm is pulled.
     2. Networking Cards:
        1. The networking cards shall be IP based with standard Ethernet and fiber optic or wire terminals.
        2. They shall be plugged in to the main panel’s board for power, supervision and ease of use.
        3. The cards shall allow Class A (Style 7) or Class B (Style 4) wiring typography and allow mixed media types such as Ethernet, Fiber Optic and copper wire.
        4. Diagnostic LEDs showing communication and links shall be provided.
        5. An external power source may be temporarily used to keep the network up and running while a panel is being serviced.
        6. Distance between panels is based on the media type used. Ethernet is 300 ft (91 m), Copper Wire is 3000 ft (914 m), and Fiber Optic is -10 dB loss (6000 ft / 1829 m).
     3. System Wiring:
        1. The SLC Bus and the Data Communication Bus (options bus) shall be wired with standard NEC 760 compliant wiring, no twisted, shielded or mid capacitance wiring is required for standard installations. All FACP screw terminals shall be capable of accepting 14 AWG (ISO 2.5 mm2) to 18 AWG (ISO 0.75 mm2) wire. All system wiring shall be in accordance with the requirements of NFPA 70, the National Electrical Code (NEC) and also comply with Article 760 of the NEC.
        2. Power Limited Wiring: For Power Limited wiring, use FPL, FPLR or FPLP approved wiring.
     4. SLC Bus:
        1. The SLC Bus shall be capable of a wiring distance of 10,000 feet from the signaling line circuit module (FPE-1000-SLC). Every signaling line circuit module shall be capable of supporting 254 detectors / pull stations / modules. Up to 127 analog sounder bases may be used with a host detector, for a total of 254 addressable points per SLC. The communication protocol shall be digital transmitting analog. The SLC bus shall be capable of functioning as two Class B Style 4 or one Class A Style 6 or 7 configuration.
     5. SLC Bus Loop Devices:
        1. Devices supported shall include addressable photoelectric smoke detectors, addressable heat detector, addressable input modules, input/relay output modules, dual input modules, and addressable eight input modules. There shall be no device type limit.
     6. Detector Functions:
        1. FACP shall receive analog information from all analog addressable sensors/detectors to be processed to determine whether normal, alarm, pre-alarm, or trouble conditions exist for each sensor/detector. The software shall automatically maintain the sensor/detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each sensor/detector. The panel will assess the sensor/detector analog data to determine when the fire condition is reached and the alarm must be generated. The analog information shall also be used for automatic detector testing/calibration and for the automatic determination of detector maintenance requirements. See Drift Compensation and Calibration portions of this document for additional details
     7. Annunciators:
        1. The main control must have a built in annunciator with a 4x20 character LCD display and feature LED's for Fire Alarm, Gas Alarm, System Trouble, System Silence, Supervisory, and Power. The LEDs for Fire Alarm and Gas Alarm must have different colors in order to be distinguishable. Systems that do not include these indications shall not be acceptable. All controls and programming keys are membrane style buttons. The annunciator must be able to silence and reset alarms by pushing the desired function key, access to the function keys shall either be granted by a key switch or by user code, depending on how the system is configured. The annunciators must have four levels of user codes that will allow the limitation of operating system programming to authorized individuals.
     8. Remote Annunciators:
        1. The fire system shall be capable of supporting up to eight remote annunciators. The LCD Remote Annunciator model FMR-1000-RCMD shall have the same control and display layout so that they match identically the built in annunciator. Remote annunciators shall have the same functionality and operation as the built in annunciator. All annunciators shall have 4x20 character LCD display and shall feature LED's for Fire Alarm, Gas Alarm, System Trouble, System Silence, Supervisory, and Power. The LEDs for Fire Alarm and Gas Alarm must have different colors in order to be distinguishable. Systems that do not include these indications shall not be acceptable.
        2. The annunciator must be able to silence and reset alarms by pushing the desired function key, the access to the function keys shall either be granted by a key switch or by user code, depending on how the system is configured. The annunciators must have four levels of user codes that will allow the limitation of operating system programming to authorized individuals.
        3. The control panel shall allow all annunciators to accommodate multiple users input simultaneously. Remote annunciators shall be capable of operating at a distance of 4000 feet (1219 m) from the main control panel on unshielded non-twisted wire.
        4. An annunciator with 4x20 character LCD display, acknowledge and scroll buttons shall be available.
     9. Annunciator Modules:
        1. The fire system shall be able to support up to eight LED annunciator modules (D7030X) that shall be used to drive eight LED's for zone annunciation. The D7030X shall reside on the option bus, and can be up to 3300 feet (1010 m) from the control.
     10. Distributed Power Panel:
         1. The contractor shall supply an FPP-RNAC-8A-4C power booster compatible with the FPA-1000-V2 fire alarm control panel. The power booster shall have 8 Amps of output power, four NAC circuits rated at 2.5 Amps each, and one Form C trouble relay. The four NAC circuits shall have similar functionality as the NAC circuits on the main panel. The fire system shall be capable of supporting up to four (4) power modules. The 4 NAC circuits of each of the 4 FPP-RNAC-8A-4C power boosters shall be synchronized and individually controlled for a total of 16 NAC circuits. The distributed Power module shall be capable of being connected via an option system bus.
         2. Each NAC circuit shall be able to produce the output patterns Steady, Temporal Code 3, Pulsed, California March, Wheelock Synch, System Sensor Synch and Gentex Synch or be configured as a power supply output.
         3. The FPP-RNAC-8A-4C power booster shall provide 8 LEDs which indicate AC ok, Trouble NAC circuit 1, Trouble NAC circuit 2, Trouble NAC circuit 3, Trouble NAC circuit 4, Input active, Ground fault. The power module shall be able to monitor ground fault and indicate if necessary.
     11. Digital Communicator:
         1. The digital communicator shall be an integral part of the control panel and be capable of reporting all points and all zones of alarm, supervisory, and trouble as well as all system status information such as loss of AC, low battery, ground fault, loss of supervision to any remote devices with individual and distinct messages to a central station or remote station. The communicator shall also be capable of up/downloading of all system programming options, Event history and Sensitivity compliance information to a PC on site or at a remote location.
         2. The communicator shall have an answering machine bypass feature that will allow the panel to respond to communication even on phone lines that have other communication equipment present. The communicator shall be capable of reporting via SIA, Contact ID, 3/1 formats and Modem IIIa2. The communicator shall have a delayed AC loss report function which will provide a programmable report delay to help ease traffic to the central station during a power outage.
     12. Web Server
         1. The Web Server shall be an integral part of the control panel and be capable of reporting all points and all zones of alarm, supervisory, and trouble as well as all system status information such as loss of AC, low battery, ground fault, loss of supervision to any remote devices with individual and distinct messages to a central station or remote station. The communicator shall also be capable of up/downloading of all system programming options, Event history and Sensitivity compliance information to a PC on site or at a remote location.
         2. The software to connect to the integrated Web server shall be Microsoft Internet Explorer or Mozilla Firefox. There shall be no proprietary software needed to assess the panel. Systems that do not include these indications shall not be acceptable.
     13. Dry Contacts:
         1. The FACP shall have three onboard programmable Form C relays with default operation for common Fire alarm, common trouble, and common supervisory which shall be programmable to other conditions, if necessary.
     14. Ground Fault Detection:
         1. A ground fault detection circuit shall be provided to detect positive and negative grounds on all field wiring. The ground fault detector shall operate the general trouble devices as specified but shall not cause an alarm to be sounded. A single ground fault will not interfere with the normal operation, such as alarm, or other trouble conditions.
     15. Test Functions:
         1. A "Walk Test" mode shall be a standard feature of the fire alarm control panel. The walk test feature shall function silently or audible. In the audible mode that each alarm input tested will operate the associated notification appliance for 5 seconds or 10 seconds. The FACP will then automatically perform a reset and confirm normal device operation.
         2. A "Fire Drill" mode shall allow the manual testing of the fire alarm system notification circuits. The "Fire Drill" shall be capable of being controlled at the main annunciator, and remote annunciators FMR-1000-RCMD.
         3. A "Disable Mode" shall allow for any point or NAC circuit to be disabled without affecting the operation of the total fire system.
     16. Remote Input Capabilities:
         1. The control panel shall have provisions for supervised switch inputs for the purpose of Alarm reset and silence operations.
     17. Notification Appliance Mapping Structure:
         1. All notification circuits and modules shall be programmable via a mapping structure that allows output activation to be flexibly associated with input activation or system conditions. Each of these outputs shall have the ability to be triggered by any of the panel's 128 software zones, 97 Group zones and 8 global zones. Any number of inputs shall be mapped to a software zone. Any software zone may trigger outputs individually. Global zones may be triggered by global conditions such as global alarms, global trouble, or global gas. Additionally each output can be individually configured to control the cadence pattern of the output so that sounders can indicate a variety of conditions.
     18. On board programmer:
         1. The FACP shall have an on board programmer which will allow for all system functions and options to be programmed via the on board annunciator keypad. Any panel that does not have this capability will not be accepted.
     19. Language descriptions:
         1. The FACP shall provide the ability to have a text description of up to 20 characters for each input point, on the system. The use of individual lights to provide descriptions will not be acceptable.
         2. The FACP shall be able to switch its operating and programming language between English, Latin American Spanish and Brazilian Portuguese. The display of the main board annunciator and the remote annunciator should be adaptable to English, Latin American Spanish, and Brazilian Portuguese.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + - 1. Dead front door to protect circuit's board and wiring. The cabinet shall have an extra dead front door to prevent touching the circuit boards, power supply and wirings. The dead front door shall be easily removable to facilitate installation and service.

\* NOTE TO SPECIFIER \*\* FPD-7024 Product only. Delete if not required.

* + - 1. Audible System Trouble Sounder: An audible system trouble sounder shall be an integral part of the control unit. Provisions shall also be provided for an optional supervised remote trouble signal.
    1. Power Supply and Charger:
       1. The entire system shall operate on 24 VDC power supply with the rated current available of 4 Amps. The FACP shall have a battery charging circuit capable of complying with the following requirements:
          1. Sixty (60) hours of battery standby with five (5) minutes of alarm signaling at the end of this sixty (60) hour period (as required per NFPA 72 remote station signaling requirements) using rechargeable batteries with automatic charger to maintain standby sealed lead-acid batteries in a fully charged condition.

\* NOTE TO SPECIFIER \*\* Delete above or below option for battery standby power duration.

* + - * 1. Twenty-four (24) hours of battery standby with five (5) minutes of alarm signaling at the end of this twenty-four (24) hour period (as required per NFPA 72 central station signaling requirements) using rechargeable batteries with automatic charger to maintain sealed lead-acid batteries in a fully charged condition.
      1. The power supply shall comply with UL Standard 864 9th Edition for power limiting.
      2. The FACP will indicate a trouble condition if there is a loss of AC power or if the batteries are missing or of insufficient capacity to support proper system operation in the event of AC failure. A "Battery Test" will be performed automatically every three minutes to check the integrity of the batteries. The test shall disconnect the batteries from the charging circuit and place a load on the battery to verify the battery condition.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + - * 1. FMR-1000-RCMD: Remote Command Center.
        2. FMR-1000-RA: Remote Annunciator.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. SLC Loop Device Support:
       1. The FACP shall support following devices in a SLC loop:

Analog Addressable with regard to device type:

1. FAH-440: Addressable (1…254) Heat Detector
2. FAP-440: Addressable (1…254) Photoelectric Smoke Detector
3. FAP-440-T: Addressable (1…254) Photoelectric Smoke/Heat Detector
4. FAP-440-TC: Addressable (1…254) Photoelectric Smoke/Heat/CO Detector.
5. FAP-440-D: Addressable (1…254) Dual Ray Photoelectric Detector
6. FAP-440-DT: Addressable (1…254) Dual ray Photoelectric Smoke/Heat Detector
7. FAP-440-DTC: Addressable (1…254) Dual Ray Photoelectric Smoke/Heat/CO Detector
8. FAA-440-B4-ISO: Analog Addressable (1…254) Isolator Detector Base (4‑inch (102 mm))
9. FAA-440-B6-ISO: Analog Addressable (1…254) Isolator Detector Base (6‑inch (152 mm))
10. FAA-440-B4: Analog Detector Base (4‑inch (102 mm))
11. FAA-440-B6: Analog Detector Base (6‑inch (152 mm))

Analog Addressable without regard to device type:

* + - * 1. FAP-325: Addressable Photoelectric Smoke Detector Head.
        2. FAH-325: Addressable Photoelectric Heat Detector Head.
        3. FAI-325: Analog Ionization Smoke Detector Head.
        4. FAA-325-B4: Analog Detector Base (4 inches (102 mm)).
        5. FAA-325-B6: Analog Detector Base (6 inches (152 mm)).
        6. FAD-325-DH: Analog DUCT Detector.
        7. FAD-325-V2F-DH: Analog DUCT Detector, version 2
        8. FMM-325A: Analog Single Action Manual Station.
        9. FMM-325A-D: Analog Double Action Manual Station.
        10. FLM-325-CZM4: Conventional Zone Module.
        11. FLM-325-2I4 : Dual Input Monitor.
        12. FLM-325-2R4: Dual Relay Module.
        13. FLM-325-ISO: Short Circuit Isolator.
        14. FLM-325-N4: Supervised Output Module.
        15. FLM-325-I: Contact Monitor.
      1. The FCAP shall support the operation of up to 127 base sounders per SLC loop of the following type:
         1. FAA-325-B6S: Analog base sounder.
      2. Addressable detectors/sensors shall be intelligent analog addressable and shall connect with two wires to the fire alarm control panel signaling Line Circuits (SLC).
      3. Addressable detectors/sensors shall provide tri-color alarm, trouble and polling LED indicator. The indicators shall flash red or green under normal conditions, indicating that the detector/sensor is operational and in regular communication with the control panel. The indicators shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED indicator.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only in combination with FAP-440 series. Delete if not required.

Addressable detectors/sensors shall provide at least a bi-color alarm and polling LED indicator. The indicators shall flash red or green under normal conditions, indicating that the detector/sensor is operational and in regular communication with the control panel. The indicators shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. The FAP-440 series shall also provide a trouble indicator which is flashing yellow on trouble. Moreover, related to the FAP-440 series it shall indicate a revision mode by flashing red on each message to the panel. An output connection shall also be provided in the base to connect an external remote alarm LED indicator.

* + - 1. The fire alarm control panel shall permit addressable detector/sensor sensitivity adjustment through keypad programming of the system or by assessing the built-in web browser. The panel on a time-of-day basis shall automatically adjust and alternate sensitivity between Day and Night modes.
      2. The addressable detectors/sensors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance via intelligence and control from the panel per calibration and drift compensation functions. The detectors/sensors and control panel shall meet the calibrated sensitivity test requirements of NFPA Standard 72 and UL864.
      3. Addressable detectors/sensors shall include a separate twist-lock base. Each FAA-325-xx series base shall permit direct interchange with each Bosch Security System FAx-325 series head and each FAA-440-xx series base shall permit direct interchange with each Bosch Security System FAx-440 series head. The vandal-resistant, security locking feature shall be used in those areas required by the application and implemented per the manufacturer's instructions. The locking feature shall be optional and can be implemented when required. Both 4‑inch (102 mm) and 6‑inch (152 mm) models shall be supported and shall be Bosch Security System FAA-325-B4/FAA-440-B4 and FAA-325-B6/FAA-440-B6 respectively.
      4. Addressable detectors/sensors shall provide an integrated contamination test whereby an internal test of the chamber or sensor is performed by the control panel automatically every 4 hours. This operation shall guarantee every detector/sensor in the system is operating within the sensitivity range specified. Any detectors/sensors that do not pass this test shall indicate a trouble and maintenance alert on the control panel.
      5. Addressable devices shall have a stored internal device type code that the control panel shall use to identify the specific type of device. The panel shall automatically identify the type of detector/sensor, module, etc. Each device type shall use a unique type code.
      6. Addressable detectors/sensors shall measure its environmental background and communicate its analog value to the control panel in real time ambient conditions. The control panel, not the detector/sensor, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector/sensor to be set and monitored by the control panel. The system operator shall have the ability to view the background measurement of each detector/sensor.
      7. Addressable modules shall mount in a standard 4‑inch (102 mm) square electrical construction box. Mini-Modules shall fit inside a standard 4‑inch square or single-gang box.
      8. The Fxx-325-xx Addressable devices shall be capable of accepting 12 – 22 AWG wire. The FAP-440 series addressable devices shall be capable of accepting 12 – 22 AWG wire.
      9. Addressable devices shall be UL listed and compatible with the Bosch Security Systems analog/addressable FPA-1000 series control panel.
      10. Addressable device addresses shall be electrically programmable and stored in EEPROM.
      11. Addressable devices of the Fxx-325-xx series shall be programmed / addressed by using the D5070 Hand-held Device Programmer. Addressable devices of the FAx-440-xx series shall be programmed/addressed automatically or by rotary switches.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Analog Photoelectric Smoke Detector - (FAP-440/FAP-440-T/FAP-440-TC)

1. Analog photoelectric smoke sensors shall have an UL listed operating range of 1.25%/ft – 3.5%/ft (UL268) obscuration. Analog photo smoke sensors that do not support this operating range or velocity capability shall not be acceptable.
2. The Analog Photoelectric Smoke/Heat Detector shall provide a fixed temperature value at +135°F (+57°C) and RoR always on.
3. Analog photo smoke detectors shall have a low profile design, only 2.44 inches (62 mm) high, including base.
4. Drift compensation shall be built in.
5. The plastics shall be resistant to yellowing from prolonged UV exposure.
6. The smoke chamber shall be easy to clean without disassembling and by using the Chamber Maid feature.
7. The address programming shall automatic and/or via rotary address switches.
8. A self monitoring function shall supervise the chamber for contamination and automatically adjust the sensitivity level.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Analog Photoelectric Heat Detector - (FAH-440):
       1. Analog heat sensors shall have a UL listed installation range from 32 to 150°Fahrenheit and have a programmable alarm threshold temperature of 135 to 194°Fahrenheit.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Analog Detector Base - (FAA-440-B4/FAA-440-B6):
       1. Analog Detector Base communicates over a two conductor bus.
       2. An integrated third terminal can be used to perform additional functions.
       3. The implemented locking tool shall prevent unauthorized removal of the detector head. The locking tool shall only be optional.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Analog Detector Isolator Base - (FAA-440-B4-ISO/FAA-440-B6-ISO)
       1. Analog Detector Base communicates over a two conductor bus.
       2. An integrated third terminal can be used to perform additional functions.
       3. The integrated isolator shall maintain loop functionality in the case of a short circuit.
       4. The implemented locking tool shall prevent unauthorized removal of the detector head. The locking tool shall only be optional.

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* + 1. Analog Photoelectric Smoke Detector - (FAP-325):
       1. Analog photo smoke sensors shall have a UL listed operating range from .88%/ft to 3.57%/ft with obscuration graduated across an air velocity range up to 4000 fpm. Analog photo smoke sensors that do not support this operating range or velocity capability shall not be acceptable.
       2. Analog photo smoke sensors shall have a low profile design, only 1.97 inches (50.04 mm) high, including base.
       3. Drift compensation shall be built in.
       4. The plastics shall resist yellowing from prolonged UV exposure. The color shall be bone.
       5. The smoke chamber shall be removable to allow ease of maintenance and cleaning.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Analog Ionization Smoke Detector - (FAI-325):
       1. Analog ion smoke sensors shall have a UL listed operating range from .55%/ft to 1.15%/ft obscuration.
       2. Analog ion smoke sensors shall have a low profile design, only 2.22 inches (56.34 mm) high, including base.
       3. Drift compensation shall be built in.
       4. The plastics shall resist yellowing from prolonged UV exposure. The color shall be bone.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Analog Thermal/Heat Detector - (FAH-325):
       1. Analog heat sensors shall have a UL listed installation range from 32 to 150°Fahrenheit and have a programmable alarm threshold temperature of 135 to 157°Fahrenheit.
       2. Analog heat sensors shall have a low profile design, only 2.0 inches (51 mm) high, including base.
       3. The plastics shall resist yellowing from prolonged UV exposure. The color shall be bone.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Analog Photoelectric Duct Smoke Detector - (FAD-325):
       1. Analog photo duct smoke sensors shall have a UL listed operating range from .88%/ft to 2.75%/ft with obscuration across an air velocity range from 300 to 4000 fpm. Analog photo duct smoke sensors that do not support this operating range or velocity capability shall not be acceptable.
       2. Drift compensation shall be built in.
       3. The plastics shall resist yellowing from prolonged UV exposure. The color shall be bone.
       4. Analog photo duct smoke sensors shall include two built-in programmable Form C relays, rated at 10 Amps at 250 VAC. An alternate non-relay two-wire model shall also be available that does not require 24 VDC input power. The relay model operates on four-wires and requires 24 VDC input power.
       5. The duct detector housings shall be of metal construction and complete mechanical installation may be performed without removal of detector cover. The duct detector shall not require additional filters or screens which must be maintained. The housing shall contain a base which will accept an analog photoelectric duct sensor head. The housing cover shall be clear for easy inspection. Terminal connections shall be of the screw type and be a minimum of a #6 size screw. For installations requiring relay function (FAD-325-R), terminals shall be provided for remote pilot, remote alarm indication, strobe/ horn and remote key switch. A manual reset switch shall be located on front of the device. For installations not requiring relay function (FAD-325), visual indication of alarm and power must be provided.
       6. The smoke chamber and head shall be removable to allow ease of maintenance and cleaning.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Analog Photoelectric Duct Smoke Detector - (FAD-325-V2F):
       1. Analog photo duct smoke sensors shall have a UL listed operating range from .90%/ft to 2.65%/ft with obscuration across an air velocity range from 300 to 4000 fpm. Analog photo duct smoke sensors that do not support this operating range or velocity capability shall not be acceptable.
       2. Drift compensation shall be built in.
       3. The plastics shall resist yellowing from prolonged UV exposure. The color shall be bone.
       4. Analog photo duct smoke sensors shall include two built-in programmable Form C relays, rated at 10 Amps at 250 VAC. An alternate non-relay two-wire model shall also be available that does not require 24 VDC input power. The relay model operates on four-wires and requires 24 VDC input power.
       5. The duct detector housings shall be of metal construction and complete mechanical installation may be performed without removal of detector cover. The duct detector shall not require additional filters or screens which must be maintained. The housing shall contain a base which will accept an analog photoelectric duct sensor head. The housing cover shall be clear for easy inspection. Terminal connections shall be of the screw type and be a minimum of a #6 size screw. For installations requiring relay function (FAD-325-V2F-R), terminals shall be provided for remote pilot, remote alarm indication, strobe/ horn and remote key switch. A manual reset switch shall be located on front of the device. For installations not requiring relay function (FAD-325-V2F), visual indication of alarm and power must be provided.
       6. The smoke chamber and head shall be removable to allow ease of maintenance and cleaning.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Addressable Sounder Base - (FAA-325-B6S):
       1. The addressable sounder base shall be fully programmable and operate on an independent SLC address. The addressable sounder base shall not require extra control wiring, DIP switches, decade dial (rotary) switches, etc. to link multiple, independent sounder bases, or groups of sounder bases together. The addressable sounder base shall accommodate all analog sensors, such as photo, ion, or heat.
       2. The addressable sounder base shall be UL listed as an indication device that provides 85 decibels of sound level output at 10 feet (3 m) and shall have programmable audible patterns for temporal, continuous, or march time.
       3. The addressable sounder base shall be programmable to operate from any global event category, zone, point, or Cause & Effect logic. The flexible programming and operation shall allow multiple trigger sources for fire alarm, supervisory, and other logic to support hotel and high-rise apartment style applications, all from intelligent addressable output control from the panel.
       4. The sounder base shall include support for a remote alarm LED indicator as an option.
       5. The addressable sounder base shall be self addressing based on the host sensor address it is attached to, not requiring any special device address programming. The addressable sounder base shall automatically add 127 plus the detector address to obtain its independent address. The addressable sounder base shall operate in the higher SLC address range from 128 to 254. Systems which cannot automatically address the sounder base, sounder bases that are not fully programmable, or SLC that do not support 254 addresses shall not be accepted.
       6. The plastics shall resist yellowing from prolonged UV exposure. The color shall be bone.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Addressable Manual Pull-Station - (FMM-325A/FMM-325A-D):
       1. Manual pull stations shall be addressable FMM-100 series single or dual action models, FMM-325A or FMM-325A-D. Models shall be made of die-cast metal and painted red enamel. The words Fire Alarm shall be in a contrasting color and be embossed text ½ inch tall. The electronics shall connect to the SLC loop of the control panel.
       2. Manual pull stations shall be Underwriters Laboratories Inc. Listed, FM approved, and CSFM Approved, and be installed within the limits defined in the American Disabilities Act.
       3. The Addressable Manual Pull-Station shall have the following features and options:
          1. All metal construction
          2. Single and dual action models available
          3. Extremely easy to operate
          4. Address is programmable in EEPROM
          5. Resettable by key lock
          6. Terminals accept up to 12 AWG wire
          7. Surface mount back box available
          8. ADA compliant

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Addressable Conventional Zone Module - (FLM-325-CZM4):
       1. Addressable Conventional Zone Module shall provide one supervised IDC initiating zone for conventional alarm initiating devices and will connect to the SLC.
       2. The Conventional Zone Module shall be suitable for Class A (Style D) or Class B (Style B) operation.
       3. The Conventional Zone Module shall provide an address Initiating Device Circuit (IDC) of up to 25 conventional smoke detectors depending on the model and brand. Conventional devices with a NO dry contact output may also be used and do not have a restriction of 25 devices. UL 2-wire compatibility is required on all conventional zone powered devices used on the IDC of the CZM module. Devices with NO dry contact output shall not require UL 2-wire compatibility.
       4. The Conventional Zone Module shall have a bi-colored LED indicator that flashes green when polled and latches on red (controlled by panel) when activated for alarms.
       5. The Conventional Zone Module shall require a 24 VDC auxiliary power source to provide IDC power for the detectors.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Addressable Dual Input Monitor Module - (FLM-325-2I4):
       1. The Dual Input Monitor Module shall provide two independently monitored inputs to connect NO dry contact type initiating devices to the SLC. Each input shall be capable of independent operation, such as one input for water-flow (Fire), and the other for valve tamper (Supervisory). The two inputs shall not interfere with each other or require common function and shall be capable of programmable operation, such as water-flow (Fire), valve tamper (Supervisory), manual pull-station (Fire), and other general event categories.
       2. The Dual Input Monitor Module shall only occupy one SLC address. The two inputs shall be sub-addresses that operate under the single SLC address of the module. An SLC using FLM-325-2I4 shall be capable of (508) inputs when all (254) SLC addresses are used.
       3. The DIMM shall operate on Style 4, 6, or 7 SLC. The inputs shall be capable of being programmed for NO or NC contacts, with an option for non-supervised NC (no EOL) operation.
       4. The Dual Input Monitor Module shall have a bi-colored LED indicator for displaying device polling and alarm status.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Addressable Contact Monitor Module - (FLM-325-I4/-I4-A/-I4-AI/-IM):
       1. Addressable Contact Monitor Module shall provide a monitored input to connect NO. dry contact type initiating devices to the SLC. The input shall be capable of programmable operation, such as water-flow (Fire), valve tamper (Supervisory), manual pull-station (Fire), and other general event categories.
       2. The Addressable Contact Monitor Module shall operate on Style 4, 6, or 7 SLC. The input shall be capable of being programmed for a NO or NC contact, with an option for non-supervised NC (no EOL) operation.
       3. The Addressable Contact Monitor Module shall have a bi-colored LED indicator for displaying device polling and alarm status.
       4. The Addressable Contact Monitor Module should be either come in a 4‑inch (102 mm) back box (FLM-325-I4 series), or as mini module with terminal screws (FLM-325-IM).
  1. The module shall have an integrated isolator to prevent an SLC bus short from defeating the whole bus.
  2. The output shall be wired for Class B (Style Y) or Class A (Style Z) operation.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Addressable Supervised Output Module - (FLM-325-N4/-NA4/-NA4I):
       1. The Supervised Output Module shall provide supervision and controlled activation of polarized 24VDC audio/visual notification appliances and other 24 VDC powered devices.
       2. The Supervised Output Module shall provide a voltage output rated at 24 VDC at 2.0 Amps. The output shall be wired for Class B (Style Y) or Class A (Style Z) operation. The output shall provide reverse polarity operation for supervision of the device circuit. Outputs patterns shall be Temporal, Continuous, and March. There shall be a silence-able option.
       3. The Supervised Output Module shall be programmable to operate from any global, group or local zone. The flexible programming and operation shall allow multiple trigger source options for fire alarm, supervisory, and other logic to support hotel and high-rise apartment style applications, all from intelligent addressable output control from the panel.
       4. The Supervised Output Module shall have a bi-colored LED indicator for displaying device polling and control status.
       5. Systems that do not meet the FLM-325-N4 series performance criteria shall not be acceptable.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Addressable Dual Relay Module - (FLM-325-2R4/-2R4-2A/-2R4-2AI/-2R4-8A/--2R4-8AI):
       1. The FLM-325-2R4 series shall provide two independently controlled relay outputs to connect devices requiring control from the fire system to the SLC. Each output shall be capable of independent operation. The two outputs shall not interfere with each other or require common function and shall be capable of programmable operation such as general event categories, zone control, point control, silence-able option.
       2. The Dual Relay Module shall only occupy one SLC address. The two outputs shall be sub-addresses that operate under the single SLC address of the module. An SLC using FLM-325-2R4 series shall be capable of 508 outputs when all 254 SLC addresses are used.
       3. The Dual Relay Module shall operate on Style 4, 6, or 7 SLC. The outputs shall be two Form C relay contacts rated at 1 A at 30 VDC, 1 pF and 0.5A at 125 VAC, 0.6 pF, or 2 A at 30 VDC, 1 pF and 0.5 A at120 VAC, 0.6 pF, or 8 A at 30 VDC/250 VAC, 1 pF and 4.8 A at 250 VAC, 0.6 pF. The FLM-325-2R4 series shall not require a 24 VDC auxiliary power supply source.
       4. The Dual Relay Module shall have operating parameters maintained in the module after device initialization and will not require individual control commands from the control panel during fire conditions to operate. The control panel shall instead broadcast system-wide commands on the SLC of the FLM-325-2R4 series or group of FLM-325-2R4 series will respond based on individual programming allowing simultaneous group device activations from a single control panel command. The FLM-325-2R4 series shall also have the ability to receive individual commands (non-group commands) from the control panel along with the group command broadcasts. Systems that do not meet this requirement shall not be acceptable.
       5. The Dual Relay Module shall be programmable to operate from any global zone, group zone or local zone. The flexible programming and operation shall allow multiple trigger source options for fire alarm, supervisory, and other logic to support elevator recall, fan/damper control, door holder/lock control, and other building control functions, all from intelligent addressable output control from the panel.
       6. The Dual Relay Module shall have a bi-colored LED indicator for displaying device polling and control status.
       7. Systems that do not meet the Dual Relay Module performance criteria shall not be acceptable.

\* NOTE TO SPECIFIER \*\* FPA-1000 Product only. Delete if not required.

* + 1. Short Circuit Isolator Module - (FLM-325-ISO):
       1. The Short Circuit Isolator Module shall provide automatic isolation of wire-to-wire short circuits on a Class A (Style 6 or 7) SLC or Class B (Style 4) SLC trunk and/or branch circuits. The isolator module shall prevent addressable devices from being rendered inoperative by a short circuit fault on the SLC when used in a NFPA 72-2002 Style 7 configuration. When used in Style 4 or 6 hybrid configurations (i.e. not fully Style 7 compliant), the isolator module shall limit the number of addressable devices from being rendered inoperative by a short circuit fault on the SLC.
       2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the segment of the SLC that is shorted. When the short circuit condition is corrected, the Short Circuit Isolator Module shall automatically reconnect the isolated segment.
       3. The Short Circuit Isolator Module shall not require address-setting or an SLC address. The SCI operation shall be completely automatic. It shall not be necessary to replace or reset a Short Circuit Isolator Module after its normal operation. The Short Circuit Isolator Module shall have the ability to be placed anywhere on the SLC and shall not have a limit of how many can placed on a given SLC.
       4. The Short Circuit Isolator Module shall provide a single yellow LED that shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.
    2. The FACP shall provide sync signal for the following appliances:
       - 1. Wheelock.
         2. System Sensor.
         3. Gentex

1. EXECUTION
   1. WIRING
      1. Installer's Responsibilities:
         1. The installer shall coordinate the installation of the fire alarm equipment.
         2. All conductors and wiring shall be installed according to the manufacturer's recommendations.
         3. It shall be the installer's responsibility to coordinate with the supplier, regarding the correct wiring procedures before installing any conduits or conductors.
      2. Installation of System Components:
         1. System components shall be installed in accordance with the latest revisions of the appropriate NFPA pamphlets, the requirements contained herein, National Electrical Code, local and state regulations, the requirements of the fire department and other applicable authorities having jurisdiction (AHJ).
         2. All wire used on the fire alarm system shall be UL Listed as fire alarm protection signaling circuit cable per National Electrical Code, Article 760. The use of FPL, FPLR or FPLP wiring for power limited applications.
   2. DEVICE INSTALLATION
      1. Furnish and install, all devices where shown on the drawings, the following applicable codes, standards and manufacturer recommendation to ensure proper operations and functions as intended.
   3. FINAL TEST
      1. Before the installation shall be considered completed and acceptable by the awarding authority, a test of the system shall be performed as follows:
         1. The contractor's job foreman, a representative of the owner, and the fire department shall operate every building fire alarm device to ensure proper operation and correct annunciation at the control panel.
         2. At least one half of all tests shall be performed on battery standby power.
         3. Where application of heat would destroy any detector, it may be manually activated.
      2. The communication loops and the indicating appliance circuits shall be opened in at least two locations per circuit to check for the presence of correct supervision circuitry.
      3. When the testing has been completed to the satisfaction of both the contractor's job foreman and owner, a notarized letter cosigned by each attesting to the satisfactory completion of said testing shall be forwarded to the owner and the fire department.
      4. The contractor shall leave the fire alarm system in proper working order, and, without additional expense to the owner, shall replace any defective materials or equipment provided by him under this contract within one year (365 days) from the date of final acceptance by the awarding authority.
      5. Prior to final test the fire department shall be notified in accordance with local requirements.
   4. AS BUILT DRAWINGS, TESTING, AND MAINTENANCE INSTRUCTIONS
      1. As Built Drawings:
         1. A complete set of reproducible "as-built" drawings showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of system.
      2. Operating and Instruction Manuals:
         1. Operating and instruction manuals shall be submitted prior to testing of the system. Three complete sets of operating and instruction manuals shall be delivered to the owner upon completion. User operating instructions shall be provided prominently displayed on a separate sheet located next to the control unit in accordance with UL Standard 864.

END OF SECTION