

d) Directional Changes in Conduit Runs  
Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends offset with hickory or conductive metallic raceway systems. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

e) Pull Wire  
Install pull wires in empty conduits. Pull wire shall be plastic having minimum 200-pound tensile strength. Leave minimum 36 inches of slack at each end of pull wire.

f) Data System Conduits  
Install in accordance with specified requirements for conduit and with additional requirement that no length of run shall exceed 150 feet for trade sizes 2 inches and smaller and shall not contain more than two 90-degree bends or equivalent. Provide pull or junction boxes where necessary to comply with these requirements. Inside radii of bends in conduits one-inch trade size and larger shall be minimum five times nominal diameter. Terminate conduit at bottom edge of cable trays and backboards with plastic bushings.

g) Conduit Installed in Concrete Floor Slabs  
Locate so as not to adversely affect structural strength of slabs. Install conduit within middle one-third of concrete slab. Do not slack conduits. Space conduits horizontally not closer than three diameters, except at cabinet locations. Curved portions of bends shall not be visible above finish slab. Increase slab thickness as necessary to provide minimum one-inch cover over conduit. Where embedded conduits cross building and/or expansion joints, provide suitable watertight expansion/deflection fittings and bonding jumpers. Expansion/deflection fittings shall allow horizontal and vertical movement of raceway. Conduit larger than one-inch trade size shall be parallel with or at right angles to main reinforcement; when at right angles to reinforcement, conduit shall be close to one of supporting steel. Where nonmetallic conduit is used, raceway must be converted to rigid steel or steel IMC before rising above floor, unless specifically indicated.

h) Locknuts and Bushings  
Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where installed bushings are used, and where bushings cannot be brought into firm contact with the box, otherwise, use at least minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on end of conduits, and provide insulating type where required by NFPA 70.

i) Stub-Ups  
Provide conduits stubbed up through concrete floor for connection to free-standing equipment with adjustable top or coupling threaded inside for plugs, set flush with finished floor. Extended conduits to equipment in rigid steel conduit, except that flexible metal conduit may be used 6 inches above floor. Where no equipment connections are made, install screwdriver-operated threaded flush plugs in conduit end.

j) Flexible Connections  
Provide flexible steel conduit between 3 and 6 feet in length for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size shall be 3/4 inch diameter. Provide liquid-tight flexible conduit in wet locations and in fire pump rooms. Provide separate ground conductor across flexible connections.

k) Firestopping  
Conduits passing through smoke and fire partitions shall be rigid steel threaded type with grounding bushings. E.M.T. and PVC shall transition to rigid steel threaded conduit a minimum of 12 inches beyond each side of the partition. Penetrations shall be fire stopped in accordance with section 07920 "Firestop Systems".

5. Boxes, Outlets, and Supports

Provide boxes in wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, and when specifically indicated. Boxes in other locations shall be sheet steel, and nonmetallic boxes may be used with nonmetallic conduit system. Each box shall have volume required by NFPA 70 for number of conductors enclosed in box. Boxes for mounting lighting fixtures shall be minimum 4 inches square, or octagonal, except that smaller boxes may be installed as required by fixture configurations. Boxes for use as masonry-block or the walls shall be square-cornered, life-type, or standard boxes having square-cornered, life-type covers. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with outside of exterior surfaces. Provide separate boxes for flush or recessed fixtures when required by fixture terminal operating temperature. Fixtures shall be readily removable for access to boxes unless ceiling access panel are provided. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of ceiling supports, or make adequate provisions for distributing load over ceilings support members in an approved manner. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. Threaded studs driven in by powder charge and provided with washers and nuts. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for future support; support sheet metal boxes directly from building structure or by bar hangers. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 24 inches from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

a) Boxes  
Boxes for use with raceway systems shall be minimum 1 1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets shall be minimum 4 inches square, except that 4-by-2-inch boxes may be used where only one raceway enters outlet. Telephone and data outlets shall be minimum of 4 inches square by 1 1/2 inches deep, except for wall mounted telephones and outlets boxes for handicap telephone stations.

b) Pull Boxes  
Construct of at least minimum size required by NFPA 70 of code-gauge galvanized sheet steel, and compatible with nonmetallic raceway systems, except where cast-metal boxes are required in locations specified herein. Provide boxes with screw-fastened covers. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.

6. Mounting Heights  
Mount panels, circuit breakers, and disconnecting switches to height of operating handle at its highest position is maximum 78 inches above floor. Mount lighting switches 48 inches above finished floor, receptacles 18 inches above finished floor, and other devices as indicated. Measure mounting heights of wiring devices and outlets to center of device or outlet.

7. Conductor Identification  
Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, color coding shall be by factory-applied, color-impregnated insulation. For conductors No. 4, 6, 8, and 10 AWG and larger diameter, color coding shall be by plastic-coated, self-sticking markers, color nylon cable ties and plates, or heat shrink-type sleeves.

8. Splices  
Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make splices in conductors No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

9. Covers and Device Plates  
Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster flings are not permitted. Install plates with alignment tolerance of 1/16 inch. Use of sectional-type device plates are not permitted. Provide gasket for plates installed in wet locations.

10. Electrical Penetrations  
Seal openings around electrical penetrations through fire resistance-rated walls, partitions, floors, and ceilings utilizing proper firestopping materials to maintain fire resistive integrity.

11. Grounding and Bonding  
In accordance with NFPA 70. Ground exposed, non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, and neutral conductor of wiring systems. Make ground connection at main service equipment, and extend grounding conductor to point of entrance of metallic water service. Make connection to water pipe by suitable ground clamp or lug connection to plugged tee. If flanged pipes are encountered, make connection with lug bolted to street side of flanged connection. Supplement metallic water service grounding system with additional made electrode in compliance with NFPA 70.

a) Resistance  
Maximum resistance to-grounding system shall not exceed 5 ohms under dry conditions. Where resistance obtained exceeds 5 ohms, contact Engineer for further instructions.

b) Telephone Service  
Provide main telephone service equipment ground consisting of separate No. 6 AWG ground wire in conduit between equipment backboard and readily accessible grounding connection. Equipment end of ground wire shall consist of coiled length at least twice as long as terminal cabinet or backboard height.

12. Equipment Connections  
Provide power wiring for the connection of motors and control equipment under this section of the specification. Except as otherwise specifically noted or specified, automatic control wiring, control devices, and protective devices within the control circuitry are not included in this section of the specifications but shall be provided under the section specifying the associated equipment.

13. Elevator  
Connectors to the elevator shaft include: (1) per NFPA 70, Article 620, provision of 120 volt, 20 ampere circuit (including circuit protection, conduit and wires) from the indicated panel to elevator machine room; terminate circuit in 100 volt, 30 ampere, 2 pole fused disconnect switch in elevator machine room. (2) in the elevator pit, provision of light fixture, with light switch adjacent to point of access, and 20 ampere duplex receptacle (weatherproof), serve from circuits as indicated. Provide circuit to line terminals of elevator controller, and disconnect switch on line side of controller, outlet for control power, outlet receptacle and work light at mid height of elevator shaft, and work light and outlet receptacle in elevator pit.

3.01 FIELD QUALITY CONTROL

A. Furnish test equipment and personnel and submit written copies of test results. Give Engineer 5 working days notice prior to each test.

1. Devices Subject to Manual Operation  
Each device subject to manual operation shall be operated at least five times, demonstrating satisfactory operation each time.

2. 600-Volt Wiring Test  
Test 600-volt wiring and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance test on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 2500 ohms.

3. GFCI Receptacle Test  
Test GFCI receptacles with a "load" (such as a plug in light) to verify that the "line" and "load" leads are not reversed.

4. Firestopping Field Test  
Submit written reports indicating locations of electrical penetrations and type of firestopping used at each location. Type shall be recorded by UL listed print numbers.

5. Grounding System Test  
Test grounding system to ensure continuity, and that resistance to ground does not exceed 5 ohms. Test each ground rod for resistance to ground before making connections to rod, tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to Engineer, and indicate location of rods as well as resistance and soil conditions at time measurements were made.

END OF SECTION

QUALITY ASSURANCE

1.00 DESCRIPTION

A. Work Included:  
This section approved. Division 16 Specification outlines the requirements and procedures for Sections of Division 16 as hereinafter specified.

B. Related work described elsewhere:  
Applicable Sections of Division 16 specified hereinafter.

1.01 ENGINEERING SUPERVISION:

A. The services of a qualified technician shall be provided to supervise the installation, make adjustments and test for proper operation. The technician shall not designate personnel in the operation, adjustment and maintenance of the system.

B. The manufacturer and/or his authorized agent shall show satisfactory evidence upon request that he maintains a fully equipped factory service organization capable of furnishing adequate inspection and service to the equipment including standard factory approved replacement parts. The manufacturer and/or his agent shall be prepared to offer a service contract for the maintenance of the system after the guarantee period expires. Vendor employing outside service shops for service on all "On Call" or "Contract" basis shall be disqualified as being unsatisfactory. Complete bona fide service and parts facilities shall be provided at a location further distance from the job site than 25 miles.

C. The manufacturer of the equipment shall furnish grants to the Owner of a one year contract, effective from the date of completion and acceptance of the installation, for maintenance and inspection service of the equipment furnished by a qualified service engineer. This service contract shall provide for a minimum of two inspection during the contract year. Such engineering service shall be furnished within fourteen days of written request by the Architect/Engineer.

D. System and its components specified herein shall be the product of a manufacturer of established reputation who has designed and produced similar systems and components for a period of at least 10 years. Vendors shall be prepared to furnish a list of 10 similar installations in the project area now rendering satisfactory service for possible inspection by the Architect/Engineer.

E. Distributors shall be authorized agents of the equipment furnished.

1.02 INSTRUCTION MANUALS:

A. Four bound copies of complete instructions for the operation and maintenance of the system shall be furnished to the Owner including circuit drawings and wiring diagrams.

1.03 TESTS:

A. After installation and prior to acceptance, the systems shall be tested in the presence of a representative of the manufacturer. All necessary tests shall be made and any deficiency found shall be corrected and the system shall be re-tested.

B. Dielectric grounds, short circuits continuity of conductors and insulation resistance tests shall be made in accordance with the recommendation of the manufacturer.

C. Special test shall be performed as described in their applicable Section.

1.04 SHOP DRAWINGS:

A. Before ordering material to be shipped to the project, submit to the Architect/Engineer for approval shop drawings of each system as outlined in Division 16100 Section 1.02 giving details, dimensions, wiring diagrams, etc. Each drawing shall be marked with the building title for the particular project. Submit five (5) copies of each drawing.

END OF SECTION

FIRE DETECTION AND ALARM SYSTEM

1.1 DESCRIPTION:

A. This section of the specification includes the furnishing, installation, and connection of the microprocessor-controlled fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panel, auxiliary control devices, annunciators, power supplies, and wiring as shown on the drawings and specified herein.

B. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for protected premises signaling systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.

C. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

D. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

E. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and shall be installed in compliance with the UL listing.

F. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

1.2 SCOPE:

A. A new microprocessor controlled fire detection and alarm system shall be installed in accordance with the specifications and drawings.

B. Basic Performance:  
1. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D).  
2. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z).  
3. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

1.3 SUBMITTALS:

A. General:  
All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent equipment (compatible UL Listed) from other manufacturers may be substituted for the specified equipment.

B. Shop Drawings:  
Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, and complete wiring point-to-point diagrams.

C. Manuals:  
Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s) including technical data sheets (with model numbers to be used indicated).

D. Certifications:  
Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.4 GUARANTY:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance.

1.5 POST CONTRACT MAINTENANCE:

Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the major equipment manufacturer for a period of five (5) years after guaranty expiration.

As part of the submittal work, include a quote for a maintenance contract to provide all maintenance test and repair as required after the warranty period. Include also a quote of hourly rates, response time and technician travel costs. Submittals which do not include a complete statement of maintenance costs will not be accepted.

1.6 PERFORMANCE CRITERIA / APPLICABLE PUBLICATIONS:

The publications and/or standards listed below form a part of this specification. The publications are referenced in text by the basic designation only.

- A. National Fire Protection Association (NFPA) - USA:  
No. 70 National Electrical Code (NEC)  
No. 72 - 1993 National Fire Alarm Code  
No. 101 Life Safety Code
- B. Underwriters Laboratories Inc. (UL) - USA:  
No. 50 Cabinets and Boxes  
No. 268 Smoke Detectors for Fire Protective Signaling Systems  
No. 864 Control Units for Fire Protective Signaling Systems  
No. 268A Smoke Detectors for Duct Applications  
No. 521 Heat Detectors for Fire Protective Signaling Systems  
No. 228 Door Closers/Holders for Fire Protective Signaling Systems  
No. 464 Audible Signaling Appliances  
No. 1971 Visual Signaling Appliances  
No. 38 Manually Actuated Signaling Boxes  
No. 346 Waterflow Indicators for Fire Protective Signaling Systems  
No. 1481 Power supplies for Fire Protective Signaling Systems
- C. Local and State Building Codes.
- D. All requirements of the Authority Having Jurisdiction (AHJ).
- 1.7 PERFORMANCE CRITERIA / APPROVALS:
- A. Each system must have proper listing and/or approval from the nationally recognized agency responsible for the particular area.
- UL Underwriters Laboratories Inc.  
FM Factory Mutual  
ULC Underwriters Laboratories Canada  
MEA Material Equipment Acceptance (NYC)  
CSFM California State Fire Marshal
- B. The Fire Alarm Control Panel shall meet the modular labeling requirements of Underwriters Laboratories Inc. Each subassembly of the FACP, including all printed circuit cards, shall carry the appropriate and official UL modular label.

PART 2.0 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL. GENERAL:

A. All equipment and components shall be new, and the manufacturer's current model.

B. All equipment and components shall be installed in strict compliance with manufacturer's recommendations.

C. All Equipment shall be attached to wall and ceiling/floor assemblies and shall be held firmly in place. (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.2 CONDUIT AND WIRE:

A. Conduit:  
1. Conduit shall be in accordance with the National Electrical Code (NEC), local and state requirements.  
2. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.  
3. 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, as per NEC Article 760.29.

4. Conduit shall be 3/4" 4 inch (19.1mm) minimum. Coupling and connectors shall be set screw steel in dry locations. Compression type in wet locations.

5. Conduit shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backboxes, except where specified by the factory.

B. Wires:  
1. Wiring shall be in accordance with local, state and national codes (e.g., NEC ARTICLE 760). Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02mm) for initiating device circuits and signaling line circuits, and 14 AWG (1.63mm) for notification device circuits.  
2. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).  
3. All field wiring shall be completely supervised.

C. Terminal Boxes, Junction Boxes and Cabinets:  
1. Shall be UL listed for their purpose and use.

D. The main fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

2.3 MAIN FIRE ALARM CONTROL PANEL

A. The main FACP shall be a Notifier NFV2-100 (FireHarden 100-2) and shall contain a microprocessor based central processing unit (CPU). The CPU shall communicate with and control slave microprocessor controlled modules which provide the interface to initiating device circuits; notification appliance circuits; building controls.

B. System Capacity and General Operation  
1. The control panel shall include the following standard circuits:  
a. Form-C alarm and trouble relays.  
b. Two Style Y or Z Notification Circuits.  
c. Manual Reset (Momentary Switch).  
d. The control panel shall be capable of being configured for 4,8,12 or 16 initiating zones.  
2. The control panel shall have the ability for eight optional control points for a. Manual Reset (Momentary Switch).  
b. Manual Reset (Momentary Switch).  
c. Manual Reset (Momentary Switch).  
d. Manual Reset (Momentary Switch).  
3. The CPU shall provide the following operator controls and indicators:  
AC POWER (Green LED)  
SYSTEMS ALARM (Red LED)  
SUPERVISORY (Yellow LED)  
SYSTEM TROUBLE (Yellow LED)  
SIGNALS SILENCED (Yellow LED)  
ANNUNCIATOR/MODULE TROUBLE (Yellow LED)  
POWER TROUBLE (Yellow LED)  
ACKNOWLEDGE (Momentary Switch)  
SIGNAL SILENCE (Momentary Switch)  
SYSTEM RESET (Momentary Switch)  
LAMP TEST (Momentary Switch)  
Notification CKT 1 ALARM (Green LED)  
Notification CKT 1 TROUBLE (Yellow LED)  
Notification CKT 2 ALARM - (Green LED)  
Notification CKT 2 TROUBLE (Yellow LED)  
ALARM RELAY ON (Green LED)  
ALARM RELAY TROUBLE (Yellow LED)  
REMOTE SILENCE/TIE ON (Green LED)  
REMOTE SILENCE/TIE TRBL (Yellow LED)

5. The system shall be fully field programmable, configurable and expandable without the need for special tools or PROM programmers. Programming shall not require replacement of memory ICs.  
6. All programming shall be accomplished through front control panel indicators and switches. Systems which require complicated diode matrices or laptop computers are not considered suitable substitutes.  
7. All programs shall be stored in non-volatile memory and shall be retained with the unlikely loss of both primary and secondary power.  
8. Entry into program mode shall require a special programming key and a special password.  
9. Notification and relay circuits shall be programmable to activate on alarm from a single initiating zone or combination of initiating zones. Systems which are limited in programming, such as general alarm, are not acceptable substitutes.  
10. The FACP shall have the following programmable functions:

a. Signal silence inhibit, 30 seconds to 5 minutes.  
b. Automatic silence select, 5 to 20 minutes.  
c. Presignal delay select 1 to 3 minutes.  
d. Positive Alarm Sequences, per NFPA 72 3-8.3.  
e. Trouble Reminder.

C. Central Processing Unit Module  
The Central Processing Unit (CPU) Module shall communicate with, monitor, and control all other modules in the panel. Removal, disconnection, failure, or change of type of any control panel module shall be detected and reported by the CPU as a module trouble. The CPU shall contain and execute all custom programs for specific action to be taken if a fire situation is detected in the system. Such programs shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power sources occur. CPU switches may be used to disable or enable any initiating zone, notification circuit or relay in the system.

D. Initiating Zone Module  
1. The Initiating Zone Module shall provide eight fully supervised Style B (Class B) Initiating Device Circuits (IDC).  
2. IDC circuits shall be capable of monitoring and powering two wire smoke detectors or may monitor normally open dry contact devices.  
3. The Initiating Zone Module shall provide red ALARM and yellow TROUBLE LEDs for each IDC circuit.  
4. Custom label inserts shall be available for individually written (or typed) description of each IDC zone.  
5. The Initiating Zone Module shall include removable wiring terminal blocks for ease of installation and service. The terminal blocks shall be UL listed for use with up to 12 AWG (3.25mm) wiring.  
6. Smoke detector alarm verification shall be available as a programmable option for each IDC circuit.  
7. Each IDC zone shall be capable for operation as Standard Fire, Tamper/Supervisory, Waterflow, or a low priority "Not" alarm zone. Systems which require add on or special modules to perform these operations are not considered equals.  
8. Each IDC shall be capable of providing the following programmable remote system operations: ACKNOWLEDGE, SILENCE, or RESET.  
9. The Initiating Zone module shall have the ability to wire Style D (Class A) with a simple to install add on module. When connected, it shall support any combination of Style B or Style D circuits.

E. Notification Circuit Module  
1. The notification Circuit Module shall provide four fully supervised Style Z (Class A) Notification circuits.  
2. Each Notification Circuit Module shall support 3.0 amps per circuit and 6.0 amperes maximum per module.  
3. Each Notification Circuit shall not activate on either manual or automatic commands in the event of a short circuit condition.  
4. The Notification Circuit Module shall have an expansion printed circuit board to extend it's capacity to eight notification circuits.  
5. The module shall provide eight green ON/OFF LEDs and eight yellow TROUBLE LEDs. These LEDs will indicate the status of the individual circuits.  
6. Each Notification Module shall be capable of operation in Steady, March Time or Temporal Code (NFPA 72 A.2.2.2.2).  
7. The Notification Circuit Module shall be provided with removable wiring terminal block for ease of installation and service. The terminal strips shall be UL listed for use with up to 12 AWG (3.25mm) wiring.  
8. An optional zone order shall be available for programmable coded outputs. Options shall include the following programmable features, up to 99 rounds, delay, pulse time, digit pause, and round pause.

F. Control Relay Module  
1. The Control Relay Module shall provide four Form-C auxiliary relay contacts rated at 5 amperes, 28 VAC.  
2. Relay circuits shall be capable of activation from any one zone or groups of zones.  
3. Relay circuits shall be capable of activation from any one zone or groups of zones.  
4. An expansion board shall be available to extend the capacity of the control relay module from four to eight circuits.  
5. Each control relay may be programmed to deactivate on depression of the signal silence switch.  
6. The Control Relay module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal blocks shall be UL listed for use with up to 12 AWG wiring.

G. Universal Digital Alarm Communicator Transmitter (UDACT). The UDACT is an interface for communicating digital information between a fire alarm control panel and a UL-listed central station.  
1. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 5,000 feet (1528.8m) from the fire alarm control panel. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.  
2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to three different telephone numbers.  
3. The UDACT shall be completely field programmable from a built-in keypad and a standard telephone. The UDACT shall support transmission of up to 2,040 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.  
4. The UDACT shall support independent zone point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 2,040 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.  
5. Communication shall include vital system status such as:  
- Independent Zone (Alarm, trouble, non-alarm, supervisory)  
- Independently addressable Device Status  
- AC (Main) Power Loss  
- Low Battery and Earth Fault  
- System Off Normal  
- 12 and 24 Hour Test Signal  
- Abnormal test Signal (per UL requirements)  
- EIA-485 Communications Failure  
- Phone Line Failure  
6. The UDACT shall support independent zone point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 2,040 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.

H. Enclosures:  
The control panel shall be housed in a UL-listed cabinet suitable for surface mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish. An optional semi-flush trim ring shall be available for finished installations.

I. Power Supply:  
1. The Main Power Supply for the Fire Alarm Control Panel shall provide all control panel and peripheral device power needs, as well as 2.0 amperes of 24 VDC for the Fire Alarm Control Panel.  
2. Provisions will be made to allow the audio visual power to be increased as required by adding an additional 3.0 amp expansion power supply. All power supplies shall be designed to meet 1995 UL and NFPA requirements for power limited operation on all notification and initiating circuits.  
3. The power supply shall provide and integral battery charger for use with batteries up to 60 AH. Batteries larger than 25 require the BB-55 battery cabinet.  
4. The Main Power Supply shall continuously monitor all field wires for Earth Ground conditions, and shall have the following LED indications: Ground Fault LED, Battery Fail LED and AC Power Fail LED.

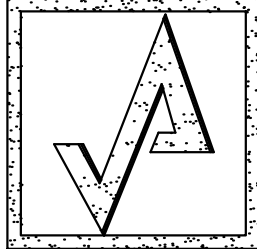
J. Field Charging Power Supply: The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.  
1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60 hour standby.  
2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. For outputs two Style Y or Z and two style Y) shall be available for connection to the Notification devices.  
3. The FCPS shall include an attractive surface mount backbox.  
4. The Field Charging Power Supply shall include the ability to delay the AC fail delay per 1995 NFPA requirements.  
5. The FCPS include power limited circuitry, per 1995 UL standards.

K. Specific System Operations  
1. Walk Test Operation  
a. Walk Test Operation shall test Initiating Device Circuits and Notification Device Circuits from the field without returning to the panel to reset the system.  
b. Upon activation of an Initiating device, all outputs normally activated by the tested zone shall activate for approximately four seconds. Only circuits were selected for walk test shall participate in the test.  
c. Including a trouble into the initiating circuit shall activate the controlled outputs and remain activated until the trouble is cleared.  
2. Alarm Verification Operation  
When an alarm condition is detected on an Initiating Device Circuit which has been programmed for Alarm Verification, the system will automatically enter the ALARM verification mode. If the alarm condition is still present after a preset time period of 13 seconds, then the system will automatically enter the alarm mode.  
3. Waterflow Operation  
All Initiating Device Circuits shall be programmable to provide Waterflow detection. If an alarm occurs on a Waterflow zone, all Notification Appliance Circuits which are "Mapped" to that zone will not be affected by the silence switch.  
4. Supervisory Operation  
An alarm on a Supervisory circuit shall activate all programmed Waterflow detection. If an alarm occurs on a common Supervisory LED, and activate the zone which is in alarm.  
5. Signal Silence Operation  
All Notification Appliance Circuits of the system shall be capable of being programmed to deactivate with depression of the Signal Silence switch.  
6. Releasing Service  
The control panel shall have the ability to be configured for releasing service and include selectable time delays, abort and manual release circuits.  
7. Pre-signal Operation  
The control panel shall have the capability of operation in a pre-signal mode, with selectable time delays and manual evacuation control.  
8. The control panel shall include a Positive Alarm Sequence (PAS) option per NFPA 72 3-8.3. Selectable PAS delay shall include 1.2, and 3 minutes.  
9. Two Stage Alert/Evacuation Option  
The control panel shall have the capability to perform two-stage alert/evacuation signaling per U.S. and Canadian requirements.

2.4 BATTERIES:

A. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm on a normal AC power failure.

B. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks, refilling, spills and leakage shall not be required.



AHARONIAN  
& ASSOCIATES INC.  
ARCHITECTS

310 George Washington Highway  
Suite 100  
Smithfield, Rhode Island  
0 2 9 1 7

T 401-232-5010  
F 401-232-5080

WWW.ARCH-ENG.COM

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REVISIONS

NUMBER	REMARKS	DATE



VINCENT A. DIHORO INC.  
CONSULTING ENGINEERS  
89 Access Road Suite Eighteen  
Norwood, Massachusetts 02062  
tel: (781) 255-9754 fax: (781) 255-9725 email: vadjr@vadeng.com  
www.vadeng.com

FOR PERMIT ONLY

PROJECT TITLE

Cumberland  
FARMS  
100 Crossing Blvd, Framingham, Massachusetts

STORE #  
V0636

22905 S.R. 7

BOCA RATON, FL  
Palm Beach County

DRAWING TITLE

ELECTRICAL  
SPECIFICATIONS

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