SECTION 16720 – FIRE ALARM SYSTEM

PART 1 – GENERAL

1.1 SCOPE & RELATED DOCUMENTS:

A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations in connection with the installation of the Fire Alarm System Network shown on the drawings and as herein specified and as directed by the Architect/Engineer.

B. The requirements of the conditions of the Contract, Supplementary Conditions and General Requirements, apply to the work specified in this section.

C. The complete installation is to conform to the applicable sections of NFPA-71, NFPA-72, NFPA 90A, Life safety code 101, ADA, FM, UL, Local Code Requirements of the City and National Electrical Code with particular attention to Article "Fire Alarm Systems", unless noted otherwise in these specifications or on the drawings.

D. The work covered by this section of the specifications is to be coordinated with the related work as specified elsewhere under the project specifications.

E. The installation shall be per the manufacturers rules and specifications.

F. The manufacturer shall be licensed and certified in accordance with any City Ordinance, and shall provide Certificate upon demand of the building owner, architect or engineer. The manufacturer shall coordinate and provide a test of the system in the presence of the Local Fire Department – Fire Prevention Division in accordance with the Fire Departments Testing requirements. The manufacturer shall submit any or all calculation and diagrams to City or State Fire Departments as required to get system approved.

G. It shall be the responsibility of the Contractor to provide all equipment and material compatible to the system supplied. All equipment shall be located as shown on the drawings. Any equipment or programming not specifically mentioned in this specification or not shown on the drawings, but required for approval by the Local Authority Having Jurisdiction or required for the operation of a completely functional system shall be furnished and installed.

H. Fire alarm drawings from manufacturer and programming displays on final read out shall indicate owner approved room numbers.

1.2 QUALITY ASSURANCE:

A. Each and all items of the Fire Alarm System shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the "U.L." label. All control equipment is to be listed under UL category UOJZ as a single control unit. Partial listing shall NOT be acceptable. The system components shall meet the requirements of the Americans with Disabilities Act (ADA).

B. All equipment shall be U.L. approved for both fire and security and installed in accordance with the requirements of the National Electric Code, Americans with Disabilities Act (ADA), local codes and these specifications, with the stricter requirement governing in case of possible variance. Systems equipment shall be jointly guaranteed by the Electrical Contractor and the systems' manufacturer for a period of one (1) year from the date of acceptance.

C. Manufacturers equipment shall conform to the standards herein and the manufacturer must supply proof of having produced similar equipment for at least ten years, provide the Engineer with a written history of similar local systems now rendering satisfactory service. Supplier of this equipment must also have had service and sales of the same programmed system for past 4 years. The supplier shall be licensed and certified in accordance with any and laws and ordinances and shall provide proof of same upon demand of the building owner, Governing agencies, Architect or Engineer. The manufacturer shall coordinate and provide a test of the system in the presence of the local Fire Department in accordance with the Fire Departments Testing requirements.

1.3 GENERAL:

A. Equipment shall be a 4010 or 4100 LIFE ALARM system as manufactured and supplied by Simplex Time Recorder Co., as required for the number of identified sensors. Maximum number of devices on a circuit shall not exceed 80% of the rated capacity of the circuit. Unless otherwise indicated; the system shall be the standard product of one manufacturer and shall be factory coordinated.

B. Systems as manufactured by Notifier or EST equal to those specified and approved by the Engineer, will be acceptable. Manufacturer shall submit to engineer prior to bidding proposed equipment list.

C. "Sensor" as described in this Specification for smoke, heat, and duct sensors is a descriptive term used by Simplex and shall be a term interchangeable with "detector" as indicated on the Drawings and NFPA 72.

1.4 OPERATION:

A. The fire alarm control panel shall monitor addressable devices within the buildings and shall report to the annunciator panel.

B. The F.A.C.P. shall be 24 VDC operation with 120 VAC operating power. Internally mounted, properly sized, sealed gelyte lead acid batteries shall be provided for operating the system in standby mode for 24 hours followed by alarm mode for 5 minutes.

C. Provide alarm initiation from manual stations located at each exit, automatic smoke/heat sensors located as shown, sprinkler water flow and sprinkler tamper switches. Provide audiovisual alarm indicating devices on the inside. All devices shall be located as shown on the drawings.

D. Provide a general alarm indication throughout the building when any fire alarm initiating device described is activated.

E. Provide the closure of all smoke doors during a general alarm. This function shall remain in effect until the system has been completely returned to its normal state (silencing of signals alone shall not reset this control status). Where connections are shown to door holders and smoke sensors provided with door hardware, provide capacity in the control panel to power the door holders provided with the door hardware. Provide additional 10 percent power capacity in the control panel for additional future door holders.

F. The entire system may be reset only following the resetting of individual alarm initiation devices and a resetting procedure within the F.A.C.P. system trouble indication devices shall continue to operate until this operation is complete.

G. Provide separate zone annunciation for each flow switch plus a common zone annunciation for all tamper switches.

H. Provide Digital Control Communicator (DACT) to comply with applicable FCC codes. Unit shall feature either pulse or touch tone dialing. "Call waiting" tones shall not prevent proper operation. It shall feature full line seizure with on board relay. Communicator shall transmit upon any alarm activation in the building. Verify format and provide interface as required. Mount communicator on wall adjacent to control panel and provide wiring between communicator and monitoring control panel per manufacturer's instructions. Fee for any monitoring fees shall be included in the Contractor's Bid if monitoring is required.

1.5 CONTROL OPERATION:

A. The fire alarm control panel shall allow for loading or editing special instructions and operating sequences as required. The system shall be capable of on site programming to accommodate and facilitate expansion, building parameter changes or changes as required by local codes. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.

B. The ability for selective input/output control functions based on AND/ing, ORing, timing and special coded operations shall also be incorporated in the resident software programming of the system.

C. To accommodate and facilitate job site changes, initiation circuits shall be individually configurable on site to provide either alarm/trouble operation, alarm only, trouble only, current limited alarm, no alarm, normally closed device monitoring, a non-latching circuit or an alarm verification circuit.

D. To accommodate and facilitate job site changes, indicating appliance circuits shall be individually configurable on site to provide upon activation a fast march-time, slow march time, temporal code, PNIS code or a master code until silenced or reset upon any output circuit. The PNIS coded pulse on and off time may be selectable on site to provide 16 different duty cycles between ¼ second and 5 seconds.

E. The system shall have the capability to store a minimum of 300 alarms and 300 troubles in a historical data file.

F. An alarm shall be displayed on an 80 character LCD display. The top line of 40 characters shall be the point label and the second line shall be the device type identifier. The system alarm red LED shall flash on the control panel and the remote annunciator until the alarm has been acknowledged at the control panel or the remote annunciator. Once acknowledged, this same LED shall latch on. A subsequent alarm received from another zone after acknowledged shall flash the system alarm LED on the control panel and remote annunciator. The LCD display shall show the new alarm information by device as applicable as follows:

1. Manual stations, smoke sensors each floor
2. Sprinkler system flow switch (typical each zone)
3. Elevator heat sensor, elevator equipment room
4. Sprinkler system tamper switch (common for all zones)
5. Elevator smoke sensor, main floor
6. Elevator smoke sensor, all remaining floors
7. Elevator smoke sensor, elevator equipment room
8. Kitchen hood (if installed)

G. A pulsing alarm tone shall occur within the control panel and the remote annunciator until acknowledged.

H. The activation of any system smoke sensor shall initiate an Alarm. Verification operation whereby the panel will reset the activated sensor and wait for a second alarm activation. If, within one (1) minute after resetting, a second alarm is reported from the same or any other smoke sensor, the system shall process the alarm as described previously. If no second alarm occurs within one minute the system shall resume normal operation. The Alarm Verification shall operate only on smoke sensor alarms. Other activated initiating devices shall be processed immediately. The alarm verification operation shall be selectable by zone.

I. The control panel shall have the capability to display the number of times a zone/device has gone into a verification mode.

J. Alarm verification zones shall have the capability of being divided into seven different groups where by only two verification zones from a group will confirm the first activation and cause the panel to follow programmed alarm actions.

K. Fire Sprinkler System:

1. The control panel shall have a dedicated Supervisory Service LED and a dedicated Supervisory Service Acknowledge Switch.
2. The activation of any standpipe or sprinkler valve tamper switch shall activate the system supervisory service audible signal and illuminate the LED at the control panel and the remote annunciator. Differentiation between valve tamper activation and opens and/or grounds on fire alarm initiation circuit wiring shall be provided.
3. Activating the Supervisory Service Acknowledge Switch shall silence the supervisory audible signal while maintaining the Supervisory Service LED on indicating the tamper contact is still in the abnormal station.
4. Restoring the valve to the normal position shall cause the Supervisory Service LED to extinguish thus indicating restoration to normal position.
5. Restoring the valve to the normal position shall cause the supervisory service audible signal to sound thus indicating restoration to normal position. Activating the Supervisory Service Acknowledge Switch will silence the audible signal and restore the system to normal.
6. Provide 120 volt circuit to exterior fire sprinkler bell. Verify location with fire sprinkler system contractor.
7. Provide power and monitoring circuit to fire sprinkler system air compressor if installed. Verify location with fire sprinkler system contractor.

L. A manual evacuation switch shall be provided to operate the systems alarm indicating appliances. Other control circuits shall not be activated. However, a true alarm shall be processed as described previously.

M. Activation of an auxiliary bypass switch shall override the automatic functions either selectively or throughout the system.

N. Alarm and trouble conditions shall be immediately displayed on the control panel from Alphanumeric LCD display. If more alarms or troubles are in the system the operator may scroll to display new alarms.

O. The system shall have an alarm list key that will allow the operator to display all alarms, troubles, and supervisory service conditions with the time of occurrence.

P. The actuation of the enable walk test program at the control panel shall activate the "Walk Test" mode of the system which shall cause the following to occur:

1. The city connection circuit shall be disconnected.
2. Control relay functions shall be bypassed.
3. The control panel shall show a trouble condition.
4. The alarm activation of any initiation device shall cause the audible signals to code a number of pulses to match the zone number.
5. The panel shall automatically reset itself after signaling is complete.
6. Any momentary opening of an initiating or indicating appliance circuit wiring shall cause the audible signals to sound for 4 seconds to indicate the trouble condition.
7. The control panel shall have the capacity of 8 distinctive walk test groups.

Q. All auxiliary manual controls shall be supervised so that all switches must be returned to the normal automatic position to clear system trouble.

R. Each independently supervised circuit shall include a discrete LED read-out to indicate disarrangement conditions per circuit.

S. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the control panel and the remote annunciator. A green "power on" LED shall be displayed continuously while incoming power is present.

T. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the control panel and remote annunciator.

U. The System Expansion Modules shall be electrically supervised for module placement. Should a module become disconnected from the C.P.U. the system trouble indicator must illuminate and audible trouble signal must sound.

V. The system shall have provisions for disabling and enabling all circuits individually for maintenance and testing purposes.

W. Wiring to a hardwired (non-serial) remote annunciator shall be supervised for open and ground conditions. A separate annunciated trouble LED read-out indication must be provided. It shall illuminate and an audible trouble signal shall sound at the control panel upon the detection of an open or ground condition.

1.6 MULTIPLE ADDRESSABLE PERIPHERAL NETWORK (MAPNET II):

A. Communication with addressable devices: The system must provide communication with all initiating and control devices individually. All of these devices are to be individually annunciated at the control panel. Annunciation shall include the following conditions for each point:

Alarm
Trouble
Open
Short
Ground
Device Fail/or Incorrect Device

B. All addressable devices are to have the capability of being disabled or enabled individually.

C. Up to 127 addressable devices may be multi-dropped from a single pair of wires. Systems that require factory reprogramming to add or delete devices are unacceptable.

D. Format – The communication format must be a poll/response protocol to allow 1-tagging of the wire to addressable devices and be completely digital. A high degree of communication reliability must be obtained by using parity data bit error checking routines for address codes and check sum routines for the data transmission protocol. Systems that do not utilize full digital transmission protocol (i.e. –that may use time pulse width methods to transmit data, etc..) will not be acceptable since they are considered unreliable and prone to errors.

E. Identification of Addressable Devices – Each addressable device must be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact.

F. Wiring Type, Distance, Survivability and Configuration Wiring types will be approved by the equipment manufacturer. The system must allow up to 2,500 feet wire length to the furthest addressable device.

G. Sensor Operation:

1. Smoke sensors shall be smoke density measuring devices having no self contained alarm set point (fixed threshold). The alarm decision for each sensor shall be determined by the control panel. The control panel shall determine the condition of each sensor by comparing the sensor value to the stored values.
2. The control panel shall maintain a moving average of the sensors' smoke chamber value to automatically compensate (move the threshold) for dust and dirty conditions that could affect detection operation. The system shall maintain a compensation a constant smoke obscuration sensitivity for each sensor (via the floating threshold) by compensating for environmental factors. Photoelectric sensor smoke obscuration sensitivity shall be adjustable within 0.3% of either limit of the UL window (0.5% to 4.0%) to compensate for any environment.
3. The system shall automatically indicate when an individual sensor needs cleaning. When a sensor's average value reaches a predetermined level, a "DIRTY SENSOR" trouble condition will be audibly and visibly indicated at the control panel for the individual sensor. Additionally, the LED on the sensor base shall glow steadily giving an indication alert at the sensor location. If a "DIRTY SENSOR" is left unattended, and its average value increases to a second predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control panel for the individual sensor. To prevent false alarms, these "DIRTY" conditions shall in no way decrease the amount of smoke obscuration necessary for system activation. For scheduling of maintenance, the control panel shall be able to generate an "ALMOST DIRTY" indication for any sensor approaching a "DIRTY" trouble condition.
4. The control panel shall continuously perform an automatic self-test routine on each sensor, which will functionally check sensor electronics and ensure the accuracy of the values being transmitted to the control panel. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition with the sensor location at the control panel.
5. An operator at the control panel, having a proper access level, shall have the capability to manually access the following information for each sensor:

   Primary status
   Device type
   Present average value
   Present sensitivity selected *
   Peak detection values *
   Sensor range (normal, dirty, etc.)
   Values shall be in "percent of smoke obscuration" format so that no interpretation is required by the operator.
6. An operator at the control panel, having a proper access level, shall have the capability to manually control the following for each sensor:

   Clear peak detection values
   Enable or disable the point
   Clear verification tally
   Establish alarm sensitivity
   Control a sensor's relay driver output
7. It shall be possible to program the control panel to automatically change the sensitivity settings of each sensor based on time-of-day and day-of-week (for example, to be more sensitive during unoccupied times and less sensitive during occupied periods). There shall be seven (7) sensitivity settings available for each sensor.
8. The control panel shall have the capability of being programmed for a pre-alarm or two-stage function. This function allows an indication to occur when, for example, a 3% sensor reaches a threshold of 1.5% smoke obscuration.
9. Individually identified sensors as well as conventional initiating device and notification appliance circuits shall be supported within a single control panel. Provide a minimum of 20% more capacity than indicated on the drawings.
10. For increased smoke detection assurance, all individually addressed smoke sensors shall be provided with alarm verification. Only a verified alarm shall initiate the alarm sequence operation.

1.7 ELEVATOR RECALL:

A. The control panel shall control all elevators as specified in this Section under Elevator Recall. Elevator recall zoning shall be as described in NFPA 72, or as required by local codes and ordinances. A smoke sensor shall be installed in the elevator machine room and shall be zoned as described in NFPA 72, or as required by local codes and ordinances.

1. Where hoistways and/or elevator machine rooms are sprinklered, the main line power to the elevator controller shall be shut down per the requirements of ANSI A17.1. A combination rate of rise/fixed temperature heat sensor shall be installed adjacent to the sprinkler head in the elevator machine room and/or the hoistway, set lower than the rating of the sprinkler head. (Minimum distance between head and sensor shall be 3 times the depth of the head or a maximum of 24"). A shunt trip circuit breaker shall be installed in the elevator controller feeder. The heat sensor(s) shall be connected to the shunt trip circuit breaker to disconnect power to the elevator controller on activation of the sensor(s).

B. Elevator Recall:

1. When alarms are reported by the elevator smoke sensor, control points tied to the elevator control circuitry will energize and the elevators will be recalled to the ground floor for fire fighters use. Should the fire be on the ground floor the elevators will be sent to the alternate safe floor. Only sensors at the elevator doors or the elevator machine room may cause elevator recall.
2. The Electrical Contractor shall coordinate with the elevator manufacturer so that the specified operation is obtained.
3. The Electrical Contractor shall provide conduit and wire between the monitoring control cabinet and the elevator control cabinet and/or hoistway junction box as required by the elevator system specified.

1.8 POWER REQUIREMENTS:

A. Each control panel shall receive 120 VAC power from a dedicated circuit with locking clip over circuit breaker. 120 VAC power shall be at 20 Amps, unless otherwise noted. Label circuit breaker "Fire Alarm Control Circuit" in red.

B. All circuits requiring system operating power shall be 24VDC and shall be individually fused at the control panel.

PART 2 – PRODUCTS

2.1 FIRE ALARM CONTROL PANEL:

A. Provide and install a Simplex Type 4010 or 4100, Addressable Fire Alarm Control Panel, as required by the number of identified sensors. Construction shall be modular with solid state, microprocessor based electronics. An 80 character LCD display shall indicate alarms, supervisory service conditions and any troubles.

B. The control panel shall contain the following. Verify quantities of each item with system supplier:

1. 80 character LCD display
2. Mapnet Addressable Circuit Cards Alarm Indicating Appliance Circuit (Class A or Class B)
3. (selectable) Local Energy, Shunt Master Box, or Reverse Polarity Remote Station Connection
4. Form C Trouble Contact (2.0 Amps each) with feedback
5. Earth Ground Supervision Circuit
6. Basic 5 Amp Power Supply
7. Expansion 8 Amp Power Supplies
8. Automatic Battery Charger
9. Set Standby Batteries to give 24 hours of operation upon loss of commercial power.
10. Lot Resident non-volatile programmable operating system memory for all operating requirements
11. Programmable action keys
12. Supervised Annunciator Circuits
13. March time code, temporal code, selective code, zone code, general alarm, time limit cutout, and alarm silence inhibit, for NAC's. Set alarm for temporal code in all new buildings.
14. Provide all strobe circuits with Synchronization.

2.2 REMOTE ANNUNCIATOR(S):

A. Where shown on the drawings or required by the local Authority Having Jurisdiction, provide and install a Simplex Alpha/Numeric Fire Alarm Annunciator with a two line by 40 character (80 character total) LCD display. Annunciator shall Display all Alpha/Numeric messages as displayed at the FACP. Annunciator shall also contain an alarm, trouble and supervisory service LED and acknowledgment switches, system reset and alarm silence switch, display time key, (4) programmable control keys with indicating LED's, dimmed silence LED and a key switch to activate or deactivate all other switches. The annunciators shall mount in a common flush mounted steel cabinet. Connect to the FACP with one Clifford 1P18BTCS, twisted shielded pair of 18's and two #14 power wires. Capabilities shall exist for a maximum of (32) annunciators per 4100 FACP. Verify location of annunciator with local fire department and owner.

2.3 PERIPHERAL DEVICES:

A. All remote devices requiring outlet boxes shall be mounted on flush outlet boxes as recommended by the manufacturer, or as specified elsewhere in this division of the specifications. Any required surface devices (where approved by the Engineer) shall be installed on surface outlet boxes that are at a minimum the same size as the device. No part of a surface device shall overlap the outlet box. Verify all installation requirements and box types with manufacturer prior to rough-in.

B. All devices shall be supervised for trouble conditions. The system control panel shall be capable of indicating the type of trouble condition (open, short, device missing/failed). Should a device fail, it shall not hinder the operation of other system devices. Should a problem occur on a particular wire run, it shall not affect other wire runs.

C. Addressable Manual fire alarm stations, double action, plainly marked to "Push and Pull Down" to sound alarm, located as shown on the drawings at a height of 48" from finished floor to top, semi flush mounted. Circuit shall be 2-wire addressable loop supervision. Provide matching backbox for surface mounting only where job conditions require and where prior approval of the Architect is obtained. Where tamperproof devices are indicated on the drawings, provide station with tamperproof clear Lexan shield with alarm and battery. Alarm to sound when shield is lifted. A manual station shall be installed at all exit doors on all floors, whether or not indicated on the drawings. A manual station shall be installed at interior fire sprinkler system riser location, or as determined by Local Fire Marshal, whether or not indicated on the drawings. Provide manual stations with wire guards in gymnasiums, multi-purpose rooms, and where noted on the drawings.

D. Smoke detectors shall be True Alarm photoelectric sensors and Addressable Sensor Bases mounted on a flush mounted outlet box. The addressable smoke sensors shall be of the photoelectric type and shall communicate actual smoke chamber values to the system control panel. The sensors shall be listed to UL Standard 268 and shall be documented as compatible with the control equipment to which they are connected. The sensors shall be listed for both ceiling and wall mount applications. Each sensor base shall contain a LED that will flash each time it is scanned by the control panel (once every 4 seconds). When the control panel determines that a sensor is in the alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors which do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable. Each sensor shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location. Each sensor shall be scanned by the control panel for its type identification to prevent inadvertent substitution of another sensor type. The control panel shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed. The sensor's electronics shall be immune from false alarms caused by EMI and RFI. Where designated on the drawings, provide unit with sounder base with Piezo horn and relay to power remote LED indicator light.

   Smoke sensors shall be installed on the ceiling at each control panel, extender panel, and annunciator location.

E. Zone Adapter Module – Zone Adapter Modules shall be used for monitoring of water flow, valve tamper, nonaddressable sensors, and for control of evacuation indicating appliances and mechanical systems.

1. An addressable interface module shall be provided for interfacing normally open direct contact devices to an addressable signaling line circuit. The device shall be a Simplex Type Zone Adapter Module (ZAM).
2. ZAM's shall be capable of mounting in a standard 4 11/16" square, 2 1/8" deep electric box with a 4 11/16" square 1 ½" deep extension ring. Verify box size with manufacturer. ZAM's shall include cover plates to allow surface or flush mounting. Zam's shall receive their 24VDC power from a separate two wire pair running from an appropriate power supply.
3. There shall be three types of devices:

   Type 1: Monitor ZAM
   Type 2: Control ZAM
   Type 3: IAM (Individually Addressable Module
4. For Type 1 and/or Type 3 above:

   For conventional 2-wire smoke sensor and/or contact device monitoring with Style B or Style D (NFPA-72 initiating device circuit) wiring supervision.

   Type 1 only:

   This type of addressable device module shall provide power to, and monitor the status of a zone consisting of conventional 2wire smoke sensors and/or N/O contact devices as specified elsewhere and identified on the drawings. The supervision of the initiating device circuit wiring shall be Style B. These ZAM's shall communicate the zone's status (normal, alarm, trouble) to the control panel. This device cannot power 2-wire smoke sensors.
5. For Type 2 above:

   For non-supervised control. This type of addressable device shall provide double pole, double throw relay switching for loads up to 120VAC. It shall contain easily replaceable 2 amp fuse, one on each common leg of the relay.
6. The ZAM shall be supervised and uniquely identified by the control panel. Device identification shall be transmitted to the control panel for processing according to the program instructions. Should the ZAM become non-operational, tampered with, or removed, a discrete trouble signal, unique to the device, shall be transmitted to, and annunciated at, the control panel.
7. The ZAM shall be capable of being programmed for its "address" location on the addressable device signaling line circuit. The ZAM shall be compatible with addressable manual stations and addressable sensors on the same addressable circuit.

F. Interior audio/visual fire alarm signal device unless noted otherwise on the drawings shall be wall mount or ceiling mount A/V unit, as indicated on the drawings, in color as selected by the Architect. Device shall be U.L. listed to Standard 1971 and meeting the requirements of ADA. A/V shall be 24VDC and shall be electro-mechanical in design with electronic control (no moving parts) providing 87db at 10 feet, with 24VDC xenon flasher, 110 CD (U.L.) intensity unless noted otherwise on the drawings, mounted on a flush mounted box. Visual only devices shall be wall mount or ceiling mount (as indicated on the drawings) strobe in color as selected by the Architect, with the same features as the strobe on the audio/visual unit, 110 CD (U.L.) intensity unless noted otherwise on the drawings. Candela intensities listed on the drawings are based on U.L. intensities. A/V units shall be provided with horn, strobe, and adaptor. Interior horn only units for high ambient noise level locations shall be 100dB at 10 feet, 24VDC, mounted on a flush mounted box. See the drawings for individual locations. Strobes shall be capable of being mounted in a vertical or horizontal position and still meet the requirements of U.L. for polar light distribution. Provide strobe circuit with Synchronized Flash Module for all strobe units. If multiple sound cards are used, audible signals shall be synchronized such that all signals are the same throughout the building, to preserve the temporal code pattern. Exterior audio alarm device shall be vibrating type horn, mounted on a weatherproof surface box. Provide horns and strobes with wire guards in gymnasiums, multi-purpose rooms, and where noted on the drawings. Visual signals mounted in cold rooms shall be capable of operating with–in cold room temperatures. Where combination piezo horns and visual signals are indicated on the drawings, provide wall mounted A/V unit with integral piezo horn, 24VAC, designed for supervision of wiring and 24VAC xenon flasher with candela intensity as noted on the drawings, mounted on a flush box. Piezo horn only without visual signal shall be 24VAC, designed for supervision of wiring.

G. Magnetic door holders shall be wall mounted electromagnetic holders unless indicated otherwise on the drawings, installed and wired by the Electrical Contractor. Each door shall require a magnetic door holder near the top of the door. Verify location of holder with the door supplier. The fire alarm control shall be equipped with auxiliary relays to release holders as required by the initiating alarm circuit. Voltage of the door holders shall be 24 VDC.

H. Waterflow Switch shall have two normally open alarm contacts and tamper switch and equipped with adjustable retard feature. Provide proper unit to fit water pipe size required. This device shall be installed by the sprinkler contractor and wired by the electrical contractor. Gate Valve Switch shall have two normally closed trouble contacts, to be mounted on gate valves as directed. This device shall be installed by the sprinkler contractor and wired by the electrical contractor.

I. Thermal (heat) sensor heads shall be combination rate-of-rise/fixed temperature heat sensor (135 degrees) with matching base. The thermal type sensor shall be a plug-in unit which mounts to a twist-lock base. The sensor shall be a combination rate-of-rise/fixed temperature sensor U.L. listed as a rate compensated heat sensor. Where indicated otherwise on the drawings, provide combination rate-of-rise/fixed temperature heat sensor (200 degrees) with matching base, or fixed temperature heat sensor (200 degrees) with matching base. See the drawings for temperature ratings. The sensors shall fit into a base that is common with both photoelectric and ionization sensors and shall be compatible with other addressable sensors, addressable manual stations, and addressable Zone Adapter Modules on the same circuit. There shall be no limit to the amount of sensors, stations or Zone Adapter Modules which may be activated at the same time simultaneously. Each rate-of-rise sensor shall be capable of operating at a selectable rate-of-rise between 15 and 20 degrees Fahrenheit per minute and shall be self-restorable. Fixed temperature sensing is independent of rate-of-rise sensing and operates at 135 degrees Fahrenheit. Each sensor shall be capable of being configured for utility monitoring and capable of sensing temperature between 32 and 158 degrees Fahrenheit.

J. Fire alarm signal circuit power extender if required shall provide an internal power supply, battery charger and supervised notification appliance circuits, style Y or style Z. The extender panel shall connect as an addressable device to the host panel. The extender panel shall monitor each output NAC for trouble conditions and Earth faults and report back to the host panel if trouble occurs. Provide with additional signal circuits as required. The extender panel shall be capable of being remotely mounted from the host control panel and shall be housed in a beige steel cabinet to match host control panel. Provide dedicated 120 volt circuit to each extender panel, with locking clip over circuit breaker. Extender panels shall be located in Storage Rooms, Mechanical Rooms, or Janitor Rooms only. Extender panels shall not be located in public access areas. Verify locations of extender panel with Engineer and Architect prior to installation.

K. Elevator Interface Relays shall be 24 VDC operation, mounted in surface cabinet. These relays shall be controlled and powered from the Control Panel. Contacts shall be 2PDT rated at 10 amps resistive 28 VDC/120 VAC.

L. Resident room smoke detectors shall be True Alarm photoelectric sensor and Addressable Sounder Base, mounted on a flush mounted outlet box. The addressable smoke sensors shall be of the photoelectric type and shall communicate actual smoke chamber values to the system control panel. The sensors shall be listed to UL Standard 268 and shall be documented as compatible with the control equipment to which they are connected. The sensors shall be listed for both ceiling and wall mount applications. Each sensor base shall contain a LED that will flash each time it is scanned by the control panel (once every 4 seconds). When the control panel determines that a sensor is in the alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors which do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable. Each sensor shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location. Each sensor shall be scanned by the control panel for its type identification to prevent inadvertent substitution of another sensor type. The control panel shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed. The sensor's electronics shall be immune from false alarms caused by EMI and RFI. Provide unit with sounder base with Piezo horn and relay to power remote LED indicator light.

   Tenant handicap rooms shall be equipped with addressable ZAM units to control associated room strobe units.

PART 3 – EXECUTION

3.1 INSTALLATION:

A. Provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations. All wiring shall be installed in metallic conduit with all the provisions of NEC – Article "Fire Alarm Systems", unless noted otherwise in these specifications or on the drawings, or if required may be reclassified as non-power limited and wired in accordance with NEC–Article "Fire Alarm Systems".

1. Upon completion, the contractor shall so certify in writing to the owner and general contractor.
2. All junction boxes shall be sprayed red and labeled "Fire Alarm". All system cables will be labeled in boxes. Wiring color code shall be maintained throughout the installation.
3. All devices including zams shall be provided with labels indicating the device identification numbers.
4. End of line resister when located in field shall be installed with a box and labeled (E.O.L.).

B. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.

C. The contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.

D. Contractor and equipment supplier shall jointly provide a proposed riser diagram for the fire alarm system indicating all devices, equipment, and cabling with the shop drawing submittals prior to construction. If changes are made during construction a corrected riser diagram shall be submitted with the operating and maintenance manuals upon project completion. Riser diagram shall use symbols as shown on the drawings and shall have room numbers adjacent to all devices. All wiring shall be in conduit. On Final drawing riser diagram shall reflect owners approved room numbers.

E. This Contractor shall furnish and install all wiring, conduit, junction boxes and outlet boxes required for the installation of a complete system. All wiring shall be installed in metallic conduit, shall be color coded throughout and shall be free and clear of opens, grounds, and shorts between conductors. All Fire Alarm wiring shall be #14 gauge solid copper, with the exception of the MAPNET II addressable cable which shall be West Penn #3975 (.210" OD) and ADA Audio/Visual signals and horns shall be wired with West Penn #995 (.251" OD). (Shielded wiring required only if required by the Manufacturer.). Maximum number of devices on a circuit shall not exceed 80% of the rated circuit capacity. All equipment shall be grounded with an approved earth Ground wire being supplied at the control panel. All wiring shall be in conformance with Article 760 of the National Electric Code. Verify all wiring with system manufacturer prior to installation.

F. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.

G. Contractor shall not remove protective covers from smoke sensors until all construction work and cleanup has been performed. If this is not adhered to all cleaning costs to clean dirty smoke sensors shall be paid for by the contractor.

H. A 1" conduit with data cable shall be provided from the fire alarm control panel to the main telephone terminal board for monitoring.

I. Smoke sensors shall be installed on the ceiling at each control panel, extender panel, and annunciator location.

3.2 SERVICE AND TESTING:

A. The manufacturer shall co-ordinate and provide a test of the system in the presence of the Fire Marshal, Owner, and local Fire Department.

B. The manufacturer shall provide supervision of the project during installation, supervision of final connections, and testing of all devices, demonstrate system operation following checkout in the presence of the Architect, Engineer and Owner, and shall after completion of the project and acceptance by same, provide any service incidental to the proper performance of the system during the guarantee period. After the guarantee period, the manufacturer shall provide an instruction service consisting of at least three direct fulltime factory trained employees under the supervision of a qualified service manager. Service availability shall be within 120 miles with a maximum 24 hour response time. The prime function of this organization shall be prompt, efficient service. Upon project completion, the equipment supplier shall present a full coverage preventive maintenance agreement to the Owner for a one year period covering all service and instructions to the customer, within a minimum of two (2) inspections per year with no additional charge for emergency calls between inspections during normal working hours. Upon completion of Fire Alarm System Testing, submit to engineer (3) copies of Testing and Inspection Report signed off as 100% functioning by the Systems supplier and the Electrical Contractor. Submit forms in NFPA 72 format including db level readings per room marked on floor plans, floor plans to be submitted in operation booklet. Db reading shall be submitted to Engineer for review thru by Engineer, inspecting personnel or final acceptance test. Bind (1) additional copy in the operation instructions booklet.

3.3 GUARANTEE:

A. After all work herein specified has been completed; the Contractor shall guarantee his work to be free from defects for a period of one year. Such defects shall apply to faulty materials or workmanship. In the event of the development of said defects, the Contractor shall remedy the failures at his own expense during normal business hours within a reasonable time after notice. Systems equipment shall be guaranteed by the manufacturer for one year.

**********END OF SECTION 16720

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