

SECTION 28 31 00

FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.01 SCOPE

- A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
1. Examine all other specifications sections and drawings for related work required to be included as work under Division 26 00 00, 27 00 00, 28 00 00.
 2. General provisions and requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Submit eight (8) copies of the following to the Engineer for approval.
1. A listing of all fire alarm components and equipment including the California State Fire Marshal (CSFM) listing numbers.
 2. CSFM listing sheets of all devices being used.
 3. Manufacturers' standard catalog data for fire alarm components.
 - a. The submittal shall be arranged in the order of the Specification and shall list the specification paragraph number, the name, the proposed model and manufacturer for each item as well as a reference indicating the specific piece of data which can be easily located in the brochure.
 - b. The manufacturers' data sheets shall be marked to indicate the specific item being proposed in cases where the sheet covers several types or sizes of item. The data sheet shall completely describe the proposed item.
 - c. Where modification to the equipment is necessary to meet the operational requirements of the contract documents, the data sheets shall include complete mechanical and electrical shop drawings detailing the modification.
 4. A listing of the outlet rough-in needed for every device and equipment item. The applicable symbol which illustrates that rough-in item on the

job plans shall be drawn on the proposal, opposite the description of the rough-in to facilitate locating the data by field personnel.

5. Elevation and dimensional information.

1.03 APPLICABLE STANDARDS

1. List of applicable codes as of November 1, 2002:
 - a) 2019 Building Standards Administrative Code, Part 1, Title 24 C.C.R.
 - b) 2019 California Building Code (CBC), Part 2, Title 24 C.C.R. (2015 International Building Code Volumes 1-3 and 2008 California Amendments).
 - c) 2019 California Electrical Code (CEC), Part 3, Title 24 C.C.R. (2014 National Electrical Code and 2007 California Amendments)
 - d) 2019 California Mechanical Code (CMC), Part 4, Title 24 C.C.R. (2015 Uniform Mechanical Code and 2008 California Amendments).
 - e) 2019 California Plumbing Code (CPC), Part 5, Title 24 C.C.R. (2015 Uniform Plumbing code and 2008 California Amendments)
 - f) 2019 California Fire Code (CFC), Part 9, Title 24, C.C.R. (2008 International Fire Code and 2008 California Amendments).
 - g) 2019 California Referenced Standards Code, Part 12, Title 24, C.C.R.
 - h) Title 19, C.C.R., Public Safety, State Fire Marshal Regulations.
 - i) 2019 California Energy Code (CEC, Part 6, Title 24 C.C.R.
2. NFPA Standards and Guides:
 - a) NFPA 13, Automatic Sprinkler Systems, 2019 Edition.
 - b) NFPA 14, Standpipes Systems, 2016 Edition.
 - c) NFPA 17, Dry Chemical Extinguishing Systems, 2016 Edition.
 - d) NFPA 17A, Wet Chemical Systems, 2016 Edition.
 - e) NFPA 24, Private Fire Mains, 2019 Edition.

- f) NFPA 72, National Fire Alarm Code, (California Amended) 2019 Edition. (Note see UL standard 1971 for "visual devices")
 - g) NFPA 253 Critical Radiant Flux of Floor Covering Systems, 2019 Edition.
 - h) NFPA 2001, Clean Agent Fire Extinguishing Systems, 2019 Edition.
3. The fire alarm system shall conform to CBC Sec. 809, CFC Article 14, Article 760 of California Electrical code, NFPA 72, and the applicable Standards and Guides referenced in CBC Chapter 60.
- B. Written certification by the fire alarm equipment manufacturer shall be submitted to the Engineer, stating that the system and its component parts are listed and approved by the California State Fire Marshal and the installation has been tested, is operational and conforms to the requirements as set forth in Part 3, Article 24, Title 19, California Code of Regulations.

1.04 EQUIPMENT AND INSTALLING QUALIFICATIONS

- A. The equipment shall be manufacturer Honeywell 6820EVS.
- B. The specification is based on the equipment of manufacturers who have been approved by the City of Torrance and the manufacturers herein named shall be considered as meeting the requirements of this specification. For all items which are identified by part number and manufacturer the Performance specifications which are published in the most recent manufacturer's data sheets available at the time of bidding this project shall be applicable to the present work as though fully written out herein.
- C. All equipment shall conform to all local applicable codes and ordinances, and shall be listed by Underwriters Laboratories.
- D. To qualify as an acceptable bidder, whether the bid is submitted to the City of Torrance, his agent, a general contractor or a sub-contractor, the system bidder or contractor shall be qualified fire alarm contractor and shall hold a valid C10 License issued by the Contractors State License Board of California. The system bidder or Contractor shall hereinafter be referred to as the Contractor. The Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work. The Contractor shall be the factory authorized distributor for the branch of equipment offered and shall have been engaged in the business of supplying and installing the specified type of system for at least five years. The Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The Contractor shall be financially able to provide a performance bond covering the work and the guarantee described. The Contractor shall provide that bond if requested.

E. Installation Certification

1. Work and material for cables, cable terminations and related components shall be performed by certified installers. The installer shall be certified by the respective product manufacturers.
2. The manufacturers of the indicated work and material, shall provide a installer education/training and certification program for the supplied products.
3. The installers performing the Contract work for the indicated products, shall have attended and successfully completed each of the respective manufacturer's installation training education programs for the specified products.
4. Submit six (6) copies of the manufacturer's certifications for each installer performing the work. The submittal shall be approved prior to initiating any related contract work.
5. Contract material installed and work performed by installers not complying with these requirements shall be removed. Removal of work and material not in compliance with these requirements shall done at the CONTRACTOR'S expense, without any additional cost to the contract and without any additional contract completion due date extensions. New material and work required to replace the non-complying removed work and material shall be provided at the CONTRACTOR'S expense, without any additional cost to the contract and without any additional contract completion due date extensions.
6. Certifications: Submit certification from the equipment manufacturer indicating the installer is an authorized representative of the equipment manufacturer in the area the new system is to be installed in and is trained on network applications.
7. Electrical Materials and equipment installed shall be new.
8. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment. The Contractor shall furnish a letter from the manufacturer of al major equipment, which certifies that the installing Contractor is the Authorized Distributor and that the equipment has been installed according to factory intended practices. The Contractor shall also furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.

1.05 WARRANTY

- A. Manufacturer shall provide a 5 year material warranty. Installer shall provide a 3 year labor warranty.

- B. Complete maintenance and repair service for a fire alarm system shall be available from a factory trained authorized representative of the manufacturer for a period of 5 years after expiration of the warranty.

PART 2 - PRODUCTS

2.01 GENERAL SYSTEM OPERATION

- A. System shall be microprocessor-based, addressable, and power-limited with Class A or Class B supervised circuits.

1. The microprocessor shall execute all supervisory and control programming to detect, report the failure or disconnection of any system module or peripheral device and initiate programmed control sequences. An isolated supervision "watchdog" circuit shall monitor the microprocessor and, upon failure, shall activate the system trouble circuits.
2. The automatic fire detection and alarm system shall consist of main control panel, transponder panel(s), notification alarm devices, remote annunciator, automatic detection devices, manual stations, printer, and CRT/keyboard, installed and wired in accordance with the drawings and shall function as specified herein.
3. The system shall be programmable in the field, by a non-computer trained person. All programmed information shall be stored in non-volatile memory.
4. The system shall operate both addressable and non-addressable ionization, thermal and photoelectric detecting devices, manual stations, water-flow switches, and external control modules.
5. The control panel shall provide power, annunciation, supervision and control for the fire detection and alarm system. The system shall be designed such that alarm indications override trouble and control conditions.
6. External circuit supervision shall not require additional wires other than the pair used for detection or alarm (only two wires shall be used from the control panel to each loop of initiating devices and two wires for the notification alarm devices). These two wires shall provide both supervision and notification alarm signals. There shall be no loss of supervision for Class "B" wired addressable devices. Class "A" supervision may be provided by adding an additional pair of wires.

- B. Alarm Conditions

1. Actuation of any manual or automatic alarm initiating device, connected to the system shall cause the following automatic functions.

- a) All notification alarm signaling units shall activate continuously. Audible notification alarms shall sound the California State coded signal.
 - b) The respective zone alarm lamp or annunciator alpha numeric readout on the central control panel, and remote annunciator panel, shall be activated.
 - c) Activate the Digital Alarm Communicator system. System shall transmit the condition to a UL listed central station monitoring facility. Supervisory station shall be approved per 2007 CFC 1006.2.4.2.2.1.5.
2. Actuation of HV/AC air duct smoke detectors shall stop the designated fans and motors in the building's air distribution system.
 3. Actuation of smoke detectors on either side of smoke doors shall energize the release mechanism on the smoke door causing the door to close.
 4. Notification alarm signal duration shall be capable of continuous sounding or adjustable from three to ten minutes.
 5. Perform any additional functions as specified herein or shown on the drawings.

C. Trouble Condition

1. A single open or single trouble condition in a manual or automatic fire initiating wiring circuit shall activate the respective zone trouble lamp or annunciator readout on the fire alarm control panel and sound a trouble signal at the control panel.
2. A single open or single trouble condition in the notification alarm signaling wiring circuit shall activate the trouble lamp or annunciator readout in the control panel and sound a trouble signal at the control panel.
3. 120 volt AC normal power shall be monitored with indication by a "power on" lamp. Upon normal power outage, the system shall activate a power trouble condition lamp or annunciator readout, and indicate a trouble condition.
4. The control panel shall monitor the standby batteries and, upon a low battery condition, activate the low battery lamp or annunciator readout and indicate a trouble condition.
5. System ground detection shall be provided for the entire system. Upon ground detection, activate the ground detection lamp or annunciator readout and indicate a trouble condition.

- D. Control panels employing alpha numeric readouts shall display the trouble condition along with a prompt to review the list chronologically. The end of the list shall be indicated.

2.02 NEW FIRE ALARM CONTROL PANEL SHALL BE 6820EVS

A. General

1. The fire alarm control panel shall be software programmable, microprocessor controlled, solid state, electronic integrated system. The panel shall be the product of one manufacturer. The control panel shall provide power, annunciation, supervision and control for the detection and alarm system. The detection system shall remain 100% operational, responding to an alarm condition while in the routine maintenance mode.
2. Addressable detection and control devices shall be individually identified by the system, and any quantity of addressable detection devices shall be in alarm and any quantity of addressable control units shall be operable at any time up to the total number connected to the system.
3. The microprocessor shall access the system program, which is stored in non-volatile programmable memory, for all control-by-event (CBE) functions. The system program shall not be lost upon failure of both primary and secondary power. Volatile memory shall not be acceptable.
4. A means shall be provided for acknowledging each abnormal condition. Each activation of the appropriate acknowledge button shall sequentially acknowledge every point in the system. After all the points have been acknowledged, the LEDs shall glow steady and the panel audible signal will be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be so indicated.
5. An alpha numeric annunciator readout shall indicate on the control panel the activation by type, loop, and address of the specific device, sub-loop or alarm/monitor/control point via an alpha numeric display. An audible alert, shall sound at the control panel and an alarm light shall flash.
6. If the microprocessor fails, the system shall executive a default signaling program. This program shall enable the control panel to sound the audible signals and summon the Fire Department. In addition, a red LED shall light to indicate the communication loop wherein the alarm originated. Inability of the system to sound signals or summon the fire department during microprocessor failure shall not be acceptable.
7. Protected access to the system controls shall be provided to allow the user/operator access to the following system functions:

- a) Status of all addressable points.
 - b) Status of all events logged.
 - c) Set/change the real-time clock and date.
 - d) Perform an operational manual test of the system from the control panel, including actuation of any initiating device and trouble circuit without alarming the remote central station. The panel shall automatically return to normal mode in the event the panel remains unattended in the service mode.
 - e) Retrieve from event log the last 300 alarms, or control points and 300 trouble conditions.
8. Individual input (monitor) and output (control) device addressability shall all be performed on the same pair of wires. Wiring shall be Class "A" or "B". When Class "B" wiring is used, no special wiring sequence shall be required on addressable device circuits. An unlimited number of wiring branches shall be permitted with no loss of supervision.
 9. A minimum of 25% addressable monitor, trouble and control points shall be provided.
 10. Where new FA Devices have been installed, Contractor shall provide all programming and testing as required for the installation of new fire alarm devices added to the new existing fire alarm installation i.e. smoke detectors, monitoring modules, heat detectors, fire alarm control panel etc.

B. Cabinet

1. A metal tamper resistant cabinet shall contain the control panel components. Panel shall be surface or flush mounting as indicated on the drawings. Provide a full height tamper resistant hinged locking cabinet door. The door shall have transparent, high impact windows to allow visual observation of all indicators and switches without opening the panel door.
2. "In-out" circuit conductors shall terminate on numbered screw-type terminals.
3. All groups of circuits or common equipment shall be clearly marked and shall be expandable by inserting interchangeable units.

- C. The control panel shall provide positive protection against the fire alarm system inadvertently being left in a non-operating status. The alarm system shall automatically restore and resound alarms and trouble signals, if subsequent

alarm initiating or trouble signals are received under any of the following conditions:

1. After the alarm or trouble silence switch have been activated.
 2. Prior to resetting system after previous alarm or trouble conditions.
- D. The system indicating and operational control devices shall be mounted on the control panel face behind the panel door and shall provide the following minimum functions:
1. Individual visual indicating pilot lights annunciator or alpha numeric readout to monitor the following alarm system conditions:
 - a) Input power.
 - b) System common alarm.
 - c) System common trouble.
 - d) Alarm or trouble signal silenced.
 - e) Ground fault.
 - f) Battery condition.
 - g) Each individual alarm, control or initiating zone-activation.
 - h) Each individual alarm, control or notification zone-trouble.
 - i) Report, by specific device number, any device removed from an addressable initiating circuit, all other devices shall continue to function.
 2. Manual control switches to allow the following system controls:
 - a) Alarm silence.
 - b) Trouble silence.
 - c) Test all indicating pilot lights and readouts.
 - d) System reset, including remote devices connected to the alarm panel.
 - e) Alarm test to initiate an alarm condition from the control panel.
 - f) Alarm disconnect for system testing without activating the Digital Alarm Communicator system.

- g) Changing the status of configured circuits (arming or disarming and changing status of relays). If any change in status degrades system operation as configured, a trouble condition shall be reported and remain until system operation again meets configured status.
- h) Perform multiple operations at the same time. These operations shall include but not be limited to timed functions and multiple configured sequences.

E. Alarm initiating zone modules.

- 1. Shall supervise and accept remote alarm actuating device input signals. An alpha numeric readout shall indicate separate zone alarm and trouble indicators for each zone.
- 2. Zones shall be compatible, and designed to operate with the connected initiating devices either addressable or non-addressable type.
- 3. A spare double throw set of software programmable auxiliary alarm relay contacts shall be provided for control of remote devices for each zone. Contacts shall be rated 120 volt-60 HZ 3 Ampere.
- 4. Each device on the system shall report as its own unique address.

F. Notification alarm signal control.

- 1. Shall supervise and activate remote notification alarm devices.
- 2. Notification alarm shall be compatible and designed to properly operate with the connected audio and visual notification alarm devices, with no signal degradation.
- 3. The notification alarm shall provide group notification signal control of all notification zones.
- 4. The alarm modules shall be field resettable to provide either continuous or coded notification alarm signals. The coded alarm signal shall provide an intermittent "on-off" pulsed sound activation of audible notification alarm devices.
- 5. A notification alarm circuit trouble indicating readout shall be provided for each notification zone.

G. Automatic ground detection shall detect either positive or negative voltages when earth connections of 50,000 OHMS or less occur, and activate the ground trouble signal.

1. A ground fault code shall provide indication of either a positive or negative ground fault and shall operate the general trouble devices as specified herein but shall not cause an alarm to be sounded.
2. A short circuit error message shall be a standard feature of the fire alarm control panel. Each communication loop shall be monitored for short circuits and shall have a distinctive error message for visual indication of circuits and operating trouble devices as specified herein but shall not cause an alarm to be sounded.

H. Power Supply Shall be per manufacture recommendation

1. The power supply shall be adequately sized to properly operate the equipment, including remotely connected, spare and future indicated equipment with all alarm devices in alarm condition. Provide 20% spare power supply capacity for future expansion. Provide transfer modules and multiple power supplies as required for proper operation.
2. Input voltage 120/240 volt or 120/208 volt 60 HZ. A.C.
3. Surge transient voltage protection on the input and output phases of the power supply shall be provided.
4. Supervised voltage types (i.e., 120V-60HZ A.C., 24 volt A.C., 24 Volt D.C., etc.)required by special connected equipment shall be supplied, including but not limited to:
 - a) Alarm initiating devices.
 - b) Notification alarm devices.
 - c) Control and annunciator panels.
 - d) Fire and smoke dampers.
5. A solid-state power transfer circuit shall provide (UPS) uninterrupted power supply between internal standby power and line power automatically and instantaneously if normal power fails or falls below 15% of normal ("brown out" conditions).
6. Individual circuit fuses shall be provided for smoke alarm detector power, main power supply notification circuits, battery standby power, and auxiliary output.

I. Battery Back-Up Operation

1. Internal batteries and battery power supplies shall be provided to allow 60 hours continuous automatic normal operation of the entire control panel

and fire alarm system after the failure of the incoming utility power. Sufficient battery capacity shall remain at the end of 60 hour period to provide ten minutes of continuous operation of all connected notification alarm devices.

2. Batteries shall be maintenance free, sealed, lead-acid or lead calcium or gelled electrolyte type rated 25% larger than required to provide power for the entire system upon loss of normal 120 VAC power for a period of sixty (60) hours with five (5) minutes of alarm signaling at the end of this sixty-hour (60) period.
 3. The battery charger, shall be automatic, dual rate with capacity to recharge completely discharged batteries in 18 hours. Charger shall be temperature compensated.
- J. Lighting and transient voltage surge protection shall be a standard feature of the fire alarm control panel and shall be incorporated in the power supply circuit, common control circuits, signal circuits, and telephone line circuit.
- K. Circuitry shall be provided in the control panel to permit transmission of trouble and alarm signals over leased or privately owned telephone cables to a remote receiving panel. A reverse polarity or a masterbox circuit as required, shall be provided in the control panel. There shall be a supervised disconnect switch to allow testing of the fire alarm signal without transmitting an alarm signal to the central station.
- L. The alpha numeric annunciator (printer and CRT/keyboard) shall list upon request:
1. Alarms with time, date and location.
 2. Troubles with time, date and location.
 3. Status of output functions, "on" or "off".
 4. Sensitivity of addressable smoke detectors.
 5. Detection device number, type and location.
 6. Status of remote relays, "on" or "off".
 7. Acknowledgment time and date.
 8. Signal silence time and date.
 9. Reset time and date.
- M. The system shall also provide the following:

1. Counting the number of addressable detectors within a "zone".
2. Which are in alarm.
3. Counting "zones" which are in alarm.
4. Counting the number of addressable detectors which are in alarm.
5. Alarm on the system.
6. Differentiating among types of addressable detectors such as smoke detectors, manual stations, water-flow switches, thermal detectors.
7. Assigning priorities to types of detectors, zones or groups of detectors.
8. Cross-zoning.

M. CONTROL FUNCTIONS

1. Control functions shall be assigned on the basis of multi-relational system initiation patterns of detection devices including full logic element equations using as "anding" zones, counting zones, counting devices, "anding" groups, conditional "if", "then", "or" programming and "anding" types of detection devices.
2. Control functions shall be assigned on the basis of, cycle, delay, count, time of day, day of week, day of month and with a holiday schedule of up to thirty (30) holidays per year. Each addressable detection device shall report its condition to the system control unit not less than every four (4) seconds in a manner such that failure of the connections to the internal electronics of the device will result in a trouble signal which identifies the specific device involved.
3. The system shall be field programmable for the response of control points to monitored devices.
4. The operating software program shall provide programmable control for the Event-Initiated-Programs (E.I.P.) which shall allow automatic operation of system control points in the event of a alarm condition. To program these E.I.P.'s, the system shall use a specifically designed user friendly programming language, which shall not require a knowledge of computer programming to learn and understand.
5. The operating software shall support the following additional capabilities:
 - a) Three levels of designated and unique Priority Alarms for each point.
 - b) Designated "Sense Mode" for status interpretation for each point.

- c) Designated Print/No Print/Vectoring Mode for each point.
6. The input statement defines the conditions required to activate the associated output statement. The input statement shall consist of single or multiple monitor point status, subroutine status, time comparison and the utilization of AND, OR, NOT, COUNT, and DELAY logic functions.
 7. The output statement defines the action to be taken by the control panel. The output statement shall consist of activation/deactivation of single or multiple control functions, subroutines, and remote Annunciator status LED's. Output statements shall also include the "Alert" messages.
 8. The software shall provide an "alert" message, unique to each point in the system, which will provide specific instructions for the operator on duty. These messages shall be up to 5 lines with up to 70 characters in each line. Each system monitor point shall have 5 specific alert messages when in alarm. Control points shall also be assigned alert messages.
 9. The hardware and software shall have the capacity to accept up to 64 independent programs. Each program shall have "Edit" or "No Edit" capability. Each program shall be written in an equation format comparable to ladder-logic equations. The Equations shall consist of an input and an output statement.
 10. Provide initial programming services for coding, loading and debugging the initial Owner specified programs, as part of the contract.
 11. Programming Command Definition
 - a) Timing command shall provide time delay and time control functions based on internal clock/calendar by time of day; day of week; day of month; month in year.
 - b) Count command shall provide a specific number of events to occur before a control action is initiated.
 - c) Pulse command shall provide on control for a specific period of time.
 - d) Cycle command shall provide on-off control for preset periods of time.
 - e) Print command shall provide printing of specified information after an event occurs.

2.03 FIRE ALARM DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Enclosure shall be red.

- B. Panel shall be solid state with eight zones for off premise monitoring of the fire alarm control panel.
- C. System shall monitor alarm and trouble conditions. System shall be power limited.
- D. System shall include dual telephone line switcher for central station reporting. Telephone lines shall be supervised.
- E. System shall include dual battery harness, batteries, and battery charger.
- F. System shall be UL listed for central station fire signaling systems (NFPA 71).
- G. System shall be California State Fire Marshal approved for central station reporting.
- H. System shall be Honeywell CELL-CAB-SK or CELL-MOD. System shall be approved for connection to the fire alarm control panel.
- I. Verify specific requirements with the City of Torrance and central station prior to submittals.

2.04 MANUALLY ACTIVATED ALARM INITIATING DEVICES SHALL BE AS SHOWN ON PLAN

- A. An electronic, digital multiplex, addressable module shall be incorporated into each device. The module shall communicate the status and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.
- B. Devices shall be suitable for use on a class "B", 2-wire supervised alarm initiating circuit.
- C. Numbered screw type terminals shall be provided for "in-out" connections of the alarm circuit wiring.
- D. The face of the station shall have lettering indicating "FIRE" and operational instructions. Stations shall be tamper resistant, semi-flush mounting.
- E. Auxiliary spare switch contact shall be provided for control of remote devices rated 120 volts - 60HZ, AC - 3AMP minimum.
- F. Stations shall provide visual indication the station has been activated. A key (and/or special tool) shall be required to gain access into the station to reset the station after being activated.
- G. Stations shall be "nonbreak-glass" type.
- H. RF and transient filtering shall be provided in the device electronics.

- I. Pull stations shall be non-coded double action, requiring two distinct manual "pulling" actions to initiate the fire alarm system.
- J. Stations installed outdoors shall be weather resistant construction, double action to activate the pull station.

2.05 AUTOMATIC ALARM INITIATING DEVICES AS SHOWN ON PLAN

A. General

- 1. An electronic digital, multiplex, addressable module shall be incorporated into each device. The module shall communicate the status and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.
- 2. Devices shall be suitable for use on a Class "B", 2-wire supervised alarm initiating circuit. Where initiating devices are shown connected to an existing system, devices shall operated on two or four wire circuits plus - 2 - wire power circuit as required by the existing equipment.
- 3. Numbered screw type terminals shall be provided for "in-out" connectors of the alarm circuit wiring.
- 4. Auxiliary double throw spare relay contact shall be provided for activation of remote rated devices 120V-60Hz, AC - 1 Ampere minimum.
- 5. RF and transient filtering shall be provided in the initiating device electronics.
- 6. Initiating devices shall be reset from the control panel and shall not require individual resetting.

B. Smoke Detector Shall be SK-PHOTO

- 1. Detectors shall comply with UL standard 268, 167 and 168, and shall use solid state electronic circuits throughout.
- 2. The smoke detector shall operate on a total of two circuit wires. Alarm signaling and detector power shall use the same conductors. Detector sensitivity shall be factory set at 1.5%.
- 3. A fine mesh insect screen shall be provided on all detector openings.
- 4. The detector shall lock-in on alarm and shall provide a visual alarm/trouble indicator light. An electromechanical test feature shall provide functional testing of the unit without smoke.

5. The detector shall also incorporate a fixed temperature heat detector rated at 135 degrees F. The heat detector shall operate the alarm circuit and alarm/trouble light.
 - a) Photo electric type smoke detectors shall employ a light emitting diode (LED) as the detector light source, activated by the presence of combustion smoke products. Failure of the LED shall activate the alarm/trouble light on the detector.
 - b) Ionization type smoke detector shall employ the triple chamber (dual chamber) ionization principle, activated by the presence of combustion products. The ionization chamber shall be RF shielded.
 - c) Air duct smoke detector photo electric or ionization type for installation on a mechanical air ducts. Two air tubes shall extend into the air duct. The sampling tube shall extend across the entire width of the air duct. The second tube shall allow air to escape back into the duct.

C. Fire Detector – Heat Shall be SK-HEAT

1. Heat detectors shall be dual action electro-thermostatic combination rate of temperature rise and fixed temperature operation. A indicator shall be visible when detector has activated.
2. The rate of rise element shall be self restoring, after activation.
3. The fixed temperature unit shall be set at 136 degrees F (190 degrees F for high temperature areas i.e. over 110 degrees F.)

2.06 NOTIFICATION ALARM DEVICES

A. General

1. Notification alarm devices shall activate automatically from the control panel. Devices shall operate on a Class "B" (Style Y), 2-wire supervised alarm notification circuit. Series wired alarm devices shall not be used.
2. Numbered screw type terminals shall be provided for "in-out" connections of the alarm circuit wiring.
3. Devices shall be installed in a box, 3 1/2" deep maximum, flush mounting unless indicated otherwise on the drawings. Size as required for the alarm indicating device and wiring connections. Provide a trim ring and metal grill cover assembly. Cover assembly shall be minimum of 1/16" minimum thick flat stainless steel or aluminum. Finish color as selected

by the City of Torrance. The word "fire" shall appear on the grill minimum 1/2" letters. The grill shall be attached with screws to the box.

4. Each audible notification visual devices shall incorporate a visual alarm indicator. The visual alarm indicating device shall be an integral part of the audible alarm box assembly.
5. Audible notification device and visual notification devices shall be connected to separate notification alarm signal circuits. Do not connect these devices to the same circuit conductors.

B. Audible Alarm Horns Shall be Wheelock

1. Horns installed indoors shall be electronic type.
2. Horn shall provide a minimum sound level of 75 DB at 10 feet, when installed in the field operating conditions shown on the drawings.
3. Outdoor horns shall be electro-mechanical, weatherproof and shall be mounted in a recessed backbox with vandal resistant grille, Soundolier 193-8/VP-161 series.
4. Audible devices shall provide a minimum sound level of 10DB over the ambient level measured 48" above the floor.

C. Visual Alarm Indicator Shall be Wheelock

1. Lamp/Strobe internally illuminated projecting lens assembly, with flasher system. Unit shall flash on and off to provide visual indicating of fire alarm.
2. The word "fire" shall appear on the lens or lens plate.
3. Flash rate, one flash per second, with a flash duration of approximately 0.001 second, flash rate independent of audible device.
4. Light source, Xenon high intensity flash strobe tube white/clear color.
5. Strobe shall have a minimum output of 75 candela with a maximum flash intensity of 120 candela.
6. Strobe shall comply with NFPA requirements.

2.07 REMOTE FIRE ALARM ANNUNCIATOR SHALL BE AS SHOWN ON PLAN

A. General

1. The annunciator panel shall be powered and operated from the fire alarm control panel. "In-out" circuit conductors shall terminate on numbered screw-type terminals.
 2. A metal tamper resistant weatherproof cabinet shall contain the annunciator components. The panel shall be surface or flush mounted as indicated on the drawings. Provide a full height tamper resistant, hinged locking cabinet door. Door shall have transparent high impact windows to allow visual observation of all indicators and switches.
 3. An electronic digital, multiplex, addressable module shall be incorporated into the annunciator. The module shall communicate the status and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.
- B. Each alarm initiating zone (including spares) shall be individually annunciated in the annunciator panel.
- C. A common fire trouble alarm shall be annunciated in the annunciator panel from the fire alarm control panel.
- D. Annunciator lamp circuits shall be automatically supervised. Provide lamp test switch in the annunciator panel.
- E. An audible alarm/trouble buzzer with silence switch and automatic resound for subsequent alarm/trouble signals shall be provided. The annunciator panel shall be automatically reset when the control panel is reset.
- F. A keyed switch shall be provided for remote reset of the system. The annunciation panel shall also be automatically reset when the control panel is reset.
- G. Provide a floor plan of the facility framed under acrylic and mounted adjacent to the fire alarm annunciator. The floor plan shall be to scale and shall have room numbers clearly displayed on all rooms corresponding to the annunciator for the purpose of easily identifying the fire zones.
- H. The installer shall provide a site map to each annunciator showing all rooms with designations and buildings with names as programmed into the fire alarm system. The map shall include symbols indicating the locations of all installed fire sprinkler flow switches, shut off valves, horns, strobes, and manual pull stations. The map shall be in a frame and attached to the wall using the appropriate material.

2.08 REMOTE EQUIPMENT MONITORING AND CONTROL SHALL BE AS SHOWN ON PLAN

- A. An electronic digital multiplex addressable module shall be provide at each device or equipment indicated to be controlled by the multiplex system. Multiple addressable control ports shall be provided in each module quantity as required for each point controlled or monitored. The module shall communicate the monitor status control action and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.
- B. Where multiple points are monitored or controlled, provide digital, multiplex, multipoints, monitor, control panel (MMCP). The panel cabinet shall be self contained NEMA 1 [3R] construction and hinged locking door. Provide tamper switch detection zone on the cabinet door, provide 60 hour battery UPS backup and power supply, the same as required for the fire alarm control panel. Panel shall be expandable using plug-in circuit monitor/control printed circuit cards. Provide barriered numbered terminal strips.
- C. Each control point shall provide a supervised "dry" relay contact single pole double throw maintained contact rated 10 ampere, 227 volt, 60 HZ A.C.
- D. Each monitor point shall provide not less than one of the following supervised methods of monitoring a remote device or equipment action or status.
 - 1. Remote "dry" contact operation normal open, normally closed or momentary contact operation.

PART 3 - EXECUTION

3.01 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

- A. The inside cover of alarm initiating devices shall be marked with the zone initiating number corresponding to the zone number in the control panel. Marking shall be with a felt-tip pen.
- B. Each fire alarm terminal cabinet shall be painted red.
- C. Provide nameplate: "Power to Main Fire Alarm Control Panel" screwed onto the branch circuit overcurrent device supplying power to the main fire alarm control panel.

3.02 WIRING (ADDITIONAL REQUIREMENTS)

- A. Review the total system point-to-point wiring layout to assure that the correct number and type of wires and conduit sizes are installed.
- B. Final connections, testing, adjusting and calibration shall be made under the direct supervision of a factory-trained technician of the system supplier.
- C. All wiring shall be in conduit.

- D. All wiring in cabinets shall be neatly formed, laced and made up on bolt and nut terminal blocks. Tag all spare conductors. All conductors shall terminate on terminal strips with spade lugs, of adequate size for all incoming and outgoing conductors. The strips shall be labeled as to their use and wiring diagram shall be placed on the cabinet door showing connections of all related equipment to these strips.
- E. Wiring requirements for shielding certain conductors shall be as recommended by the manufacturer. Provide all conduit, raceways and conductors per manufacturers recommendations and include all material and labor costs in the contract price.
- F. The conductors used for digital, multiplex communication between the fire alarm control panel and external remote initiation devices, control points and annunciators, shall be twisted, shielded, multi-conductor cable, #16 AWG copper minimum with a separate internal ground/drain conductor, UL listed for fire alarm system use. One spare pair of multiplex conductors shall be provided in all main and branch device/equipment connections for future system use. "Tees" and taps at any junction box location in the communication lines, shall be permitted by the system to additional devices without affecting proper system operation.
- G. Wire Size: Wire shall be sized to insure installed circuit voltage drop does not exceed 10% to all devices.
- H. In terminal cabinets, installer shall provide a wire index identifying the building and locations of devices.
- I. All underground wiring shall be Aquaseal suitable for outdoor use, or approved equal.

3.03 OUTLET BOXES (ADDITIONAL REQUIREMENTS)

- A. Device outlet boxes shall be flush mounted unless indicated otherwise on the drawings. Provide extension rings to finish flush with finish surface. Where the drawings indicate surface mounted devices, outlet boxes shall be cast metal with threaded hubs. Where the conduit entrances are not exposed for surface mounted devices, provide flush outlet box behind the device box and omit the conduit hubs on the device box. Size device boxes and outlet boxes per manufacturers recommendation and as required by code for wire fill.

3.04 SPECIAL INSTALLATION REQUIREMENTS

- A. Air duct smoke detectors shall be installed in the supply air ducts and return air ducts with an air flow of 2000 CFM or greater, coordinate with mechanical contractor. Sampling tube shall extend across entire duct width. Provide 3/4" conduit with 2#12 to respective motor control device to automatically shut down the respective fan motor upon detection of smoke in the air duct.

- B. Water flow switches shall be installed on each main fire sprinkler rise pipe, coordinate with the fire sprinkler contractor.
- C. Tamper switches shall be installed on each main fire sprinkler shut-off valve, coordinate with the fire sprinkler contractor.
- D. Equipment shall be weatherproof gasketed where installed in locations exterior to the building, or where indicated on the drawings. Weatherproof equipment shall be tamper resistant.
- E. Connect fire alarm control panel with security/intrusion control panel for monitoring by remote monitoring company.
- F. Connect fire alarm control panel with master clock system to turn off class passing schedule, with paging system to turn off system when fire alarm system in alarm condition.
- G. Conduit with fire alarm wiring shall be painted red.
- H. Fire alarm system shall be programmed per actual building and room designation. Submit printout for review.
- I. Contractor shall thoroughly clean all work areas where work was performed at the end of each day. All areas shall be ready for the school to occupy and conduct classes/school the next working day.
- J. Contractor shall cover all contents of the rooms in which work is being performed with suitable plastic sheeting prior to the commencement of work.
- K. In occupied campuses, Contractor shall provide for safe access for all students and staff.

3.05 TESTING

- A. The entire fire alarm system shall be tested in the presence of the local DSA Inspector and a representative of the manufacturer after the installation is complete.
 - 1. Individually activate each manual initiating station and verify correct alarm operation and control panel response.
 - 2. Individually test each automatic initiating device and verify correct alarm operation, control panel response and remote equipment operation.
 - 3. The communication loops and the notification alarm circuits shall be opened in at least two (2) locations per building to check for the presence of correct supervisory circuitry.

- B. Test the battery back-up system by disconnecting the incoming normal power and allowing this alarm system to operate 24 hours on battery power. Sound the alarm system for five minutes at the end of 24 hours on battery power.
- C. Perform all electrical and mechanical tests required by the equipment manufacturer's certification form. Measure and adjust each automatic detection detector to the maximum stable sensitivity setting. Detector tests shall be performed with the detector at its operational location and under normal operational environmental conditions in the area. Bench settings are not acceptable. An operational check-out test and report shall be performed. Submit six copies of test report results. The tests and report shall include, but not be limited to:
1. A complete list of equipment installed and wired.
 2. Indication that all equipment is properly installed and functions and conforms with these specifications.
 3. Test of individual zones as applicable.
 4. Serial numbers, locations by zone and model number for each installed detector.
 5. Voltage (sensitivity) settings for each ionization and photoelectric detector as measured in place with the HVAC system operating.
 6. Technician's name, certificate number and date.
 7. The completed manual and automatic monitoring and control system shall be tested to insure that it is operating properly. This test will consist of exposing the installed units to a standard fire test.
 8. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a ninety (90) day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the contractor shall readjust or replace the equipment and detector(s) and begin another ninety (90) day test period. As required by the Engineer, the contractor shall recheck the detectors using the fire test after each readjustment or replacement of detectors. This test shall not start until the District has obtained beneficial use of the building under tests.
- D. After the testing has been completed to the satisfaction of the inspectors, provide the NFPA certificate of compliance to the Engineer, the City of Torrance and the local Fire Official.

- E. Upon the receipt of Certificate of Compliance, the installer/supplier shall supply the Owner with a written operating, testing and maintenance instructions, point-to-point as-built drawings, and equipment specifications.
- F. Provide a two (2) hour instructional sessions conducted by a factory-authorized technician at the job site after completion of all tests to instruct the City of Torrance personnel on the use of the system. The first session shall be videotaped and conducted prior to final acceptance of the project. The second session shall be held within eleven months of final acceptance of the project, when requested by the District.
- G. Installer shall protect all work until the Fire Alarm System has been accepted by the Inspector.

3.06. OPERATING/SERVICE MANUALS

- A. Submit 5 copies of service all manuals and all current programming software including the following:
 - 1. Detailed explanation of the operation of the system.
 - 2. Instructions for routine maintenance.
 - 3. Detailed instruction for repair of major components of the system.
 - 4. Pictorial parts list and art numbers.
 - 5. Pictorial and schematic electrical drawings of wiring systems, including operating and safety control panels, annunciators and major components.
 - 6. Installation instructions for system components.
 - 7. Programming instructions and programming disk(s).
 - 8. Programming listing.
 - 9. Final test report.
 - 10. A single reproducible set of record drawings reflecting the system exactly as it was installed including exact locations of components.

END OF SECTION