Design Standard
Fire Detection and Alarm

Purpose

This design standard has the purpose of creating consistent installation of fire detection and alarm systems throughout the South San Francisco Unified School District thereby achieving a standard of quality, maintenance and performance throughout all renovation and new building projects.

Design Standard

Fire Alarm System General Requirements

- This section covers the requirements for a fully addressable fire alarm system. Review each project with District to confirm scope.
- Where required by DSA and the CBC, provide fully addressable alarm system per NFPA 72 requirements.
- Siemens MXL is the District Design Standard for Fire alarm control panel and devices. No substitutions.
- Door holders (by hardware package) – 24V. Verify AC/DC for each design.
- It is advisable to standardize devices for flow switches, smoke detectors, and tamper switches.
- Additionally, both strobes and combination horn/strobes require wire guards in student toilets and other areas prone to vandalism.
- All fire alarm cabling is to be installed in ¾" conduit.
- All fire alarm panels shall be fed from a dedicated circuit. No other loads shall be supported from this source. Label the derivation source for each circuit and panel. All wiring to be solid, not stranded.
- All connectors in boxes shall be insulated throat steel compression ¾" minimum.
- Provide conduit raceway and wiring from IDF or MDF to FACP for remote dialer Internet interface, if required and approved by District.
- All inter-building network ties on new systems to be fiber optic outside plant rated cable in underground conduit to avoid moisture affects on fire alarm system operation.
- Provide terminal cans for wiring routing on each floor of each building. Provide wiring gutters above each FACP or remote panel for wiring management.
- The voltage drop in all circuits shall be less than 5%.
- Fire devices, systems, and compatibility shall be State Fire Marshal and UL-approved.

- Provide District with opportunity to salvage old fire alarm equipment. Contractor will deliver equipment so identified by Facilities Department to District Warehouse.
- Provide SSFUSD Facilities with maintenance kit, including two of each type of device installed, including end of line resistors and any items recommended by manufacturer.

Fire Alarm Modifications

- Contractor will be responsible for any impact to the fire alarm system, such as installation of new devices and documentation with NFPA Certification of Completion form. Contractor will also be responsible for coordination required with other agencies and utility companies such as PG&E.

Training

- Site staff and custodians to be instructed on how to silence fire alarm but preserve trouble condition until District Facilities arrives for resetting and repair.
- District Facilities staff to be given orientation by contractor and Manufacturer's technician at time system is put on-line.
- Contractor to provide eight (8) hours of training by supplier with contractor present during training.

ADA Compliance

- Meet ADA requirements. Install strobe lights at 96" above finish floor or 6" below ceiling, whichever is lower.
- Refer to NFPA 72 guideline provisions for 'equivalent facilitation' for coverage requirements.
- Ceiling mounted strobes are also acceptable.

A/E and Contractor Submittal Requirements

- A/E shall obtain Fire Department and DSA approvals after reviewing design package with District and before bidding. Design submittal shall include drawings that provide the following:
    - Floor Plans showing device locations and quantity of devices (equipment) on each floor
    - Zone configurations / Loop designations
    - Additional measures to secure manual pull stations and other devices within reach of students to wall or ceiling to deter vandalism.
    - Equipment location of:
        - Fire Alarm control panel: Locate in Main Office
        - Remote annunciator(s)
        - Transmitters/Transponders
        - Municipal fire alarm system connection
    - Riser diagram(s) indicating:

        - Arrangement of devices with respect to control units
    - Control Panel
    - Power supply input
    - Alarm initiating circuits
    - Alarm notification circuits
    - Ancillary function
    - Pull Station and Fire Detector Locations
    - Dimensioned locations of each manual alarm station and fire detector.
    - Typical data needed for determining fire detector locations.
    - Ceiling construction
        - HVAC system layout and controls
    - Conduit and Wiring Drawings
        - Normally not dimensioned
        - Size dictated by NEC, but not less than ¾ inches
    - Where existing system is to be replaced, provide demolition plans to document all devices and conduit to be removed. Conduit may be reused if acceptable by engineer.

- Contractor shall submit the following package to the A/E of Record. A/E will then submit the approved package to the Fire Department and DSA before construction. Seven (7) approved sets with FD and DSA Fire Marshal stamp/signature must be made available. Include:
    - Table of contents
    - Names of owner and occupant
    - Address of building, including assessor's block and lot
    - Contractor's name, address, telephone number and license number
    - Point of compass
    - Symbol list
    - Full-height cross section of schematic diagram of building, if
    - required for clarity, including ceiling construction and height
    - Locations of partitions and walls, indicating which ones extend through concealed spaces
    - Use of each area or room
    - Location of each device
    - Mounting heights of manual fire alarm boxes and visual notification appliances
    - Equipment list showing quantity, make, model, and CSFM listing sheet of each device
    - Manufacturer's specification sheets
    - Type and size of wire, cable, conduit and conduit fill ratio. Include manufacturers specification sheet
    - Single line riser diagram
    - Point-to-point wiring diagram
    - Wiring diagram showing the connection to the primary power supply
    - Standby battery calculations for notification appliance circuits
    - Voltage drop calculations

  - Sequence-of-operation description or matrix
  - Assignment of class designations, style designation or both to initiating device circuits based on their performance capabilities under abnormal conditions. (This does not apply for addressable initiating device circuits.)
  - Description of annunciation zones or list of device locations and their addresses
  - Type of system (ie protected premises, central station, etc.) and identification of zones transmitted, if any
  - Voice message content and languages (if applicable)
  - Description of ancillary features and operations (eg smoke evacuation, fire damper operation, fan shutdown, door hold-open devices, special extinguishing systems, fire pump monitoring, etc.)
  - Description of any special features such as detector cross zoning or alarm verification
  - Name of alarm service company which will be responsible initially for inspection, testing and of system after it is accepted
- Final Test (by contractor). Use applicable NFPA 72 Certificate of Completion Form for a new installation.
- Pretest all devices before final test and provide District with documentation to demonstrate that this pretest has been completed.
- Perform final test in presence of manufacturer, Fire Department and School District representatives with completed Certificate of Completion and close out documentation such as as-builts and O&M manuals. School District representation should include site administration, SSFUSD Facilities and DSA inspector.
- The contractor will pay for expenses at $100/hour/person attending a final test should more than three devices fail.
- Operate every building fire device.
- Half of test shall be performed on stand-by power.
- Initiating circuits and notification circuits shall be opened in at least one location per zone.
- At least 72-hours notice must be given to invite the following parties to the final testing: Fire Department if required, SSFUSD Facilities Department, Project Electrical Engineer, DSA inspector, District PM/ CM and Supplier's Technician.
- The contractor shall provide the necessary personnel and equipment to conduct the tests outlined above as part of their contract.
- Contractor to obtain DSA acceptance sign-off upon successful completion of test.
- The system warranty shall start after final acceptance sign-off and approval by the IOR.
- The final acceptance test shall be performed within two weeks of putting the new system on line. If the contractor is not ready for final acceptance, then an operational test for occupancy with the Fire Department will be performed within two weeks and a full acceptance test will be scheduled on a later date.
- Close-out Documentation (by contractor):

- Five sets of as-built drawings, material submittals, and O&M manuals per 1-7.2.2.2.1 of the 1993 NFPA 72 required.
- Loop resistance to be recorded as part of the as built.
- Four sets of keys: one set for site and two for SSFUSD Facilities
- NFPA 72 Certificate of Completion

Fire Alarm Operation

Upon activation of any manual station, automatic detection device, or sprinkler flow switch, the fire alarm system shall operate as follows:

- Audible alarm indicating devices shall be silenceable by the alarm silence switch on the main panel.
- Visual alarm indicating devices shall be silenced upon system reset.
- Appropriate initiating device address or zone shall show on the control panel and remote annunciator until reset.
- Subsequent zone alarm shall reactivate the alarm indicating appliances.
- Doors normally held open by door control devices shall be released upon general alarm or fire drill.
- Provide shutdown and/or control of all air handling systems if required (eg. Over 2,000 CFM).

AC Power Disconnect Switch

- Non-fused type, padlock-off handle, enclosed switch mounted next to FACP to test system on batteries. Provide ITE CFN211 AC power disconnect switch.

Fire Alarm Control Panel (FACP)

- Both trouble signal and alarm signal to be zoned by floor, and labeled on annunciator panel or displayed by address.
- Annunciator panel to include LCD with keyed activation for alarm silence and system reset and fire drill.
- Power to be on dedicated circuits with local disconnect.
- 24-hour battery back-up.
- Locate in main administrative office.
- Independent of contractor work, District will arrange for evacuation plan posting that will display shut-off location for gas, electricity, water, sprinkler on 11"x17" floor plan enclosed in clear plastic jacket.
- Display initiating device address or zone until reset.
- Address initiating devices on FACP ; for example, “2nd fl N. Stairwell #4 across from Rm 247 Smoke Detector M1-101”
- Address signaling devices on FACP; for example, “2nd fl Corridor by Rm 201 Horn Strobe TAC 2-1-1”
- Numbering system must follow DSA 1-A drawings

Gate Valve Tamper Switch

- Shall provide supervisory signal that has to be acknowledged and reset at the FACP.

Manual Pull Stations (in Student Areas)

- Dual action type.
- Shall be attached to stud with a minimum of 2-1/2" penetration. Provide conduit attachment for surface conduits just above or below box to minimize possible physical damage from vandalism.
- Provide tools to open and reset

Branch Panels

- Flush-mounted in wall required in new construction; surface-mounted acceptable if existing.
- Tag all circuits in junction boxes and panels within 2-4 inches of tie down.
- Lock-out circuits for fire alarm system.
- Panels to be lockable with keys; extra set to be provided for each of site, two sets for District.

Signal Pattern

- Constant on pattern.

Signal Time

- Fire alarm system signal shall continue until acknowledged at the FACP or time out after 10 minutes.

Smoke Detectors

- Provide smoke detector coverage to comply with Senate Bill 575 – Full coverage throughout all areas to supplement sprinkler system. Heat detectors required above accessible and concealed (accessible) combustible ceiling areas where sprinklers are not used for building protection (above ceilings).
- Shall trip the local alarm.
- Required to signal FACP to activate all magnetic door hold-open mechanism at fire separation doors in corridors.
- Required in storage areas greater than 1500 square feet.
- Required at all HVAC fire/smoke dampers at fire separations. Coordinate provisions of smoke detectors and accessories with HVAC documents for all Fire/Smoke Damper locations. Each FSD to be stand alone control via local detector, with 120V normal power connection.
- Required at all air handling units over 2,000 CFM rated for automatic shut-down upon alarm. Automatic shut-off to be locally wired through respective unit starter HOA contacts

- Detectors to be provided by Division 26, installed by Division 23, and connected complete by Division 26.
- Provide remote test switches and indicators for all concealed detectors at FSD's or HVAC units.
- Switches to be located out of normal reach.
- Required if combustibles are present below raised floor (eg sophisticated computer room).
- Required in all children's center impacted area, such as room where children nap.
- Locate one adjacent to the FACP and/or remote transponder panels or power supplies.
- Require one detector only in separation door with headers less than 24" high and per the latest edition of NFPA 72, including amendments.
- Required at all doors normally held open to corridors and at main office, verify with site.
- Required at all elevator smoke doors.
- At ceilings higher than 20 ft., if required, provide infrared beam detectors (sending unit and receiver), installed per NFPA guidelines. Locate detectors min. 8" below ceiling and max. 18" below ceiling with coverage to match manufacturer's listings.

Warning Devices-Audible

- Designated signal pattern until silenced by the alarm silence switch at the FACP
- 15 dba above ambient noise in all normally occupied building locations.
- Separate and distinct from other audible signals.
- Separate circuit from visual devices, unless 2-wire addressable system is used.
- Middle Schools and High Schools; Wall mounted appliance shall have their bottom heights above the finished floor at 96" or their top at no less than 6" from the ceiling, whichever is lower. 80" mounting heights shall not be used, unless specifically required.
- Elementary Schools; Wall mounted appliances shall have their bottom heights above the finished floor at standard 80" height or 6" below the ceiling, whichever is lower.

Warning Devices-Visual

- Addressable devices compatible with alarm panel.
- Existing systems which employed visual alarms and were approved at the time of installation may have their use continued throughout the building without conforming to the following.
- Existing buildings shall comply with the requirements below (CCR Section 7204(a)) when extensive remodeling occurs on more than 25% of the floors of the building-extensive remodeling shall mean when more than 75% of the existing interior walls or partitions of the floor (measuring lineal footage) are removed or relocated or when new interior walls or partitions are added which exceed 75% of the total lineal footage of the combined existing walls and partitions.

- Continuous flash until the system is reset or timed out if required.
- New fire alarm systems and renovation of existing (excluding maintenance and alterations/additions caused by remodeling) shall be upgraded to include strobe lights (ADA type).
- Flash rate shall be no more than 2 flashes per second (2Hz) and no less than 1 flash every second (throughout the listed voltage range of the appliance) per NFPA 72.
- Middle Schools and High Schools; Wall mounted appliance shall have their bottom heights above the finished floor at 96" or their top at no less than 6" from ceiling, whichever is lower. Ceiling mounted devices are acceptable, when properly listed for use and coverage. 80” mounting heights shall not be used, unless specifically required.
- Elementary Schools; Wall mounted appliances shall have their bottom heights above the finished floor at standard 80” height or 6” below the ceiling, whichever is lower.
- Calculations to substantiate visibility conformance with ADA are required.
- Install at 99' intervals in corridors.
- Locate in all classrooms, restrooms, corridors, enclosed stairways, music practice rooms, band rooms, gymnasiums multipurpose rooms, occupational shops, toilets, meeting rooms with capacity of 4 or more, teacher lunch rooms, on enclosed elevator lobbies, rooms with instruction for the hearing impaired, areas that generate noise that will interfere with detection of audible signaling device, occupancies of more than 50 people; stair enclosures devices to be negotiated.
- Provide wire guard in boys' and girls' restrooms, gymnasiums.
- Provide approved covers that will not minimize audible or visual coverage of strobe/horns.

Waterflow Switch

- Shall provide signal that has to be acknowledged and reset at the FACP and local alarm bell and horn/strobes when activated.
- Also activate 120VAC exterior bell, independent of FACP.

Fire Suppression System

- Required in school kitchens with Type I hood, which collects and removes grease and smoke. However, the suppression system is not required for Type II hoods, which collects and removes steam, vapor, heat or odors.
- Shall be supervised from the FACP located in the main office.
- Shall provide a disabling push button for kitchen horn in FACP.
- Shall include a separate pull station and horn in the kitchen area, and a gas shut-off valve or power disconnect, depending on the type of cooking range.
- Use shunt trip breakers for all electric appliances under Type 1 hoods.
- When a fire suppression system is activated either by fire or by pulling a local kitchen pull station, it should do the following:
    - Send an audio and visual signal to the FACP.

- Shut supply valve for gas cooking range or trip the power to the electric cooking range and sound general alarm.
- Kitchen area horn shall also be activated in case of pulling of any pull station within the school area.

Post Indicator Valve

- Provide a means for supervision to the FACP.

Manufacturers

- Siemens AG

Substitutes Allowed?

- No substitutions

Associated Standards

- Division 1 Design Standard Codes and Standards
- 23 00 00 Design Standard Basic HVAC System Design
- 26 00 00 Design Standard Basic Electrical Requirements

End of Document