SECTION 28 31 00
Fire Alarm and Signaling Systems

PART 1 GENERAL

1.1 DESIGN & ADMINISTRATIVE PROCEDURES
1.2 SCOPE OF WORK
1.3 DESIGN REFERENCES
1.4 SUBMITTALS
1.5 TRAINING

PART 2 PRODUCTS & INSTALLATION

2.1 MATERIALS AND EQUIPMENT
2.2 INSTALLATION

PART 3 INSPECTIONS & ACCEPTANCE

3.1 FIELD INSPECTIONS
3.2 SYSTEM ACCEPTANCE

PART 1 GENERAL

1.1 DESIGN & ADMINISTRATIVE PROCEDURES

A. General:

1. Due to the wide variety of types of University projects, which include residential, office, instructional, research laboratory, and public assembly facilities, the University's fire protection requirements are often extensive and complex in scope. The Project Team shall take a careful and comprehensive approach to fire protection issues in general, and shall attempt to identify specific fire protection requirements early in the schematic design phase. This will require a meeting with Stanford University Fire Marshal’s Office (SUFMO) and User Group representatives to review the major design issues (panel type, capacity, capability, evacuation zoning, FSD control, training, etc.) involved.

2. Designers shall work with the Stanford Project Manager to identify fire protection requirements and coordinate design review and approval between SUFMO, other project stakeholders, and jurisdictional authorities. Project design requirements shall include compliance with the Americans with Disabilities Act (ADA) guidelines.
3. In general, all fire protection design issues are subject to internal review and approval by SUFMO prior to the submission of working plans and specifications to the Santa Clara County Fire Marshal or other jurisdictions for plan check and permits.

B. Negotiations: If, during the course of a project, special negotiation with jurisdictional authorities regarding fire code compliance is required, the Project Manager is responsible for coordinating any required input from Designers during the negotiation process. Therefore, Designers shall immediately notify the Project Manager when any such special circumstances arise, so that the Project Manager can initiate the negotiation process through the appropriate University representatives.

C. Quality Assurance

1. Installer Qualifications: Engage an experienced installer who is a factory-authorized service representative to perform the work of this section. It is expected the technicians performing the installation are certified Fire/Life Safety Technicians by the State of California, are factory trained on the system being installed, and have over 5 years of experience performing installations. NICET certification is not required but desired.

D. Related Work

1. General: Drawings and general provisions of Contract, including General and Supplementary Conditions and the following related Sections, apply to work of this Section.

2. Section 00 73 19/01 35 00: Environmental Health and Safety (includes Asbestos and Lead Management)

3. Section 01 33 00: Submission Requirement Guidelines

4. Section 33 10 00: Domestic and Lake Water Systems

5. Section 21 30 00: Fire Pumps

6. Section 21 13 00: Automatic Fire Sprinkler Systems

7. Section 14 21 00: Traction Elevator & Section 14 24 00: Hydraulic Elevator Specifications

8. Section 23 05 00: Common Work Results for HVAC

9. Section 26 05 00: Common Work Results for Electrical Systems 600V or Less

10. Section 28 01 00: ACES Card Access

11. Section 23 33 00 Air Duct Accessories
E. Existing Fire Alarm Systems

1. Do not remove any portion of the existing fire alarm system from operation while installing new work without written approval of SUFMO. A demolition plan check and permit is generally required by AHJ prior to removal of any fire alarm system devices.

2. Demolition of the fire alarm system devices in the project area is generally required prior to asbestos abatement work being done. The fire alarm system wiring shall be clearly identified and protected within the project area to ensure abatement and demo work do not cause unwanted alarm signals. Otherwise fire alarm circuits shall be re-routed around the project area.

3. Where existing fire alarm systems have notification devices that do not sound a distinct Temporal-3 pattern and/or do not synch visually, and the project involves more than 25% of the floor area, it is required to upgrade all the devices on the floor to provide the Temporal-3 pattern and sync visually.

4. Where existing fire alarm systems do not activate the notification devices within 10 seconds of the activation of the initiating device, it may be required to upgrade the fire alarm system to comply or for Stanford to provide a compliance agreement with the local jurisdiction within an agreed upon timeframe.

5. Fire Alarm System Impairment Protocol: Contractors impairing any part of a fire protection system must submit a written procedure, stand alone or part of Site Safety and Logistics Plan, with details including but not limited to: a list of devices that will be impaired, dates and times of impairment, a detailed emergency evacuation plan if necessary, and a list of the technicians performing the impairment. Impairment signs shall be posted on the FACP, annunciators, and components affected by the impairment. Signs shall be installed and maintained by the contractor. Additional requirements may include a dedicated fire watch by security officers, providing air horns to qualified building occupants (i.e., building ERT), fire sprinkler system connected directly to AES Radio Alarm Transmitter, etc. These additional items will be determined by SUFMO.

6. In order to accomplish the above requirements, temporary locations of some existing and/or new equipment may be necessary. These temporary locations shall be reviewed/approved by SUFMO prior to submitting to AHJ for review and approval.

7. All wiring to removed devices shall be pulled back to a junction box terminal strip: abandoning existing or new wiring is prohibited.
1.2 SCOPE OF WORK

A. General:

1. The Contractor shall furnish and install a complete fire detection and alarm system, including software programming, all wiring, power supplies, components, accessories, and wiring and connections to devices furnished by others, all tested and inspected as operable.

2. The Contractor shall furnish the system with by-pass functions to disable the NACs, door holders, FSD and AHU shutdowns, Elevator recall and power shunt trip as required, and any other function that may disrupt building occupants while testing. Minimum spare capacity on new systems or major upgrades: 20% on the input and output circuits and 20% battery capacity is required.

3. For new fire alarm systems, installation of the FACP and AES Radio shall be in the 1st floor IT Room to ensure a strong, reliable radio signal to the Stanford furnished AES wireless radio subscriber unit.

4. It is intended that the Contractor shall furnish and install a fully functional fire alarm system. Any items, supplied by others, which are missing or defective, shall be brought to the attention of the Stanford Project Manager immediately.

5. These standards are provided to obtain and maintain adequate, approved fire protection for Stanford University. Any questions regarding these standards shall be directed to Stanford University Fire Marshal’s Office.

6. Prior to installation, all plans shall be approved by SUFMO prior to being submitted to the County Fire Marshal's Office or other jurisdiction for plan check and permit.

1.3 DESIGN REFERENCES

A. Fire alarm system, equipment, installation, and wiring materials and methods used shall comply with the following codes and standards:

1. California Code of Regulations (CCR), Title 24, currently adopted editions, of Building Code (CBC), Fire Code (CFC), and Mechanical Code (CMC)

2. CCR, Title 19, Division1 State Fire Marshal

3. NFPA 13, current CFC referenced edition: *Standard for the Installation of Sprinkler Systems* and all appendices

4. NFPA 70, current CFC referenced edition: *National Electric Code*

5. NFPA 72, current CFC referenced edition: *National Fire Alarm and Signaling Code* and all appendices

7. Santa Clara County Fire Code Amendment NS1100.117 (for locations in unincorporated Santa Clara only – including main campus and School of Medicine)

8. Palo Alto Municipal Code, Title 15 (for locations within city limits only – including Stanford Medical Center, Hoover Pavilion, Welch Road)

1.4 SUBMITTALS

A. Procedure: Shop drawings, calculations, material data sheets, and CSFM listings shall be submitted to Stanford University Fire Marshal’s Office (SUFMO) for review and approval prior to submission to the local jurisdiction and the purchase and/or installation of equipment. Submissions to SUFMO for review and approval may either be PDF or hardcopy.

Projects located within Santa Clara County involving no more than ten fire alarm notification and/or initiating devices may qualify as a Minor System Modification (MSM) which is an expedited permit process. SUFMO review and approval of the plans is required prior to submission to SCCFMO. However, SCCFMO plan review is not required. More information and required forms for MSM submittals can be found at the following link: http://www.sccgov.org/sites/fmo/permits.

B. Shop Drawings: Shop drawings shall be computer generated (AutoCAD compatible DWG format) drawings, compatible with Stanford requirements, and shall include all item as required by the CFC and NFPA 72. Additional items shall be shown:

1. Wiring diagrams indicating:

a. Panel Layout (i.e., control panel elevation, power supply location, AES Wireless Radio location, auxiliary power supplies, etc.) Use AES radio details provided by SUFMO.

b. All control panel and auxiliary equipment wiring terminations.

c. Inter-module panel wiring where appropriate.

d. Arrangement of control panel modules in cabinets.

e. Arrangement of annunciation and wiring terminations.

f. Connection details for each device to be installed: smoke detector, horn, horn/strobe, duct detectors, interposing relays for Fan's, FSD's, shunt trip, elevator recall, door holders, smoke control, roll down doors, smoke guards etc. Each detail should be to the board level showing terminal connections and polarity requirements noted.

g. Open cable wiring systems shall include details of strain relief used at connections, hanging method, protection at wall and floor penetrations and in-wall wire runs

h. Riser diagrams showing size of conduit, conductor size and type, and the number of conductors in each conduit run. Shielded or other special types of conductors shall be indicated where required.

i. Point-to-Point Diagrams

j. Battery calculations and circuit voltage drop calculations
2. System Operation Matrix with Narrative and Ladder Logic Diagrams or other approved means to clearly indicate output functions from each type of initiating device. This is to ensure field programming is consistent with the approved drawings.

3. Title block with SU Building Name, Street Address, and Quad-Building No. (e.g., Herrin Labs, 385 Serra Mall, 07-400).

4. Dimensioned elevation view of wall mounted devices such as FACP, Enclosures, “Gutters”, etc. to ensure device heights and clearances are appropriate.

5. Equipment Legend summarizing symbols, description, device count, model no., CSFM listing No. of ALL devices and components used for the project.

6. Plans shall clearly identify the supervising station as a Remote Supervising Station on the drawings in accordance with the California Fire Code (CFC) requirements.

C. As-built drawings in AutoCAD compatible format shall be submitted to SUFMO for review prior to final project submittal of record drawings to ensure all field conditions, project data, and SUFMO plan review comments have been incorporated into the final record set of drawings.

1.5 TRAINING

A. SUFMO on a project specific basis will request training sessions. This will be covered during the Design phase of the project.

PART 2 PRODUCTS & INSTALLATION

2.1 MATERIALS AND EQUIPMENT

A. General:

1. FACP: The Fire Alarm Control Panel type shall be one of the “Acceptable” models. Panel type shall be determined based on building use, product reliability, availability and cost.

2. For new systems, acceptable Fire Alarm Control Panels:
   a. Siemens FireFinder XLS
   b. Notifier NFS-320, NFS2-640, and NFS2-3030
   c. Potter PFC-6030, PFC-6075, PFC-6200, and PFC-6800.
   d. AES 7706-ULF
   e. As approved by SUFMO for newer Siemens, Notifier, Potter, AES, or other panels for specific situations.
3. **Document Cabinets:** An appropriate sized cabinet shall be provided next to the main FACP that can house 24”x 36” drawings, a printed copy of the FACP software database, and any other material required by NFPA 72. The cabinet shall be marked “FIRE ALARM DOCUMENTS” or “SYSTEM RECORD DOCUMENTS”. If all documents cannot properly fit inside the cabinet, a second cabinet shall be provided. Acceptable cabinets are the DSB (5 ½” x 37”), the FAD (12” x 13”), or the SRD (12” x 13”) all manufactured by Space Age Electronics.

4. **Components (initiating, notification and auxiliary devices) shall be UL Listed and/or FM Approved, CSFM Listed, and compatible with the FACP to be used.**

5. **Alarm Transmitting Equipment:** Transmission of alarms to Palo Alto Communications will be accomplished by AES Radio Alarm Transmitter (RAT) supplied by SUFMO (purchased by the project). The Fire Alarm System designer shall incorporate the CAD compatible AES RAT wiring details provided by SUFMO into the shop drawings. Wiring between the FACP and RAT will be completed by SUFMO. AES enclosure is provided by Stanford and mounted by the installing contractor.

6. **Sprinkler Waterflow and Valve Tamper Switches –** Waterflow switches are Potter Electric VSR series with duel SPDT switches; PIV and Backflow Valve Tamper Switches shall be Potter PIV and OSY models.

7. **Exterior Sprinkler Horn –** Any compatible 120 VAC or 24VDC exterior weatherproof horn with constant tone (not coded or temporal-3) rated at 95 dB at 10’ minimum.

8. **Door Hold-Open Devices:** - Electromagnetic devices, Rixson ASSA ABLOY FM 998, 24VDC/120 VAC.

9. **Fire Smoke Dampers (FSD):** These shall be in accordance with Stanford FDG and BGM requirements for on-going maintenance and be ordered with their respective end-switch package and remote test panel with red/green lights. Ruskin FSD’s shall use the MCP4 control panel on a 1-1 basis for each FSD.

10. **Wiring & Conduit:** All wiring shall meet manufacturer specifications and the following where allowed by the manufacturer:
a. ABOVE GROUND: unless specified differently by the manufacturer, unshielded twisted-pair solid copper conductors in EMT conduit is preferred. "Open Cable" applications shall use FPLP "red" jacket cable with solid conductors with appropriate colored inner conductor jackets following the standard SUFMO color code – see 2.2.E(4). Note: this type of FPLP cable is usually a special order with minimum quantities required. Larger gauge wires are acceptable to meet voltage drop requirements; 16 awg is acceptable for SLC circuits if allowed by the manufacturer. Contractor is required to provide detail and material cut sheets for dedicated hangers and strain relief used for open cable applications.

b. For Open Cable "FPLP" Strain Relief shall be provided. Strain relief shall be by Arlington LCPG50 or approved equal.

c. UNDER GROUND: All underground wiring shall be direct bury type for wet locations listed for underground use, and run in conduit as specified in 2.2.B(3).

11. Circuit Breakers: All circuit breakers that supply power to fire alarm equipment or emergency communication systems shall supply no other loads, have an approved breaker locking device installed, and be marked in red. The Space Age Electronics ELOCK-FA is an approved locking device that meets all of the NFPA 72 requirements.

12. Terminal Cabinets: All terminal cabinets shall be red in color and display the words “FIRE ALARM TERMINAL CABINET” on the front. SUFMO approved terminal cabinets include the Space Age Electronics ACE, TC, and IF Series Cabinets. The MFR (Multi-Fast Rail) is available to mount addressable modules inside the approved terminal cabinets to provide a means to interface with Emergency Control Functions, Two-Way Radio Communication Enhancement Systems, or any other system to be interfaced with the fire alarm system.

2.2 DESIGN & INSTALLATION

A. Accessibility & Location:

1. All devices, panels, components shall be directly accessible for maintenance by providing 36” clearance to front and 18” to sides of device. All panel doors shall be able to be fully opened unless approved by SUFMO.

2. From the floor, the device shall be reachable by ladder. If a lift is required device location shall be specifically approved by SUFMO. Top of FACP, terminal cabinets, and auxiliary & booster power supplies shall be installed at a nominal 6’ above finished floor. External battery enclosures shall be installed with the bottom of the enclosure being no lower than 2’ and no higher than 4’.

3. Duct Detectors & Sample Tubes (Fan Shutdowns and FSDs): For Laboratory buildings, area smoke detection shall be used to control FSDs. Area detection minimizes disruptions to research activities during maintenance and troubleshooting.
4. Duct detectors shall be used for Fan shutdowns. Differential pressure tests are required to validate installation is within duct detector listing parameters. In-duct "plenum" type detectors shall be used for FSD control at non-lab buildings because there is no minimum air velocity requirement associated with their listing as is the case with externally duct mounted detectors with internal sample tubes. FSD access hatches and FSD position indicating test switches shall be fully coordinated with other trades including and approved by SUFMO prior to installation. Access hatches shall be hinged type whenever possible and located directly under the in-duct detection. The FSD position indicating test switches 4 shall normally be installed below ceiling.

5. Coordinate location of FACP, AES RAT, remote annunciator, power supplies, and terminal cabinets with SUFMO prior to shop drawing submittal. FACP s shall not be located in basement locations. Locations should provide a compatible environment to the manufacturers listing of these devices. The impact on building occupants by system trouble indicators shall be considered during location selection.

6. The AES RAT subscriber unit installation location shall be at the 1st floor IT Room or 1st floor dedicated Fire Alarm Control Room. This location will be chosen to ensure a strong reliable radio signal is provided to the AES subscriber unit. In all cases this unit shall be installed in above grade rooms at the 1st floor level. Contact the Fire Systems Supervisor or Lead Tech to schedule this visit. It is very important that a suitable location is determined for optimum RF signal strength.

7. Exterior devices shall be avoided, but where required shall be installed per manufacturers requirements for weather-proof devices. Where devices are subject to direct water spray enclosure shall be a NEMA 4 enclosure.

8. Fire panel and control equipment shall be inside a conditioned environment.

9. Notification devices shall not be placed in walk-in coolers or freezers. These are considered non-common spaces and do not require visible notification. Private offices (single or multiple persons) are not considered common spaces and shall not require visible notification.

B. Wiring:

1. All new wiring for existing buildings shall match existing wiring, raceways, color coding, etc. unless approved by SUFMO.
2. All wiring for new laboratory buildings shall be run in metal (EMT) conduit due to the high density of building systems typically above ceilings and the frequency of renovations. Non-laboratory buildings shall be run in metal (EMT) conduit or listed open "FPLP" cable as outlined in section 2.1 above. Conduit sizing, fill density, bends, hanging, routing (parallel and perpendicular to building structure), and strain relief shall be in accordance with the NEC, CEC and this specification. Exception: wiring to remote alarm indicators mounted in ceiling tiles shall be plenum rated FPLP cable and be provided with a “service loop” to allow for movement of ceiling tiles for maintenance.

3. Connection to PIV’s and backflow preventers (BFP’s) shall be run in conduit with approved listed underground direct buried cable. Work shall be coordinated with underground fire service installation subcontractor.

4. Underground conduit shall be Schedule 40, PVC at twenty-four (24) inches, minimum, below grade and rigid steel, wrapped with 20 mil tape at less than twenty-four (24) inches. Risers from underground conduits to exterior devices shall be rigid steel (from the elbow at the base to above grade). Underground conduits shall be 3/4 inch trade size, minimum and weatherproof grommets shall be used at connections to junction boxes and switch cases.

5. Wiring shall be continuous from device to device. Splicing shall be accomplished by use of approved terminal blocks. Wire nuts are only allowed on 120V AC power splices.

6. Wire to initiating devices shall be minimum 16 awg and notification devices shall be minimum 14 awg, solid core conductors unless required otherwise by manufacturer's guidelines. All wiring must comply with the manufacturer’s specifications.

7. All control panel wiring shall be fully dressed and bundled with nylon tie wraps. Bundled wiring shall be routed parallel to terminal strips within control panels, with individual conductors turned out at 90 degree angles to their associated terminal connections. AC power conductors shall be bundled and routed separately from low voltage conductors. A minimum 2-inch separation shall be maintained between AC power conductors and low voltage conductors wherever possible. All control cabinets shall be sized to accommodate the requirements of this section.

8. Each conductor terminating within a control panel shall be uniquely numbered with durable plastic tags or uniquely identifiable by a combination of numbers and color codes. These conductor numbers shall be shown on the record (As-Built) drawings in a manner allowing ready identification of any field wiring conductor in any control panel.

9. All connections and end-of-line devices shall be accessible for inspection, testing and servicing.
C. Routing:

1. All fire alarm system conduits/wire shall be run either parallel or perpendicular to building structural members. Open cable applications should use the building structure for protection per NEC. Circuit layout shall minimize the number of risers used and be run in common areas wherever possible (not in private offices, dorm rooms, etc.) to facilitate isolation of areas on the same floor without affecting other floors, and to reduce impact to occupants during troubleshooting.

2. All conduit penetrations of walls shall be provided with escutcheon plates on either side of the wall.

3. All conduit penetrations of walls, floors, and ceiling shall be sealed around the conduits, restoring the walls, floors and ceilings to their original condition, fire resistance and integrity.

4. Conduit shall be concealed except where shown on the drawings.

5. All conduit, raceways, junction boxes, panels, electrical enclosures, relays and device back boxes shall be concealed in ceiling spaces, electrical shafts or closets in all finished areas.

6. Conduit, raceways, junction boxes, panels, electrical enclosures, relays and device back boxes may be exposed in unfinished areas.

7. Open cable (FPLP) @ Walls and Floors: install cable in flex or EMT conduit where cable runs vertically concealed in walls. Where vertical run is not concealed in a wall and runs through the floor it should be sleeved in conduit or in a fire rated assembly as required for the floor penetration. Where horizontal run penetrates walls and is routed below 7', it should be sleeved in conduit.

8. Open Cable Hanging & Strain Relief: Provide submittals to SUFMO for approval prior to purchase and plan submittal. Strain relief is required where cable enters a can or j-box (Arlington LPCG50 or approved equal); cable should not be self-supported. Provide details on the drawings.

D. Mounting, Labeling of Devices, and Locking:

1. All fire alarm devices shall be rigidly mounted, using appropriate back boxes, to building structural members, permanent walls, ceilings or fixtures designed for the purpose.

2. All devices shall be labeled with device address or device count as appropriate. Label shall be sticky back type **self-adhesive, minimum ¼” font size width** attached to base of device. Label identification shall be consistent with As-Built drawings. Devices behind access panels or above ceilings shall also have a label placed on the access door or on the T-bar ceiling.
3. All locks for Fire Alarm Control Units, terminal cabinets, battery cabinets and other cabinets associated with the Fire Alarm System shall be keyed alike, and shall be compatible.

E. Color Coding and Wire Numbering:

1. All conductors entering and leaving terminal cabinets and junction boxes shall be numbered in a logical and consecutive manner.

2. All conductors shall be color-coded. Color coding shall be by wire insulation, not taping or banding. The numbering and color-coding shall be continuous for each circuit wire. Where Open Cable "FPLP" is being used, outer red jacket is acceptable, but inner jackets of the individual conductors shall be color codes as stated in the table below.

3. Wires shall be numbered at each connection, termination, and junction point. Wire numbering tags shall be Brady Perma-Code, Westline, or equal.

4. Color coding shall be as follows, except color coding in existing (E) buildings shall be maintained:

<table>
<thead>
<tr>
<th>CIRCUITS</th>
<th>COLOR CODES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm Initiating Circuits</td>
<td>Blue (+) and Brown</td>
</tr>
<tr>
<td>Waterflow Switch</td>
<td>Blue (+) and Brown</td>
</tr>
<tr>
<td>Horns, Strobes, and Horn/Strobes</td>
<td>Yellow (+) and Black</td>
</tr>
<tr>
<td>Speakers</td>
<td>Red (+) and Black</td>
</tr>
<tr>
<td>System AC Power</td>
<td>Black (+) and White</td>
</tr>
<tr>
<td>Sprinkler Horn – 120V AC</td>
<td>Black (+) and White</td>
</tr>
<tr>
<td>Sprinkler Horn – 24V DC</td>
<td>Red (+) and Black</td>
</tr>
<tr>
<td>Valve Supervision (Tamper Switch)</td>
<td>Yellow (+) and Orange</td>
</tr>
<tr>
<td>DC Power</td>
<td>Red (+) and Black</td>
</tr>
<tr>
<td>Synchronization cable</td>
<td>Yellow (+) and Black</td>
</tr>
<tr>
<td>Remote Alarm Indicators (RLI)</td>
<td>Red (+) and Black</td>
</tr>
<tr>
<td>PAD-3 Activation from FACP</td>
<td>Yellow (+) and Black</td>
</tr>
<tr>
<td>Voice: Speaker Circuit</td>
<td>Red (+) and Black – Shielded (Red Jacketed)</td>
</tr>
<tr>
<td>Voice: Strobe Circuit</td>
<td>Yellow (+) and Black</td>
</tr>
</tbody>
</table>

F. Fire Alarm Control Panel (FACP) Software:

1. Messages for all initiating devices shall be formatted as follows:
   a. Single Building: [FLOOR][AREA DESCRIPTION][ROOM NUMBER],
   b. Multiple Buildings: [BUILDING NUMBER OR NAME][FLOOR][AREA DESCRIPTION][ROOM NUMBER].
   c. Examples:
      1) 1ST FLR NORTH CORRIDOR BY RM 103
      2) STAUFFER 3 1ST FLR N. CORRIDOR BY RM 103
d. Abbreviations used in messages must make sense to responding Fire Department personnel and are subject to SUFMO approval and changes.

e. Confirm room numbers prior to programming that match the Permit approved drawings.

2. All devices shall point report to the SUFMO Remote Supervising Station via Contact ID format.

3. The FACP software file shall be submitted to the SUFMO Fire Systems Supervisor at least 5 days prior to uploading into the FACP.

4. Functions shall be programmed into the panel to allow bypass of door holders, elevator recall, FSD’s, Fan Shutdown, NACs, and others as needed. This should be complete at time of SUFMO Pre-Test and tested for functionality.

5. All changes to FACP software shall be tested per NFPA 72. This testing shall include all new or modified devices and functions. The testing shall also include up to 10% of existing devices (not to exceed 50) at the discretion of SUFMO and/or SCCFMO.

6. Alarm Verification shall not be used unless specifically approved by SUFMO.

G. Emergency Control Functions:

1. Elevator Phase I Emergency Recall Operation:
   a. The Designated Level Recall (Primary) shall be at street level (ground or 1st floor) unless otherwise specified by Palo Alto Fire Department or local AHJ and coordinated with SUFMO.
   b. The Alternate Level Recall shall be either the basement, where provided, or the 2nd floor unless otherwise specified by Palo Alto Fire Department or local AHJ and coordinated with SUFMO.

2. Elevator Shutdown:
   a. It is Stanford's intention to set up Passenger elevator hoistways and machine room/controller closets without sprinkler protection so shunt trip auxiliary functions are not required as allowed by CBC. Where shunt trip function is provided it shall be initiated using restorable type, fixed temperature Heat Detectors.
   b. Where elevators are provided with heat detector controlled shunt trip, signage (generally installed by others) shall be placed immediately adjacent to each elevator call station and inside each elevator car immediately adjacent to the emergency key switch or car operation buttons stating the following:

   **CAUTION: THIS ELEVATOR EQUIPPED WITH HEAT DETECTOR-CONTROLLED POWER SHUTOFF**

   Lettering shall be at least 1/4" high on contrasting background.

   a. In-duct detection or exterior mounted duct detection shall be provided with remote alarm indicators – Typically duct or in-duct detectors are not in plain view such that it is not clear which device is in alarm. Remote alarm indicators are additional devices installed in plain view near the detector to provide device location for fire emergency response personnel. FSD Position Indicator test switches may act as remote alarm indicators if visible from the floor and the FSD is closed only by the associated detector.

   b. Automatic shutdown of fan units (supply and/or return where required) controlled by smoke detection as required by applicable codes shall be arranged for automatic restart after FACP has been reset to normal. The preferred method of large supply and return fan detection be done using externally mounted duct detectors inside a NEMA rated weatherproof enclosure with internal sampling tubes. Where fan units are small and serve only one or two rooms, it is preferred that area smoke detection be provided in the room(s) to monitor the fan and provide the required shutdown functions.

   c. Humidification: Air Handling Units that have integrated humidification systems may require special detection means and methods and assistance by the mechanical engineer of record will be required. Shop drawing submittal shall include appropriate details and product data to conduct a complete review of the detection design to ensure unwanted alarms will not occur. Field testing and confirmation may be required as part of final approval.

H. Remote Indicators

   1. See Section G.3 - “Fire/Smoke Damper (FSD) Control and Fan Shutdown. Duct Detection with Remote Indicators” above. Remote indicators, where installed shall normally be below ceilings and visible from the floor.

I. Main Waterflow Switch

   1. Generally furnished under the specification covering the automatic fire sprinkler installation. The electrical connection, programming and testing is completed under the fire alarm scope of work.

   2. Provide a waterflow switch at the base of the sprinkler riser piping or basement inlet and at all floor control valve assemblies.

J. Fire Sprinkler Valve tamper switches

   1. Wire the two tamper switches for the OS&Y sprinkler control valves on the Backflow Prevention device in series using one monitor module.

K. Exterior Sprinkler Horn:
1. This is a weatherproof 120V AC or 24V DC device. Generally furnished under the specification covering the automatic fire sprinkler installation. The electrical connection and testing is completed under the fire alarm scope of work.

2. This shall be mounted on the exterior of the building at an approved location in plain view and sound a constant tone (not temporal-3).

3. This shall only be wired (120V AC or 24V DC) directly from and activated by the main waterflow switch located at the base of the sprinkler riser or at basement inlet.

4. Source of power can be a dedicated 120V AC circuit with separate breaker, or 24V DC from the aux power terminals of a Power Supply (i.e., PAD-3, etc.) that does not lose power on an AC Power Loss.

5. The power (AC or DC) to the outside sprinkler horn shall be supervised at the FACP.

L. Synchronization:

1. If two or more visual appliances can be viewed at the same time, they must either be synchronized or located far enough apart so that their intensity at the viewer’s location is low enough to be considered safe in accordance with NFPA 72. Therefore, in order to prevent any compliance issues SUFMO requires that all new strobe devices to be synchronized.

M. Electrical and Mechanical Rooms

1. Electrical Rooms – Install smoke detection in the building’s main electrical room.

2. Mechanical Rooms – Install heat detection (nominally rated at 200°F) in all mechanical rooms without fire sprinklers.

N. Residential Smoke Alarms: The 2013 California Fire Code requires the interconnection of room smoke alarms to the building fire alarm system. This shall be done by using monitor modules programmed to report as a supervisory signal; multiple smoke alarms can be monitored by a single module. Signal shall be received at the Remote Supervising Station and response by Housing personnel will follow.

PART 3 INSPECTIONS & ACCEPTANCE

3.1 FIELD INSPECTIONS

A. All installations are subject to inspection and approval by SUFMO prior to final approval by the Santa Clara County Fire Marshal or other local jurisdiction as appropriate.
B. Rough-In Inspection: Prior to Test #2 (Pre-Test) [section 3.2.A (3b)], and before sheetrock is applied to walls, all wiring and device location shall be inspected by SUFMO personnel. All punchlist items to be resolved prior to covering conduit with sheetrock.

Coordination of the Rough-In inspection shall be by the contractor providing at least one-week advanced notice.

3.2 SYSTEM ACCEPTANCE

A. Required Tests:

1. Audibility Tests: Audibility levels shall be measured and recorded on the record drawings for all areas when the building is close to being complete. A minimum of two audible readings (ambient reading and alarm reading) shall be recorded in each room to ensure code required levels are met. Building status should include doors and windows installed and closed; all ceiling tiles, carpeting/flooring, painting, finishes and any sound absorbing systems complete; HVAC systems should be complete and operating at design levels. For sleeping rooms, additional alarm reading should be taken at the pillow level. Results should be included on the approved record drawing "as-built" set submitted at the completion of work as outlined in 3.2.B.

2. Differential Pressure Tests: All duct detectors with sample tubes will require a differential pressure test across the sample tube inlet and return to verify that installation meets manufactures listing requirements. This test usually is completed by the mechanical contractor installing the associated HVAC ductwork.

3. Tests: After complete installation of the equipment and with the FACP reading “Normal”, the Contractor shall perform three (3) complete tests of the system.

a. Test #1 (Contractor’s Test):

1) Shall be performed by the installing contractor and manufacturer’s representative if applicable. The test shall include proper operation of the fire alarm system, including remote annunciators, initiating/notification/auxiliary devices and control sequencing in accordance with factory recommended procedures and approved plans. Audible and Differential Pressure testing as outlined in 3.2.A (1) (2) should be completed or scheduled for completion as soon as the building construction allows prior to the final inspection (Test #3).

2) Send email confirmation to SUFMO addressing the following:
   - Fire alarm control panel is in normal status
   - The latest revision of the FACP software has been given to the Fire Systems Supervisor so updates can be made in the remote monitoring station software database. All software updates should be provided to supervisor at least two to five business days in advance.
b. Test #2 (SUFMO Test):

1) Shall be performed by the installing contractor and manufacturer’s representative in the presence of SUFMO representatives. Coordination of testing shall be by the contractor providing at least one-week advanced notice to SUFMO:

2) The test shall include proper operation of the complete fire alarm system including control functions as in Test #1, but shall include verification of the Remote Supervising Station alarm signals.

3) A punchlist will be developed by SUFMO and the Contractor shall correct punchlist items prior to the final acceptance test (Test #3). There will be a re-inspection of punch list items. If additional re-inspections are found necessary to assure compliance with the Contract, they shall be made at the Contractor's expense.

c. Test #3 (Final Test):

1) After Test #1 and #2 have been completed, the Contractor shall request a final acceptance inspection by coordinating the final test with the Project Manager, SUFMO representatives and the Santa Clara County Fire Marshal (or other AHJ as appropriate). Coordination of testing shall be by the contractor providing at least one-week advanced notice to SCCFM and SUFMO.

2) 24-hours prior to the Final Test date, SUMFO will remove or witness removal of AC power from the panel and auxiliary power supplies to facilitate the Battery Test during the Final Test.

3) The test shall include proper operation of the fire alarm system and control functions as in Test #1 and #2, but shall include audible/visible testing of all notification devices on Battery Power for 5 minutes. A copy of contractor’s audibility tests, differential pressure tests, as-built drawings, and record of completion shall be made available to the AHJ during this test. Duct detectors shall be tested under full airflow (dynamic) conditions. Operation of the AES Wireless Radio reporting to the remote supervisory station including receipt of the appropriate signals at the Palo Alto Communications Center will be at the discretion of the AHJ. A complete report of SUFMO Test will be provided to the AHJ.

4) After the successful completion of the Final Test with the approval of the AHJ, the system shall be placed online reporting to Palo Alto 911 Emergency Dispatch Center. SUFMO will coordinate with the General Contractor ensuring proper building keys are installed in the Knox Box. Alarm contractor shall provide the FACP key to the General Contractor to be placed in the Knox Box.
5) Provide the FACP software program file to the onsite SUFMO Technician directly after the completion of the Final Test and the system has been placed online. The SUFMO technician will provide a USB flash drive to copy the file to.

6) The Record of Completion as required by NFPA 72.

4. Panel Turnover – Upon successful completion of the final test (Test #3) the control of the fire panel will turn over to SUMFO. Further construction work that requires shutdown of fire alarm system devices or placing the system on test will be done by a SUFMO Alarm Technician after coordinating with SUMFO directly.

B. Record Drawings and Maintenance Manuals

1. Upon completion of the work and approval of the “as-built” drawings by SUFMO, the Contractor shall turn over to the Stanford Project Manager and SUFMO one set each of the following:

   a. Full size set of approved “as-built” drawings.
   b. Two sets of CAD (AutoCAD compatible) files (one for SUFMO, one for LBRE Maps and Records).
   c. Maintenance Manuals when required by SUFMO
   d. Letter of Warranty.

END OF SECTION
APPENDIX

SUFMO Protocol for Working on Fire Alarm Systems at Stanford University

Contractors working on any fire alarm system at Stanford will need to:

- Have prior approval from a SUFMO Fire Protection Engineer (FPE) of the work being performed.
- Schedule 48 hours in advance by phone (not show up unannounced) with Frank Gardner or Mo Miranda (650) 725-2129 when a qualified technician will be on campus to work on any given system. For qualifications see NFPA 72 2013 (10.5.2).
- A qualified technician shall always be monitoring on site while the system is on test unless approved otherwise by SUFMO.
- After confirming by phone, follow up with an email to Frank and Mo confirming the dates and times, description of the work to be done, and the name of the tech on site that will be responsible for impairment procedures and fire watch – see further details below.
- Call our office at (650) 725-2129 to put the monitoring of the alarm system on-test before working on a system and be specific as to whether the entire system (no fire department response) or just trouble signals (no SUFMO Tech response) need to be on-test.
- Provide an impairment procedure including tags that will go on any FACP being worked on, including all annunciators. This tag must include the areas being affected, the on-site contact’s name and phone, and the dates and times of the impairment.
- **Take full responsibility to ensure that if there is an actual fire emergency in the building and the fire alarm system is activated, the appropriate action is taken. If the entire system is on-test, this includes investigating the alarm (or trouble), calling the fire department (911) or (650) 329-2413, or SUFMO on-call if appropriate, and activating the NACs to notify the occupants.**
- Call our office before leaving the building (for any reason) to make sure the system shows normal and the monitoring is back online to Palo Alto Communications.
- Test to make sure the changes to the system did not adversely affect the functionality of the system in any way.
- Schedule with Frank or Mo to test with a SUFMO Tech and Engineer per normal procedures.