SECTION 13930

AUTOMATIC FIRE SPRINKLERS

PART 1 - GENERAL

1.1 CONDITIONS & REQUIREMENTS:

A. Refer to the General Conditions and Supplementary General Conditions and General Requirements

1.2 SCOPE OF WORK:

A. Provide a complete sprinkler system or modification to an existing system as required by contract agreements. Systems are to be hydraulically calculated and comply with state and local code and specifications in this standard. Sprinkler retrofits in existing buildings shall meet current code and specifications rather than being designed to match existing portions of the structure, except when making changes to existing pipe-scheduled wet-pipe sprinkler systems, as allowed by the NFPA 13 and local ordinances.

B. Include all plant facilities, labor, material, equipment and service necessary for the design, fabrication and installation of the automatic sprinkler system and piping.

C. Obtain all necessary permits and prepare shop drawings and submittals as specified in section 1.6. Permits will generally be required from the authority having jurisdiction which will be one of the following:
   1. Santa Clara Count Fire Marshal (SCCFM)
   2. Palo Alto Fire Department (PAFD)
   3. Office of Statewide Health Planning and Development (OSHPD)
   4. San Mateo County Fire Department

1.3 RELATED WORK:

A. Reference the SOM Facilities Design Guidelines for other applicable guidance:
   1. Section 07800 – Fire and Smoke Protection
   2. Section 13850 – Detection and Alarm
   3. Section 13920 – Fire Pumps

1.4 QUALITY ASSURANCE:

A. Contractors Qualifications: The Contractor shall be a California licensed contractor with a C-16 license experienced in the installation of automatic sprinkler systems.

B. Permits shall be obtained from the authority having jurisdiction for new and retrofit work on fire protection systems.

C. Shop drawings and materials cut sheets shall be submitted for all sprinkler installations and modifications to the Stanford University Fire Marshal's Office (SUFMO) for review, in accordance with section 1.6, prior to permit application.

D. All welded fittings and piping shall be inspected and approved by the permit issuing authority, or at their discretion, SUFMO, prior to installation.

E. New and modified underground piping shall be flushed and hydrostatically tested at 200 psi, for 4 hours then flushed and witnessed by the permit issuing authority, SHC Engineering and Maintenance Department, and/or SUFMO.

F. New and modified sprinkler piping shall be hydrostatically tested at 200 psi for 2 hours and witnessed by the permit issuing authority and/or SUFMO.

1.5 REFERENCES:

A. Systems, equipment, installation, and materials and methods used shall comply with the following (most current) National Fire Protection Association (NFPA) standards:

1. NFPA Standard 13 – Installation of Sprinkler Systems and all appendices.

2. NFPA Standard 14 – Standpipe, Private Hydrant, and Hose Systems, and all appendices.

3. NFPA Standard 20 – Installation of Stationary Pumps and all appendices.

4. NFPA Standard 24 – Private Service Mains and all appendices.

5. Santa Clara County Fire Code Amendment NSI 1100.89 (for locations in unincorporated Santa Clara only; main campus and School of Medicine)

6. Palo Alto Municipal Code, Title 15 (for locations within city limits only; Stanford Medical Center, Hoover Pavilion, and Welch Road)

B. Pipe hangers and earthquake bracing shall comply with FM Global Property Loss Prevention Data Sheet 2-8, Earthquake Protection for Water Based Fire Protection Systems.

C. Construction safety practices shall comply with California Fire Code Article 49, Hot Work and Article 87 Fire Safety During Construction, Alteration or Demolition of a Building.

1.6 SUBMITTALS:

A. Shop Drawings and Working Plans:

1. Manufacturer's catalog sheets and installer's shop drawings for all pieces of equipment used in the system, and working plans in accordance with the requirements found in NFPA 13 shall be submitted to the Project Manager and SUFMO. If the manufacturer's catalog sheets show more than one item, the items proposed for use shall be clearly identified by means of an arrow or other specific marking.

2. Seismic calculations and hydraulic calculations shall be provided for all new sprinkler systems. Submit hydraulic calculations for modifications and additions to existing sprinkler systems when the modifications increase the area coverage per sprinkler, or add equivalent pipe length to supply or feed mains, or when calculations are requested by SUFMO or authority having jurisdiction.

3. After review by SUFMO the contractor shall revise the working drawings, and calculations, addressing each comment of SUFMO, prior to submitting the working drawings to the authority having jurisdiction for approval and permit. Submit at least 4 sets of revised drawings, calculations and materials for final review. One set will be retained by SUFMO. The other sets will be stamped, if approved, and returned to the submitter for submission to the authority having jurisdiction for permit application.

4. Fire protection underground submittal drawing shall be prepared and submitted by installing contractor. SCCFM requires a separate permit submittal for underground and above ground portions of the fire suppression system. Said drawings shall bear the company name of the installing contractor. Submittal using the civil or site consultants' drawings will not be accepted. A permit from the SCCFM is required for the work from the discharge side of the BFP, including the FDC to the base of riser in the building. All the necessary details including but not limited to depth of bury, types of joints, calculation of the size of thrust blocks and location of the FDC relative to the fire hydrant(s) shall be provided. Submit the drawings and materials package to Utilities Department and SUFMO prior to submitting to the authority having jurisdiction.

5. Contractor shall provide a complete set of stamped permit drawings to the SOM Project Manager prior to the start of construction in addition to the record set that is to be maintained at the project site.

6. Renovations to existing buildings requiring relocating or adding a small number of sprinklers may qualify for an abbreviated permit process that will not require SCCFM plan review prior to construction. SUFMO will advise the contractor on procedures for projects that qualify for "Small Project" processing.

B. Drawings of Record:

1. Updating Drawings: Provide and keep up-to-date, a complete record set of approved shop drawings, corrected daily to show every change from the approved shop drawings. Keep this set of prints on the job site and use only as a record set. Do not make changes in the approved layout without definite instructions from the SOM Project Manager in each case.

2. Final Record Set: Upon completion of the work, the record drawings shall be submitted for review by the SOM Project Manager. Provide record mylar reproducible plans and CD's at the close of the project indicating all changes to the documents. A separate set of as-built fire protection drawings shall be submitted to SUFMO.

1.7 SAFETY AND INDEMNITY:

A. Safety: The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours.

1.8 GUARANTEE:

A. The Contractor shall issue a certificate of guarantee certifying that all materials and workmanship supplied and/or installed by the Contractor shall be free from defects for a period of not less than one year from the date of substantial completion or beneficial occupancy, whichever occurs first.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. General:

1. All materials and equipment furnished by the Contractor shall be new, first grade products of current manufacture. All materials and equipment shall be approved or listed for use in automatic sprinkler systems, for the intended use. Where two or more pieces of equipment performing the same function are required, they shall be the product of one manufacturer and exact duplicates.

B. Piping, Fittings, and Specialties:

1. Pipe installed inside the building shall be in accordance with the most current NFPA 13, Table 6.3.1.1. Exterior piping less than 2" diameter shall be hot-dipped galvanized and insulated with approved material.

2. Plastic piping (CPVC or polybutylene) shall not be used in automatic sprinkler systems without specific authorization from SUFMO.

3. Mechanical tees may be used for modifications to existing sprinkler systems. Mechanical Tees shall not be used in the design of new systems.

4. Plan-end fittings shall not be used in automatic sprinkler systems.

5. Shop-weld thread-o-lets may be used in lieu of tee fittings, but field (site) welding will not be permitted.

6. Pipe joints shall be screwed, flanged or grooved utilizing standard-or light-weight grooved flexible or rigid-type couplings installed in accordance with their individual listings. Grooves in Schedule 40 steel piping shall be cut grooves only. Rolled grooves in Schedule 40 piping are not allowed.

2.2 SUBSTITUTIONS:

A. No substitutions shall be made in the materials submitted and approved without a re-submittal and prior approval of the Project Engineer / Owner.

2.3 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Delivery, store, and handle materials in a manner to prevent damage.

B. Protect equipment from weather and dampness.

PART 3 – EXECUTION

3.1 OCCUPANCY SPECIFIC DESIGN:

A. Criteria for hydraulic design systems:

	Bldg/Room or Area	**SPRINKLER DENSITY**
1.	Living quarters	Light hazard
2.	Group H-5 Occupancies (fab areas)	0.02 GPM/3000 Sq. Ft.
3.	Group H-2,3,4 Laboratories	0.17 GPM/3000 Sq. Ft.
4.	Group L Laboratories and Adjacent mixed occupancy	0.17 GPM/3000 Sq. Ft. 0.12 GPM/3000 Sq. Ft.

5. Group B Laboratories & class rooms 0.15 GPM/1500 Sq. Ft.

6. Offices and lobbies Light hazard

7. Attics and utility spaces Ordinary hazard

8. The above density and area standards contemplate the present occupancy mix of dormitories, classrooms, offices, assembly areas, H-2, H-3, H-4, H-5 and L occupancies. The table generally shows the minimum requirements established by code. Other designs that provide equivalent protection may be considered where not prohibited by code.

9. Reduction of the sprinkler operating area when quick response sprinklers are used, in accordance with NFPA 13 section 4.2.3.2.3 will be acceptable in office and similar occupancies that do not have the potential for future conversion to labs.

10. The room design method (4.2.3.3 NFPA 13 ed 2002) shall only be used when specifically authorized by SUFMO.

11. Extended coverage sprinklers shall not be used without specific authorization from SUFMO.

B. The use of sprinkler system pipe schedules for system extensions or changes shall be based on the following:

1. Light Hazard Occupancies – Sprinkler piping for Residential and Office Occupancies may follow Light Hazard Pipe Schedule as outlined in NFPA 13.

2. Ordinary Hazard Occupancies – Sprinklers in all other occupancies shall comply with Ordinary Hazard Pipe Schedule as outlined in NFPA 13.

3. Extra Hazard Occupancies – Sprinklers shall be hydraulically calculated, including system extensions or changes to existing systems.

C. Sprinkler systems on campus shall be connected to and supplied by potable water system maintained and operated by Stanford Campus Utilities Department or by the City of Palo Alto. Use water supply data provided by SUFMO for design. Lake water and well water is not to be used unless specifically directed.

3.2 INSTALLATION:

A. General:

1. An asbestos building materials survey and clearance by Stanford EH&S is mandatory prior to the start of any construction activity in existing buildings. Furthermore, decommissioning and clearance by EH&S is mandatory prior to any laboratory-related renovation. Contact Kip Fout at 650-723-0486 for information and scheduling inspections.

2. Arrange shutdown of existing sprinkler systems with SOM Engineering & Maintenance Department at least 48 hours in advance. (See attached Utilities Shutdown Request Form). Sprinkler systems are to be put back into service by the end of each workday.

3. Sprinkler installations in buildings with multiple floors shall have a floor control valve, check valve, drain, water flow alarm switch and inspector test valve for each floor. Each floor's water flow switch will be on it's own branch line off the main.

4. Exterior pipe on wet sprinkler systems less than 2" diameter shall be equipped with insulation or electric tracing wire. The insulation and lagging shall be done to the architect's specifications.

5. The Contractor shall be responsible for all openings required for sprinkler piping. Clearance for piping shall be in a accordance with NFPA 13, Section 9.3.4. The Contractor is responsible for sealing penetrations with listed fire rated assemblies at fire rated walls and floors.

6. Cutting structural members for passing sprinkler piping or pipe hanger fastenings will not be permitted except with approval of the Architect/Owner.

7. Where piping is indicated to be installed above finished ceilings, removal and replacement of ceilings shall be the responsibility of the Contractor, unless otherwise stated in the contract. Ceiling replacement materials shall match finish of adjacent ceiling areas.

8. Where piping passes through exterior walls, roofs, or basement walls, there shall be a minimum of two inches (2") clearance around the pipe. Annular space between the piping and the adjacent construction shall be sealed watertight using an approved/listed system. Apply sealant in accordance with manufacturer's instructions and the product listings.

9. Piping may pass partially through top of wall plates at interior partitions. Contractor shall exercise care to cut only sufficient material to allow installation of piping. Top plates shall not be cut through to allow piping to pass.

10. All piping shall be reamed to remove all burrs, and pipe sections shall be cleaned inside to remove all chips and foreign materials prior to making joints.

11. Hangers, flexible connections and seismic bracing shall be installed in accordance with the requirements of FM Global Standard 2-8. When upward or lateral movement of sprinklers would result in impact against the building structure or equipment, the branch line and the end sprinkler shall be restrained per FM 2-8 or NFPA 13, 9.3.6.

12. Split wall plates or escutcheons shall be installed where exposed piping passes through a finished floor, wall or ceiling. They shall fit snugly around piping, and shall cover the entire annular space around the piping. The finish of escutcheons or wall plates shall match the color of adjacent walls, ceiling or floors.

13. Pressure gauges shall be provided on the riser near the main drain valve and on the system side of each floor check valve.

14. Hangers, couplings and sway bracing shall be installed in accordance with all applicable requirements of NFPA 13. Powder driven studs shall not be used for attaching hangers or braces to structures.

B. Fire Department Connection:

1. Fire department connection (FDC) shall be horizontal type with dual clappered inlets, red metal plugs and a sign with raised letters that reads “AUTO SPKR.” Fire department connection shall be equipped with check valve as specified in section 2.01.

   The location of the FDC shall be approved by SUFMO. The FDC will generally be located within 50 ft of the Fire Department access road, and near a hydrant supplied by the potable water system (not Lake water hydrant). A permanent sign with 1” min. letters showing the Building name or address shall be attached to the FDC, unless it is obvious which building it supplies.

2. Install fire department connection eighteen inches (18”) to twenty-four inches (24”) above paving or grade with twelve-inch (12”) clearance around all sides.

C. Backflow Preventer:

1. A double check or reduced pressure Backflow Preventer shall be provided on all sprinkler and standpipe mains. The Backflow Preventer shall be a model specified by the Stanford Campus Utility Department.

2. The backflow preventer shall be installed above ground with eighteen (18) to twenty-four (24) inches of clear space between the ground and the valve stem of the associated control valves. The double check backflow preventer shall be provided with two (2) Mueller R-2360-6 Outside Screw and Yoke (OS&Y) valves having resilient seats, one located on the supply side of the backflow preventer and the second on the system side of the check backflow preventer. Refer to Stanford University Utilities standard detail CS133, available on the Facilities Design Group web site. The OS&Y valves shall be provided with electronic supervision per section 3.01G.

D. Valves

1. Outside sectional valves must be Post Indicating Valves (PIV's) should be located forty (40) feet from the exterior wall of the building, minimum, unless faced by a blank wall where a lesser distance may be acceptable. A PIV shall not be installed where it would be redundant to the OS&Y required for a backflow preventer.

2. Flow control valves shall be provided in all buildings with more than one floor and shall be a U.L. listed or FM Global approved OS&Y or butterfly type valve. Valve supervisory switches shall be provided on all sprinkler system control valves using Potter OSYSU-A1 or OSYS-B. Butterfly valves may have internal or external mounted supervisory switches. External switches shall be Potter devices. Valves shall have means to lock them in the open position.

3. All drain valves and test valves shall be listed for fire service and have replaceable rubber or composition discs.

4. Post indicator valves (PIV) shall be installed in a Christy box.

5. Inspector's test valves shall be installed downstream of each water-flow device. Inspector's test outlets shall be located at the remote section of the zone and be piped to drain into the sanitary sewer system. Valves shall be within six feet (6') of the floor or finished grade. When the discharge outlet cannot be seen from the valve or when inspector's test connections are piped into the sewer system, a sight glass shall be provided. Direct interconnections shall not be made between the sanitary sewer system and the sprinkler drains (NFPA 13).

6. Where interior sectional or floor control valves are provided, they shall be provided with a drain connection sized as required by NFPA 13. In addition, a main drain test connection shall be provided on all sprinkler risers. Auxiliary drains shall be provided as required NFPA 13. Sprinkler water shall discharge into the building sanitary sewer drains. Outdoor drainage into landscaped areas will be permitted ONLY when approved by the SOM Project Manager.

   Discharge to storm drains is not permitted. In all cases, all drains and test connections shall discharge to an approved location capable of accepting the full flow from each valve in the opened position. Drains shall not discharge to janitor's sinks. Direct interconnection shall not be made between drain or test piping and sewer drains. Provide an approved air gap for all connections to sewers.

   Outdoor drains shall be arranged such that a full flow from the main drain will not damage landscaping or surroundings. An acceptable outdoor drain termination for a two-inch main drain is a three inch by three inch by two inch (3" x 3" x 2") bullhead "T" with three inch (3") shoulder nipples and three inch (3"), forty-five degree elbows pointed away from the building.

7. Install control valves, supply valves, and water flow switches in clearly accessible locations within five feet (5') of the floor.

8. Install check valve and water flow indicators with adequate clearance from obstructions so that they can be removed and serviced.

E. Sprinklers

1. Sprinklers shall be upright, pendant or sidewall as appropriate for the design basis, shall be located in all areas required by NFPA 13 section 9-1 and 8-14 and shall be of the glass bulb type rated at 155-165 degrees F. NFPA 13, chapter 8.3.2, shall be followed to provide sprinklers of higher temperature rating where required.

2. Use standard response except in light hazard applications and other areas where quick response is required by code. Residential sprinklers will normally be used in dormitory rooms.

3. Concealed flush sprinklers may be used as per the listing of the sprinkler. Use concealed sprinklers in dormitory hallways and dormitory common spaces whenever the construction will accommodate concealed sprinklers.

4. Where called for as pendant sprinklers from concealed piping, escutcheons shall be white in color (or other at Architect's option) and shall be approved fro use with the sprinkler selected. Pendent standard spray sprinklers shall utilize two

(2) piece escutcheons that are designed to prevent slipping apart. Escutcheons having an overall depth of 1-1/2 inch shall not be used except where it is necessary to install a sprinkler farther below the ceiling than is customary.

5. All sprinklers shall be installed in accordance with NFPA 13.

6. Sprinklers shall have ½ inch orifice unless approved in advance by the SUFMO.

7. Provide sprinkler guards on all pendant sprinklers located within seven feet (7') of the floor. Also provide guards on all sprinklers in closets.

8. Extra sprinklers in the quantities required by NFPA 13 shall be provided and shall be placed within an approved cabinet located adjacent to the main riser or alarm panel. The cabinet shall be provided with a sprinkler wrench, or special wrench where applicable.

F. Pipe Hangers and Earthquake Bracing

1. Coach screws shall only be used for attaching hangers when the wood structural members meet the minimum dimensions required by NFPA 13 or FM Global 2-8. Coach screws shall not be used as a substitute for lateral braces using the "short hanger" rule of NFPA 13.

2. Hanger and earthquake brace attachments to plywood trusses shall be in accordance with a design approved by the truss manufacturer for the calculated loads.

3. Tolco Figure 909Sway Brace Attachment is not an acceptable appliance.

4. All C-clamp type hanger attachments shall be equipped with a retaining strap.

G. Fire Alarm and Related Equipment:

1. All water flow detection devices, supervisory devices and other electrical equipment shall be installed in accordance with the requirements of Section 13850 Detection and Alarm.

2. New exterior electric horn shall be 120 VAC-powered, Pyrotronics HAC-120, Federal 350 weatherproof, or 24 VDC-powered Wheelock AH-24WP, or approved equal supplied under this Section and connected under Section 13850 Detection and Alarm.

3. Vane type water flow indicators shall be Potter VSR series, or approved equal, shall include two (2) single pole double throw (SPDT) contacts, and pneumatic

adjustable retard. Pressure type water flow indicators shall include two (2) single pole double throw (SPDT) contacts, and pneumatic adjustable retard. Water flow indicators shall be installed under this Section and connected and adjusted under Section 13850, Detection and Alarm.

4. Valve supervisory switches shall include SPDT contacts. Butterfly valves with internal supervisory switches are acceptable. External mounted supervisory switches are acceptable. External mounted supervisory switches shall be Potter devices. Potter OSYSU-A1 or OSYS-B valve supervisory switches and shall be connected to the building's fire alarm system as outlined in Section 13850, Detection and Alarm.

5. PVC conduit shall be used to run buried conductors to exterior valves for tamper switch wiring. The vertical riser section shall transition to steel conduit wrapped with 10-mil tape before extending above ground. Weatherproof grommets shall be used at connections to junction boxes and switch cases.

H. Special Applications

1. Work Stations: When a building is protected by an automatic fire sprinkler system, sprinkler protection shall be provided for all combustible workstations where hazardous materials are used, stored or dispensed. The sprinkler shall be installed within each branch exhaust duct at the point of connection and within individual hoods/plenums. The sprinkler in the exhaust connection shall be located not more than two (2) feet from the point of connection to the plenum. The sprinkler and associated piping shall be of a type listed for the specific environment, and be accessible for periodic inspection. For this application ASTM 136, per CFC 215, will be used to determine if a material is noncombustible.

2. Gas cabinets for hazardous materials shall be equipped with a corrosion resistant ½" orifice sprinkler when required by code or authority having jurisdiction. The installation shall normally be supplied from the room sprinkler system without an isolation valve.

3.3 PAINTING AND MARKING OF PIPING:

A. General

1. Paint all exposed steel piping, equipment and other materials such as fittings, hangers, etc., except sprinklers, bronze or brass fittings and/or moving parts when required by the contract. Priming coat to be yellow zinc chromate paint or equal. Apply priming coats and touch up all painted areas that are nicked or scratched (such as wrench marks, etc) to assure a smooth prime painted finish.

2. Finish paint color shall match existing finishes.

3. Sprinkler protective bags or wrappings shall be removed after painting is finished. All sprinklers that have any paint on them shall be replaced. Cleaning of painted sprinklers will not be allowed.

4. Provide pipe markers with the words "AUTO SPRINKLER" or "FIRE SPRINKLER" in minimum 2 inch high lettering to identify feed mains. Markers shall be so located so as to be easily read from the ground or floor level. Markers shall be spaced at a maximum of 25 feet between markers.

3.4 SANITIZATION:

A. All underground piping from the street main to the backflow preventer assembly shall be sanitized in accordance with Stanford University Facility Guidelines Section 02510.

3.5 FIELD QUALITY CONTROL:

A. Flushing and Testing

1. Underground main piping shall be flushed prior to connection to the sprinkler riser. Flushing shall be performed in accordance with the requirements of NFPA 13 and NFPA 24, Private Fire Service Mains. Flushing shall be continued at least until a clear flow is obtained. The flush shall be witnessed by SUFMO and the permit issuing authority.

2. All components of the underground system, from the tapping valve to the base of riser, must be hydrostatically tested at 200 psi for a minimum of four (4) hours. All interior piping and components of the sprinkler system must be hydrostatically tested at 200 psi for a minimum of two (2) hours. All piping must be exposed for the hydrostatic test. Portions of the systems may be tested separately but care must be taken to insure that all piping, connections thereto and all devices are tested. Flushing and hydrostatic tests must be witnessed by SUFMO and by the permit issuing authority, or their designated representatives. Seventy-two hour notice must be given to the Project Manager, SUFMO and the permit issuing authority, prior to inspections, flushing or hydrostatic testing. Hydrostatic testing for small modifications to existing systems may be waved at the discretion of the Fire Marshal.

3. An internal inspection shall be made of existing piping, in the presence of the SUFMO, when modifying, extending or connecting to existing branch lines, feed mains and cross mains that were installed 20 or more years earlier. The piping shall be flushed if required by the fire marshal. Fire Marshal shall determine whether the existing piping is suitable for system expansion.

4. All shop welded pipe and fittings shall be made available for inspection by SUFMO and the permit issuing authority prior to installation. Rejected welds will be corrected or replaced at no cost to the owner.

5. Pipe, hangers and bracing shall remain exposed until inspected by SUFMO and the AHJ. Changes shall be made where required for acceptance.

B. Certification

1. The Contractor shall certify that the work is installed in accordance with the project requirements and the requirements of NFPA 13 and NFPA 24. Prior to scheduling formal tests with the Authorities Having Jurisdiction, Contractor shall prepare and sign appropriate Contractor's Material and Test Certificates for each part of the work, as found in NFPA 13.

2. The installer shall warrant the installation against material and installation defect for a period of one year from permit final, unless other warranty agreements are established by the contract.

3.6 CLEAN UP

A. Upon completion of the Work under this Section, immediately remove all surplus materials, rubbish and equipment associated with or used in performance of this portion of the Work.

END OF SECTION