SECTION 21 13 00
Fire Suppression Sprinkler Systems

PART 1 GENERAL

1.01 SCOPE OF WORK
1.02 RELATED WORK
1.03 QUALITY ASSURANCE
1.04 REFERENCES
1.05 SUBMITTALS

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

PART 3 EXECUTION

3.01 OCCUPANCY SPECIFIC DESIGN
3.02 INSTALLATION
3.03 PAINTING AND MARKING OR PIPE
3.04 SANITIZATION
3.05 FIELD QUALITY CONTROL

PART 1  GENERAL

1.01  SCOPE OF WORK

A. General:

1. 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 codes as referenced in section 1.04 and these specifications. 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 NFPA 13 and local ordinances.

2. Work shall include modification to all existing piping within the project area in regards meeting current code requirements for hangers, and protection against seismic damage. Include all plant facilities, labor, material, equipment and service necessary for the design, fabrication, and installation of the automatic sprinkler system and piping.
3. Obtain all necessary permits and prepare shop drawings, submittals, and calculations as specified in section 1.05. Permits will generally be required from the authority having jurisdiction (AHJ) which include, but are not limited to, the following:

a. Santa Clara County Fire Marshal Office (SCCFMO) for projects in the main campus and most of the School of Medicine;

b. Palo Alto Fire Department (PAFD) for off-campus properties within the City of Palo Alto; these involve some of the School of Medicine facilities;

c. Office of Statewide Health Planning and Development (OSHPD) for the Stone Complex (Stanford Hospital/School of Medicine Buildings) and any other buildings that directly supports the Hospital Operations.

4. When working on existing systems that are offline so modifications can be done, the system shall be placed online at the end of each normal work day, unless approved by Stanford University Fire Marshal’s Office (SUFMO). While the system is offline, the contractor shall be responsible to place the system back in service as soon as possible should the fire alarm system activate.

1.02 RELATED WORK

A. General: Consult Stanford University Facilities Design Guidelines (fdg.stanford.edu) for other applicable guidance and applicable drawing details (i.e., CS-134).

1. Section 01 33 00: Submission Requirements

2. Section 00 73 19/01 35 00: Environmental Health and Safety, which includes asbestos and lead management.

3. Section 31 23 33: Trenching, Backfilling and Compacting

4. Section 32 01 00: Site Restoration and Rehabilitation

5. Section 33 10 00: Domestic and Lake Water System

6. Section 28 31 00: Fire Detection and Alarm Systems

7. Section 21 30 00: Fire Pumps

1.03 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 AHJ for new and retrofit work on fire protection systems.
C. Shop drawings, materials cut sheets, hydraulic calculations and seismic bracing calculations shall be submitted for all sprinkler installations and modifications to SUFMO for review, in accordance with section 1.05, prior to permit application.

1.04 REFERENCES

A. When codes and standards are cited elsewhere in these guidelines, the Systems, equipment, installation and materials and methods used shall comply with these guidelines in addition to 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, Division 1 State Fire Marshal
3. NFPA 13, current CFC referenced edition: Standard for the Installation of Sprinkler Systems and all appendices. NOTE: NFPA Standards 13D and 13R are not allowed except when specifically approved by SUFMO.
4. NFPA 14, current CFC referenced edition: Standard for the Installation of Standpipe and Hose Systems and all appendices
5. NFPA 20, current CFC referenced edition: Standard for the Installation of Stationary Pumps for Fire Protection and all appendices
6. NFPA 24, current CFC referenced edition: Standard for the Installation of Private Service Mains and Their Appurtenances and all appendices
7. Santa Clara County Fire Code Amendments, currently adopted version (for locations in unincorporated Santa Clara only – including main campus and School of Medicine)
8. Palo Alto Municipal Code, Title 15, currently adopted version (for locations within city limits only – including Stanford Medical Center, Hoover Pavilion, Welch Road)

B. Construction safety practices shall comply with California Fire Code (CFC) Chapters 33 and 35 for “Fire Safety During Construction and Demolition” and “Welding and Other Hot Work.”

1.05 SUBMITTALS

A. Shop Drawings and Working Plans:

1. A complete set of working plans should be submitted to SUFMO for approval prior to submitting to the AHJ for approval and permit. The working plans should include all shop drawings, materials submittals, and calculations.
2. Drawings shall be prepared electronically in an AutoCAD compatible program.

3. 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 Stanford 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.

4. 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, flexible drops are added to the existing system, sprinklers are replaced with new sprinklers having a different K-factor or when calculations are requested by SUFMO or AHJ.

5. After review by SUFMO the contractor shall revise the working drawings and calculations, addressing each comment, prior to submitting the working drawings to the AHJ for approval and permit. Submit at least four (4) sets of revised drawings, calculations and materials for final review. One (1) set will be retained by SUFMO. The other sets will be stamped, if approved, and returned to the submitter for submission to SCCFM or City of Palo Alto, or other AHJ as appropriate, for permit application. PDF plans may be submitted in lieu of hard-copy plan to SUFMO for review. SUFMO will electronically stamp and return any PDF plans.

6. Fire protection underground shop drawings shall be prepared and submitted by the installing contractor. 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 Backflow/FDC relative to the fire hydrant(s) shall be provided. Submit the drawings and materials package to Stanford Utilities Department and SUFMO prior to submitting to the AHJ for review and permit. A permit will also be required when a project includes new hydrants. SCCFMO 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 backflow preventer (BFP), including the FDC, to the base of riser in the building.

7. Contractor shall provide a complete set of stamped permit drawings to the Stanford Project Manager and SUFMO prior to the start of construction in addition to the record set that is to be maintained at the project site.
8. Renovations to existing buildings within Santa Clara County requiring relocating or adding ten (10) or fewer sprinklers may qualify to for an expedited permit process that will not require SCCFMO plan review prior to construction (but still require a SCCFMO permit). Procedures for the “Minor Systems Modification Program” can be found online under the “Permits” tab at http://www.sccgov.org/portal/site/fmo/, or directly at http://www.sccgov.org/sites/fmo/permits.

B. Record Drawings:

1. Updating Drawings: Provide and keep up-to-date, a complete record set of approved shop drawings, corrected daily to show every change to 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 instructions from the Stanford Project Manager.

2. Final Record Set of Drawings: Upon completion of the work, the record as-built drawings shall be submitted to the Stanford Project Manager in accordance with the project close out requirements and a separate digital set (in AutoCAD compatible DWG format), shall be submitted to SUFMO. Minor System Modification (MSM) as-built plans may be submitted in PDF form in lieu of AutoCAD.

The 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.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. General:

All materials and equipment furnished by the Contractor shall be new, first grade products. All materials and equipment shall be approved or listed for use in automatic sprinkler systems, for the intended use. Where two (2) or more pieces of equipment performing the same function are required, they shall be the product of one (1) manufacturer and exact duplicates.

B. Sprinklers

1. Sprinklers shall be glass-bulb type upright, pendant or sidewall as appropriate for the design basis.
2. Sprinklers shall be temperature rated at 155 degrees F in all conditioned spaces, and 200 degrees F in unconditioned spaces (attics, mechanical rooms, etc.). Use of higher temperature rated sprinklers shall be provided in areas required by NFPA 13.

3. Sprinklers shall be standard response except in light hazard applications and other areas where quick response is required by code.

4. The use of listed residential sprinklers is permitted in residential occupancies (i.e., dormitories).

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

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

7. Sprinkler escutcheons for concealed and semi-recessed sprinklers shall use slip on, thread-off design.

8. The use of flexible sprinkler drops is permitted.

9. New adjustable drops are acceptable. Adjustable drops shall not be re-used or re-adjusted after their initial installation.

C. Piping:

1. Pipe installed inside the building (aka, overhead system) shall be in accordance with NFPA 13 and be coated by the manufacturer to resist or prevent microorganism induced corrosion (MIC) such as Allied XL ABF pipe, Wheatland MIC Shield coated pipe, or equivalent.

2. Plastic piping (CPVC) shall be permitted with specific authorization from SUFMO prior to awarding of the sprinkler contract.

3. Riser assemblies and threaded pipe shall be schedule 40. No pipe shall be less than Schedule 10.

D. Valves:

1. Floor control valves shall be UL listed or FM Global approved OS&Y or butterfly type valves.

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

3. Post indicator valves (PIV) shall be installed in a Christy box.
E. Hangers and Bracing:

1. Tolco Figure 909 Sway Brace Attachment is not an acceptable appliance, use of the Tolco Figure 980 or equivalent attachment with shear-off head is permitted.

2. Where flexible sprinkler drops are provided, brackets shall be connected to ceiling grid using only the fasteners and brackets provided by the manufacturer as listed with the flexible drop assembly. Standard sheet metal screws are not acceptable. The suspended ceiling grid shall meet the ASME-7 standards (ASTM C635 and C636) for this application.

F. Fittings:

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

2. Plain-end fittings shall not be used.

3. Shop welded thread-o-lets (weld-o-lets) may be used in lieu of tee fittings, but welding on site will not be permitted. (See Part 1.03E)

G. Fire Department Connection (FDC):

1. The FDC shall be a minimum dual clappered type with brass or aluminum plugs/caps. The number of clappers shall be a minimum of three inlets if the building has a Class 1 wet standpipe installed.

2. The FDC shall be equipped with Kwik Check type, or Wafer check valve listed for fire sprinkler system use.

H. Back Flow Preventer (BFP):

1. The BFP shall be a model specified by Stanford Utility Department and listed for use in automatic fire sprinkler systems. These will be a reduced pressure type backflow preventer.

I. Specialties:

1. Exterior electric horn shall be 120 VAC-powered, Pyrotronics HAC-120, Federal 350 weatherproof, or 24 VDC powered Wheelock AH-24WP.

2. Water flow switches shall be Potter VSR series. They 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.
3. Valve supervisory switches shall be Potter and include SPDT contacts. Butterfly valves with integrated internal supervisory switches are acceptable. External mounted supervisory switches shall be Potter OSYSU series devices for OSY valves on BFP’s. Use PCVS series for PIV or butterfly valves.

4. Air vents shall be ECS Ejector Automatic Air Vent or other automatic failsafe type at all interior locations at the high point of each floor system. Use of non-failsafe type air vents are permitted at exterior locations that can discharge to a SUFMO approved location.

PART 3 EXECUTION

3.01 SYSTEM DESIGN

Design of the fire sprinkler systems shall be in accordance with these guidelines and the codes and standards referenced in section 1.04. Use of other codes and standards shall be done only after SUFMO authorization.

A. Criteria for hydraulically designed systems:

1. The Density/Area Method in NFPA 13 shall be used for pipe sizing.

2. Alternate design methods in accordance with NFPA 13 shall be permitted with specific authorization from SUFMO. The design method shall be clearly stated on the drawings with appropriate NFPA 13 sections cited. All conditions required by NFPA 13 for the design method shall be called out on the drawings.

B. Reduction of the sprinkler operating area when quick response sprinklers are used, in accordance with NFPA 13 will be acceptable in office and similar light hazard occupancies that do not have the potential for future conversion to labs. The use of sprinkler system pipe schedules for system extensions or changes shall be based on the following:

<table>
<thead>
<tr>
<th>Hazard Classification</th>
<th>Design Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Hazard (Residential and Offices)</td>
<td>Pipe Schedule</td>
</tr>
<tr>
<td>Ordinary Hazard</td>
<td>Pipe Schedule</td>
</tr>
<tr>
<td>Extra Hazard</td>
<td>Hydraulically Calculated</td>
</tr>
</tbody>
</table>

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

D. General System Requirements:

1. Systems 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.
2. Floor control or interior sectional valves 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 in NFPA 13. In order of preference, all sprinkler water shall discharge either:

a. into building sewer drains, or

b. outdoors onto landscaped areas.

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. 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"), 45 degree elbows pointed away from the building.

3. Valve supervisory switches shall be provided on all sprinkler system control valves. Butterfly valves may have internal or external mounted supervisory switches. Valves shall have a means to lock them in the open position.

4. Inspector's test valves shall be installed downstream of each water-flow device. Inspector's test outlets shall be piped to drain outside of the building or into the sanitary sewer drain with the required air gap.

5. Systems shall have a water flow switch installed immediately when the underground fire service enters the building at the basement wall or 1st floor slab at an approved location. This water flow switch is referred to as the "MAIN WATERFLOW", and is in addition to the others installed at each floor level system.

6. The sprinkler system should be provided with an exterior water flow horn with constant tone. The horn shall be mounted in an approved location on the exterior of the building near the "MAIN WATERFLOW" switch at the base of the riser or basement inlet.

7. Exterior pipe on wet sprinkler systems less than two inches (2") in diameter shall be equipped with insulation or electric tracing wire. The insulation and lagging shall be done to the architect’s specifications.

8. The location of the FDC shall be approved by SUFMO. The FDC will generally be located within 50 feet of the Fire Department access road and near a hydrant supplied by the potable water system (not a Lake water hydrant).
9. A permanent engraved sign with a minimum one inch (1”) letters stating “AUTO SPINKLER” or “AUTO SPRK/STAND PIPE” and the building name, Stanford building ID, and the building street address shall be attached to the FDC and BFP. Submittal of the FDC and BFP signage shall be provided for approval as part of the underground fire service submittal in section 1.05.

10. A reduced pressure backflow preventer (BFP) shall be provided on all sprinkler and standpipe systems. The OS&Y valves shall be provided with electronic supervision.

11. Outside sectional valves may be provided where the BFP serves more than one building; however, Stanford Utilities Department must be consulted to determine if a BFP can serve more than one building. Where used, outside sectional valves shall be post indicating valves (PIV's) and shall be located at least 40 feet from the exterior wall of the building unless faced by a blank wall where a lesser distance may be acceptable.

12. Air vents shall be provided at the high point of all systems. In buildings where floors are isolated with floor control assemblies (with check valves), an air vent shall be provided at the high point on each floor. Air vents should be installed in locations which are accessible for maintenance. An Inspectors Test Valve (ITV) is acceptable alternative to an air vent for locations which air vents would not be accessible for maintenance with specific authorization from SUFMO. This would be in addition to an ITV at the riser.

3.01 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. The project manager should coordinate the inspection. Contact Kip Fout at 650-723-0486 for information or to schedule inspections.

2. Arrange shutdown of existing sprinkler systems with SUFMO at least 48 hours in advance by calling 650-725-2129. Sprinkler systems are to be put back into service by 2:30 pm each workday. An online Work Request shall be submitted by the Stanford Project Manager prior to the shutdown; however, if one has already been submitted to SUFMO for the same project additional work requests are not required. This can be done via the Stanford EHS Fire Safety web site: http://sufmo.stanford.edu.
3. The contractor shall be responsible for all openings required for sprinkler piping. Clearance for piping shall be in accordance with NFPA 13. The contractor is responsible for sealing penetrations with listed fire rated assemblies at fire rated walls and floors, and with noncombustible materials at non-rated walls and floors.

4. Cutting structural members for routing sprinkler piping or pipe hanger fastenings is not permitted except with approval of the Project Architect and Structural Engineer.

5. 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.

B. Fire Department Connection:

1. Install FDC 24 inches to 36 inches above paving or grade with 36 inches clearance around all sides to a height of 78". Provide bollards if it is within six feet (6') of a roadway or drivable surface.

2. The FDC and riser should be painted flat black per Stanford architectural standards. Siamese and clappers should not be painted black. Provide a band of yellow four inch (4") reflective tape on the FDC riser.


C. Back Flow Preventer:

1. The BFP shall be installed above ground with 24 inches of clear space between the ground and the valve stem, or center of OS&Y hand wheel whichever is less of the associated OS&Y control valves. Provide bollards if it is within six feet (6') of a roadway or drivable surface.

2. The BFP and riser should be painted flat black per Stanford architectural standards. Provide a band of yellow 4 inch (4") reflective tape on the BFP riser.


D. Valves:

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

2. Install check valves and water flow indicators with adequate clearance from obstructions so that they can be removed and serviced.
3. Direct interconnections shall not be made between sewers and sprinkler drains per NFPA 13 and overland flow of the sprinkler discharge shall not be to a storm drain.

4. Main drain discharge to sanitary sewers shall have the required air gap. Sewer lines shall be sized and arranged to accept up to 400 gpm for 15 seconds without overflow into the building.

5. When a valve or inspector’s test connection discharge cannot be seen from the valve and are piped into the sewer system, a sight glass shall be provided. Inspectors test valves shall be within 6' of the floor or finished grade at the remote end of the sprinkler system discharging to an approved sewer connection or outside location.

E. Sprinklers:

1. Provide sprinkler guards on all pendant sprinklers located within seven feet (7') of the floor and on sprinklers in closets and other locations where sprinklers may be subject to mechanical damage.

2. Spare sprinklers shall be provided in the quantities required by NFPA 13 (at least six (6)) and shall be placed within an approved cabinet located adjacent to the main riser or fire alarm control panel. The cabinet shall be provided with a sprinkler wrench, or special wrench for each type of sprinkler used.

3. Provide or update the list of sprinklers provided and post it at the sprinkler cabinet as required by NFPA 13. Sprinkler spares cabinet location shall be approved by SUFMO prior to installation.

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. 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. 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 28 31 00 Fire Detection and Alarm Systems.
2. Exterior electric horn shall be supplied under this Section and connected under Section 28 31 00 Fire Detection and Alarm Systems.

3. Water flow indicators shall be installed under this Section and connected and adjusted under Section 28 31 00 Fire Detection and Alarm Systems.

4. Valve supervisory switches shall be connected to the building's fire alarm system as outlined in Section 28 31 00.

H. Special Applications:

1. Compact Shelving: Storage using compact shelving systems (mobile aisle) shall be limited to storage of paper materials such as books, periodicals and files with no more than 5% of scattered plastic materials up to 8’ high. This allows protection as Light Hazard occupancy in accordance with NFPA 13. Storage of more hazardous commodities (i.e., plastics) is not permitted without specific review and approval by SUFMO and the AHJ. Storage of higher hazard commodities may require sprinkler system designs that are not achievable in existing facilities above the 1st floor or Basement without major modifications to the existing sprinkler system, if at all.

2. Laser Tables with Optical Racks: Optical Racks shall use perforated metal shelving with at least 60% open area. Racks exceeding 4ft in width shall also have a clear 6" longitudinal flue space extending from the bottom of the rack up to the top. Sprinklers shall be designed for a minimum of 0.15/1500 and be arranged to surround the periphery of the laser table if at all possible. Minimum of 18" clearance between the top of storage and sprinkler deflectors is required. Top shelf shall be positioned to allow the required clearance.

3. Fume Hoods (Santa Clara County & Palo Alto Jurisdictions): Fume hoods shall be equipped with automatic fire protection per the local Ordinances. An evaluation by SUFMO shall be made to determine whether sprinkler protection is appropriate. Hoods protected by sprinklers should have a small orifice (K=2.8), corrosion resistant, glass bulb) sprinkler installed through the top or the side. Connect the sprinkler to the overhead sprinkler system using a flexible drop without a dedicated valve. Bio Safety Hoods and Laminar Flow Hoods are generally exempt from this requirement unless otherwise required by SUFMO.

4. Gas cabinets for hazardous materials shall be equipped with a corrosion resistant small orifice (K=2.8), glass bulb sprinkler from a flexible drop when required by code or AHJ. The installation shall normally be supplied from the room sprinkler system without an isolation valve.
3.03 PAINTING AND MARKING OF PIPE

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 complete smooth prime painted installation.

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", or "STANDPIPE" in minimum two inch (2") 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.

5. The underground contractor shall provide signage at the back flow assembly and building FDC. See section 3.01, System Design.

3.04 SANITIZATION

A. All underground piping from the street main to the BFP shall be sanitized in accordance with the requirements of Section 33 10 00 per the Stanford Water Department requirements.

3.05 FIELD QUALITY CONTROL

A. Inspections, Testing, and Flushing:

1. When flex drop assemblies are to be used, a ceiling bracket inspection is required by SCCFMO prior to closing the ceiling.

2. 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. Flushing shall be continued at least until a clear flow is obtained. The flush shall be witnessed by SUFMO and the permit issuing authority.

3. 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 as required by Stanford Water Department.
4. All interior piping and components of the sprinkler system must be hydrostatically tested at 200 psi for a minimum of two (2) hours.

5. Hydrostatic testing of existing piping that includes the control valves (PIV's, OS&Y's, Butterfly) shall be avoided as it can cause damage to the existing valve seals resulting in a failed test. If new piping is added to the system that is required to be hydrostatically tested above working pressure, it shall remain isolated during the test and tied-in to the existing system after passing the hydrostatic test.

6. Portions of the underground systems may be hydrostatically 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 AHJ. At least 72 hours notice must be given to the Stanford Project Manager, SUFMO and the AHJ prior to inspections, flushing or hydrostatic testing.

7. An internal inspection shall be made of existing piping, in the presence of SUFMO technicians, when modifying, extending or connecting to existing branch lines, feed mains and cross mains. The piping shall be flushed if required by SUFMO. SUFMO shall determine whether the existing piping is suitable for system expansion.

8. All shop welded pipe and fittings shall be made available for inspection by SUFMO and the AHJ prior to installation. Rejected welds will be corrected or replaced.

9. 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 AHJ, the 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.

END OF SECTION