NSF 5.00: FIRE SPRINKLER SYSTEMS

5.1; SCOPE:

5.1.1; All fire sprinkler systems within the boundaries of KCFPD #16 (Northshore Fire Department), including the cities of Kenmore and Lake Forest Park shall meet the criteria as set forth in these standards.

5.1.2; The authority having jurisdiction for all new system installations or existing system modifications, upgrades, equipment replacement, or repair work done within KCFPD #16 shall be the Northshore Fire Marshal or his designees. The Fire Marshal shall be responsible for the interpretation and application of standards to actual design and installation situations. The local water utility (Northshore Utility District, Shoreline Water, etc.) shall have jurisdiction for underground supply piping as follows: commercial or multi-family systems, (13 or 13R) all piping on the upstream side of the vault or edge of the building property where no vault is installed; single-family systems, (13D) the meter and all piping upstream of the meter.

5.1.3; The 2007 edition of NFPA pamphlet 13, 13D, 13R, 24, and 72 shall be used when referenced unless specifically noted otherwise. The current adopted building and fire codes shall be used.

5.1.4; Automatic fire sprinkler systems shall be installed in structures as required by the International Building Code and the International Fire Code as amended by Washington State, applicable local amendments for Kenmore and Lake Forest Park, as required by other adopted codes or as required by the Fire Marshal for mitigation of special hazards, where there is inadequate water supply or where access is unduly difficult.

5.2; PERMIT REQUIRED:

1. A permit shall be obtained from the Northshore Fire Department for the following work related to fire sprinkler systems:
    a. Installation of a new fire sprinkler system.
    b. Modifications of an existing fire sprinkler system.

    The installation contractor shall obtain the permit and the permit shall be valid only for the contractor identified on the permit application. The Northshore Fire Department issues permits at Station 51, 18030 73rd Ave. NE, Kenmore, WA, 98028.
2. New fire sprinkler systems shall **not** be installed nor shall modifications be made to existing systems until a complete application has been submitted, plans have been reviewed and approved, a permit has been issued and the approved plans have been reviewed by the designer for changes which may have been required as part of the review. A set of stamped, approved, plans and the permit inspection card must be on site for reference by the installer and fire inspector.
3. A minimum of one permit is required for each building of a multi-building project. A permit is only valid for the work and by the contractor designated by the permit. The permit is not transferable.
4. Failure to obtain a permit prior to installation or modification of any portion of a fire sprinkler system may result in penalties including, but not limited to, doubling of required permit fees.
5. Replacement of recalled sprinkler heads requires notification of the Fire Prevention Division. The “Recalled Sprinkler Head Replacement” form shall be filled out completely and mailed to the Northshore Fire Department, 18030 73rd Ave. NE, Kenmore, WA 98028.

5.3; SYSTEM DESIGN:

General

All fire sprinkler systems shall be designed and installed in a professional manner. Installing contractors must be licensed in the State of Washington for the type of work to be performed.

5.3.1; Plans

5.3.1.1; General

1. At least three (3) complete sets of plans, three complete sets of manufacturer's specification sheets for all equipment being installed, and a completed permit application form must be submitted in person. Half the estimated permit fee will be due and payable at this time. The permit application form shall be thoroughly and accurately completed prior to submittal.
2. Accurate, approved underground civil drawings shall be submitted with the overhead design.
3. Plans shall meet the minimum standards as set forth in Chapter ~~8~~ 22 of NFPA 13. Plans that do not have these minimum items will be returned to the designer. Delays in review time for failure to provide required and accurate information on the plans is the responsibility of the person submitting the plans.
4. All plans shall be on a minimum of 11" x 17" and maximum of 36" x 48" paper using a minimum of $^1/_8$" and a maximum of ¼" scale (architectural only), unless approved otherwise, in advance, by the Fire Marshal.
5. Each page of the plans and the front page of the calculations shall be stamped with a valid Washington State certificate seal identifying the appropriate level of competency and each stamp shall be signed by the licensed designer.
6. If the designer is other than the installation contractor, the designer shall be identified on the plans and the professional relationship between the contractor and designer shall be described. The designer's written authorization shall be attached to the plans for any field changes requiring re-submittal of plans.

5.3.1.2; Underground (Exterior)

1. A separate permit is required for all underground sprinkler supply piping for systems being installed to NFPA 13 or 13R standards. All underground piping plans must be designed in accordance with NFPA 24 and 13 and shall be approved by the Fire Marshal and the local water utility prior to installation. All visual inspections shall be performed before covering the pipe. Additional tests shall be performed as directed by the Fire Marshal or the local utility inspector.
2. A State of Washington "U" level or level 3 license is required to perform underground work.
3. Pipe shall not extend under the slab of a building. Exception: Piping to supply the system riser may extend a maximum of ten feet under the building. more than 10', horizontal,.
4. No inspection of the underground shall be requested without a valid underground material and test certificate documenting the installation.

5.3.2; Design

5.3.2.1; General

1. Design of fire protection system underground and over head shall be per the **2007 edition** of NFPA 13, 13D, or 13R, as applicable, except as modified herein.

2. Rooms or areas where wet pipe systems are installed shall be maintained at a minimum of 40 degrees F.

   Exception: When allowed by the Fire Marshal heat tracing may be used. The heat tracing shall be listed for sprinkler piping and shall be installed and tested in accordance with the manufacturer's specifications. All heat tracing circuits shall be supervised by the building fire alarm system for power supply and temperature.

5.3.2.2 Underground

1. For NFPA 13D systems, the following applies:
   a. Pipe size shall be a minimum of 1";
   b. Pipe type shall be as approved by the Plumbing Code.
   c. A backflow prevention device shall be installed between the overhead sprinkler system and the potable water system as required by the applicable water utility.
2. All NFPA 13 fire sprinkler systems, other than residential, shall be fed by a minimum of 6" ductile iron underground, unless hydraulic calculations by a sprinkler designer prove a different size is acceptable to the Fire Marshal. The FDC line and the underground (PIV) line shall be the same size.
4. When a combination system is installed in the building, the designer shall determine the size of the underground based on the maximum potential flow of the systems installed and proven with hydraulic calculations. In no case, other than the above, shall the 6" minimum be reduced. Where applicable, an allowance for interior hose streams from standpipes shall be included.
5. FDC sizing shall be proven through hydraulic calculations when a combination system is provided in the building. The minimum size of FDC piping shall be 4 inch in an NFPA 13 system and shall be no less than the size of the system riser. See 5.3.2.4

5.3.2.3; CONTROL VALVES

All NFPA 13 and 13R systems shall have an exterior, post indicator valve.
The following applies to these control valves:

1. Installed in a location approved by the Fire Marshal.
2. At least 40 feet from any building (generally this location is in the same planter island as a fire hydrant).

   Exception: When approved by the Fire Marshal, control valves may be located closer to structures. If a wall post indicator valve is proposed, the construction on each side of the valve shall be one hour with no openings and shall extend 10 feet to either side and to 10 feet above ground level.
3. Exterior control valves shall be located adjacent to the fire department connection for the system served.

   Exception: When approved by the Fire Marshal, exterior control valves may be located away from fire department connections.
4. Post Indicator Valves shall be installed so that the top of the operating nut is 36" to 44" above finish grade. PIV's shall be painted red. The address of the building served shall be painted in nominal 3" white letters on the valve body.
5. Above ground exterior control valves shall be protected from vehicular damage when located within 10 feet of driving surfaces.
6. Exterior control valves shall be locked open with a non-case hardened lock or approved rotary shackle lock.
7. Above ground backflow prevention devices shall have supervised tamper switches.

8. For NFPA 13 or 13R systems valves located between the water supply and any sprinkler head shall be supervised.
9. Locking, sealing, or removing the handle of the valve are not acceptable methods of valve supervision.
10. Both interior and exterior control valves shall be labeled.

5.3.2.4; FIRE DEPARTMENT CONNECTIONS (FDC)

All NFPA 13 and 13R systems and standpipe systems shall have a fire department connection (FDC). FDC's shall be:

1. Installed in a location approved by the Fire Marshal (generally this location is in the same landscape area as a fire hydrant and no more than 40 feet from a hydrant).
2. Located at least 40 feet from any building.
   Exception: When approved by the Fire Marshal, FDC's may be located closer to structures. If a wall FDC is proposed, the construction on each side of the valve shall be one hour with no openings and shall extend 10 feet to either side and to 10 feet above the ground.
3. FDC's (and PIV's) shall be marked:
   a. They shall be visible and accessible from the Fire Department access road.
   b. FDC's shall be painted red. The address of the building served shall be painted in nominal 3" white letters on the riser pipe.
   c. Complexes, combination systems and special designed systems shall have the address and any fire department pump pressure criteria, etched in 18 gauge (min.) metal and permanently attached (u-bolts) to the FDC.
4. The FDC shall also be the same size as the main supply or PIV line and shall not be smaller than the size of the main system riser. FDC piping shall terminate in a vault or at the system riser. The FDC check valve shall be accessible.
5. FDC's shall be a siamese connection in accordance with the following conditions:
   a. Each inlet shall have its own clapper valve.
   b. Minimum size 4" x 2 ½ x 2 ½.
      Exception: 13R systems are allowed to have a single 2 ½" inlet when the riser size is less than 4".
   c. Additional inlets or a 4" Storz adapter may be required on systems with large water demands or for unique sites.
6. FDC caps and their fasteners shall be frangible metal or an approved alternate.
7. FDC's shall be protected from vehicular damage when located within 10 feet of driving surfaces.
8. Fire Department Connections shall be installed so that the height of the hose connection is 30" to 42" above finish grade. The area within a 4' radius around FDC's or control valves shall be level and clear of obstructions

5.3.3; OVERHEAD

5.3.3.1; NFPA 13D systems:

1. Sprinkler systems for one- and two-family dwellings shall be designed and installed in accordance with NFPA 13D.
2. Ceilings shall be installed in all areas, including basements prior to final inspection.
3. An approved 6" exterior alarm bell is required on all 13D systems.
4. For piping in attics or other unheated areas an inspection of the insulation tented over the pipe is required prior to cover. The insulation batts shall be tacked in place to prevent displacement during blowing in of loose insulation.

5.3.3.2; For NFPA 13R and all commercial (NFPA 13) systems:

5.3.3.2.1; General

1. NFPA 13R systems shall only be installed for protection of residential occupancies up to and including four stories in height as approved by the fire marshal

5.3.3.2.2; Hydraulic Calculations

1. Hydraulic calculations shall include a 10% safety factor.
2. Hydraulic calculations shall include all piping from the public water supply main to the remote area.
3. All new systems shall be hydraulically calculated. All additions to existing systems shall be hydraulically calculated.
4. When the addition or modification is not located in the hydraulically remote area or involves only "arm-over" or "drop" type installation, and will not degrade the performance of the system, no new calculations are required. A letter from the designer attesting to this shall be submitted with the permit. The letter shall also bear the contractor's competency stamp and signature.

5.3.3.2.3; Fire Sprinkler Riser Rooms

1. Risers shall be located in a separate room from the general occupancy. The main fire sprinkler riser, its appurtenances and the building's fire alarm panel shall be located in this room. A 3-foot clearance in front of the entire width of the fire sprinkler equipment, and 1-foot clearance on the remaining 3 sides shall be provided.
2. The location of the fire sprinkler riser room shall be determined during the site plan approval process and be identified on the architectural drawing. The riser room shall have direct access from the exterior.
3. Storage is prohibited in fire sprinkler riser rooms.
4. Phone and electrical equipment may be allowed in the fire sprinkler riser room, provided it does not interfere with the operation of the fire alarm panel or access to the fire sprinkler system components. Three (3) foot clearance is required between other equipment and sprinkler system components.
5. Interior drains in riser rooms, and at remote riser locations shall be sized to accept the flow from the system drain when fully opened. Exterior drains shall be directed and/or protected so as not to disrupt landscaping, etc. from the system drain when fully open. Plans shall be made for drainage from testing volumes.
6. Riser room shall be locked at all times and shall be openable with the building master key secured in the Knox box.
7. All riser rooms shall be provided with zone maps showing what areas of the building are covered by the system(s) installed. These maps shall be accurate as to the building layout, the location of all zones, standpipe outlets, control valves, and water-flow alarm devices. All maps shall be legible and easily understood. They shall be laminated and permanently attached to the wall in the riser room. When the system is modified, it is the responsibility of the installing contractor to update the maps.
   Exception: Buildings with no more than one sprinkler zone per floor.
8. All fire sprinkler riser rooms shall have signs on the door stating: "Fire Sprinkler and Fire Alarm Control" (as applicable). Letters shall be a minimum of 2" in height and shall contrast with their background.

5.3.3.2.4; Control Valves

1. Multi-story buildings shall have at least one control valve, drain, and water flow switch for each floor.
   Exception: R-1 and R-2 townhouse style buildings.
2. Control valves shall be located in approved locations. They shall not be more than 6-feet above finished floor to the top of the valve.
3. Department of Health approved back flow prevention is required on all systems. Submittals shall indicate whether this will be installed in the building, or outside in a vault. The location of the backflow assembly shall be approved by the local water utility. A certified backflow assembly tester shall test this assembly. After this test is complete, the completed backflow assembly test form shall be submitted to the local water utility.

5.3.3.2.5; Sway Bracing

1. The system piping shall be braced to resist both lateral and horizontal seismic loads and to prevent vertical motion resulting from seismic loads in accordance with NFPA 13. Seismic bracing details and calculations shall be included with the application documents for all new sprinkler system installation permits.

5.3.3.2.6; Alarms

1. All sprinkler system flows shall be detected by paddle type flow switches (wet systems only) or pressure switches (dry systems only). These devices shall detect a flow from one or more sprinklers, and trigger a local alarm within 90 seconds of opening the inspector's test valve. Additionally, a signal shall be received at the central station monitoring company within this same time period.
2. Location of interior and exterior alarm sounding devices shall be as per NFPA 72 and NSF Fire Alarm Standard.

5.3.3.2.7; Special Design Requirements

1. When attached to a fire sprinklered building, overhangs shall be protected as follows:
   a. Canopies or attached walkway covers greater than 4 feet and that are associated with occupancies where combustibles are stored, handled or used under such canopies or attached walkway covers shall be provided with fire sprinklers regardless of construction type. This includes coverings over vehicle parking areas.
   b. For 13R systems: covered decks, overhangs and attached stairs used for egress purposes shall be provided with fire sprinkler coverage.
2. All enclosed parking garages shall be equipped with quick response fire sprinklers.

5.3.4; NFPA 13

5.3.4.1; INSPECTION

5.3.4.1.1; General

1. The installing contractor shall pretest all systems prior to requesting an inspection. The contractor should allow for a minimum of 48 hours (2 working days) for the request to be filled. A fire inspector will confirm an appointment with the contractor prior to arriving on the site.
2. The installing contractor shall perform all pretests and acceptance tests (i.e. flush, purity, hydrostatic, & flow) at their expense and with their own or rented equipment.

5.3.4.1.2; Underground

1. The contractor shall be responsible for ensuring that all test water is safely disposed of and does not create a safety hazard or damage property. The contractor shall provide, and oversee the operation of all equipment and be responsible for damages.
2. Underground mains, including lead in connections and FDC lines, shall be flushed as per NFPA 24 and local water utility requirements prior to connection to the overhead. The contractor shall provide a copy of the "Underground Material and Test Certificate" to the fire inspector prior to final inspection.

5.3.4.1.3; Overhead

1. All 13D systems shall pass a cover inspection, a functional flow test proving the system design and a final inspection (that includes operation of the exterior bell).
3. All new commercial and residential (including 13R) systems shall be hydrostatically tested per NFPA 13. No leaks or drops in pressure shall be observed during the hydrostatic test. Dry pipe systems shall be air tested for 24 hours at 40 psi in accordance with NFPA 13.
4. Tenant improvement or repair work involving more than 20 fire sprinklers being added or relocated will require a hydrostatic test as per NFPA 13. Exception: Modifications that cannot be isolated, such as relocated drops, shall not require testing in excess of system working pressure.
5. Inspections of all piping, hangers, bracing and valves is required prior to covering the pipe.
6. All dry systems regardless of size shall provide a continuous stream of water to the inspector's test within 60 seconds of the opening of the inspector's test valve. A test connection shall be provided for pre-action systems using supervisory air. The connection used to control the level of priming water shall be considered adequate to test the operation of the alarms monitoring the supervisory air pressure.
7. Existing systems (all types): If code violations are noted in existing systems during an inspection, they shall be corrected immediately and prior to final inspection. These violations include, but are not limited to; incorrect hangers, earthquake bracing, sprinkler spacing, design criteria, etc.
8. Backflow assembly testing is required in accordance with NFPA 13 and local water utility requirements. The contractor shall provide all of the necessary hardware, gauges, etc. for this test. The contractor shall also make provisions for proper disposal of the water flow generated by the test.

5.3.5; MAINTENANCE

1. All fire sprinkler systems shall be maintained, inspected, and tested at least annually using the procedures from NFPA 25.
2. Contracts for the maintenance and emergency repair of all systems in the building(s) must be in place prior to the final acceptance of any system. These contracts shall specifically state that emergency repair response, initiated by the owner, fire department personnel, or fire dispatch will be provided 24 hours a day, 7 days per week.