

## 15300 Fire Sprinkler Systems

### Part 1: General

- 1.01 The University is responsible for the operation and maintenance of the building fire sprinkler systems. Consequently, extensions, additions, or other modifications necessary for a project must be planned, budgeted, designed, and constructed by the project.
- 1.02 Select and specify fire protection equipment based on specific project requirements and these general guidelines.
- 1.03 For system design pressures and hydraulic calculations, prior to installation, test and confirm available water supply with consideration for aggregate demand of existing and planned structures in the geographical area serviced by the University's water distribution grid. See Section 2.04 for additional information.
- 1.04 Confirm and field verify that Raleigh Fire Department apparatus will have unobstructed access to the Fire Department Connection to supplement fire sprinkler fire flow pressures.
- 1.05 Comply fully and insert as an Appendix in the project specifications the NC Department of Insurance, Office of the State Fire Marshal publication entitled "FIRE SPRINKLER SYSTEMS" latest edition. Designer shall document any deviation from the requirements of this publication to facilitate the review process.
- 1.06 Fire sprinkler systems shall be submitted to the NC Department of Insurance, Office of the State Fire Marshal, Engineering Division for review and approval at each phase of design. The address is 322 Chapanoke Road, Raleigh, NC 27603. Telephone numbers: (919)661-5880, (800)634-7854.
- 1.07 Contact AHJ, (NCDoI-OSFM, Engineering Division - State Property Plan Review Section) by Schematic Phase to determine need for fire pump. Except for buildings classified as high rise or those containing any hazardous occupancy area, if the water supply will satisfy the sprinkler system demand comfortably without a fire pump, but achieving 100psi at the top of the standpipe would require a pump, then NCDoI-OSFM may possibly permit the pump to be omitted. This will be evaluated on a project-by-project basis, upon request, and may require separation of the standpipe from the sprinkler system. If permitted, the rationale for not requiring 100 psi at the top of the standpipe is as follows:
  - a. NCSU has no trained fire brigades. The use of fire hose by other than those specifically trained in fire fighting is dangerous.
  - b. City of Raleigh Fire Department (RFD) will be the first responder for manual fire suppression. Fire departments will not use any hose other than their own, for safety reasons.
  - c. For the above reasons, NCSU does not provide any fire hose at 2.5" fire department valves. Class I standpipes (without hose) can be permitted by the AHJ in fully sprinklered buildings.
  - d. When the RFD arrives they will bring pumpers and can pressurize the standpipe to meet their needs for manual fire fighting. Having the standpipe system separate from the sprinkler riser will prevent possible over-pressurization of the sprinkler system and also allows continued fire fighting in case the sprinkler system is overwhelmed.
- 1.08 The prime focus of the fire protection design shall be performance, reliability, durability, and maintainability.

**Part 2: Design Guidelines - Fire Sprinklers General**

- 2.01 Contractor's shop drawings shall be submitted to the following for approval:
- a. Design Engineer of Record
  - b. NC Department of Insurance, Office of the State Fire Marshal
  - c. NCSU Facilities Planning and Design
  - d. NCSU Environmental Health and Safety
  - e. NCSU Campus Police Fire Protection Office
- 2.02 Submit specified fire sprinklers equipment catalog cut sheets with or before final design review CD submittal.
- 2.03 Use the same manufacturer for each grouping of sprinkler heads, valves, etc. for the entire building.
- 2.04 The design engineer will arrange for a fire flow test to determine the Design Water Supply during the Schematic Design Phase. In order to ensure hydraulically efficient sprinkler systems and to compensate for pressure fluctuations with the University distribution system due to operating characteristics of the City of Raleigh water system, the Design Water Supply to be stated in the contract documents shall be the tested fire flow with the static and residual pressures reduced by 10 psi. The fire flow test will only be valid for 12 months. The installing sprinkler contractor shall still include a 10% cushion in his hydraulic design.
- 2.05 Provide adjustable swing arms for all pendant sprinkler head drops. Locate sprinkler heads in lay-in ceiling in center of tile.
- Pendant heads shall be semi-recessed with a two-piece adjustable metal threaded escutcheon. Push on escutcheons are not acceptable.
- 2.07 Sprinkler heads in finished areas shall be designed and installed to maintain the ceiling pattern established by the lights and diffusers even if extra coverage is required.
- 2.08 Furnish to NCSU the following replacement stock: Sprinkler heads: No less than 6 heads of each type and rating for systems up to 300 heads. No less than 12 sprinklers for systems having 300 to 1000 heads. No fewer than 24 sprinklers for systems having 1000 heads. The referenced guidance will apply for portions of facilities having more than 1000 heads. Replacement head cabinets of sufficient size or number for storage of replacement heads will be furnished and installed in an area where the ambient temperature rating will not exceed 100°F. In addition, 2 sprinkler wrenches shall be provided for each type of sprinkler installed. When applicable, where concealed sprinklers are installed an equal number of cover plates shall be furnished.
- 2.09 Paint red all exposed fire sprinkler piping in mechanical rooms. Do not paint sprinkler heads or obscure equipment nameplate data. Exposed piping in all other areas (corridors, stairwells, labs, and offices) shall be painted to match adjacent color schemes. Piping above lay-in ceilings shall be labeled by banding at 20' intervals and labeled on both sides of walls and other obstructions.
- 2.10 All valves controlling water supplies for sprinkler systems or portions thereof, including floor control valves, shall be located for convenient access and operable from the floor level. When this provision is not feasible other approved means shall be provided. All sprinkler valves and controls shall be labeled.
- 2.11 Locate a schedule of fire protection valves adjacent to the main fire alarm control panel for the building.

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- 2.12 If at all possible, locate sprinkler riser in a mechanical room with direct outside access. Ensure that room is heated by a permanent fixed means of a mechanical or electrical heat source. Electrical heating tapes shall not be considered as an acceptable alternative means for freeze protection.
- 2.13 Flow control (on/off) sprinkler heads may be used only with written permission of NCDol-OSFM. Quick response heads may be used where valuable or irreplaceable building contents have a high probability of extensive damage/loss or where combustible loads warrant.
- 2.14 All exposed piping and heads shall be installed as high as possible to maintain head clearance. Sprinkler heads less than 7' shall be provided with guards.
- 2.15 Only U.L. or F.M. listed sprinkler heads shall be acceptable for use.
- 2.16 Provide a summary sheet with the following information for each fire sprinkler zone: hazard classification, water application density, available water flow and pressure (static and residual data) as determined by a recent (within one year) water flow test, and test hydrant locations.
- 2.17 Indicate the location of all standpipes, tamper switches, and flow switches. Provide a riser diagram showing major components.
- 2.18 Indicate the flow characteristics and location of any fire pumps required.
- 2.19 As required by NFPA 13, the sprinkler system should typically include the following components:
  - a. An alarm check valve with outside water motor gong.
  - b. A Post Indicator Valve (PIV) located 40 feet from building walls. Contact the NCDol-OSFM if site conditions do not permit this.
  - c. A Fire Department Connection (FDC) located on the building side of the backflow prevention device and on the street side of any alarm check valve. Where permission has been obtained to use a design per 1.05, provide a separate FDC for the standpipe system labeled "STANDPIPE". Provide permanent sign indicating location of FDC.
- 2.20 All sprinkler flow and tamper switches shall be furnished and installed under Division 15, and wired under Division 16.
- 2.21 Designer shall solicit input from NCSU Fire Protection at 515-2568 when developing fire sprinkler plans.
- 2.22 NCSU Fire Protection will witness all testing of systems per the applicable NFPA code.

### Part 3: Design Guidelines – Fire Sprinkler Specialties

- 3.01 **Post Indicator Valve:** Provide one for each system. Provide electrical supervision (tamper switch) for each valve.
- 3.02 **Fire Department Hose Valves:** Specify 2-1/2" hose valves without hose. Specify 2-1/2" X 1-1/2" reducing coupling with cap and chain at each 2-1/2" fire department hose valve. Threads to match City or Raleigh Standard.
- 3.03 **Backflow Preventers:** Locate backflow preventers inside building. Backflow preventers and their installation shall meet City of Raleigh Public Utilities Department requirements.

- 3.04 **Fire Hydrants:** Fire hydrants and their installation shall meet City of Raleigh Public Utilities Department requirements and NFPA 24. Where possible, hydrants should be installed in a looped system around building perimeter to reduce friction loss in water flow. Said hydrants should be looped around the building perimeter and outside the calculations of the subject building's "fall zone".
- 3.05 **Fire Pumps:** Discuss with NCSU the option of using electric or diesel drive models. Locate the fire pump assembly inside the building within a two-hour fire rated room preferably with direct exterior access. Room shall have permanent heat and emergency lighting.

#### Part 4: Design Guidelines – Piping Materials

- 4.01 **Underground Fire Line:** Cement lined ductile iron pipe with push-on joints except use mechanical joints at all elbows. Minimum 36" cover to top of pipe. Install per NFPA 24 and City of Raleigh Public Utilities Department requirements.
- 4.02 **Aboveground Sprinkler Piping:** Schedule 10 black steel sizes 1-1/2" and larger for use only with roll groove fittings. Schedule 40 black steel sizes 1" – 1-1/4" with threaded fittings. Discuss with NCSU the option of using listed CPVC piping in dormitories. See section 15075 Mechanical Identification for color scheme and labeling requirements.