

NC State University Design and Construction Guidelines

Division 21 Fire Protection

1.0 Purpose

- A. These guidelines provide requirements for fire protection equipment.

2.0 General Requirements

- A. Fire protection equipment shall fully comply with NFPA Standards. The latest edition of the North Carolina State Construction Office (SCO) publication entitled "FIRE SPRINKLER SYSTEMS" shall be used as a guideline in the design of these systems.
- B. The Design Water Supply shown in the contract documents shall be the field tested fire flow with the static and residual pressures. The fire flow test will only be valid for 12 months prior to the start of construction. The installing sprinkler contractor shall include a 10 psi cushion in the hydraulic design.

3.0 Materials and Standards

- A. The same manufacturer shall be used for sprinkler heads, valves, etc. for the entire project.
- B. Sprinkler Heads:
 - 1. Flow control (on/off) sprinkler heads are unacceptable. Quick response heads shall be used where approved by NFPA.
 - 2. Adjustable swing arms shall be provided for all pendent sprinkler head drops. Where lay-in ceilings are utilized, sprinkler heads shall be located in center of tile. 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.
 - 3. Pendent heads shall be semi-recessed with a two-piece adjustable metal threaded escutcheon. Push-on escutcheons are not acceptable.
 - 4. Only U.L. or F.M. listed sprinkler heads shall be acceptable for use.
- C. Sprinkler system shall meet NFPA 13 requirements and include the following components:
 - 1. An alarm check valve with outside water motor gong.
 - 2. A Post Indicator Valve (PIV) which shall be located a minimum of 40 feet from building walls.
 - 3. A Fire Department Connection (FDC) which shall be located on the building side of the backflow prevention device and on the street side of any alarm check valve. Where sprinkler and standpipe systems are separated, a separate FDC for the

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standpipe system labeled "STANDPIPE" shall be provided. Permanent signage indicating location of FDC shall be provided.

4. The FDC shall be located to provide unobstructed access for fire department apparatus.

D. Piping

1. Underground fire line shall be cement lined ductile iron pipe with push-on joints. Mechanical joints shall be used at all elbows. Minimum 36" cover shall be provided to top of pipe.
2. Above-ground sprinkler piping shall be Schedule 10 black steel. For sizes 1-1/2" and larger only roll groove fittings shall be used. For pipe sizes 1" – 1-1/4", Schedule 40 black steel with threaded fittings shall be utilized.

- E. The location of all tamper switches and flow switches shall be indicated on the drawings. A riser diagram showing major components shall be provided.

F. Fire Sprinkler Specialties

1. A PIV and tamper switch shall be provided for each system.
2. Fire Department hose valves shall be 2-1/2" without hose. 2-1/2" X 1-1/2" reducing coupling with cap and chain shall be provided at each fire department hose valve. Threads shall match National Standard.
3. Backflow preventers shall be installed with the highest portion no more than 48" above the floor and the lowest point no less than 12" above the floor. Devices shall be provided with 3 foot clearances around the device for testing and maintenance and shall be provided with a method of discharging water out of building.
4. Fire hydrants and their installation shall meet AWWA standard requirements and NFPA 24. Fire hydrants shall be installed in a looped system around building perimeter outside the subject building's "fall zone" calculations. Hydrant control valves shall be located in valve boxes.
5. The fire pump assembly shall be located inside the building with direct exterior access. Room shall have permanent heat and emergency lighting. Fire pump shall be installed and located as to be tested per NFPA 20 Standard.

4.0 Installation

- A. Sprinkler risers shall be located in a heated mechanical room with direct outside access.
- B. Exposed piping and heads shall be installed as high as possible. Sprinkler heads less than seven (7) feet above the floor shall be provided with guards. In other areas where there is

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the potential to damage the sprinkler heads (athletics, etc.) guards shall be provided for the heads.

- C. Exposed fire sprinkler piping in mechanical rooms and similar unfinished spaces shall be painted red. Sprinkler heads and equipment nameplate data shall not be painted. Exposed piping in all other areas which are painted shall be painted to match adjacent color schemes and shall be labeled by banding at 20 foot intervals and labeled on both sides of walls and other obstructions. Piping above lay-in ceilings shall be labeled by banding at 20 foot intervals and labeled on both sides of walls and other obstructions.
- D. All valves controlling water supplies for sprinkler systems or portions thereof, including floor control valves, shall be located for unobstructed access and within 7 feet above the floor level. All sprinkler valves and controls shall be provided with tamper switches and labeled. Valves located above ceilings shall receive prior approval by NC State. If valves are concealed above a lay-in ceiling, color-coded ceiling markers shall be provided. If valves are located above a hard ceiling, access doors with markers shall be provided. A schedule of fire protection valves shall be located adjacent to the main fire alarm control panel.
- E. Requirements regarding backflow preventer (BFP) installations vary depending on location. The following is a brief overview:
 - 1. Main Campus, Centennial Campus, and the Spring Hill district shall have City of Raleigh (CoR) master backflow preventers (BFP's). Building BFP shall be installed inside the building in accordance with CoR Public Utilities Handbook requirements. Water main extensions MUST be permitted by CoR.
 - 2. Centennial Campus North of Achievement Drive shall have building BFP installed outside the building in accordance with CoR Public Utilities Handbook requirements. Water main extensions MUST be permitted by CoR.
 - 3. Centennial Campus South of Achievement Drive does not have CoR BFP's to protect the water main running along Main Campus Drive from Achievement Drive south to the Friday Center. Building BFP shall be installed outside the building in accordance with CoR Public Utilities Handbook requirements. Water main extensions MUST be permitted by CoR.
- F. The following replacement stock shall be provided to NC State:
 - 1. Required number of spare sprinkler heads in accordance with NFPA 13 and installed replacement head cabinets.
 - 2. Two (2) sprinkler wrenches per type of sprinkler installed.
 - 3. Concealed sprinkler cover plates equal to number installed.

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- G. A summary sheet with the following information for each fire sprinkler zone shall be provided: hazard classification, water application density, design area, hose stream allowance, available water flow and pressure (static and residual data).
- H. NC State shall witness all testing of systems per the applicable NFPA code.