

# DESIGN AND CONSTRUCTION GUIDELINES AND STANDARDS

DIVISION 21 • FIRE SUPPRESSION

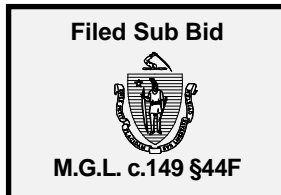
## 21 00 00 • FIRE SUPPRESSION –SPRINKLER

### SECTION INCLUDES

Wet Pipe Sprinkler Systems  
Dry Pipe Sprinkler System  
Residential Sprinkler Systems  
Standpipe Systems  
Fire Pumps  
Underground Water Mains

### RELATED SECTIONS

09 20 00 Gypsum  
09 90 00 Painting  
22 00 00 Plumbing  
26 00 00 Electrical  
28 00 00 Electronic Safety and Security



*Fire Protection –Sprinkler Systems are a stipulated filed sub-bid category under M.G.L. Chapter 149, §44F. If the cumulative estimated value of the work in this section exceeds \$20,000 and the project's total cost is over \$100,000, it triggers the filed sub-bid requirement.*

### TECHNICAL STANDARDS

#### DESIGN

The design intent should be to minimize pipe sizes, conceal as much of the piping as possible and incorporate all of the exceptions allowed in current codes and NFPA or other applicable standards.

For example NFPA 13R does not require sprinklers for:

Small closets (< 24SF),  
Small bathrooms (<55 SF), or  
Attics and crawl spaces

CPVC sprinkler piping running through closets requires protection from high heat that may impair the system. Two options are available:  
1) provide a sprinkler head in the closet or 2) change that section of piping to iron. It appears to be easier to provide a sprinkler head in the closet than to change the piping.

All products specified shall have UL and FM approval, if applicable.

Review the proposed design with the local Fire Department and Authority Having Jurisdiction. Do not commit verbally or in writing to local FD or AHJ any features requested or discussed that are not required by code or standards before obtaining prior approval from DHCD/LHA.

Coordinate with the local fire department and determine if a fire watch will be required during construction. When a fire watch is required, the

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contract documents should be structured so that the contractor owns this expense.

Do not install wet system piping in unheated, areas even with insulation tented as shown in NFPA standards. It is impossible to control or obtain satisfactory installation of insulation in attic spaces to prevent freeze-ups. Install wet system piping only in warm or heated areas. The installation of dry pendent sprinklers has an application on a limited basis. Antifreeze systems are not permitted at this time.

### DRY PIPE SYSTEMS

Avoid dry pipe systems unless required to provide sprinkler protection in an unheated attic space having a wood roof.

Dry system piping should be arranged to provide complete drainage of all piping. Provide proper pitch in all piping to low point drains. These low point drains should be located in locations that are heated and accessible to maintenance personnel such as janitor's closets, boiler rooms, etc. and not in resident's closets, above ceilings, etc. Designers must check the elevations and drainage features of all dry piping after construction.

A dry pipe valve trip test in accordance with NFPA procedures should be included in the specification. If this piping, including fittings and valves, is exposed to the outside or conditions of high moisture (unventilated or poorly ventilated attics) which could cause corrosion, it should be a galvanized material or other corrosion resistant material.

### SEISMIC COSIDERATIONS

NFPA Standards 13D & 13R do not require any seismic restraints. NFPA Std. 13 does require seismic restraints if required by the building code. The Designer cannot expect a contractor to interpret the code and determine if seismic restraints are required. Please do not indicate this in the specification. Based on a review of current information (USGS seismic risk map), Massachusetts has a very low risk of earthquakes and these residential properties are not classified as essential, e.g. hospital. Therefore, unless the Consultant has done an analysis for the need for seismic restraint do not include general statement to provide and leave it to the contractor to figure it out.

### FIRE PUMP

For mid or high rise buildings with an existing fire pump, a full fire pump test is required if not done recently, i.e. within past two years. If a new fire pump is required to supply automatic sprinkler protection, then design the pump in accordance with the most recent and applicable NFPA standard # 20.

Provide **full size** by-pass piping for pump installations. This by-pass piping with valves will allow the use of public water supply for automatic sprinklers in the event the pump is out of service.

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The sprinkler system **should not be** hydraulically designed to the maximum output of the fire pump, e.g. lower floors may be adequately supplied from available public water supply and still have optimum pipe sizing. The design should assure some level of protection if the fire pump is out of service.

The preferred driver for fire pumps is electric motor (less maintenance); however, this requires adequate electrical capacity and possible connection to an existing emergency generator. If a new fire pump is required, the fire pump controller should be compatible with the existing emergency generator. If there is no emergency generator, review other pump drivers such as diesel engine, natural gas engine, etc. Provide cost comparisons of different drivers. The intent is to have the most reliable system.

Similarly code-required new standpipe systems should be designed in accordance with most current NFPA standard # 14.

The majority of systems should be hydraulically designed to the available water supply (with a minimum 10% allowance) in accordance with NFPA residential sprinkler standards 13R or 13D as applicable. Provide hydrant flow test information for design. If available test data is used, it should not be more than two years old. If current flow test data is not available, conduct a flow test prior to designing. Check with local FD if they will accept two year old test results for design of system or if they will require a more recent test.

### **WATER SUPPLY**

NFPA 13R & 13D permit the use of combined domestic water and fire suppression systems. This design approach should be considered. This approach has a potential drawback in that it requires flows of domestic load and fire loads be combined in hydraulic calculations which may result in the available water supply being inadequate when using the preferred smaller size pipes. However, this may be overcome by the use of the NFPA permitted residential domestic shutoff valve for dual purpose systems, e.g. Tyco Model RSV-1. This arrangement may not be suitable for the local housing authority to operate and maintain and be more trouble than it's worth.

There is a potential for water hammer with high pressure water systems. Evaluate and provide for correction of hydraulic shock if anticipated, e.g. pressure reducing valves (PRV's).

If the existing connection to the public water supply is not adequate to support the installation of automatic sprinkler protection, a new and suitable water main connection will be required. This new main should be designed in accordance with NFPA standard 24 for underground water mains. Coordinate with the local water department and obtain their written requirements before beginning the water main design.

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If the existing water supply cannot support the addition of a sprinkler system, provide an evaluation of why it cannot. In addition evaluate the feasibility of providing an on-site water supply and pump system to satisfy calculated sprinkler demand.

### PIPING

Optimize piping arrangements to minimize exposed piping. Generally the use of sidewall sprinklers will facilitate the concealing of piping.

In finished or occupied areas in retrofit applications, where piping cannot be concealed behind existing construction, install it in a prefabricated metal or plastic soffit. Products such as Deco Shield or prepainted metal soffit material are acceptable. In unoccupied or unfinished areas, piping should remain exposed.

Escutcheons should be specified for all piping penetrations in finished areas.

Provide backflow protection in accordance with the plumbing code and Department of Environmental Protection requirements.

Commercial pipe and valve identification standards are not required on residential systems except where expressly called for by NFPA 13R & 13D. The snap-on pipe markings will be subject to vandalism. Painted markings in unfinished areas, if needed, should suffice.

CPVC piping, if exposed in finished areas and not covered with soffit, etc., should be painted to match the wall. Use CPVC pipe manufacturer recommended paints--DO NOT USE oil based paint.

Provide spare sprinkler cabinets and locate them where they will not be subject to vandalism.

Do not install CPVC piping in areas subject to cooking oils accumulation, such as over stoves. Specify metal piping in these locations, even if piping is to be covered in a soffit.

Access panels should be provided, if required. These panels should be properly sized to provide for adequate maintenance repair and to fit the replacement of what they are providing access to, and be suitable for the construction surface fire resistance in which they are being installed.

### ALARMS

#### **In elderly resident locations:**

Typically, fire alarm control panels are existing and sprinkler waterflow and valve tamper alarms can be interfaced with the building fire alarm system without costly changes.

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### **In family developments:**

Usually these locations do not have central fire alarm systems and the addition of automatic sprinkler protection requires that some notification system be provided. Local sprinkler waterflow alarms should be compliant with current code and standards based on the number of dwelling units unless local written ordinances supersede the code requirements.

Determine if there is a written local ordinance requiring a Fire Department connection for sprinkler water flow. If there is no special ordinance, design to applicable codes and standards. If there is a written local ordinance, design in compliance with this and provide a copy of the ordinance for the record.

### **RECORD DRAWINGS AND TRAINING**

Since fire protection sprinkler shop drawings are typically very representative of the final installation of the sprinklers, the Consultant should coordinate the contractor prepared As Builts with the Record Drawings required for the Local Housing Authorities files.

Include the system hydraulic calculations, either done by the Contractor or Designer, in the O & M Manual. Indicate this requirement in the specification section.

Specify to provide training to the housing authority on the system operation and maintenance. The intent of this training should be to familiarize the housing authority with the system and not make them sprinkler system service contractors. It would be advisable to include a service contract requirement in the specification, especially if there is a dry pipe system or fire pump. These are specialized types of equipment requiring special training.