

# RESIDENTIAL FIRE SPRINKLER SYSTEMS

Office of State Fire Marshal – Department of Fire Services  
November 2009



# *Residential Fire Sprinkler Systems*

## WHAT IS THE NEED?

### DID YOU KNOW?

- On average, there is a residential fire in Massachusetts approximately every 40 minutes
- In 2007, ~85% of fire injuries and deaths were in the home (residential occupancies).



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# *Residential Fire Sprinkler Systems*

## MEMORY LANE....

- 1973 *America Burning* report
- 1975 NFPA 13D (based on standard systems)
- 1976 National Fire Prevention & Control Administration [now USFA]
- 1980 NFPA 13D (based on residential sprinklers)
- 1989 NFPA 13R (multi-family low-rise)



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# *Residential Fire Sprinkler Systems*

## WHEN ARE SPRINKLERS INSTALLED

- State Building Code (780 CMR)
- Massachusetts General Laws (MGL Chapter 148 various sections)
- Local Boards - Zoning/Planning/Appeals
- Owner's desire – voluntary  
(housing groups, builders)



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# PURPOSE

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NFPA 13 – Life Safety & Property Protection

NFPA 13D – Life Safety

NFPA 13R – Life Safety



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# SYSTEM TYPE?

NFPA 13 – All Structures with Residential Occupancy

NFPA 13R – Residential Use only up to 4 Stories (780 CMR:502 for height definition). Section A.1.1 - Not for mixed use (780 CMR:302.2 & 302.1 for mixed use definition)

NFPA 13D – 1 & 2-Family Homes (including Manufactured Homes)



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# SYSTEM TYPE?

## MASSACHUSETTS MODIFICATIONS

Aggregate Area  $>12,000 \text{ ft}^2$  -  
Use NFPA 13 (780 CMR: 903.2.8)

Balconies (780 CMR:903.3.1.2.1)

3-family (triple decker) - can use NFPA 13D  
w/20 minute water supply (780 CMR: 903.2.8)



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# DIFFERENCES: WATER SUPPLY

NFPA 13D – 10 minutes

Installed pumps are not required to meet NFPA 20

Installed pressure vessels are not required to meet NFPA 22

NFPA 13R – 30 minutes

Installed pumps must meet NFPA 20

Installed pressure vessels must meet NFPA 22



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# COMPONENTS

## LISTINGS

NFPA 13D – Required for all except:

- a) *Tanks & expansion tanks*
- b) *Pumps*
- c) *Hangers*
- d) *Waterflow detection devices*
- e) *Waterflow valves (not including bypass)*
- f) *Pipes identified in standard*

NFPA 13R & NFPA 13 – Required for all except  
hanger rods & pipes identified in standard



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# COMPONENTS

## PIPE & FITTINGS

NFPA 13D, 13R, 13 – common requirements

*Exceptions: NFPA 13D - multipurpose systems with no fire department connection permits 130 psi pressure rating*

*NFPA 13D permits the use of ½" pipe for certain 'network systems'*



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# COMPONENTS

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## UNDERGROUND PIPE

NFPA 13D & 13R – Not within scope, assumed to conform to local plumbing codes



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# COMPONENTS

## SPRINKLERS

NFPA 13D – Residential

NFPA 13R – Residential

*Exception: Quick-response if up to 4 in dwelling unit*

NFPA 13 – Residential in Dwelling Unit OR  
Quick-response (light hazard  
occupancies)



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# COMPONENTS

## FDC

NFPA 13D – None required

NFPA 13R – Single 1-½" or 2-½" Connection

*Exception: Inaccessible or  
1-story <2000 sq ft*



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# COMPONENTS

## ALARMS & ITC

NFPA 13D – Not required if smoke detectors inst.

NFPA 13R – Required

(If building alarm is installed, waterflow alarm must be connected)

**\*\* Must provide test connection if alarm is installed (all)**



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# DIFFERENCES: DESIGN

## NUMBER OF DESIGN SPRINKLERS

NFPA 13D – Maximum 2 sprinklers operating

NFPA 13R – Maximum 4 sprinklers operating  
(inside dwelling units)

NFPA 13 – Total of 4 sprinklers operating  
(residential design approach)



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# DIFFERENCES: DESIGN

## DISCHARGE

NFPA 13D – 0.05 gpm/ft<sup>2</sup>

Listing of sprinkler

NFPA 13R – 0.05 gpm/ft<sup>2</sup>

Listing of sprinkler

NFPA 13 – 0.1 gpm/ft<sup>2</sup>

Listing of sprinkler

**\*\* Design pressure can never be below 7 psi (all)**



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# DIFFERENCES: DESIGN

## SPRINKLER OMISSIONS

### NFPA 13D

- Bathrooms <55 sq ft
- Certain small closets
- Garages, carports
- Attached open structures (porches)
- Attics & concealed spaces not used for living
- Entrance vestibules (not the only means of egress)



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# DIFFERENCES: DESIGN

## SPRINKLER OMISSIONS

### NFPA 13R (entire building)

- Certain small bathrooms
- Certain small closets
- Attached open structures (porches, balconies)
- Attics & concealed spaces not used for living or storage (no fuel-fired equipment)
- Ventilation equipment space  
(concealed w/ no fuel-fired)



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# DIFFERENCES: DESIGN

## SPRINKLER OMISSIONS

### NFPA 13R CONT'D (entire building)

- Elevator shafts & machine rooms
- Penthouse equipment rooms
- Exterior closets with no openings to interior



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# DIFFERENCES: DESIGN

## SPRINKLER OMISSIONS NFPA 13 (Dwelling Units)

- Certain small bathrooms  
(except in nursing homes or where  
doors open into public exitways)
- Certain small closets in hotels and motels



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# DIFFERENCES: DESIGN

## DEMAND CALCULATIONS

NFPA 13D – Pipe sized using NFPA 13D Tables

NFPA 13R – Using NFPA 13 hydraulic calculations

**\*\* Must add domestic demand for multipurpose systems in multi-family if no automatic domestic shutoff**



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# DIFFERENCES: DESIGN

## SUBMITTALS

NFPA 13D – Calculations

No test certificates

No working plans

NFPA 13R – Similar to NFPA 13

No underground certificate



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# DIFFERENCES: DESIGN

## CONTROL VALVES MULTIPURPOSE SYSTEMS

Domestic use considered monitoring

Separate shutoff allowed on fire sprinkler portion  
only if valve is monitored (traditionally)



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# DIFFERENCES: DESIGN

## SPRINKLER POSITIONING

NFPA 13D & 13R - Follow residential sprinkler listing

NFPA 13 – Follow residential sprinkler listing &  
New section dealing with residential sprinkler



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# DIFFERENCES: ACCEPTANCE TESTS

NFPA 13D – Hydrostatic at system pressure  
when no FDC

NFPA 13R – In accordance with NFPA 13



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# DIFFERENCES: MAINTENANCE

NFPA 13D – Maintained in working order (owner)  
Specifics for antifreeze loops  
General guidance in Annex

NFPA 13R – In accordance with NFPA 25



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# FIELD ISSUES

- Failure to follow listings (i.e. plastic pipe)
- Sprinklers too close (<8 FT)
- Incorrect spacing (even squares, listed flow)
- Water supply arranged incorrectly (domestic monitoring)
- Manufactured buildings (data label, plans?, installer?)
- Cathedral/sloped ceilings (original listing)
- Freezing (Antifreeze requires exp. chamber)
- Residential sprinklers in non-residential areas



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# PRACTICAL ISSUES

- Sprinkler myths (water damage, cosmetics)
- Overly restrictive backflow requirements
- Burdensome standby fees
- Expensive separate fire main requirements
- Nonpayment shutdown concerns
- Meter sizes



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# PRACTICAL ISSUES

- Education (general public will go to FD for info)
  - NFPA One Stop Data Shop
  - Home Fire Sprinkler Coalition
  - NFPA Staff
- Home builder resistance
- Installers (different market, licensing)
- Home privacy
- FD local requirements
- Seasonal homes



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# CONTACTS

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