NFPA No.

13D

SPRINKLER SYSTEMS—

ONE- AND TWO-FAMILY DWELLINGS

1975

NATIONAL FIRE PROTECTION ASSOCIATION

470 Atlantic Avenue, Boston, MA 02210

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Standard for
Installation of Sprinkler Systems in
One- and Two-Family Dwellings and Mobile Homes

NFPA No. 13D — 1975

1975 Edition of No. 13D

This edition was adopted by the National Fire Protection Association at the Annual Meeting — 1975 on recommendation of the Committee on Automatic Sprinklers after review by the public.

Origin and Development

Recognizing the need to reduce the annual life loss from fire in residential occupancies (about 50 percent of total loss of life by fire), the Committee on Automatic Sprinklers appointed a subcommittee in May 1973 to prepare a Standard on the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Mobile Homes. The Subcommittee was composed of members of the Committee on Automatic Sprinklers and other technically competent experts. This document is the result of the work of the subcommittee.

This standard recommends, but does not require, sprinklering of all areas of one- and two-family dwellings and mobile homes; it permits sprinklers to be omitted in certain areas. These areas are shown by NFPA statistics to be the ones where the incidence of life loss from fires in dwellings is low. Such an approach produces a reasonable degree of fire safety. Greater protection of both life and property will be achieved by sprinklering all areas of dwellings.

Interpretation Procedure of the Committee on Automatic Sprinklers

Those desiring an interpretation shall supply the Chairman with five identical copies of a statement in which shall appear specific reference to a single problem, paragraph, or section. Such a statement shall be on the business stationery of the inquirer and shall be duly signed.

When applications involve actual field situations they shall so state and all parties involved shall be named.

The Interpretations Committee will reserve the prerogative to refuse consideration of any application that refers specifically to proprietary items of equipment or devices. Generally inquiries should be confined to interpretation of the literal text or the intent thereof.

Requests for interpretations should be addressed to the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

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Tentative Interim Amendments to

Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Mobile Homes

NFPA No. 13D–1975

1. Add before Chapter 1 General Information, a Preface to read as follows:*

Preface

It is not the purpose of this standard to require the installation of automatic sprinkler systems in one- and two-family dwellings and mobile homes. Rather, it is intended that this document provide a methodology for those individuals wishing to install a sprinkler system for additional life safety and property protection.

Alternative methods of protection exist such as those described in NFPA No. 74, *Standard for the Installation, Maintenance, and Use of Household Fire Warning Equipment (see Appendix B).*

NFPA No. 101, *Code for Safety to Life from Fire in Buildings and Structures*, gives guidance for Fire Protection of Dwellings, and NFPA No. 501B, *Standard for Mobile Homes (see Appendix B)*, gives guidance for Fire Protection of Mobile Homes.

2. In Section 1-2, third line, "a significant degree of" *is deleted and* "improved" *is added, to read as follows:*

1-2 Purpose. The purpose of this standard is to provide a sprinkler system that will aid in the detection and control of dwelling fires and thus provide improved protection against injury, life loss and property damage.

3. In 1-4, delete the present section and move the first sentence of A-1-4 to 1-4* changing the word* "should" *to* "shall," *to read as follows:*

1-4* Maintenance. The owner is responsible for the condition of a sprinkler system and shall keep the system in normal automatic operating condition.

4. In 3-1.6.2, add an exception at the end, after (j), to read as follows:*

Exception: For dwellings manufactured off-site, the minimum pressure needed to satisfy the system design criteria on the system side of the meter shall be specified on a data plate by the manufacturer.

5. In 3-3.4, Exception No. 3, after carports add* "garages" *and delete* "open" *in the second line, to read as follows:*

Exception No. 3: Sprinklers may be omitted from open attached porches, carports, garages and similar unheated attached structures.

(Tentative Interim Amendments continued on page 16.)

NOTICE

Following adoption of this edition of NFPA 13D by the NFPA, certain organizations appealed to the Board of Directors and, in a hearing with the Standards Council, objected to the distribution of 13D on the basis that parties of substantial interest did not have adequate opportunity to participate in the development of 13D. As a result of those objections, distribution of 13D was stopped by the Board and the Committee on Automatic Sprinklers was directed to add other interests to the Subcommittee that developed 13D. The expanded Subcommittee reviewed 13D and proposed Tentative Interim Amendments to it which were approved by the Committee on Automatic Sprinklers. On April 2, 1976, the Standards Council of NFPA approved the release of the Tentative Interim Amendments and released 13D for distribution with the Tentative Interim Amendments.

Standard for Installation of Sprinkler Systems in One- and Two-Family Dwellings and Mobile Homes

NFPA No. 13D — 1975

NOTICE: An asterisk (*) following the number or letter designating a subdivision indicates explanatory material on that subdivision in Appendix A.

Chapter 1* General Information

1-1* Scope. This standard deals with the design and installation of automatic sprinkler systems for one- and two-family dwellings and mobile homes.

1-2 Purpose. The purpose of this standard is to provide a sprinkler system that will aid in the detection and control of dwelling fires and thus provide a significant degree of protection against injury, life loss and property damage.

1-3 Definitions.

1-3.1 Dwelling means any building which contains one or two "dwelling units" intended to be used, rented, leased, let or hired out to be occupied, or which are occupied for living purposes.

1-3.2 Dwelling Unit means a single building or other shelter providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

1-3.3 Sprinkler System means an integrated system of piping connected to a water supply, including a controlling valve and a device for actuating an alarm when the system operates, with listed sprinklers which will automatically initiate water discharge over a fire area.

1-3.4 Pre-engineered Systems means packaged systems of components designed to be installed according to pre-tested limitations as listed by a nationally recognized testing laboratory.

1-3.5 Wet System means a system employing automatic sprinklers attached to a piping system containing water and connected to a water supply so that water discharges immediately from sprinklers opened by a fire.

1-3.6 Dry System means a system employing automatic sprinklers attached to a piping system containing air or inert gas under atmospheric or higher pressures. Loss of pressure from the opening of a sprinkler or detection of a fire condition causes the release of water into the piping system and out the opened sprinkler.

1-3.7 Antifreeze System means a system employing automatic sprinklers attached to a piping system containing an antifreeze solution and connected to a water supply. The antifreeze solution, followed by water, discharges immediately from sprinklers opened by a fire. (*See 3-1.4.2.*)

1-4* Maintenance. A sprinkler system installed under this standard shall be maintained in proper working order.

1-5 Design and Installation.

1-5.1 Devices and Materials.

1-5.1.1 Only new listed sprinklers shall be employed in the installation of sprinkler systems.

1-5.1.2* Only approved materials and devices shall be used in sprinkler systems.

Exception: Listing may be waived for tanks, pumps, hangers, water flow detection devices and water control valves.

1-5.1.3 Pre-engineered systems shall be installed within the limitations which have been established by the testing laboratories where listed.

1-5.1.4 Pre-engineered systems may incorporate special sprinklers or nozzles, water application rates, methods of application, nozzle placement and piping arrangements differing from those detailed elsewhere in this standard.

1-5.1.5* All systems shall be tested for leakage at normal system operating water pressure.

1-6* Working Plans. When required by the authority having jurisdiction or the owner, working plans shall be submitted for approval before any equipment is installed or remodeled.

Chapter 2 Water Supply, Valves, and Pressure Gages

2-1 General Provisions. Every automatic sprinkler system shall have at least one automatic water supply. When stored water is used as the sole source of supply, the minimum quantity shall be 250 gallons.

2-2 Water Supply.

2-2.1* Water supply connections direct from city water mains or combination domestic-automatic sprinkler connections shall be an acceptable water supply source.

2-2.1.1 When sprinkler systems are directly connected to a potable water supply, a rubber faced check valve shall be installed on the discharge side of the control valve.

2-2.1.2* Meters are not recommended for use in sprinkler systems.

2-2.2* An elevated tank shall be an acceptable water supply source.

2-2.3 A water source and automatically operated pump is an acceptable water supply.

2-3 Valves and Drains.

2-3.1* Each system shall have a water control valve located immediately on the discharge side of its water supply.

2-3.2* Each sprinkler system shall have a one-half inch or larger drain connection with valve on the system side of the control valve.

2-3.3* Additional drains shall be installed for each trapped portion of a dry system which is subject to freezing temperatures.

2-4 Pressure Gages.

2-4.1 A pressure gage shall be installed on the system side of the control valve on wet systems.

2-4.2 A pressure gage shall be installed to indicate water supply pressure and a second gage shall be installed to indicate air or inert gas pressure on dry systems.

Chapter 3 System Design

3-1 Design Criteria.

3-1.1 Application Rate. The minimum design density (rate of water application) shall be 0.10 gallons per minute per square foot (gpm/sq ft).

3-1.2 Water Demand. The water demand shall be 25 gpm or the area of the largest room in square feet multiplied by 0.10, whichever is less. (*See 3-1.6 for design methods.*)

3-1.3 Sprinkler Coverage.

3-1.3.1 Standard sprinklers mounted at the ceiling shall be spaced so that the maximum area protected by a single sprinkler does not exceed 256 sq. ft.

3-1.3.2 The maximum distance between ceiling mounted sprinklers shall not exceed 16 feet on or between pipe lines and the maximum distance to a wall or partition shall not exceed 8 feet.

3-1.3.3 Sidewall sprinklers shall be spaced so that the maximum area protected does not exceed 256 sq. ft.

3-1.3.4 For sidewall sprinklers, the maximum distance between sprinklers mounted along the same wall shall not exceed 16 feet. The maximum distance to an adjacent corner shall not exceed 8 feet. The maximum projected throw shall not exceed 16 feet.

3-1.3.5 Special sprinklers may be installed with larger protection areas or distances between sprinklers than those specified in 3-1.3.1 through 3-1.3.4, when such installations are made in accordance with the listings of a nationally recognized testing laboratory.

3-1.4 System Types.

3-1.4.1 Wet-Pipe Systems. A wet-pipe system shall be used when all piping is installed in areas not subject to freezing.

3-1.4.2* Systems in Unheated Areas.

(a) Where system piping is located in unheated areas subject to freezing, dry or antifreeze system types shall be used.

(b) When used, antifreeze systems shall be in conformity with any state or local health regulations. Glycerine, diethylene glycol, ethylene glycol, propylene glycol and similar materials shall not be used in antifreeze solutions in water supply tanks.

3-1.5 Piping.

3-1.5.1 Pipe or tube used in sprinkler systems shall be of the materials in Table 3-1.5.1 or in accordance with 3-1.5.2 through 3-1.5.7. The chemical properties, physical properties and dimensions of the materials listed in Table 3-1.5.1 shall be at least equivalent to the standards cited in the Table and designed to withstand a working pressure of not less than 175 psi.

Table 3-1.5.1

Materials and Dimensions	Standard
Ferrous Piping (Welded and Seamless)	
Welded and Seamless Steel Pipe for Ordinary Uses, Specification for Black and Hot-Dipped Zinc Coated (Galvanized)	ASTM A120–72a
Specification for Welded and Seamless Steel Pipe	ASTM A53–72a
Wrought-Steel Pipe	ANSI B36.10–70
Copper Tube (Drawn, Seamless)	
Specification for Seamless Copper Tube	ASTM B75–72 or
Specification for Seamless Copper Water Tube	ASTM B88–72
Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube	ASTM B251–72
Brazing Filler Metal (Classification BCuP-3 or BCuP-4)	AWS A5.8–69
Solder Metal, 95–5 (Tin-Antimony-Grade 95TA)	ASTM B32–70

3-1.5.2 Standard Wall Schedule 40 pipe is permitted.

3-1.5.3 Copper tube shall have a wall thickness of Type K, L or M.

3-1.5.4 Other types of pipe or tube may be used, but only those investigated and listed for this service by a nationally recognized testing and inspection agency laboratory.

3-1.5.5 Whenever the word pipe is used in this standard, it shall be understood to also mean tube.

3-1.5.6 Thin-wall steel pipe with a wall thickness of 0.120 in. may be joined with mechanical groove couplings approved for service with grooves rolled on the pipe by an approved groove rolling machine.

3-1.5.7 Fittings used in sprinkler systems shall be of the materials listed in Table 3-1.5.7 or in accordance with 3-1.5.9. The chemical properties, physical properties and dimensions of the materials listed in Table 3-1.5.7 shall be at least equivalent to the standards cited in the Table. Fittings used in sprinkler systems shall be designed to withstand the working pressures involved, but not less than 175 psi cold water pressure.

Table 3-1.5.7

Material and Dimensions	Standard
Cast Iron	
Cast Iron Screwed Fittings 125 and 250 lb.	ANSI B16.4–1971
Cast Iron Pipe Flanges and Flanged Fittings	ANSI B16.1–1967
Malleable Iron	
Malleable Iron Screwed Fittings, 150 and 300 lb.	ANSI B16.3–1971
Steel	
Factory-Made Wrought Steel Buttweld Fittings	ANSI B16.9–1961
Buttwelding Ends for Pipe, Valves, Flanges and Fittings	ANSI B16.25–1972
Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures	ASTM A234–73
Steel Pipe Flanges and Flanged Fittings	ANSI B16.5–1973
Forged Steel Fittings, Socket Welded and Threaded	ANSI B16.11–1973
Copper	
Wrought Copper and Bronze Solder-Joint Pressure Fittings	ANSI B16.22–1973
Cast Bronze Solder Joint Pressure Fittings	ANSI B16.18–1972

3-1.5.8 Joints for the connection of copper tube shall be brazed.

Exception: Soldered joints may be used for wet-pipe copper tube systems.

3-1.5.9 Other types of fittings may be used, but only those investigated and listed for this service by a nationally recognized testing and inspection agency laboratory.

3-1.6 Pipe Sizing.

3-1.6.1 Piping shall be sized in accordance with 3-1.6.2 and 3-1.6.3 unless piping has been hydraulically calculated to achieve the design density specified in 3-1.1. When piping is sized hydraulically, calculations shall be made in accordance with the methods described in *NFPA No. 13, Standard for the Installation of Sprinkler Systems.* (*See Appendix B.*) Minimum pipe size shall be three-quarter inch.

3-1.6.2* To size piping for systems connected to a city water supply and fitted with one-half inch orifice sprinklers, the following approximate method is acceptable:

(a) Determine water pressure in the street.

(b) Arbitrarily select pipe sizes.

(c) Deduct meter losses if any. [*See Table 3-1.6.2(c).*]

(d) Deduct loss for elevation. (Building height in feet x 0.434 = psi)

(e) Deduct losses from street to control valve by multiplying the factor from Table 3-1.6.2(a) by the total length(s) of pipe in feet.

Table 3-1.6.2(a)

Design Factors (Psi/Ft) with 25 Gpm Flow		
Pipe Size, Inches	**Steel (C = 120)**	**Copper (C = 140)**
¾	0.64	0.52
1	0.20	0.14
1¼	0.05	0.05
1½	0.02	0.02
2	0.008	0.004

(f) Deduct losses for piping within building by multiplying factor from Table 3-1.6.2(a) by the total length in feet of each size of pipe between the control valve and the farthest sprinkler.

(g) Deduct valve and fitting losses. Count the valves and fittings from the control valve to the farthest sprinkler. Determine the equivalent length for each valve and fitting as shown in Table 3-1.6.2(b) and add these values to obtain the total equivalent length for each pipe size. Multiply the equivalent length for each size by the factor from Table 3-1.6.2(a) and total these values.

(h) In multilevel buildings, steps (a) through (f) shall be repeated to size piping for each floor.

(i) If the remaining pressure is less than 20 psi, pipe or meter size shall be increased. If this pressure is substantially greater, it *may* be possible to decrease piping or meter size.

(j) The remaining piping shall be sized the same as the piping to the farthest sprinkler unless smaller sizes are justified by calculations.

3-1.6.3 To size piping for systems with an elevated tank, pump or pump-tank combination, determine the pressure at the water supply outlet and proceed through steps (b), (d), (f), (g), (h), (i) and (j) of 3-1.6.2.

Table 3-1.6.2(b)

Equivalent Length of Pipe in Feet
For Fittings and Valves

Fitting/Valve Diameter Inches	*Elbows*			*Tees*		*Valves*					
	45 Degrees	*90 Degrees*	*Long Radius*	*Flow Thru Branch*	*Flow Thru Run*	*Gate*	*Angle*	*Globe*	*Globe "Y" Pattern*	*Cocks*	*Check*
¾	1	2	1	4	1	1	10	21	11	3	3
1	1	3	2	5	2	1	12	28	15	4	4
1¼	2	3	2	6	2	2	15	35	18	5	5
1½	2	4	3	8	3	2	18	43	22	6	6
2	3	5	3	10	3	2	24	57	28	7	8

Based on Crane Technical Paper No. 410.

Table 3-1.6.2(c)
Pressure Drop in Meters

Meter Size, (Inches)	*Pressure Loss* at 25 gpm (psi)*
5/8	28.0
3/4	10.0
1	3.6
1½	1.2
2	Less than 1.0
3	Negligible

*From Appendix B — Chart 1, National Standard Plumbing Code, National Association of Plumbing-Heating-Cooling Contractors, 1973 Edition, Page B-19.

3-1.7 Piping Configurations. Piping configurations may be looped, gridded, straight run, or combinations thereof.

3-2 Piping Support.

3-2.1* Piping shall be supported from structural members. This standard contemplates hanging methods comparable to those used in local plumbing codes.

3-2.2 Piping laid on open joists or rafters shall be secured to prevent lateral movement.

3-3 Sprinklers.

3-3.1* This standard permits the use of ordinary (135°–170° F) and intermediate (175°–225° F) temperature rated sprinklers.

3-3.2 Intermediate temperature rated sprinklers shall be used in attics, furnace rooms and elsewhere where normal air temperatures may exceed 100° F. Ordinary temperature rated sprinklers shall be used in all other areas.

3-3.3 In any single building, only one nominal sprinkler orifice size shall be used.

Exception: Hydraulically calculated systems may have more than one orifice size (see 3-1.6.1).

3-3.4* Location of Sprinklers. Sprinklers shall be installed in all areas.

Exception No. 1: Sprinklers may be omitted from bathrooms not exceeding 40 sq. ft.

Exception No. 2: Sprinklers may be omitted from small closets where the least dimension does not exceed 3 ft. and the area does not exceed 24 sq. ft.

Exception No. 3: Sprinklers may be omitted from open attached porches, carports, and similar unheated attached open structures.

Exception No. 4: Sprinklers may be omitted from attics which are not used or intended for living purposes or storage.

Exception No. 5: Sprinklers may be omitted from entrance foyers which are not the only means of egress.

3-4* Alarms.

3-4.1* Waterflow Alarms. Sprinkler systems shall be provided with a waterflow detecting device arranged to sound an alarm which will be audible in all living areas over background noise levels with all intervening doors closed.

Tentative Interim Amendments — cont.

6. In A-1-1, Levels of Protection, the second sentence of the first paragraph, and subsections A-1-1(a) — (e) are deleted. The last paragraph is moved to become the second paragraph so that A-1-1 reads as follows:

A-1-1 Levels of Protection. Various levels of fire safety are available to dwelling occupants to provide life safety and property protection.

This standard recommends, but does not require, sprinklering of all areas in a dwelling; it permits sprinklers to be omitted in certain areas. These areas are the ones shown by NFPA statistics [*see Tables A-1-1(a) and A-1-1(b)*] to be the ones where the incidence of life loss from fires in dwellings is low. Such an approach produces a reasonable degree of fire safety. Greater protection to both life and property will be achieved by sprinklering all areas of dwellings.

Guidance for installation of smoke detectors and fire detectors may be found in NFPA No. 74, *Standard for the Installation, Maintenance, and Use of Household Fire Warning Equipment* (*see Appendix B*).

7. Add to Appendix B:

(d) NFPA No. 101–1973, Code for Safety to Life from Fire in Buildings and Structures.

(e) NFPA No. 501B–1974, Standard for Mobile Homes.

Appendix A

This Appendix is not a part of this NFPA Standard . . . but is included for information purposes only.

A-1 Explanatory. This standard assumes that in most systems sprinklers having a nominal orifice diameter of one-half inch will be used and that, in most fires, only one sprinkler will operate. The system contemplates a basic density of 0.10 gallons per minute per sq. ft. or an approximate total water application rate of 25 gallons per minute for a duration of 10 minutes. The total water supply, if stored on premises, is at least 250 gallons.

A-1-1 Levels of Protection. Various levels of fire safety are available to dwelling occupants to provide life safety and property protection. In order of descending degree of protection, these are:

(a) Installation of a sprinkler system with sprinklers in all areas including bathrooms, closets, attics, and attached structures plus a smoke detector in the hallway outside all sleeping areas.

(b) Installation of a sprinkler system with sprinklers in all areas including bathrooms, closets, attics and attached structures.

(c) Installation of a sprinkler system with sprinklers totally or partly omitted in bathrooms, closets, attics and attached structures and with fire detectors in all areas where sprinklers are omitted.

(d) Installation of a sprinkler system with sprinklers totally or partly omitted in bathrooms, closets, attics and attached structures and with a smoke detector in the hallway outside all sleeping areas.

(e) Installation of a sprinkler system with sprinklers totally or partly omitted in bathrooms, closets, attics and attached structures.

Guidance on installation of smoke detectors and fire detectors may be found in NFPA No. 74, *Standard for the Installation, Maintenance, and Use of Household Fire Warning Equipment* (*see Appendix B*).

This standard recommends, but does not require, sprinklering of all areas in a dwelling; it permits sprinklers to be omitted in certain areas. These areas are the ones shown by NFPA statistics [*see Tables A-1-1(a) and A-1-1(b)*] to be the ones where the incidence of life loss from fires in dwellings is low. Such an approach produces a reasonable degree of fire safety. Greater protection to both life and property will be achieved by sprinklering all areas of dwellings.

Table A-1-1(a)

Occupancy Fire Record for One- and Two-Family Dwellings

Origin of Fatal Fires	*Percent*
Living Room	37.2
Kitchen	21.6
Bedroom	12.8
Basement	11.6
Utility Room	2.6
Closet	2.4
Attic, concealed space	2.4
Bathroom	1.9
Attached Garage	1:6
Hall, Stairway	1.4
Dining Room	1.2
Porch or other outside area	3.3
	100.0

Table A-1-1(b)

Causes of Fires		*Percent*
Heating Equipment		28.2
Defective	17.9	
Chimney or flue defective	4.1	
Combustibles too near heater	3.6	
Improper operation	1.8	
Clothing ignited	0.8	
Smoking Materials		18.5
Improper disposal	2.1	
Accidental disposal	12.0	
Smoking in bed	3.3	
Smoking near flammable vapors	0.3	
Clothing ignited	0.8	
Electricity		13.8
Wiring faults	5.4	
Defective appliances	4.1	
Christmas tree lights	1.5	
Misuse	2.8	
Children and Matches		10.5
Mishandling Flammable Liquids		9.2
Gasoline	6.4	
Kerosene	1.8	
Miscellaneous	1.0	
Cooking Equipment		6.7
Defective	2.3	
Chimney or flue defective	0.5	
Improper operation	2.1	
Clothing ignited	1.8	
Natural Gas Leaks		4.4
Arson or Other Incendiary		2.3
Oil Lamps		1.8
Thawing Water Pipes		0.8
Miscellaneous		3.8
		100.0

A-1-4 The owner is responsible for the condition of a sprinkler system and should keep the system in normal automatic operating condition. A minimum monthly maintenance program should include the following:

(a) Inspection of all valves to assure that they are open.

(b) Pumps, where employed, should be operated.

(c) The alarm system should be tested.

NOTE: When it appears likely that the test will result in a response of the fire department, notification of the fire department should be made prior to the test.

(d) The pressure of air or inert gas used with dry systems should be checked.

(e) Water supply pressure should be checked.

(f) Water level in tanks should be checked.

(g) Care should be taken to see that sprinklers are not painted either at the time of installation or during subsequent redecoration. When painting sprinkler piping or painting in areas next to sprinklers, the sprinklers may be protected by covering with a bag which should be removed immediately after painting has been finished.

(h) For further information see NFPA No. 13A, *Recommended Practice for the Care and Maintenance of Sprinkler Systems* (Appendix B).

A-1-5.1.2 At least one spare sprinkler of each type, temperature rating and orifice size used in the system should be kept on the premises. When fused sprinklers are replaced by the owner, fire department or others, care should be taken to assure that the replacement sprinkler is correct.

A-1-5.1.5 Testing of a system can be accomplished by filling the system with water and checking visually for leaks at each joint or coupling.

Dry systems should also be tested by placing the system under normal air or inert gas pressure. Any leak which results in a drop in system pressure greater than 2 pounds in 24 hours should be corrected. Check for leaks using soapy water brushed on each joint or coupling. Leaks will be shown by the presence of bubbles. This test should be made prior to concealing the piping.

A-1-6 Working plans should be drawn in accordance with NFPA No. 13, *Standard for the Installation of Sprinkler Systems* (*see Appendix B*).

A-2-2.1 Connection for fire protection to city mains is often subject to local regulation concerning metering requirements. Preferred and acceptable water supply arrangements are shown in Fig. A-2-2.1.

A-2-2.1.2 When a meter must be used between the city water main and the sprinkler system supply, an acceptable arrangement is shown in Figure A-2-2.1.2. Under these circumstances, the flow characteristics of the meter must be included in the hydraulic calculation of the system. [*See Table 3-1.6.2(c).*]

A-2-2.2 When a tank is used for both domestic and fire protection purposes, a low water alarm actuated when the water level falls below 250 gallons is recommended.

A-2-3.1 System control valves should be of the indicating type, such as plug valves, ball valves, or OS & Y valves.

A-2-3.2 System or main drain connections should be fitted with a one-half inch or larger globe valve, angle valve or sillcock. The required drain should be located in the piping system so that the drain may also function as a test connection. (*See Fig. A-2-2.1.*)

A-2-3.3 An additional drain should be installed at the low point of a trapped portion of a dry system.

A-3-1.4.2 Information regarding antifreeze solutions and system piping arrangements can be found in NFPA No. 13, *Standard for the Installation of Sprinkler Systems* (*see Appendix B*). Antifreeze solutions are recommended for use only to the extent necessary for maintaining sprinkler protection in unheated areas.

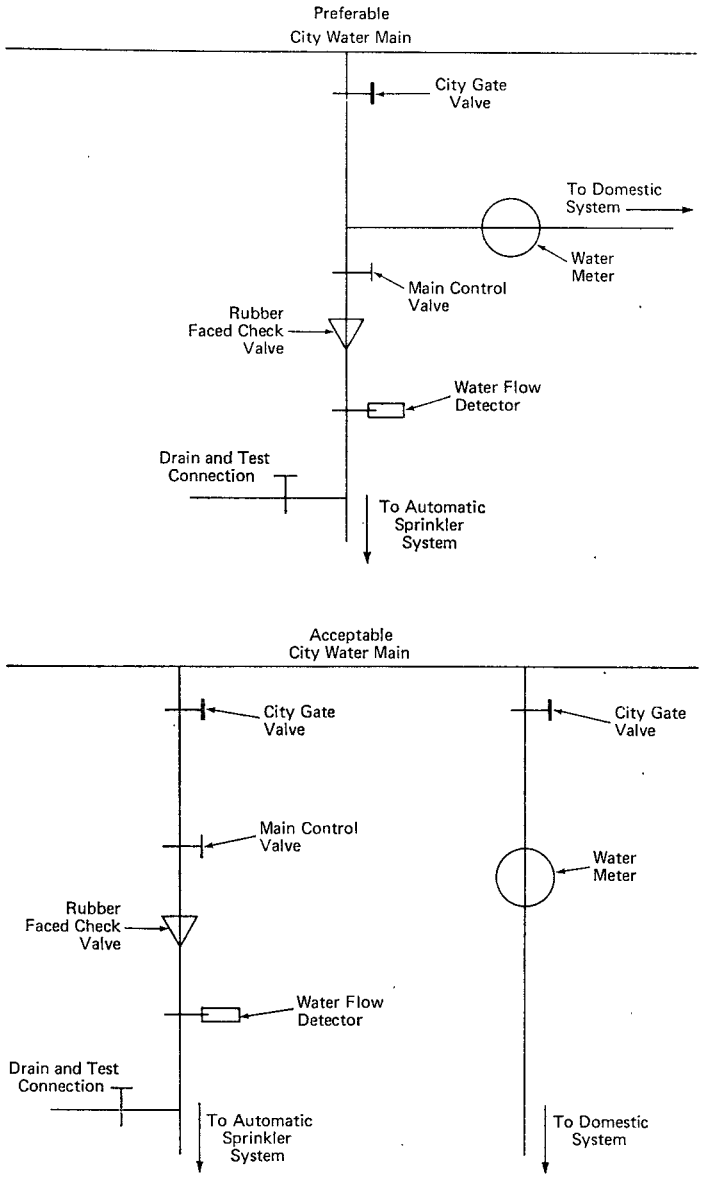

Preferable
City Water Main
City Gate Valve
To Domestic System
Water Meter
Main Control Valve
Rubber Faced Check Valve
Water Flow Detector
Drain and Test Connection
To Automatic Sprinkler System
Acceptable
City Water Main
City Gate Valve
Main Control Valve
Rubber Faced Check Valve
Water Flow Detector
Drain and Test Connection
To Automatic Sprinkler System
City Gate Valve
Water Meter
To Domestic System

Figure A-2-2.1

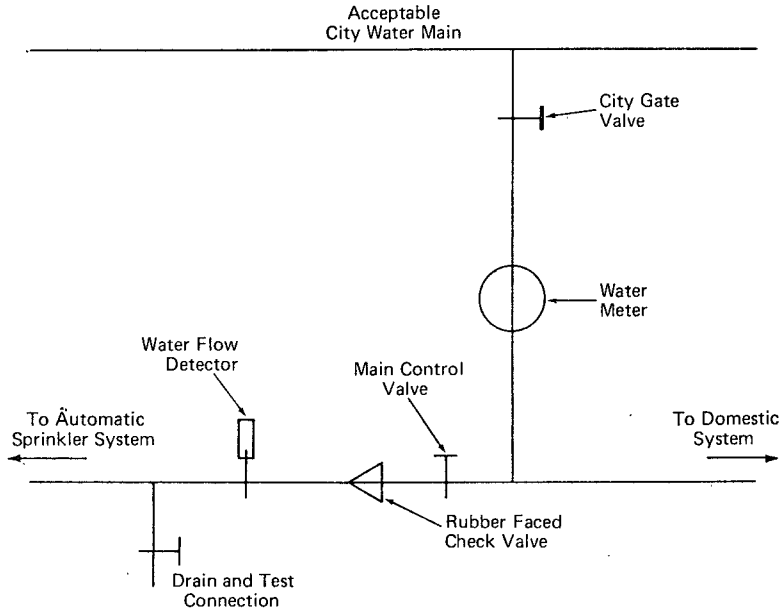


Figure A-2-2.1.2

	Individual Loss	Net Total
a. Water Pressure in Street (Static Gauge Pressure) _____		_____
b. Arbitrarily Select Pipe Size _____		
c. Deduct Meter Loss (___ Size) _____	_____	_____
d. Deduct Loss for Elevation (_____ ft. x .434) _____	_____	_____
e. Deduct Loss From Street to Sprinkler System Control Valve*		
_____ Pipe — _____ ft.		
_____ Valves — _____ ft.		
_____ Elbows — _____ ft.		
_____ Tee — _____ ft.		
Total — _____ ft. x _____	_____	_____
f. Deduct Loss for Piping — Control Valve to Farthest Sprinkler		
_____" Size, _____ ft. x _____		
_____" Size, _____ ft. x _____ = _____	_____	_____

g. Deduct Valve and Fitting Losses, Sprinkler System Control Valve to Farthest Sprinkler**

Size	Quan.	Description	Total Equiv. Feet
	_____	90° Elbow	_____
	_____	45° Elbow	_____
	_____	Tee	_____
	_____	Check Valve	_____
	_____	Valve (_____)	_____
		Total	Ft. x _____ = _____ _____

Size	Quan.	Description	Total Equiv. Feet
	_____	90° Elbow	_____
	_____	45° Elbow	_____
	_____	Tee	_____
	_____	Check Valve	_____
	_____	Valve (_____)	_____
		Total	Ft. x _____ = _____ _____

Remaining Pressure Must be at Least 20 PSI _____

*Factors from Table 3-1.6.2(a) **See Table 3-1.6.2(b)

Figure A-3-1.6.2(a). Calculation Sheet

	Individual Loss	*Net Total*
Pressure at Water Supply Outlet	.....	.....
a. Deduct Loss for Elevation (—ft. x .434)	.....	.....
b. Deduct Loss from Piping Within Building*	.....	.....
Remaining Pressure Must be at Least 20 Psi	.....	.....

*Factors from Table A-3-1.6.2(a).

Figure A-3-1.6.2(b). Calculation Sheet - Elevated Tank, Booster Pump, Pump-Tank Supply

A-3-2.1 Support methods described in NFPA No. 13, *Standard for the Installation of Sprinkler Systems*, are considered to be acceptable methods for use in this standard (*see Appendix B*).

A-3-3.1 Listed Quick Response-Extended Coverage Sprinklers are preferred from a life safety standpoint in normally occupied areas.

A-3-3.4 For an increased level of life safety, detection devices should be installed in all areas which are not sprinklered. For an increased level of protection, sprinklers should be installed in all areas.

A-3-4 Alarms may also be transmitted to a responding fire department when the fire department has provided for the receipt of such alarm.

A-3-4.1 Alarms should be of sufficient intensity to waken a sleeping person. The tests of audibility level shall be conducted with all household equipment, which may be in operation at night, in full operation. Examples of such equipment are window air conditioners and room humidifiers.

Appendix B

This Appendix is not a part of this NFPA Standard . . . but is included for information purposes only.

B-1 Referenced Publications.

B-1-1 NFPA Standards. This publication makes reference to the following NFPA codes and standards and the year dates shown indicate the latest editions available. All these publications may be obtained by ordering them from the Publications Department, National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(a) NFPA No. 13–1974, Standard for the Installation of Sprinkler Systems

(b) NFPA No. 13A–1971, Recommended Practice for the Care and Maintenance of Sprinkler Systems

(c) NFPA No. 74–1974, Standard for the Installation, Maintenance, and Use of Household Fire Warning Equipment

Appendix C

This Appendix is not a part of this NFPA Standard . . . but is included for information purposes only.

The following material contains sample calculations for a typical one-story dwelling and for a typical two-story dwelling.

The calculations for the two-story dwelling have been done by the simplified method described in 3-1.6.2 and by standard hydraulic calculation procedures as described in NFPA Standard No. 13, *Standard for the Installation of Sprinkler Systems* (*see Appendix B*).

The calculations for the single-story residence have been done only by the method described in 3-1.6.2.

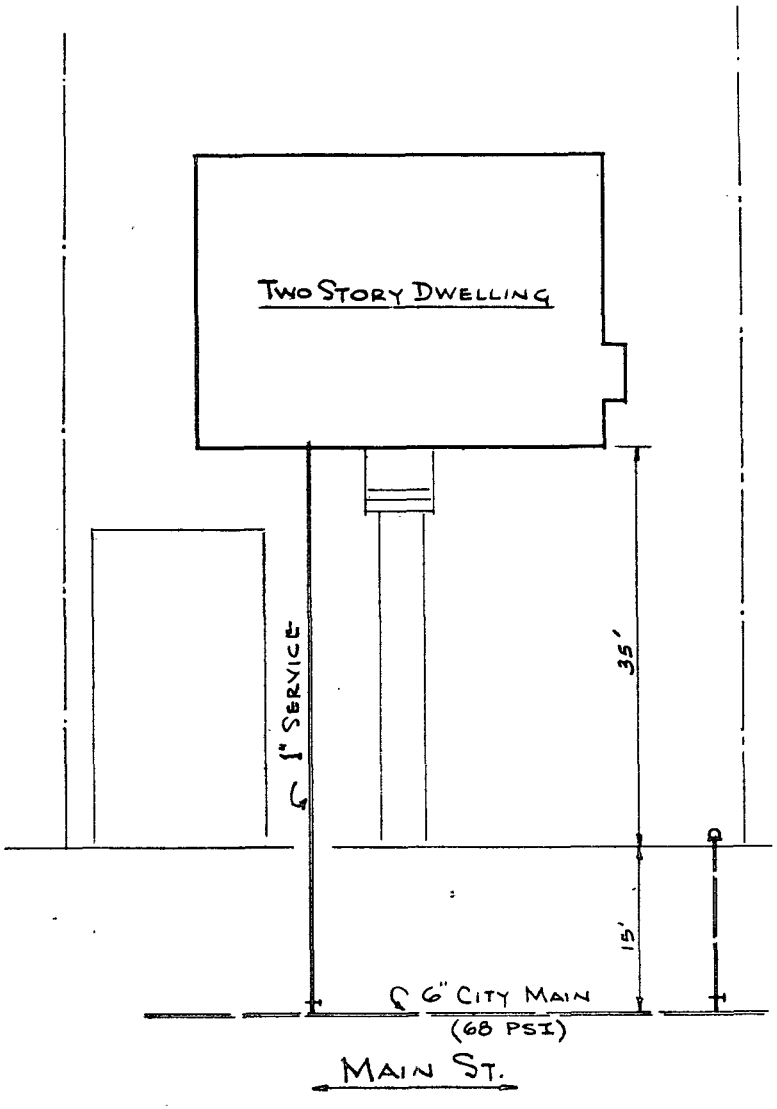
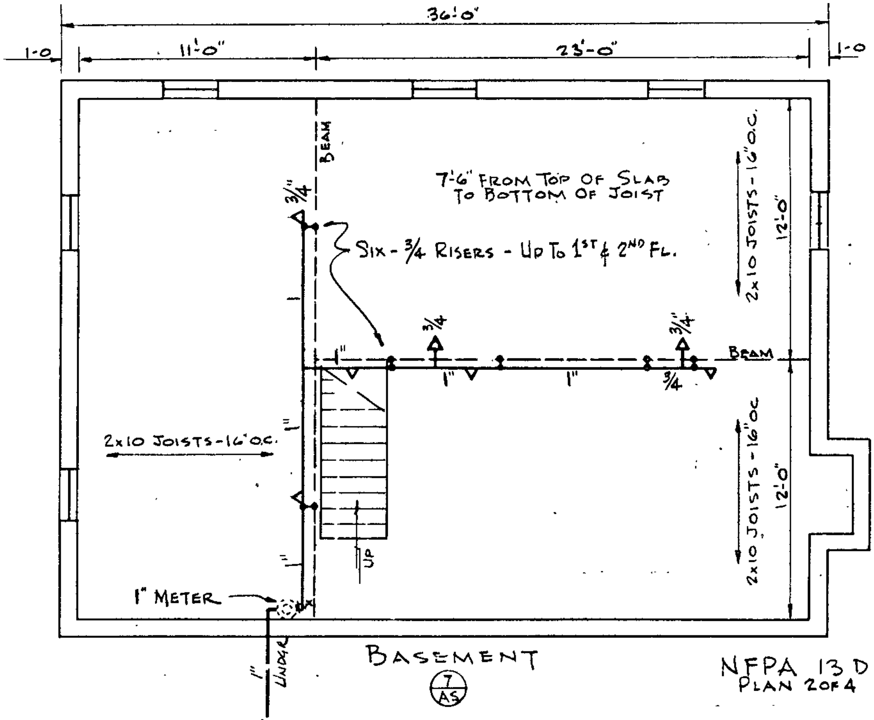


Figure C-1



36'-0"
1-0
11'-0"
23'-0"
1-0
BEAM
7'-6" FROM TOP OF SLAB
TO BOTTOM OF JOIST
3/4
SIX - 3/4 RISERS - UP TO 1ST & 2ND FL.
2x10 JOISTS - 16" O.C.
12'-0"
3/4
3/4"
BEAM
1"
1"
1"
3/4
2x10 JOISTS - 16" O.C.
2x10 JOISTS - 16" O.C.
12'-0"
UP
1" METER
1" UNDER
BASEMENT
7
AS
NFPA 13 D
PLAN 2 OF 4

Figure C-2

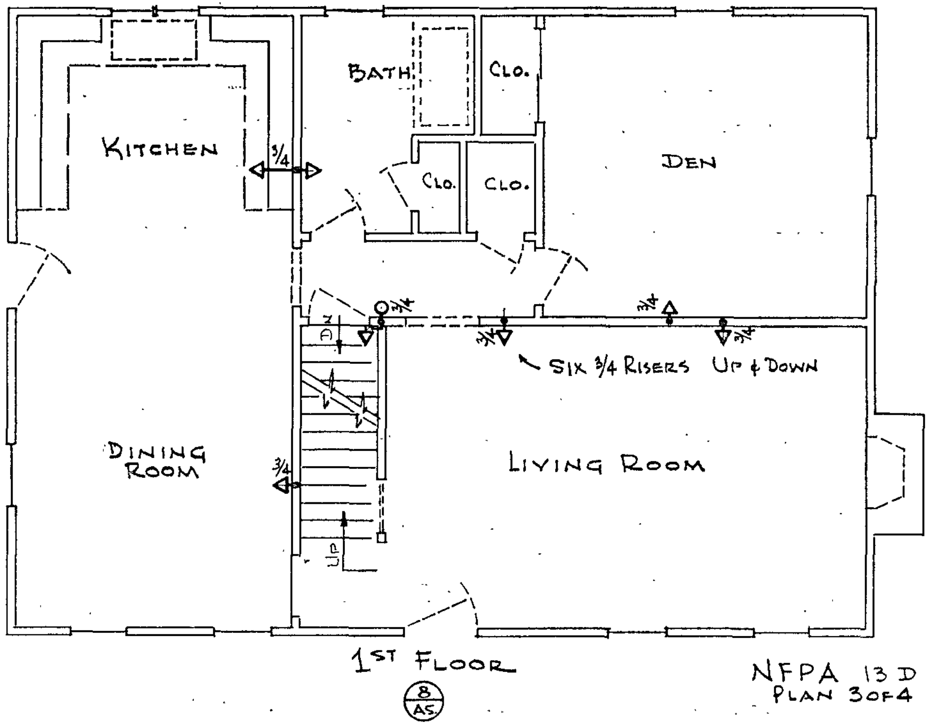

KITCHEN
3/4
BATH
CLO.
CLO.
CLO.
DEN
3/4
3/4
3/4
3/4
DN
SIX 3/4 RISERS UP & DOWN
DINING ROOM
3/4
LIVING ROOM
UP
1ST FLOOR
8
AS.
NFPA 13 D
PLAN 3 OF 4

Figure C-3

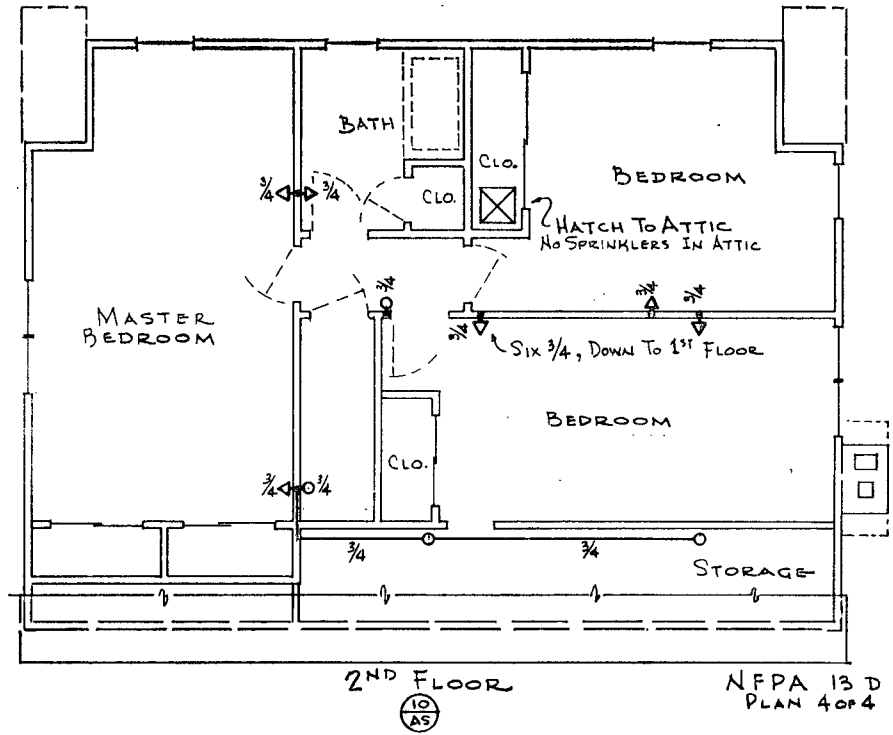

BATH
CLO.
CLO.
BEDROOM
HATCH TO ATTIC
NO SPRINKLERS IN ATTIC
MASTER BEDROOM
SIX 3/4, DOWN TO 1ST FLOOR
BEDROOM
CLO.
STORAGE
2ND FLOOR
10
A5
NFPA 13 D
PLAN 4 OF 4

Figure C-4

	Individual Loss	Net Total
a. Water Pressure in Street (Static Gauge Pressure)		68
b. Arbitrarily Select Pipe Size 1" & 3/4"		
c. Deduct Meter Loss (1" Size)	3.6	64.40
d. Deduct Loss for Elevation (25 ft. x .434)	10.85	53.55
e. Deduct Loss From Street to Sprinkler System Control Valve*		
1" Pipe – 51 ft.		
2 Valves – 2 ft.		
2 Elbows – 6 ft.		
1 Tee – 5 ft.		
Total – 64 ft. x .14 =	8.96	44.59
f. Deduct Loss for Piping – Control Valve to Farthest Sprinkler		
3/4" Size, 19 ft. x .52 = 9.88		
1" Size, 35 ft. x .14 = 4.90	14.78	29.81

g. Deduct Valve and Fitting Losses, Sprinkler System Control Valve to Farthest Sprinkler**

Size	Quan.	Description	Total Equiv. Feet
3/4"	6	90° Elbow	12
		45° Elbow	
		Tee	
		Check Valve	
		Valve (____)	
		Total	12 Ft. x .52 = 6.24 23.57

Size	Quan.	Description	Total Equiv. Feet
1"	1	90° Elbow	3
	1	45° Elbow	
	1	Tee	5
	1	Check Valve	4
	1	Valve (OS&Y)	1
		Total	13 Ft. x .14 = 1.82 21.75

Remaining Pressure Must be at Least 20 PSI

*Factors from Table 3-1.6.2(a) **See Table 3-1.6.2(b)

Figure C-5. Calculation Sheet for Two Story Dwelling on Main Street (See Figures C-1 through C-4)

Hazen and Williams' C. = 140 Density = .10 Area = 170 sq. ft.

K	*Gpm*	*Total Gpm*	*Pipe ID*	*Equiv Ft.*	*PF/L*	*Total PSI*	*Ref PT*	*Notes*
Cross Main						9.00	1	Roof
5.56	17	17	.75	19.8	7.06	16.06		
Elvation		17		8.0	3.46	19.52	2	2nd Fl.
0	0	17	.75	21.0	7.80	27.32		
Elevation		17		8.0	3.46	30.78	3	1st. Fl.
Spk = 0	0	17	.75	21.0	7.80	38.58	4	
		17	.75	34.8	12.63	51.21		
Meter Loss		17	.75		4.90	56.11		
Elevation		17		9.0	3.90	60.01	5	Base of Riser
Underground Hazen and Williams' C. = 140		17	.99	65.0	6.25	66.26 (See NOTE)		"A" & City Connection

NOTE: 68 psi available

Figure C-6. Hydraulic Calculation for Two Story Dwelling on Main Street (*See Figure C-7.*)