Report of Committee on Water Extinguishing Systems

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(Nonvoting)

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Technical Committee on Automatic Sprinklers

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Harry Shaw, US Fire Administration
Vote limited to NFPA 13D
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  (Alternate to K. Forget)

This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

The Report of the Committee on Water Extinguishing Systems and Related Equipment is presented in 6 parts.

Part I, prepared by the Technical Committee on Automatic Sprinklers proposes for adoption its Report on amendments to NFPA 13-1980, Standard for the Installation of Sprinkler Systems. NFPA 13 is published in Volume 2 of the 1982 National Fire Codes and in separate pamphlet form.

Part I has been submitted to letter ballot of the Technical Committee on Automatic Sprinklers in 3 segments. Segment number 1 consists of Proposal P75 (Chapter 9), segment number 2 consists of Proposal 403 (sections 4-2.5 and 4-2.5.2), and segment number 3 consists of the balance of the Proposals.

The Technical Committee on Automatic Sprinklers consists of 23 eligible voting members. On Proposal P75 (Chapter 9), 21 voted affirmatively, 1 has been recorded as not voting (Mr. Hammerman), and 1 ballot not returned (Mr. Henry).

On Proposal 403 (sections 4-2.5 and 4-2.5.2), 22 voted affirmatively, and 1 ballot not returned (Mr. Henry).

On the balance of the Proposals, 21 voted affirmatively, 1 negative (Mr. Jensen), and 1 ballot not returned (Mr. Henry).

Mr. Jensen voted negatively for the following reasons:

Proposal 101, (1-1)

The words "exposure protection" in lines 2 and 3 limit the standard to open systems for this application only and are in conflict with new paragraph 3-16.2.6 (page 35) of this vote draft.

Proposal 109, (1-11.3.1 and 1-11.4.1)

As written, the exception implies that you can test a portion of the system. The phrase "at the low point of the individual systems or zones being tested" should not have been inserted as proposed. Rather, a second sentence should have been added which says, "The test pressure shall be read from a gauge located at the low point of the individual systems or zone being tested."

Proposal 201, (2-2.1 and 2-2.1.2.12)

As written, the paragraph permits a design area less than 2000 sq ft which I do not believe is the Committee's intent. Inserting the word "to" between the words "not" and "less" in the last line will correct the problem. Further, it is impossible to incorporate Figure A-2-2.1.3 into section 2-2.1(b) as suggested. The latter figure as currently drawn encompasses an area ranging from 1500-5000 sq ft and densities of .05 to .22. The word "incorporate" should be changed to the word "combine" to repair this item.

Proposal P77, (2-2.1.2.2 Exception)

A written, this implies that each and every hose connection within reach of a hydraulic system must have water added for it. I believe the Committee's intent was to add a maximum of 100 gpm per Table 2-2.1(b), but that is not what the Exception says. I will submit a public proposal later in an attempt to repair this.

Proposal P79, (2-8.1)

The substantiation given does not support the action taken by the Committee. It is only the opinion or concern of the Submitter. If the Committee's reason is that the UL/FM listing limits the use to underground situations, then we should say so and indicate that our rationale is to preclude an impropr use deriving from the listing.

Proposal P52, (3-10.3.4) and Proposal P88, (3-3.4)

If pipe is run through gypsum wallboard when it forms a part of a rated assembly, any differential movement between the wall and the pipe will cause the wallboard to fail. This will violate fire resistance rating of the wall. Often this will occur above membrane ceilings where it cannot be seen. In my opinion, it is necessary to allow some clearance in such situations. Further, I believe we have a responsibility not to recommend construction that may be realistically expected to fail under common use conditions.

Proposal P90, (3-12.3.2)

No figure has been provided with the vote draft; therefore it is impossible to vote affirmatively on this item.

Proposal P39, (3-16)

Paragraph 3-16.1(C) is an improper description of the discharge character of a sidewall sprinkler. Sidewall sprinkler will discharge 60 percent of its water outward into the room in a half paraboloid pattern and 40 percent of its pattern down on the back wall. UL did a Bulletin of Research on this back in the 1940's. Section 3-16.2.1 (Exception) is vague and unclear; 3-16.2.3 presents no rationale for restricting the use of old style sprinklers. Section 3-16.2.6 conflicts with the scope as stated in the report draft in Proposal 101. Exception 2 to 3-16.6.1 conflicts with proposal 306 on page 40. Also as written on page 37 (Exception 2), will intorduce gross confusion in the industry because of the lack of consistency between the color code suggest for glass bulb sprinklers and all other types of sprinklers. Though I recognize the rationale is pressure from ISO, I do not think we can repair the situation by legislating confustion. If we are going to change to the ISO color standards for glass bulb sprinklers, then we should change the color standards for all sprinklers and be uniform.

Proposal P100, (3-16.2.5 and Table 3-16.5)

The committee action is in conflict with the action on Proposal P39.

Proposal P117, (Table 3-16.5)

Such sprinklers are permitted under the present standard by 3-16.2.6 and in this draft by 3-16.5.2. The proposal merely describes what is available and points out that it is UL/FM listed. I believe it should be included in the standard.

Proposal 404, (4-1.3.8, 4-3.6 and 4-4.4.2)

The recommendation does no make sense. We have not described joist spacing depth of beam or beam spacing with respect to defining composite wood joist construction. Apparently there is to be a figure associated with this and nothing is provided.

Proposal 401, (4-4.4.2(d)

The wording permits an unsprinklered concealed space having exposed sealer plastics with a 25 or less flamespread. Wall corner tests of these types of materials have demonstrated their combustibility.

Proposal P21, (4-4.8.1.1)

The paragraph simply does not make sense to me. If we are within a combustible shaft, the important criteria would seem to be how the sprinkler wets the exposed combustible sufaces and not whether we have some magical 200 square foot number. If one were dealing with a building having a 10-foot floor to floor space, 16 feet or lineal wall surface would be the maximum for a sprinkler; i.e., a square area of 4 x 4 feet. It seems to me that the spacing rules permit one to cover an area of 15 x 15, which would appear to place an upper limit of 1000 square feet for a square configuration. I think we are going to have trouble with the public understanding this section.

Proposal P62, (4-4.8.2.3)

The substantiation does not support the recommendation. Further, it is not consistent with NFPA 101 and the test done jointly by Grinnell and Otis Elevator in the late 1940's.

Proposal P67, (4-4.2.1)

Having just completed modification of the sprinkler protection design for the stages at two major hotels, one in Reno and one in Las Vegas, where we had major stage lifts (approximately 40 x 60), I would point out that the props on the lifts need to be protected, and at all levels. In this particular instance, the lifts encompassed 4 stories and had 3 levels and what is proposed in P67 would simply not have worked.

To get water into the combustibles on the lifts it was necessary to go to an application of extended coverage sidewalls. I would recommend that this be referred back to committee for careful reconsideration.

Proposal 501, (5-2.7.3)

This is maintenance or operating instructions and belongs in 13E, 13A or the Appendix.

Proposal 405, (5-3.4)

We should also refer to NFPA 72E.

Proposal P108, (5-6.1.2.3 and 5-6.1.12)

This change in 5-6.1.2.2 defeats the entire purpose of section 5-6.1. The combined systems that have been installed to date are arranged so that if a non-sprinkler component fails, the protection characteristics will not be defeated. For example, luminaires in the SSA systems were fed through restriction fittings and even if there were a failure, could not rob the system of water. This should be returned to sub-committee so they can study the problem before we overreact.

Proposal P83, (A-3-1.1.4)

While the attempt to include thicknesses is laudable, I believe we have opened the door to an obligation to include thicknesses of all piping products when we include this table. Soon we will be carrying a sprinkler standard that will be the size of the NFPA Handbook.

Proposal P64, (A-4-4.8.2.3)

If one makes this change, the material in former A-4-4.8.2.3 (Proposal 402) becomes mandatory and we have placed a severe prescriptive requirement for the precise design of draft stops and location of sprinklers in the standard. Architecturally this becomes an extreme problem where one must aesthetically treat stairways that are visually important in light hazard occupancies. There is no fire record that supports the need for this restrictive requirement.

Part I has also been submitted to letter ballot of the Correlating Committee on Water Extinguishing Systems and Related Equipment which consists of 8 voting members; all of whom voted affirmatively.

Part II of the Report is a draft of a proposed new document NFPA 13S, Installation of Limited Protection Sprinkler Systems for Small Buildings presented by the Technical Committee on Automatic Sprinklers. This Report is submitted for the purpose of information and the Committee solicits Public Proposals on this document. This Report is not submitted for formal action by the Association.

Part III, prepared by the Technical Committee on Foam-Water Sprinklers proposes for adoption its Report on a new document NFPA 16A-1983, Recommended Practice for the Installation of Closed Head Foam-Water Sprinkler Systems.

Part III has been submitted to letter ballot of the Technical Committee on Foam-Water Sprinklers which consists of 18 voting members; of whom 17 voted affirmatively, and 1 negatively (Mr. Wohlers).

Mr. Wohlers voted negatively for the following reason:

Section 3-2.3 of NFPA 16 lists an exception to this paragraph for aircraft hangars and refers to NFPA 409, which list the deluge foam water supply of 45 minutes.

In NFPA 16A, the purpose of closed head systems is to reduce water supplies. It is neither logical nor economical to increase water supply requirements to 60 minutes for closed head systems, and is contrary to other NFPA standards.

Part III has also been submitted to letter ballot of the Correlating Committee on Water Extinguishing Systems and Related Equipment which consists of 8 voting members; all of whom voted affirmatively.

Part IV, prepared by the Technical Committee on Private Water Supply Piping Systems proposes for adoption its Report on a reconfirmation of NFPA 26-1976, Recommended Practice for the Supervision of Valves Controlling Water Supplies for Fire Protection. NFPA 26-1976 is published in Volume 13 of the 1982 National Fire Codes and in a separate pamphlet form.

Part IV has been submitted to letter ballot of the Technical Committee on Private Water Supply Piping Systems which consists of 23 voting members; of whom 18 voted affirmatively, and 5 ballots not returned (Messrs. Conaway, Houck, McInerney, Simpson and Zott).

Part IV has also been submitted to letter ballot of the Correlating Committee on Water Extinguishing Systems and Related Equipment which consists of 8 voting members; all of whom voted affirmatively.

Part V, prepared by the Technical Committee on Private Water Supply Piping Systems proposes for adoption its Report on a reconfirmation of NFPA 291-1977, Recommended Practice for Fire Flow Testing and Marking of Hydrants. NFPA 291-1977 is published in Volume 13 of the 1982 National Fire Codes and in a separate pamphlet form.

Part V has been submitted to letter ballot of the Technical Committee on Private Water Supply Piping Systems which consists of 23 voting members; of whom 18 voted affirmatively, and 5 ballots not returned (Messrs. Conaway, Houck, McInerney, Simpson and Zott).

Part V has also been submitted to letter ballot of the Correlating Committee on Water Extinguishing Systems and Related Equipment which consists of 8 voting members; all of whom voted affirmatively.

Part VI, prepared by the Technical Committee on Standpipes proposes for adoption partial amendments to NFPA 14-1980, Standard for the Installation of Standpipe and Hose Systems. NFPA 14-1980 is published in Volume 2 of the 1982 National Fire Codes and in a separate pamphlet form.

Part VI has been submitted to letter ballot of the Technical Committee on Standpipes which consists of 23 voting members; of whom 14 voted affirmatively, 1 negatively (Mr. Moccio) and 8 ballots not returned (Messrs. Beard, Forget, Koen, Plantinga, Suchomel, Thompson, Westhaus and Zott).

Mr. Moccio voted negatively because of the Committee Action on Proposal No. 14-13. His comments were as follows:

In the critical first minutes of a fire, this could cause confusion and perhaps a mistake by fire fighters into immediately thinking that there is no standpipe within the stairway.

In addition, I do no accept the justification used by the committee to substantiate this requirement.

Part VI has also been submitted to letter ballot of the Correlating Committee on Water Extinguishing Systems and Related Equipment which consists of 8 voting members; all of whom voted affirmatively.

13- P25 - (Entire Standard): Reject
SUBMITTER: Dennis Kirson, Brookhaven National Laboratory
RECOMMENDATION: Throughout the text of NFPA 13, whenever system requirements are given, it should be absolutely clear whether the requirement applies to dry-pipe systems only, or to both dry-pipe and pre-action systems.
SUBSTANTIATION: The definitions in Chapter 5 make a strong distinction between dry-pipe and pre-action sprinkler systems. However, the text of NFPA 13 is not consistently clear in maintaining this distinction between dry-pipe, dry, and pre-action sprinkler systems. For example, some of sub-section 5-2.7, Air Pressure and Supply, must also apply to pre-action systems (Section 5-3). Similarly, for sub-section 1-11.4, Articles 2-?.1.2.5, 2-7.?.3, 3-?.?, etc.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: Submitter has not included the paragraph of NFPA 13 to which the proposal is directed in accordance with section 10-10(b) of the Regulations Governing Committee Projects.
In addition, pre-action systems are special use systems which must conform to their listing, manufacturer's instructions, and as required by the authority having jurisdiction. Requirements applicable to dry-pipe systems may not always apply to pre-action systems.

13- 101 - (1-1): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Revise the Scope to read as follows:
1-1 Scope. This standard provides the minimum requirements for the design and installation of automatic and of open exposure protection sprinkler systems, including the character and adequacy of water supplies and the selection of sprinklers, piping, valves and all materials and accessories; but not including the installation of private fire service mains and their appurtances, the installation of fire pumps, the construction and installation of gravity and pressure tanks and towers.
SUBSTANTIATION: The revised scope of the standard is more consistent with the scope of the Committee as revised by the Standards Council at their October 30 and 31, 1980 meeting.
COMMITTEE ACTION: Accept.

13- 106 - (1-2): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Add the following to 1-2: "Nothing in this standard is intended to restrict new technologies or alternate arrangements, providing the level of safety prescribed by the standard is not lowered."
SUBSTANTIATION: Addition of new wording is in compliance with the Standards Council recommendation for inclusion of Innovative Technology statements in standards.
COMMITTEE ACTION: Accept.

13- 102 - (1-3): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Revise to read:
Sprinkler System. A sprinkler system, for fire protection purposes, is an integrated system of underground and overhead piping designed in accordance with fire protection engineering standards. The installation includes a water supply, such as a gravity tank, fire pump, reservoir or pressure tank and a connection by underground piping to a city main or both. The portion of the sprinkler system above ground is a network of specially sized or hydraulically designed piping installed in a building, structure or area, generally overhead, and to which sprinklers are attached in a systematic pattern. The valve controlling each system riser is located in the system riser or its supply piping. Each sprinkler system riser includes a device for actuating an alarm when the system is in operation. The system is usually activated by heat from a fire and discharges water over the fire area.
SUBSTANTIATION: Clarification of intent and provides for the need of a controlling valve for each system riser.
COMMITTEE ACTION: Accept.

13- 107 - (1-7.4.1): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Add a new 1-7.4.2 and revise A-1-7.4.1 by deleting the first paragraph as follows:
1-7.4.2 Extra hazard occupancies involve a wide range of variables which may produce severe fires. The following shall be used to evaluate the severity of extra hazard occupancies:
Extra Hazard (Group 1) include occupancies described in 1-7.4.1 with little or no flammable or combustible liquids.
Extra Hazard (Group 2) include occupancies described in 1-7.4.1 with moderate to substantial amounts of flammable or combustible liquids or where shielding of combustibles is extensive.
A-1-7.4.1 Extra Hazard Occupancies (Group 1) include occupancies having conditions similar to: (list same as current A-1-7.4.1 Group 1 occupancies).
Extra Hazard Occupancies (Group 2) include occupancies having conditions similar to: (list same as current A-1-7.4.1 Group 2 occupancies).
SUBSTANTIATION: Editorial revisions needed to comply with Committee recommendation to transfer Extra Hazard water supply requirements from the Appendix.
See Committee Action for proposal No. 201 on 2-2.1 and 2-2.1.2.11.
COMMITTEE ACTION: Accept.

13- P35 - (1-10): Accept in Principle
SUBMITTER: Lewis H. Zimmerman, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Before asking final approval of installed sprinkler equipment by the authority having jurisdiction, the installing company shall complete the appropriate test certificates and forward them to the authority having jurisdiction. (See section 1-12.)
SUBSTANTIATION: The required written statement is seldom, if ever, furnished. The authority having jurisdiction should not be involved in determination of whether contractural obligations have been met. The only documentation the authority should require is the appropriate test certificate forms.
COMMITTEE ACTION: Accept in Principle.
Change to read as follows:
1-10 Approval of Sprinkler Systems. Before asking final approval on the installed sprinkler equipment by the authority having jurisdiction, the installing company shall complete the "Contractor's Material and Test Certificate(s)" and forward them to the authority having jurisdiction. (See Section 1-12.)
COMMITTEE COMMENT: The revised wording should satisfy the Submitter's intent.

13- 104 - (1-11.1): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Revise 1-11.1 to read as follows:
1-11.1 Performance. All tests required by this standard for new work shall be performed by the installer and the Contractor's Material and Test Certificate (see 1-12) shall be completed and forwarded to the authority having jurisdiction. When the authority having jurisdiction desires to be present during the conduct of tests, the installer shall give the authority having jurisdiction advance notification of the time tests will be performed.
SUBSTANTIATION: This section needs editorial rearrangement for clarity.
COMMITTEE ACTION: Accept.

13- 109 - (1-11.3.1 and 1-11.4.1): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Revise 1-11.3.1, add an Exception to 1-11.3.1, delete 1-11.3.2, revise 1-11.4.1 and add A-1-11.3.1 as follows:
1-11.3.1 After "hydrostatically" on the second line, add "at the low point of the individual systems or zone being tested," Delete the word "static" from the fourth line in two locations and add the words "in the system" after the second "pressure" on the same line.
Add an Exception to 1-11.3.1 to read as follows:
Exception: At seasons of the year that will not permit testing with water an interim test may be conducted with air pressure of at least 40 psi (2.8 bars) allowed to stand for 24 hours. The standard hydrostatic test shall be conducted when weather permits.
1-11.4.1 Differential Dry-Pipe Valves. The clapper of a differential type dry-pipe valve shall be held off its seat during any test in excess of 50 psi (3.4 bars) to prevent damaging the valve.
A-1-11.3.1 Example. A sprinkler system has for its water supply a connection to a public water service main. A 100 psi (6.9 bars) rated pump is installed in the connection. With a maximum normal public water supply of 70 psi (4.8 bars) at the low system or zone being tested and a 120 psi (8.3 bars) pump (churn) pressure, the hydrostatic test pressure is 70 + 120 + 50 or 240 psi (16.5 bars).
SUBSTANTIATION: This section needs revision to correlate with requirements in NFPA 14 for combined sprinkler and standpipe systems.
COMMITTEE ACTION: Accept.

13- P76 - (1-11.4.3): Accept
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add to the end of the present sentence: . . ."by opening the inspector's test connection. Trip and water delivery times shall be recorded using the Contractor's Material and Test Certificate for Aboveground Piping."

SUBSTANTIATION: The Contractor's Material and Test Certificate for Aboveground Piping asks that the dry pipe operating test be conducted with the time recorded to trip the system through the test pipe. Nowhere in the regular paragraph type verbiage of 13 is it required that the test connection be opened. Section 1-11.4.3 is the place to state this requirement.
COMMITTEE ACTION: Accept.

13- 201 - (2-2.1 and 2-2.1.2.12): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Revise 2-2.1 as follows:
Delete Table A-2.2.1.3, Figure A-2-2.1.3 and A-2-2.1.3:
Revise 2-2.1.2.7 to read as follows:
2-2.1.2.7 For areas of sprinkler operation less than 1500 sq ft (139 m2) used for light and ordinary hazard occupancies the density for 1500 sq ft (139 m2) shall be used. For areas of sprinkler operation less than 2500 sq ft (232 m2) for extra hazard occupancies (Groups 1 and 2) the density for 2500 sq ft (232 m2) shall be used.
Add a new 2-2.1.2.12 to read as follows:
2-2.1.2.12 When high temperature sprinklers are used for extra hazard occupancies (Groups 1 and 2) the area of sprinkler operation may be reduced by 25 percent without revising the density but not less than 2000 sq ft (185.8 m2).
Combine Figure A-2-2.1.3 into Figure 2-2.1(B) without extrapolating or extending the curves.
Add the entries from Table A-2-2.1.3 to Table 2-2.1(B).
Revise the "See A-2-2.1.3" entries to "See 2-2.1.2.1."
SUBSTANTIATION: The material for extra hazard occupancies has been used extensively for the past three years successfully and should be made a mandatory part of the standard. The curves are based on actual loss experience data and a need to achieve uniformity of design is needed.
COMMITTEE ACTION: Accept.

13- P77 - (2-2.1.2.2 Exception (New)): Accept
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add an Exception to read:
Exception: For hydraulically designed systems, when hose stations connect to the sprinkler system downstream of the base of riser and serve the same area as the sprinkler system, the hose allowance shall be added to the sprinkler requirement at the points where the hose stations connect to the sprinkler system. The combined sprinkler and hose requirement shall be carried back to the base of riser in the hydraulic calculations.
SUBSTANTIATION: Inside hose stations connected to a sprinkler system can in a fire situation rob the sprinkler system of necessary water unless the use of the hoses has been considered in hydraulic design.
COMMITTEE ACTION: Accept.

13- P17 - (Table 2-2.1(B) and 2-3.3 (New)): Reject
SUBMITTER: Frank D. Harrisson, Lavino Shipping Co.
RECOMMENDATION: 2-3.3 If outside use municipal connected fire hydrants at the facility are a part of the facility water supply, a minimum of 2500 gpm is required to supply a combination of fire sprinkler system, a hose standpipe and first line municipal pumper.
SUBSTANTIATION: The municipal pumper would be supplementing the sprinkler systems, facility hose systems and their own equipment.
Combined facility demand per Table 2-2.1(B) ranges from 250 gpm for 30 minutes to 1250 gpm for 60-120 minutes plus the demand from the municipal pumpers would net a minimum of between 1500 gpm to 2500 gpm if all systems are expected to be maintained simultaneously.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: Experience does not indicate that Table 2-2.1(B) is inadequate. Fire department operations in occupancies protected by sprinkler systems are outside the scope of the Technical Committee or Automatic Sprinklers.

13- P20 - (2-5.3 (New)): Reject
SUBMITTER: Frank D. Harrisson, Lavino Shipping Co.
RECOMMENDATION: Add new 2-5.3 and title "Combined Systems and Special Problems."
If it is restricted to fire sprinkler systems in power outage free areas, I recommend electric motor driven fire pumps or in trouble areas, a double ended sub-station that derives its power from two separate sources or an emergency generator with a transfer switch. This could be used for emergency lighting as well, cost effective.
Facilities that have fire control systems that are integral with fire sprinkler, hose and hydrant systems it is a must that a dual fire pump system in large facilities or an auto/man operated engine driven pump on small systems be required. The first on-the-line pump could be electric motor driven. The second pump should be both automatic and manual control with an aircraft type throttle, therefore, it should be diesel (preferred) or L.P.G. engine driven.
SUBSTANTIATION: As you may know a master stream nozzle requires 50 psi, a combination nozzle (fog) requires 100 psi, sprinkler nozzles require 12 psi. An electric motor driven fire pump could be developing 150 to 165 psi which as it should be when the demand is automatic because the pressure will drop as the demand goes up. However, on hose and hydrant operations this is too much for anyone to handle and it causes the streams to break up.
The Fire Department or Brigade officer should have the option to start the engine, set the required pressure to maintain a proper flow on the sprinkler heads and at the same time be at a reasonable pressure for the hand lines, and then shut down the electric unit.
As the demand for the diesel unit is overcome, the electric unit could be put on the line and the diesel could be once again adjusted to demand. I find that an overall engine pressure of 75 to 100 psi is a good operating pressure and opening and closing any lines that changes demand can quickly be controlled by the pump operator.
However, when all systems go back on automatic standby, it is the duty of the pump operator and the Brigade Chief to see to it that the engine is set at 150 psi static before the system is declared back-in-service. This would cause no more hardship than restoring the fire sprinkler systems nor the hose stations.
As you see, these proceedings not only affect NFPA 13, but many others that should be coordinated such as NFPA 20, 231, 14, 24, 87, 13E, 27, etc.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: Fire pump installations and fire department operations in occupancies protected by sprinkler systems are not within the scope of the Automatic Sprinkler Committee.

13- P36 - (2-7.1 and Exception (New)): Accept
SUBMITTER: Lewis H. Zimmerman, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Delete first part of paragraph and reword so section reads:
2-7.1 A fire department connection shall be provided as described in this section.
Exception: When permission of the authority having jurisdiction has been obtained for its omission.
SUBSTANTIATION: As a performance standard, the present first sentence is superfluous.
COMMITTEE ACTION: Accept.

13- P47 - (2-8): Reject
SUBMITTER: R.P. Fleming, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Delete.
SUBSTANTIATION: Under the new arrangement of scopes and definitions, these sections refer to the private fire service main and belong in NFPA 24.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: There is a need to provide transition between underground and aboveground piping.

13- P79 - (2-8.1): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add an additional sentence to read: "Riser stubs which extend through floors or walls shall be of ferrous or copper material (see Table 3-1.1.1)."
SUBSTANTIATION: Riser stubs of listed plastic and PVC type materials have been noted in recent installations to extend above the floor. This situation compromises the sprinkler system in times of fire.
COMMITTEE ACTION: Accept in Principle.
Revise to read as follows:
2-8.1 Connection Between Underground and Above Ground Piping. The connection between the system piping and underground piping shall be made with a suitable transition piece and shall be properly strapped or fastened by approved devices. Transition pieces which extend through walls or floors shall be of ferrous or copper material.
COMMITTEE COMMENT: The revised wording should satisfy the Submitter's intent.

13- P3 - (Table 3-1.1.1 and 3-1.1.4): Reject
SUBMITTER: James L. Hirsch, Revere Copper & Brass Inc.
RECOMMENDATION: We propose Table 3-1.1.1 be amended as follows:
Change subheading from "Copper Tube (Drawn, Seamless) to "Copper and Copper Alloy Tube (Seamless and Welded).
Add: Spec. for Copper Alloy Welded Water Tube ASTM B-642.
We also propose section 3-1.1.4 be changed to read as follows:
3-1.1.4 Copper and copper alloy tube used in fire protection systems shall be produced to, and conform with, the standards listed in Table 3-1.1.1. Underground lines of copper and copper alloy shall have a wall thickness not less than Type L copper water tube.
SUBSTANTIATION: Revere Bronzite WT water tube meets engineering requirements for fire sprinkler systems using 95-5 tin-antimony solder joints. Bronzite WT is currently available in nominal sizes 1/2 in., 3/4 in., 1 in., 1 1/4 in. and 1 1/2 in. in hard straight lengths 10 ft and 20 ft standard. Bronzite WT has listings with all major plumbing codes and approvals throughout the country. There are millions of feet in satisfactory service for potable water distribution, some as long as 5 to 6 years.
Submitter also attached supportive data.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: The tubing has not been listed nor has sufficient documentation been submitted that it is equivalent to materials currently used in sprinkler systems and specified in Table 3-1.1.1. See section 3-1.1.5 which clarifies the intent of the standard.

13- P84 - (3-1.1.7 Exception (New)): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add an Exception to read:
Exception: Schedule 40 steel pipe manufactured to ANSI/ASTM A120 is unsuitable for bending. See Table 3-1.1.1, Note 1, for pipe and tubing suitable for bending.
SUBSTANTIATION: The unsuitability of bending schedule 40 steel pipe manufactured to ANSI/ASTM A120 is covered only in a footnote to Table 3-1.1.1. It deserves attention in the regular section on pipe bending.
COMMITTEE ACTION: Accept in Principle.
Revise the Note below Table 3-1.1.1 to read as follows:
"Denotes pipe or tubing suitable for bending (see 3-1.1.7) according to ASTM standards."
COMMITTEE COMMENT: Revised wording should satisfy Submitter's intent.

13- P48 - (3-4.4): Accept in Principle
SUBMITTER: R.P. Fleming, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Move this section to become section 3-3.2, applying to both pipe schedule and hydraulically designed systems.
SUBSTANTIATION: In its present location, this section applies only to pipe schedule systems. Similar rules are also needed for hydraulically designed systems. Some systems have been installed in atriums and similar situations where the 52,000 sq ft per floor is being met, but more than one floor could be simultaneously exposed to a fire.
COMMITTEE ACTION: Accept in Principle.
Revise 3-3.2 to read as follows:
3-3.2 Grated or Slatted Floors. Areas of buildings having grated or slatted floors shall be treated as one area with respect to pipe sizes, feed mains and risers.
Add an Exception to 3-4.3 to read as follows:
Exception: For buildings with grated or slatted floors, see 3-3.2.
COMMITTEE COMMENT: The revised wording and the addition of the Exception to 3-4.3 should satisfy the Submitter's intent and editorially clarify the section.

13- P32 - (3-5.3.1): Accept
SUBMITTER: Morgan S. Hill, Industrial Risk Insurers
RECOMMENDATION: Printing error, "increased to 5 in." should be changed to read "increased to 3 in."
SUBSTANTIATION: Editorial.
COMMITTEE ACTION: Accept.

13- P49 - (3-5.3.1): Accept
SUBMITTER: Lewis H. Zimmerman, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Replace "5 in." with "3 in."
SUBSTANTIATION: Editorial correction needed to correlate with referenced table.
COMMITTEE ACTION: Accept.

13- P85 - (3-8.1.1 (New)): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add a new section 3-8.1.1 to read:
3-8.1.1 Ceiling sprinkler system and rack storage sprinkler system demands shall be hydraulically balanced at the point of connection.
SUBSTANTIATION: In a fire situation, water will take the path of least resistance. Without proper hydraulic balancing, either the rack system or the ceiling system may behave hydraulically different from that intended in the system design.
COMMITTEE ACTION: Accept in Principle.
Change the Submitter's recommended text and relocate to read as follows:
2-2.1.2.3 Water supply demands for ceiling sprinklers and in rack sprinklers for rack storage systems shall be combined and hydraulically balanced at the common supply point.
Renumber existing 2-2.1.2.3 through 2-2.1.2.10 as 2-2.1.2.4 through 2-2.1.2.11.
COMMITTEE COMMENT: The relocation to 2-2.1.2.3 should satisfy the submitter's intent.

13- P33 - (3-8.5): Accept
SUBMITTER: Lewis H. Zimmerman, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Change the last part of the sentence following "(see 3-10.2)" to "or unprotected cast or ductile iron pipe may be used when joined with a gasketed joint approved for air service."
SUBSTANTIATION: Present language was written when cast-iron pipe was being joined with lead joints, which are not suitable for use in an air system, and gasketed joints consisted of flanges and rubber gaskets. Cast or ductile iron pipe can now be joined with gasketed joint fittings, but not all are suitable for use in air service.
COMMITTEE ACTION: Accept.
Change the Submitter's recommended text by changing the word "approved", in the second line to "listed" and adding the word "underground" at the very end.

13- P50 - (3-8.6): Reject
SUBMITTER: Jack Thacker, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: 3-8.6 One and one-half inch hose connections. When required, First-Aid hose stations connected to wet pipe sprinkler systems shall consist of listed or approved equipment installed in accordance with the following criteria:
(a) Each hose station outlet shall be provided with lined hose not less than 1 1/2 in. in diameter. The hose station shall be equipped with a listed combination fog and straight stream nozzle and listed rack or other approved storage facility.
(b) Hose stations supply pipes shall not be connected to any pipe smaller than 2 1/2 in.
Exception: For hydraulically designed loops and grids the minimum size pipe between the hose stations supply pipe and the source may be 2 in.
(c) The hose station shall be located so all areas to be protected can be reached with a maximum 100 ft hose with 30 ft spray. Hose station should be supplied by pipe sized to provide a minimum of 50 gpm at 40 psi at the hose valve. This pipe system shall be capable of supplying any two hose outlets simultaneously but not including sprinkler demand.
(d) Piping shall be at least 1 in. for one hose station and 1 1/4 in. for two or more units.
(e) When the pressure at any hose station outlet exceeds 100 lb/psi (6.9 bars), an approved device shall be installed at the outlet to reduce the pressure at the outlet to 100 lb/psi (6.9 bars).
SUBSTANTIATION: Section 3-8.6 does not provide designer with enough information as to gpm and/or pressure. For lack of guidance, Authorities Having Jurisdiction are then requiring section 5-4.1 of NFPA 14 (1980) to be followed, which is not the intent and in most cases can't be complied with without pumps. Also with normal pipe sizes provided with either calculated or pipe sized systems, not enough pressure is available at the nozzle with the hose pipe sizing indicated in the present NFPA 13, section 3-8.6.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: Hose stations and hose station equipment are outside the scope of the Committee on Automatic Sprinklers. See Proposal No. 309 on A-3-8.6.

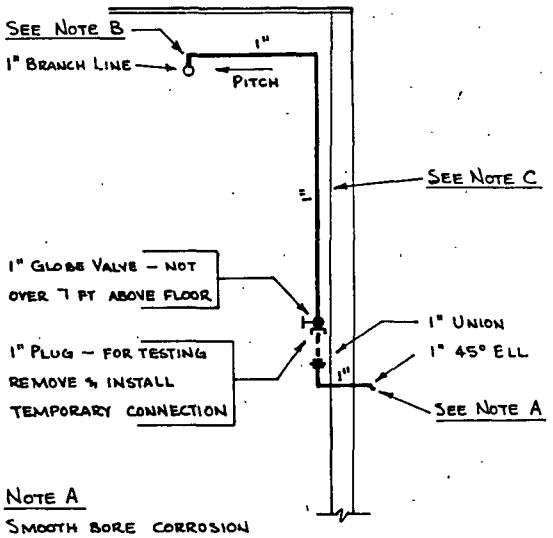
13- P86 - (3-8.6(b)): Accept
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Reword section 3-8.6(b) to read: "Pipe shall be minimum 1 in. for horizontal runs up to 20 ft (6.1 m), minimum 1 1/4 in. for the entire run for runs between 20 and 80 ft (6.1 and 24.4 m), and minimum 1 1/2 in. for the entire run for runs greater than 80 ft (24.4 m)."
SUBSTANTIATION: Rewording to stress the concept of "entire run" is needed due to a recent formal interpretation.
COMMITTEE ACTION: Accept.

13- P31 - (3-8.7): Accept
SUBMITTER: T.G. Collinge, Insurers' Advisory Organization of Canada
RECOMMENDATION: Revise first sentence: "....may be attached to wet pipe sprinkler system risers...."
SUBSTANTIATION: To clarify intent. Present wording of 3-8.7 strongly implies restriction of 2 1/2 in. hose valves to attachment to risers but does not specifically say this.
COMMITTEE ACTION: Accept.

13- P19 - (3-8.8 (New)): Reject
SUBMITTER: Frank D. Harrisson, Lavino Shipping Co.
RECOMMENDATION: Add new section 3-8.8.
3-8.8 Hose connections wet and dry pipe alternate where conditions and authorities permit a 2 1/2 in. hose connection with a gate valve can be "tee'd" into the 2 in. test drain line at each valve control house location for Fire Department and/or Fire Brigade use.
(a) A gate valve would be required on the discharge side of the "tee" to be shut down when the hose connection is in use.
(b) A 1 1/2 in. x 2 1/2 in. adapter with cap can be provided and secured to the hose connection.
(c) The facility Fire Brigade should be provided with a hose cart, wagon or pallet box with enough 2 1/2 in. hose to reach the most remote areas from the nearest valve control house to an incident and the activity is to include a gated "Wye" reducer (two 1 1/2 in. outlets), a minimum of 100 ft of 1 1/2 in. hose and a 1 1/2 in. combination nozzle.
SUBSTANTIATION: 1) This is of particular interest to marine terminals, warehouses, mills and storage facilities where hose reels and racks are subject to obstruction or damage and where freezing and/or heavy moisture is a problem.
2) One man can control both the sprinkler control valve and the hose line valves.
3) The hose line and sprinkler system can be operated simultaneously and independently; therefore, a hose drop supplied by an adjacent system, that would otherwise be an absolute necessity, would not be required.
4) A benefit in respect to economics and at the same time achieving the same results in most facilities with valve control houses that are in close proximity to indoor access.
5) The Fire Department nor the Fire Brigade would have to lay any more hose than necessary just for mopping-up and salvage operations in particular to marine terminals that could see a lay of some 1500 ft (30 lengths of 2 1/2 in.).
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: NFPA 13 is a minimum standard for the installation of sprinkler systems. It cannot be written to address local problems which are within the scope of the local authorities.

13- P51 - (3-9, 3-9.1, 3-9.2, A-3-9(New), A-3-9.2): Accept in Principle
SUBMITTER: L.R. Milam, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: 3-9 In the heading of the section, add an asterisk after the number. Provide the following advisory information in Appendix A:
A-3-9 System test pipes (inspectors test connections) should be piped from the end of the highest and most remote branch line on the system. For calculated systems, the point of connection should be the hydraulically most remote. The discharge should be at a point where it can be readily observed, but not where it may cause damage or injury. In locations where it is not practical to terminate the test pipe outside the building, the test pipe may terminate in a drain capable of accepting full flow under system pressure. (See A-3-11.4.1.) In this event, the test connection should be made using a sight test connection and an in-line smooth bore corrosion resistant orifice having a flow equivalent to one sprinkler of the type installed on the particular system. (See Figures A-3-9.1.1, A-3-9.1.2 and A-3-9.2.) The test valve should be located at an accessible point, and preferably not over 7 ft (2.1 m) above the floor.

3-9.1 Wet Systems is to remain as is. The asterisks, however, now refer only to the figures in Appendix A: Figures A-3-9.1.1 and A-3-9.1.2. Section A-3-9.1.1 is replaced by A-3-9 (above).
Revise 3-9.2 as follows:
3-9.2 Dry Pipe Systems. A test pipe of not less than 1 in. diameter terminating in a smooth bore corrosion resistant orifice giving a flow equivalent to one sprinkler shall be provided for each system. To prevent possible loss of system air, the test valve shall be provided with a plug that can be easily removed for system test.
Revise Figure A-3.9.2 as shown below:



NOTE A
SMOOTH BORE CORROSION RESISTANT OUTLET GIVING FLOW EQUIVALENT TO ONE SPRINKLER.

FIG. A-3-9.2

NOTE B
TO MINIMIZE CONDENSATION OF WATER IN THE DROP TO THE TEST CONNECTION, PROVIDE A NIPPLE-UP OFF OF THE BRANCH LINE.

NOTE C
DROP AS SHOWN COMPLIES WITH SUBPARAGRAPH 3-11.3.3.1 (EXCEPT THAT VALVE IS 1" RATHER THAN ½"). IF THE LENGTH OR SIZE OF PIPE CAUSES THE CAPACITY TO BE GREATER THAN 5 GALLONS*, ARRANGEMENT OF DROP MUST COMPLY WITH 3-11.3.3.2.

* MOST UNLIKELY. CAPACITY OF 1'-0" OF 1" SCH. 40 PIPE = 0.045 GALLONS. THEREFORE, 5 GALLONS EQUALS 111 LINEAR FEET. IF 1¼" PIPE IS USED, 5 GALLONS EQUALS 64 FEET (5 ÷ 0.078).

Figure A-3-9.2

SUBSTANTIATION: The general requirements for inspectors test connections are the same for all types of systems. The only basic differences between test connections for dry systems versus wet systems are: 1) the need to plug off the test valve to prevent possible loss of system air, and 2) the desirability of not having water trapped at a low point in the dry system -- hence the past practice of installing the test valve at the highest point on the system.

In the real world, however, installing a test valve at the highest elevation on a dry system is impractical. Often, it is completely beyond the reach of the inspector. At other times, it is most inconvenient to obtain means of getting to the valve. The valve, therefore, should be made accessible in the same manner as for a wet system, but with precautions taken to prevent loss of system air and the accumulation of water in the drop to the test connection.

COMMITTEE ACTION: Accept in Principle.

COMMITTEE COMMENT: See Committee Action on Proposal No. 307 on 3-9.

13- 307 - (3-9): Accept

SUBMITTER: Technical Committee on Automatic Sprinklers

RECOMMENDATION: Revise Section 3-9 to read as follows:

3-9 System Test Pipes.

3-9.1 Wet Systems.

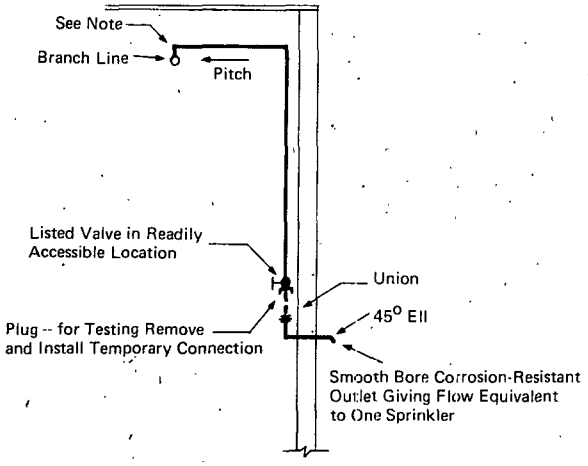
3-9.1.1 A test pipe not less than 1 in. diameter terminating in a smooth bore corrosion resistant orifice giving a flow equivalent to one sprinkler shall be provided for each system. The test connection valve shall be readily accessible. The discharge shall be to the outside, to a drain connection capable of accepting full flow under system pressure or to another location where water damage will not result.

3-9.1.2* In multi-story buildings where waterflow alarm devices are provided at each riser on each floor or where more than one alarm device is provided in one sprinkler system, a test pipe shall be provided for testing each alarm device.

3-9.2* Dry-Pipe Systems. A test pipe of not less than 1 in. in size terminating in a smooth or corrosion resistant orifice to provide a flow equivalent to one sprinkler of a type installed on the particular system shall be installed on the end of the most distant sprinkler pipe in the upper story and be equipped with a 1 in. shut-off valve and brass plug or nipple and cap.

Figure A-3-9.1.1. Delete references to pipe size.

Figure A-3-9.1.2 Delete references to pipe size. Change caption at the union to read, "Union with corrosion resistant orifice giving flow equivalent to the smallest sprinkler orifice in the system." Change sprinkler riser to system riser.



NOTE: To minimize condensation of water in the drop to the test connection, provide a nipple-up off of the branch line.

Figure A-3-9.2

SUBSTANTIATION: More guidance on the use of system test pipes is needed. Also the section should be editorially revised for clarity.

COMMITTEE ACTION: Accept.

13- P12 - (3-9.1.1 and A-3-9.1.1): Accept in Part

SUBMITTER: David M. Hammerman, Department of Economic & Community Development

RECOMMENDATION: Rewrite this section to include the information contained in A-3-9.1.1 as follows:

3-9.1.1 A test pipe of not less than 1 in. diameter terminating in a smooth bore corrosion resistant outlet giving a flow equivalent to one sprinkler shall be provided for each system.

3-9.1.1.1 The test pipe shall be piped from the end of the most remote branch line. The discharge shall be at a point where it can be readily observed. In locations where it is not practical to terminate the test pipe outside the building, the test pipe shall terminate into a drain capable of accepting full flow under system pressure.

3-9.1.1.2* Where test connections terminate inside buildings, the test connection shall be made using an approved sight connection containing a smooth bore corrosion resistant orifice giving a flow equivalent to one sprinkler. See Appendix figures A-3-9.1.1(a) and A-3-9.1.1(b).

3-9.1.1.3 The test valve shall be located at an accessible point above the floor and the control valve on the test connection shall be located at a point not exposed to freezing.

SUBSTANTIATION: As presently written the standard is weak where it requires test pipe connections. Rewriting the Appendix as mandatory provisions addresses the issue and provides for a complete automatic sprinkler system including one of the more important features, i.e., the test pipe connection and proper arrangement so that it can be used as intended for testing purposes.

COMMITTEE ACTION: Accept in Part.

COMMITTEE COMMENT: See Committee Action on Proposal No. 307 on 3-9. The Committee has resolved the Submitter's concern about the test connection accessibility and drain connection capability.

13- P87 - (3-9.2): Accept in Principle

SUBMITTER: Ron Cote', Factory Mutual Research Corp.

RECOMMENDATION: Reword section 3-9.2, Dry-Pipe Systems, to read: 3-9.2 An inspector's test, of the same nominal diameter as the smallest branchline section, with a smooth corrosion resistant orifice....and be equipped with a shutoff valve and brass plug of the same nominal size as the test piping.

SUBSTANTIATION: A more realistic test connection for simulation of one open sprinkler should be of the size as the smallest branchline piping. In some cases, this will change the inspector's test to 1 1/4, 1 1/2 or even 2 in. size.

Requiring a brass plug, rather than the current option of cast iron or brass plug, will help assure that the connection not rust together.

COMMITTEE ACTION: Accept in Principle.

In the last line delete "cast-iron or," after brass plug add, "or nipple and cap".

COMMITTEE COMMENT: The use of a nipple and cap for easy removal is consistent with current pipe fitting practices. Also see Proposal 307 on section 3-9.

13- P37 - (3-9.2): Reject

SUBMITTER: Lewis H. Zimmerman, National Automatic Sprinkler & Fire Control Assoc.

RECOMMENDATION: 3-9.2 Dry Pipe Systems. An inspectors test shall be provided at the highest and most remote end of a branch line as conveniently possible relative to the dry-pipe valve location. The test connection shall terminate in a smooth bore orifice consisting of 1 in. schedule 40 galvanized pipe and shall be controlled by a 1 in. ball type shut off valve. The pipe from the end of the branch line to the shut off valve shall be the same diameter as the branch line at the point of connection, and if necessary, shall be reduced to 1 in. nominal size by use of a reducer fitting just prior to entering the shut off valve.

SUBSTANTIATION: The present dry-pipe inspector's test requirement is unrealistically stringent in that it simulates the operation of only one sprinkler. Actual fire statistics indicate that in most situations more than one sprinkler operates in a fire involving a dry-pipe system. A 1 in. pipe as a test orifice would provide an outlet with a cross-sectional area equivalent to the cross sectional area of approximately four sprinklers and would more nearly duplicate a true fire condition. The ball valve would provide rapid operation similar to sprinklers fusing. The requirement to increase the area of application by 30 percent in a calculated dry system would also support the fact that additional sprinklers operate under actual fire conditions.

COMMITTEE ACTION: Reject.

COMMITTEE COMMENT: Presently the Committee lacks the data to write technically valid requirements for dry pipe systems. There are ongoing tests and studies being conducted at the present time that will enable the Committee to provide more substantive input to consider revision of this section for a later edition.

13- P4 - (3-9.2*, 3-9.2.1*(New), 3-9.2.2*(New)): Reject
SUBMITTER: S.R. Hoover, Kemper Insurance
RECOMMENDATION: 3-9.2 Dry Pipe Systems.
3-9.2.1* Non-Gridded Systems. A 1 in. inspector's test with a smooth bore corrosion-resistant outlet to provide a flow equivalent to one sprinkler of a type installed on the particular system shall be installed on the end of the most distant sprinkler line in the upper story and be equipped with a 1 in. shutoff valve and cast iron or brass plug.

Renumber Figure A-3-9.2 as Figure A-3-9.2.1.

Add section 3-9.2.2*:

3-9.2.2* Gridded Systems. A 1 in. inspector's test with a smooth bore corrosion resistant outlet to provide a flow equivalent to one sprinkler of a type installed on the particular system shall be installed at the point in the system which maximizes the delivery time of water to the inspector's test connection resulting from the combination of air evacuation and water fill time. The connection shall be equipped with a 1 in. shutoff valve and cast iron or brass plug.

Insert a new section in the Appendix numbered A-3-9.2.2.

A-3-9.2.2 Dry gridded systems are unique in that the entire system must be filled with water before the operating sprinklers are discharging efficiently. To accomplish this, the test pipe should be at the point which maximizes air evacuation and a water fill time for the system. This point could be one of the following--a monitor area, a mezzanine, a high bay area or a second floor; the highest point in a single floor system sloped toward the riser; or the peak of branch lines where this is required due to the roof shape. It is necessary to provide adequate testing (Section 1-11) and to prove the limitations of the system (section 5-2.3). Without these precautions, it is possible to obtain a water flow through a cross main or bulk main the the test pipe that would give an erroneous indication of the system limitations.

SUBSTANTIATION: Recently there has been concern over the inability of a dry gridded system to operate efficiently within the time limits stated by the standard. It is apparent that even in small gridded systems time delays of two to three minutes occur regularly in delivering water to the inspector's test connection. In larger systems, the delay could be much greater which may result in too many sprinklers being opened, rapidly deteriorating the water supply. Recently, changes have been made in section 5-2.3 to improve on the water delivery time. However, a major factor in proving a system can be the location of the inspector's test connection.

In the straight line system, the location at the end of the most distant branch line in an upper story worked efficiently as the water would pass through the large feed mains toward the open sprinklers while trapping air in the dead-ended branch lines. This trapped air kept the water from being diverted from its course. In gridded systems, however, the piping is balanced such that most of the grid must be emptied of air and filled with water before the sprinklers discharge efficiently.

Present wording in the standard could be interpreted so that the inspector's test connection would be installed at a point physically remote from the riser, but on or very close to one of the cross mains of the system. If that were the case, it is possible to have enough water pass through that larger pipe to reach the inspector's test connection even though the bulk of the air has not been evacuated from the system and the system could not be functioning efficiently in the case of fire. To offset that possibility, it is necessary to provide wording to show that the location of the inspector's test connection is extremely important in order to be sure that most or all of the air is evacuated from the system and that the system is full to the point of operating sprinklers efficiently.

COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: Presently the Committee lacks the data to write technically valid requirements for dry-pipe systems. There are on-going tests and studies being conducted at the present time that will enable the Committee to provide more substantive input to consider revision of this section for a later edition.

13- P43 - (3-10.2.2): Accept
SUBMITTER: Lewis H. Zimmerman, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Delete section.
SUBSTANTIATION: Section 3-10.2.2 is only a specific situation already covered by the general language of 3-10.2.1.
COMMITTEE ACTION: Accept.

13- P52 - (3-10.3.4, (a), (b) and (c) and 3-10.3.4(a) Exceptions No. 1 and 2 (New)): Accept
SUBMITTER: R.P. Fleming, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: In Section 3-10.3.4 change "sleeves" to "clearance."

In 3-10.3.4(a), add "on all sides" after "clearance" and delete "between the pipe and sleeve."

Add Exceptions to 3-10.3.4(a) as follows:

Exception No. 1: When clearance is provided by a pipe sleeve, a nominal diameter 2 in. (50 mm) larger than the nominal diameter of the pipe is acceptable for pipe sizes 1 in. through 3 1/2 in. and the clearance provided by a pipe sleeve of nominal diameter 4 in. (100 mm) larger than the nominal diameter of the pipe is acceptable for pipe sizes 4 in. and larger.

Exception No. 2: No clearance is necessary for piping passing through walls of gypsum board or equally frangible construction.

In section 3-10.3.4(b), delete "between pipe and sleeve."

Delete 3-10.3.4(c).

SUBSTANTIATION: Sleeves are unnecessary for earthquake protection. When used, however, the nominal pipe size 2 in. larger should suffice. (4 inches larger for 4 in. and larger pipe.) It should not be necessary to provide clearance around a pipe passing through a wall which will yield under pressure to the pipe.
COMMITTEE ACTION: Accept.

13- P53 - (3-10.3.5.9 (New)): Reject
SUBMITTER: R.P. Fleming, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Add new section as follows:
3-10.3.5.9 Walls, including gypsum-board non-bearing partitions, which have pipes passing through them perpendicularly may replace a transverse brace.
SUBSTANTIATION: The wall will provide the necessary resistance to excessive vibration, eliminating the need for transverse bracing.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: The Submitter has not included adequate substantiation for the change.

13- P88 - (3-10.4* (New), A-3-10, and A-3-10.4 (New)): Reject
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add a new section to read as follows:
3-10.4* Protection of Piping Against Damage Due to Impact. The annular space around sprinkler system piping passing through masonry or concrete walls shall not be filled with concrete. An annular space of minimum size 1/12 the outside pipe diameter shall be maintained, or the same size annular space filled with mastic (see Figure A-3-10.4). If the pipe passes through a firewall, the space shall be filled with mineral wool, ceramic fiber, or other compressible proprietary compound held in place with a pipe collar.

Renumber section A-3-10 as A-3-10.4.

Insert Figure A-3-10.4 as follows:

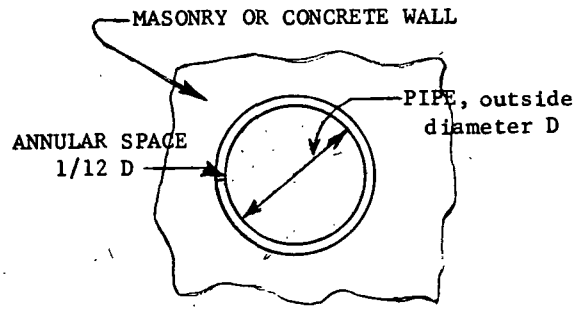


Figure A-3-10.4 Minimum Annular Space.

SUBSTANTIATION: Guidance, in addition to that provided specifically for protection from earthquake, is needed. An annular space 1/12 the outside diameter of the penetrating pipe provides adequate space in non-earthquake areas.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: Insufficient substantiation was submitted to justify the need for a change.

13- P44 - (3-11.3.2): Accept in Principle
SUBMITTER: L.R. Milam, Automatic Sprinkler Corp. of America
RECOMMENDATION: Revise section to have a minimum drain outlet or valve size of 3/4 in. and to permit the use of a ferrous plug in a brass drain valve.

In the second line of section 3-11.3.2.1, replace "1 in." with "3/4 in."

Delete Exception No. 2.

After the comma in the second line of section 3-11.3.2.2, revise the sentence to read: "....the auxiliary drain shall consist of a 3/4 in. valve complete with nipple and cap or plug."
SUBSTANTIATION: Section 3-11.2.4 permits the use of 3/4 in. drain pipe and valves for riser sizes 2 in. or smaller. If the 3/4 in. size is satisfactory for a main drain connection, it is satisfactory for an auxiliary drain connection.

Section 3-11.3.2.1 requires the use of a nipple and cap or "brass" plug when there is no valve. Here, the purpose of the brass plug is to provide dissimilar metals which make it easier to remove the plug. When a plug is required in a drain valve, however, a brass plug is not needed - not needed, that is, if the

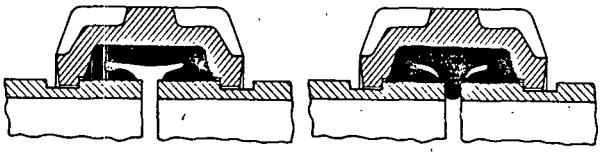
valve itself is brass, and most (if not all) drain valves are brass. In this instance, a standard case iron or malleable iron plug is satisfactory. If there is concern that a plastic plug may be used, then the sentence may be revised to read "....nipple and cap or metal plug."
COMMITTEE ACTION: Accept in Principle.
Revise 3-11.3.2.1 to read as follows:
3-11.3.2.1 When capacity of trap sections of pipes is 5 gal (18.9 L) or less, the auxiliary drain shall consist of a nipple and cap or brass plug not less than 3/4 in. in size.
Delete Exception No. 2.
Revise 3-11.3.2.2 to read as follows:
3-11.3.2.2 When capacity of trapped sections of pipe is more than 5 gal (18.9 L), the auxiliary drain shall consist of a valve not smaller than 3/4 in. in size with a nipple and cap or brass plug.
COMMITTEE COMMENT: There are listed valves with malleable iron bodies where the use of a brass plug or a nipple and cap would be more appropriate.

13- P45 - (3-11.3.3): Reject
SUBMITTER: L.R. Milam, Automatic Sprinkler Corp. of America
RECOMMENDATION: Revise section to permit the use of a ferrous plug in a brass drain valve.
In third line of section 3-11.3.3.1, delete the word "brass."
In Figure 3-11.3.3, delete the word "brass." The identifying reference at the plug will then read: "1 in. Nipple and Cap or Plug."
SUBSTANTIATION: Section 3-11.3.2.1 requires the use of a nipple and cap or "brass" plug when there is no valve. Here, the purpose of the brass plug is to provide dissimilar metals which make it easier to remove the plug. When a plug is required in a drain valve, however, a brass plug is not needed - not needed, that is, if the valve itself is brass, and most (if not all) drain valves are brass. In this instance, a standard cast iron or malleable iron plug is satisfactory. If there is concern that a plastic plug may be used, then the sentence may be revised to read: "....nipple and cap or metal plug."
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: There are listed valves with malleable iron bodies where the use of a brass plug or a nipple and cap would be more appropriate.

13- P26 - (3-11.3.3.2 Exception (New)): Accept in Principle
SUBMITTER: Dennis Kirson, Brookhaven National Laboratory
RECOMMENDATION: Add an Exception to section 3-11.3.3.2 to read:
Exception: Auxiliary drains are not required for pre-action systems installed in heated occupancies, for the sole purpose of reducing water damage resulting from damaged sprinkler heads or piping.
SUBSTANTIATION: The NFPA "Fire Protection Handbook" specifically states that dry-pipe systems are to be installed "only in locations that cannot properly be heated," yet this specific prohibition for dry-pipe systems is not in NFPA 13. No such statement in the Handbook is made or implied for pre-action systems, however, the requirements in NFPA 13 for pre-action systems appear to support such an intent for pre-action systems.
Many pre-action sprinkler systems are installed in heated occupancies, such as computer facilities, for the sole purpose of reducing serious water damage resulting from damaged sprinkler heads or broken piping. The dry system auxiliary drains required by section 3-11.3.3.2 do not appear warranted under such circumstances. An Exception covering this situation should be added to this section.
COMMITTEE ACTION: Accept in Principle.
Add a new section 3-11.3.3.4 to read as follows:
3-11.3.3.4 The provisions of 3-11.3.3.1, 3-11.3.3.2 and 3-11.3.3.3 do not apply to preaction systems in areas not subject to freezing and complying with 3-11.3.2.
COMMITTEE COMMENT: It is more appropriate to have a separate section pertaining to pre-action systems in heated occupancies rather than to have an Exception to 3-11.3.3.2.

13- P89 - (3-12.2.4): Reject
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Reword section 3-12.2.4 to read:
3-12.2.4 Listed welded fittings and welded formations are an acceptable product under the standard.
Delete the Exception to section 3-13.1.2.
SUBSTANTIATION: Welded fittings and welded formations manufactured without a national standard nor listed by an approving agency can be produced with very little quality control or assurance that the product will, in effect, meet the standards required of other types of fittings. Listings of these fittings and formations by an approving laboratory will help guarantee their integrity.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: Insufficient evidence of field problems has been submitted to warrant a change in this section.

13- P90 - (3-12.3.2 (New)): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add a new section to read as follows:
3-12.3.2 When mechanical groove fittings are installed in dry-pipe systems, the elastomeric gaskets shall include a soft tongue-like internal ring which extrudes into the gap at the pipe ends as the mechanical fitting is tightened to seal off the gasket cavity or some other gasket design which acccomplishes the same flush-type seal against the pipe. This shall prevent water from collecting in the fittings, freezing, and thereby distorting the gaskets and causing leaks in the system (see Figure 3-12.3.2).



Standard Gasket with Open Gasket Cavity.

Special Gasket with Tongue Sealing Off Gasket Cavity.

Figure 3-12.3.2

SUBSTANTIATION: A requirement for special gaskets which seal off the gasket cavity will help to solve the dry-pipe system problem explained in the proposed verbiage.
COMMITTEE ACTION: Accept in Principle.
Add a new section 3-12.3.2 to read as follows:
3-12.3.2 Mechanical grooved couplings including gaskets used on dry pipe systems shall be listed for dry pipe service.
Add a new section A-3-12.3.2 to read as follows:
A-3-12.3.2 Couplings for dry pipe service will prevent water from collecting in the coupling, freezing and thereby distorting the gaskets and causing leaks in the system.
COMMITTEE COMMENT: The Submitter's wording in Figure 3-12.3.2 pertained to one manufacturer's solution of the problem. The Committee feels that the section is better written in performance terms rather than written around one particular manufacturer's solution.

13- P91 - (3-12.3.3*): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add a new section to read:
3-12.3.3* Branch outlets from grooved couplings, or grooved fittings, which extend in any direction except vertically downward, shall be supported.
Also add A-3-12.3.3 to read:
A-3-12.3.3 Gravitational forces on unsupported, non-vertical branches can cause the pipe to rotate out of position.
SUBSTANTIATION: Instances where the rotation of unsupported branch outlets from grooved couplings resulted in disoriented sprinklers and piping have been documented. Supports will help to maintain system integrity.
COMMITTEE ACTION: Accept in Principle.
Add a new section 3-13.1.2.1 to read as follows:
3-13.1.2.1 When unique characteristics of a fitting such as a tendency to rotate require support in addition to that required in 3-15 restraint shall be provided in accordance with its listing.
Add a new section A-3-13.1.2.1 to read as follows:
A-3-13.1.2.1 Unless properly restrained, gravitational forces on unsupported nonvertical branches can cause the pipe to rotate out of position.
COMMITTEE COMMENT: The material is better located in the fitting section than in the joining of pipe and fittings section.

13- P54 - (Table 3-13.1.1): Accept
SUBMITTER: L.R. Milam, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Under the item "Cast Iron Screwed Fittings" replace "125 and 250 lb" with "Class 125 and 250."
Under the item "Malleable Iron Screwed Fittings" replace "150 and 300 lb" with "Class 150 and 300."
SUBSTANTIATION: The purpose of this change is to bring NFPA 13 up to date with the latest revision of ANSI standards B16.4 and B16.3. (ANSI B16.4, Cast Iron Threaded Fittings and ANSI B16.3, Malleable-Iron Threaded Fittings were submitted to the Committee for review.)
In 1977 both of the referenced standards were revised. One of the changes was the means by which fittings were designated. This was done to eliminate confusion which existed (and continues to exist in some quarters) between the so-called "standard weight" and "extra heavy" fittings. For example, in the 1971 edition B16.3 designated malleable iron fittings as 150 lb Class and 300 lb Class (see Table 1). In most of the text, however, this was shortened, the fittings simply being referred to as 150 lb and 300 lb respectively. In fact, these shortened designations were used on the cover of the standard and, of course, they are the designations presently shown in NFPA 13-1980.

In the 1977 edition of B16.3 the abbreviation "lb" was dropped (since it was misleading) and the fittings were redesignated as Class 150 and Class 300 respectively. The change in B16.4 for cast iron fittings was comparable. The designations in that standard are now Class 125 and Class 250. And, of course, these new designations appear on the cover of both standards (see attachments).

To see how confusion can exist when the old designations are used, refer to Table 1 in the 1977 edition of B16.3. In the temperature range at which fittings are normally used in a sprinkler system, the pressure rating of a Class 150 fitting is 300 psig. If a specification were to call for a 300 lb standard malleable iron fitting, does it mean a Class 150 with a 300 psi WWP? Or does it mean a Class 300, the old "300 lb" designation used in the "standard"? If the heavier fitting is required, the new designation is more definitive. NFPA 13 can help specification writers by using the latest ANSI designations in Table 3-13.1.1.

COMMITTEE ACTION: Accept.

13- P94 - (3-13.2): Reject
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: After the first sentence of section 3-13.2 insert: "Screwed unions shall be of the ground-joint copper alloy seat type. Unions shall be manufactured to ANSI B16.39." Continue the rest of 3-13.2 as it presently appears.

Add ANSI B16.39, "Malleable Iron Threaded Pipe Unions", to Appendix D.

SUBSTANTIATION: Screwed unions of the ground-joint copper alloy seat type will allow for the joint to be broken and reseated without leakage. ANSI B16.39 is the appropriate standard to reference.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: There are other types of unions, specifically unions using O-rings that work as well as unions made to ANSI B16.39.

13- P55 - (3-14.1.1): Reject
SUBMITTER: Lewis H. Zimmerman, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Move second paragraph to Appendix.
SUBSTANTIATION: This is guidance rather than a rule, and should be moved to the Appendix.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: It is the Committee's intent to make the requirement in the second paragraph mandatory and not advisory. Five seconds is needed to protect the system from water hammer.

13- P56 - (3-14.2.1): Accept
SUBMITTER: R.P. Fleming, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Put period after "connections". Delete remainder of sentence.
SUBSTANTIATION: Present reference to Section 2-7.3 implies that it is not always necessary to arrange fire department connections in accordance with the requirements of that section.
COMMITTEE ACTION: Accept.

13- P30 - (3-14.2.5): Reject
SUBMITTER: Russ Renk, Department of Health & Welfare, Idaho
RECOMMENDATION: Change to read:
3-14.2.5 A "double" check valve "approved by the public health authorities and the water purveyor" shall be installed in each water supply connection if there is a fire department connection on the system.
SUBSTANTIATION: 1. The water found in fire line systems does not meet federal drinking water standards (see enclosed report from Idaho and Oregon).

2. Single check valves are not recognized as an approved device for cross connection control because the single valve can easily foul. None have been approved by the University of Southern California nor are tests established to determine if they are functioning properly.

3. Single check valves have failed in many states, including Oregon, Idaho and Texas.

4. Double check valves are therefore recommended on the proper type of cross connection control device because they have a high degree of reliability and can be tested yearly to insure they are properly operating.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: The subject of public health is outside the scope of the Technical Committee on Automatic Sprinklers. Preliminary investigations from the National Bureau of Standards indicate that there is nothing more harmful in sprinkler system water than is present in public water supplies, as far as public health is concerned.

13- 308 - (3-14.2.7 and Figure A-3-14.2): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Revise 3-14.2.7.

Add an Exception to 3-14.2.7 to read:
Exception: When a wet pipe sprinkler system is equipped with an (alarm) check valve, a gate valve is not required on the system side of the (alarm) check valve.

Add Appendix Figure A-3-14.2 as follows: (See following page for Figure A-3-14.2.)
SUBSTANTIATION: This section needs editorial clarification.
COMMITTEE ACTION: Accept.

13- P95 - (3-14.3): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add an additional paragraph to section 3-14.3 to read: "The identification sign shall be minimum 25 gage (0.021 in., 0.53 mm) corrosion resistant metal. If made of a corrodable metal such as steel, the sign shall be of the same minimum gage and completely porcelain enameled. Valve control information shall be steel-stamped or otherwise permanently marked, e.g., enameled lettering in a contrasting coloring, in characters at least 1/5 in. (5 mm) high. Embossed plastic tape, pencil, ink, crayon, etc. shall not be considered permanent markings. The sign shall be secured with non-corrosive wire, chain, etc."
SUBSTANTIATION: The increased appearance of embossed plastic tape and other non-permanent identification signs necessitates the addition of the above proposed verbiage.
COMMITTEE ACTION: Accept in Principle.

Revise 3-14.3* to read as follows:
3-14.3* Identification of Valves. When there is more than one control valve, permanently marked identification signs indicating the portion of the system controlled by each valve shall be provided.

Embossed plastic tape, pencil, ink, crayon, etc., shall not be considered permanent markings. The sign shall be secured with noncorrosive wire, chain or other means.
COMMITTEE COMMENT: The revised wording should satisfy the Submitter's intent. As submitted, the wording was too prescriptive.

13- P11 - (3-15.1.1 Exception, Exception No. 2 (New), 3-15.1.3 and 3-15.1.4 through 1-9): Accept in Principle
SUBMITTER: J. Brooks Semple, Bechtel Power Corp.
RECOMMENDATION: 1. Change "Exception" to "Exception No. 1".

2. Add Exception No. 2.
Exception No. 2: Hangers and installation methods certified by a registered professional engineer for the following:

(a) Designed to support five times the weight of the water-filled pipe plus 250 lb (114 kg) at each point of piping support.

(b) These points of support are enough to support the sprinkler system.

(c) Ferrous materials are used for hanger components.

Detailed calculations shall be submitted, when required by the reviewing authority, showing stresses developed both in hangers and piping and safety factors allowed.

3. Delete 3-15.1.3 in entirety.

4. Renumber 3-15.1.4 through 1.9.
SUBSTANTIATION: Editorial to avoid repetition, avoid confusion and improve clarity.

This is being submitted for the 1982 edition, because some may feel too many words are proposed to be moved to constitute a simple editorial change, even though there is no change in the intent. If the Committee will accept this as editorial for the 1980 edition, so much the better.
COMMITTEE ACTION: Accept in Principle.

In 3-15.1.1 change "Exception" to "Exception No. 1." Add a new Exception No. 2 to read as follows:
Exception No. 2: Hangers and installation methods certified by a registered professional engineer for the following:

(a) Designed to support five times the weight of the water-filled pipe plus 250 lb (114 kg) at each point of piping support.

(b) These points of support are enough to support the sprinkler system.

(c) Ferrous materials are used for hanger components.

Detailed calculations shall be submitted, when required by the reviewing authority, showing stresses developed both in hangers and piping and safety factors allowed.

Delete 3-15.1.3 in entirety.

Renumber 3-15.1.4 through 1.9 as 3-15.1.3 through 3-15.1.8.
COMMITTEE COMMENT: The Committee agrees with the submitter's intent and believes the rearrangement in accordance with the NFPA Manual of Style should meet his intent.

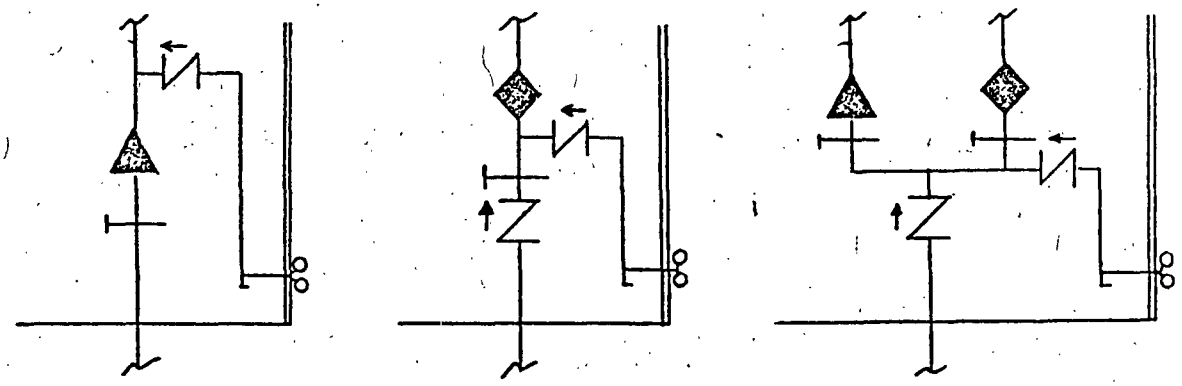


Figure A-3-14.2 Examples of Acceptable Valve Arrangements

13- P96 - (3-15.1.2* (New)): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Insert a new section 3-15.1.2* to read:
3-15.1.2* Conduit, cable trays, air piping, speakers, signs and other non-system components shall not be hung from sprinkler piping.
Add a new section A-3-15.1.2 to read:
A-3-15.1.2 The rules covering the hanging of sprinkler piping take into consideration the weight of water-filled pipe plus a safety factor. No allowance has been made for the hanging of non-system components from sprinkler piping.
Renumber sections 3-15.1.2 through 3-15.1.11 from the current standard as 3-15.1.3 through 3-15.1.12.
SUBSTANTIATION: The long standing, common sense guideline with respect to not hanging items from sprinkler piping does not appear in any NFPA 13 paragraph. As such, it should be inserted as proposed above.
COMMITTEE ACTION: Accept in Principle.
Add a new section 3-15.1.2* to read as follows:
3-15.1.2* Sprinkler piping or hangers shall not be used to support non system components.
Add a new section A-3-15.1.2 to read as follows:
A-3-15.1.2 The rules covering the hanging of sprinkler piping take into consideration the weight of water filled pipe plus a safety factor. No allowance has been made for the hanging of non-system components from sprinkler piping. Renumber sections 3-15.1.2 through 3-15.1.11 as 3-15.1.3 through 3-15.1.12 respectively.
COMMITTEE COMMENT: The addition of the requirement to include hangers makes the requirement inclusive.

13- P10 - (3-15.1.3): Accept in Principle
SUBMITTER: J. Brooks Semple, Bechtel Power Corp.
RECOMMENDATION: Delete section 3-15.
Add 3-15.1.3.
SUBSTANTIATION: Editorial to comply with Manual of Style (a statement cannot refer to itself) and for clarity.
Since this is editorial, the expired time limitation does not apply.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE COMMENT: See Committee Action on Proposal No. 11 on 3-15.11.

13- P97 - (Table 3-15.4.2): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Revert to the hook material diameters for U-hooks published in NFPA 13-1976 (then Table 3-14.4.2), i.e., 5/16 in. diameter hook material for pipe sizes up to 2 in., 3/8 in. for sizes 2 1/2 through 4 in., and 1/2 in. for sizes 5 through 8 in.
SUBSTANTIATION: The change made to the Table in NFPA 13-1976 was deliberate and is documented by the Technical Committee Report and ballots. The change made in 13-1978 and repeated in 13-1980 is an editorial mistake. Note in 13-1978 that no boldface marginal vertical line indicating a change appears. Also, the Technical Committee Report, Technical Committee Documentation, ballots and other Committee correspondence do not show the 1978 change to be deliberate.
The proposed change will correct an editorial error.
COMMITTEE ACTION: Accept in Principle.
Change Table 3-15.4.2 to read as follows:
Under the pipe size entry, leave up to 2 in. as is.
Second entry, change from 2 1/2 in. to 8 in. to 2 1/2 in. to 6 in.
Add a new third column 8 in.
Under the first hook material diameter section leave the first two entries as 5/16 and 3/8 and add a new third entry 1/2 in.
In the last column, under mm, leave the first two entries as is. Add a new third entry as 12.7.
COMMITTEE COMMENT: Although not noted as a change, a literature search into the reason for the changes indicated that the values are correct as the Committee intended. The revised Table should meet the Submitters intent.

13- P98 - (3-15.5.6, Exception (New)): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add an Exception to section 3-15.5.6 to read:
Exception: Branch outlets, from grooved couplings or grooved fittings, which extend in any direction except vertically downward. See 3-12.3.3.
SUBSTANTIATION: See accompanying proposal to section 3-12.3.3.
COMMITTEE ACTION: Accept in Principle.
Add to 3-15.5.6 "See 3-13.1.2.1."
COMMITTEE COMMENT: See Committee Action on Proposal P91 on section 3-12.3.3.

13- P34 - (3-15.7.2): Accept
SUBMITTER: Lewis H. Zimmerman, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Delete first two sentences and substitute the following: "In multi-story buildings, riser supports shall be provided at the lowest level, at each alternate level above, and at the top of the riser. Supports above the lowest level shall restrain the pipe to prevent movement by an upward thrust when flexible fittings are used."
SUBSTANTIATION: It is almost impossible to determine the live floor load design of a building, so compliance with the present language is difficult at best. The proposed language duplicates the requirements of NFPA 14, which eliminates conflicts in a combination riser situation, and also recognizes the requirement for upward restraint associated with flexible fittings.
COMMITTEE ACTION: Accept.
Change the recommended text by adding "above and below offsets," after the comma after "above" in the second line. Add the word "also" after "shall" in the third line.

13- P99 - (3-15.7.3 (New)): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Insert a new section 3-15.7.3 to read:
3-15.7.3 Listed riser supports shall be provided at the ground level, at each level above, and above and below offsets.
Renumber sections 3-15.7.3 and 3-15.7.4 as 3-15.7.4 and 3-15.7.5.
SUBSTANTIATION: The proposed level of riser support installation will make for safer installation and offer increased system integrity.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE COMMENT: See Committee Action on Proposal No. P34 on 3-15.7.2.

13- P39 - (3-16): Accept in Principle
SUBMITTER: Lewis H. Zimmerman, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Revise section as follows:
3-16 Sprinklers.
3-16.1 Types of Sprinklers.
(a) Upright sprinklers. Sprinklers to be installed with the deflector above the attaching fitting.
(b) Pendent sprinklers. Sprinklers to be installed with the deflector below the attaching fitting.
(c) Sidewall sprinklers. Sprinklers to be installed close to a wall and ceiling with the discharge pattern being projected nearly horizontally away from the wall.

(d) Extended coverage sidewall sprinklers. Sprinklers with special extended, directional, discharge patterns for use in light hazard occupancies.
(e) Open sprinklers. Any sprinkler from which the fusible actuating elements have been removed.
(f) Corrosion resistant sprinklers. Sprinklers with special coatings or platings to be used in an atmosphere which would corrode an uncoated sprinkler.
(g) Nozzles. Devices for use in applications requiring special discharge patterns, directional spray, fine spray, or other unusual discharge characteristics.
(h) Dry pendent sprinklers. Sprinklers for use in a dry-pipe system in a pendent position.
(i) Dry upright sprinklers. Sprinklers for use in an upright position on a wet system where the sprinkler only is exposed to a freezing condition.
(j) Ornamental sprinklers. Sprinklers which have been painted or plated by the manufacturer.
(k) Concealed sprinklers. Sprinklers to be installed in a pendent position with the operating mechanism above a ceiling.
(l) Old style sprinklers. Sprinklers listed to be installed in either an upright, or pendent position.
3-16.2 Use of Sprinklers.
3-16.2.1 Only listed sprinklers shall be used and shall be installed in accordance with their listing. Sprinklers shall not be altered in any respect or have any type of ornamentation or coating applied after shipment from the place of manufacture.
Exception: Where construction features or other special situations require unusual water distribution listed sprinklers may be installed to achieve specific results other than those in accordance with their listing.
3-16.2.2 Sprinklers shall not be used for system working pressures exceeding 175 psi.
Exception: Higher design pressures may be used when sprinklers are listed for those pressures.
3-16.2.3 Old type sprinklers shall not be used in a new installation.
3-16.2.4 Open sprinklers may be used to protect special hazards, or against exposure fires, or in other special locations.
3-16.2.5 Sidewall sprinklers shall be installed only in light hazard occupancies unless specifically listed for use in ordinary hazard occupancies.
3-16.2.6 Extended coverage sidewall sprinklers shall be installed only in accord with their listing, and shall not be substituted for other sidewall sprinklers.
3-16.2.7 In situations involving special problems of water distribution, sprinklers having special deflectors, or other characteristics to meet a specific need may be used. When such problems require installation of sprinklers not in accordance with their listing, permission shall be obtained fromn the authority having jurisdiction before installation.
3-16.2.8 Open sprinklers may be used to protect special hazards, for protection against exposures, or in other special locations.
3-16.3 Replacement of Sprinklers.
3-16.3.1 When sprinklers are replaced, the replacement sprinkler shall be of the same type, orifice, and temperature rating unless conditions require a different type sprinkler be installed. The replacement sprinkler shall then be of a type, orifice, and temperature rating to suit the new conditions.
3-16.3.2 Old type sprinklers may be replaced with old type sprinklers, or with the appropriate pendent or upright sprinkler.
Exception: Where construction features require an upward discharge to wet a surface, old type sprinklers may be replaced with pendent sprinklers in an upright position to achieve the necessary effect.
3-16.3.3 Old type sprinklers shall not be used to replace pendent or upright sprinklers.
3-16.3.4 Extreme care shall be exercised when replacing horizontal sidewall and extended coverage sidewall sprinklers to assure the correct replacement sprinkler is installed.
3-16.3.5 Sprinklers which have been painted or coated, except by the manufacturer, shall be replaced and shall not be cleaned by use of chemicals, abrasives, or other means. (See 3-16.9.2.)
3-16.3.6 Sprinklers 50 or more years old shall be tested at no more than 5 year intervals by a nationally recognized testing laboratory to determine if replacement is necessary.
3-16.4 Corrosion-resistant, wax coated or similar sprinklers.
3-16.4.1 Listed corrosion-resistant or special coated sprinklers shall be installed in locations where chemicals, moisture or other corrosive vapors exist sufficient to cause corrosion of such devices as in paper mills, packing houses, tanneries, alkali plants, organic fertilizer plants, foundries, forge shops, fumigation, pickle and vinegar works, stables, storage battery rooms, electroplating rooms, galvanizing rooms, steam rooms of all descriptions, including moist vapor dry kilns, salt storage rooms, locomotive sheds or houses, driveways, areas exposed to outside weather such as piers and wharves exposed to salt air, areas under sidewalks, around bleaching equipment in flour mills, all portions of cold storage buildings where a direct ammonia expansion system is used, portions of any plant where corrosive vapors prevail.
3-16.4.2 Care shall be taken in the handling and installation of wax coated or similar sprinklers to avoid damaging the coating.
3-16.4.3 Corrosion resistant coatings shall be applied only by the manufacturer of the sprinkler.
Exception: Any damage to the protective coating occurring at the time of installation shall be repaired at once using only the coating of the manufacturer of the sprinkler in the approved manner so that none of the sprinkler will be exposed after installation has been completed.
3-16.5 Sprinkler Discharge Characteristics and Identification
3-16.5.1 Table 3-16.5 shows the K factor, relative discharge and identification for sprinklers having different orifice sizes.
Exception: Special listed sprinklers may have pipe threads different from those shown in Table 3-16.5.

Table 3-16.5 Sprinkler Discharge Characteristics Identification

Nominal Orifice Size (in.)	Orifice Type	"K"[1] Factor	Percent of Nominal ½-in. Discharge	Thread Type	Pintle	Nominal Orifice Size Marked On Frame
¼	Small	1.3-1.5	25	½ in. NPT	Yes	Yes
5/16	Small	1.8-2.0	33.3	½ in. NPT	Yes	Yes
⅜	Small	2.6-2.9	50	½ in. NPT	Yes	Yes
7/16	Small	4.0-4.4	75	½ in. NPT	Yes	Yes
½	Standard	5.3-5.8	100	½ in. NPT	No	No
17/32	Large	7.4-8.2	140	¾ in. NPT	No	No
			or	½ in. NPT	Yes	Yes

[1]"K" factor is the constant in the formula.

$$Q = K\sqrt{P}$$

Where Q = Flow in gpm
P = Pressure in psi

For SI Units: $Qm = Km\sqrt{Pm}$

Where Qm = Flow in L/min
Pm = Pressure in bars
Km = 14 K

3-16.5.2 For locations or conditions not requiring as much water as is discharged by a nominal 1/2 in. (12.7 mm) orifice sprinkler, sprinklers having a smaller orifice may be used subject to the following restrictions:
(a) Small orifice sprinklers shall not be used on dry-pipe or pre-action systems.
(b) An approved strainer shall be provided in the riser or feed main which supplies sprinklers having orifices smaller than 3/8 in. (9.5 mm).
3-16.5.3 For locations or conditions requiring more water than is discharged by a nominal 1/2 in. (12.7 mm) orifice sprinkler, a sprinkler having a larger orifice may be used. Large orifice sprinklers having 1/2 in. iron pipe thread shall not be installed in new sprinkler systems.
SUBSTANTIATION: The present language does not define or indicate that there are many different types of sprinklers. This should be added to aid the authority having jurisdiction in reviewing plans and installations. Likewise, there is not sufficient guidance on sprinkler replacement. Part of this proposal is to present the material in a more orderly fashion, and in specific categories.
COMMITTEE ACTION: Accept in Principle.
Revise 3-16 as follows:
3-16 Sprinklers.
3-16.1 Types of Sprinklers. Some of the commonly used sprinklers are as follows:
(a) Upright sprinklers. Sprinklers arranged in such a way that the water stream is directed upwards against the deflector.
(b) Pendent sprinklers. Sprinklers arranged in such a way that the water stream is directed downwards against the deflector.
(c) Sidewall sprinklers. Sprinklers arranged in such a way that a one-sided (half-paraboloid) water distribution is produced.
(d) Extended coverage sidewall sprinklers. Sprinklers with special extended, directional, discharge patterns.
(e) Open sprinklers. Sprinklers from which the actuating elements have been removed.
(f) Corrosion resistant sprinklers. Sprinklers with special coatings or platings to be used in an atmosphere which would corrode an uncoated sprinkler.
(g) Nozzles. Devices for use in applications requiring special discharge patterns, directional spray, fine spray, or other unusual discharge characteristics.
(h) Dry pendent sprinklers. Sprinklers for use in a pendent position in a dry-pipe system or a wet-pipe system with the seal in a heated area.
(i) Dry upright sprinklers. Sprinklers for use in an upright position in a dry-pipe system or a wet-pipe system with the seal in a heated area.
(j) Ornamental sprinklers. Sprinklers which have been painted or plated by the manufacturer.
(k) Flush sprinklers. Sprinklers in which all or part of the body, including the shank thread, is mounted above the lower plane of the ceiling.

(l) Recessed sprinklers. Sprinklers in which all or part of the body other than the shank thread is mounted within a recessed housing.

(m) Concealed sprinklers. Recessed sprinklers with cover plates.

(n) Old style sprinklers. Sprinklers which direct only from 40 to 60 percent of the total water flow initially in a downward direction.

3-16.2 Use of Sprinklers.

3-16.2.1 Only listed sprinklers shall be used and shall be installed in accordance with their listing. Sprinklers shall not be altered in any respect or have any type of ornamentation or coating applied after shipment from the place of manufacture.

Exception: Where construction features or other special situations require unusual water distribution, listed sprinklers may be installed to achieve specific results other than those in accordance with their listing.

3-16.2.2 Sprinklers shall not be used for system working pressures exceeding 175 psi (12.1 bars).

Exception: Higher design pressures may be used when sprinklers are listed for those pressures.

3-16.2.3 Old style sprinklers shall not be used in a new installation.

Exception No. 1: For installation under piers and wharves where construction features require an upward discharge to wet the underside of decks and structural members supporting the decks, a sprinkler that projects water upward to wet the overhead shall be used. This can be accomplished by using standard pendent sprinklers installed in an upright position or by the use of old style sprinklers. See NFPA 87, Standard for the Construction and Protection of Piers and Wharves.

Exception No. 2: Old style sprinklers shall be installed in fur storage vaults. See 4-4.17.3. Also see NFPA 81, Standard on Fur Storage and Fumigation and Cleaning.

3-16.2.4 Sidewall sprinklers shall be installed only in light hazard occupancies.

Exception: Sidewall sprinklers specifically listed for use in ordinary hazard occupancies.

3-16.2.5* Extended coverage sidewall sprinklers shall be installed only in accordance with their listing.

A-3-16.2.5 Multiple extended coverage sidewall sprinklers may be used in a single room or space not exceeding 9 ft (2.7 m) in height unless otherwise indicated in the listing. Where such sprinklers are placed back to back, a baffle should be employed so that the operation of one sprinkler will not prevent the other from operating.

3-16.2.6 Open sprinklers may be used to protect special hazards, for protection against exposures, or in other special locations.

3-16.3 Replacement of Sprinklers.

3-16.3.1 When sprinklers are replaced, the replacement sprinkler shall be of the same type, orifice, and temperature rating unless conditions require a different type sprinkler be installed. The replacement sprinkler shall then be of a type, orifice, and temperature rating to suit the new conditions.

3-16.3.2 Old style sprinklers may be replaced with old style sprinklers, or with the appropriate pendent or upright sprinkler.

3-16.3.3 Old style sprinklers shall not be used to replace pendent or upright sprinklers.

3-16.3.4 Extreme care shall be exercised when replacing horizontal sidewall and extended coverage sidewall sprinklers to assure the correct replacement sprinkler is installed.

3-16.3.5 Sprinklers which have been painted or coated, except by the manufacturer, shall be replaced and shall not be cleaned by use of chemicals, abrasives, or other means. (See 3-16.9.2.)

3-16.4 Corrosion-resistant, wax coated or similar sprinklers.

3-16.4.1 Listed corrosion-resistant or special coated sprinklers shall be installed in locations where chemicals, moisture or other corrosive vapors exist sufficient to cause corrosion of such devices as in paper mills, packing houses, tanneries, alkali plants, organic fertilizer plants, foundries, forge shops, fumigation, pickle and vinegar works, stables, storage battery rooms, electroplating rooms, galvanizing rooms, steam rooms of all descriptions, including moist vapor dry kilns, salt storage rooms, locomotive sheds or houses, driveways, areas exposed to outside weather such as piers and wharves exposed to salt air, areas under sidewalks, around bleaching equipment in flour mills, all portions of cold storage buildings where a direct ammonia expansion system is used, portions of any plant where corrosive vapors prevail.

3-16.4.2 Care shall be taken in the handling and installation of wax coated or similar sprinklers to avoid damaging the coating.

3-16.4.3 Corrosion resistant coatings shall be applied only by the manufacturer of the sprinkler.

Exception: Any damage to the protective coating occurring at the time of installation shall be repaired at once using only the coating of the manufacturer of the sprinkler in the approved manner so that none of the sprinkler will be exposed after installation has been completed.

3-16.5 Sprinkler Discharge Characteristics and Identification

3-16.5.1 Table 3-16.5 shows the K factor, relative discharge and identification for sprinklers having different orifice sizes.

Exception: Special listed sprinklers may have pipe threads different from those shown in Table 3-16.5.

Table 3-16.5 Sprinkler Discharge Characteristics Identification

Nominal Orifice Size (in.)	Orifice Type	"K"[1] Factor	Percent of Nominal ½-in. Discharge	Thread Type	Pintle	Nominal Orifice Size Marked On Frame
¼	Small	1.3-1.5	25	½ in. NPT	Yes	Yes
5/16	Small	1.8-2.0	33.3	½ in. NPT	Yes	Yes
⅜	Small	2.6-2.9	50	½ in. NPT	Yes	Yes
7/16	Small	4.0-4.4	75	½ in. NPT	Yes	Yes
½	Standard	5.3-5.8	100	½ in. NPT	No	No
17/32	Large	7.4-8.2	140	¾ in. NPT	No	No
			or	½ in. NPT	Yes	Yes

[1]"K" factor is the constant in the formula.

$$Q = K\sqrt{P}$$

Where Q = Flow in gpm
P = Pressure in psi

For SI Units: $Qm = Km\sqrt{Pm}$

Where Qm = Flow in L/min
Pm = Pressure in bars
Km = 14 K

3-16.5.2 For light hazard occupancies not requiring as much water as is discharged by a nominal 1/2 in. (12.7 mm) orifice sprinkler, sprinklers having a smaller orifice may be used subject to the following restrictions:

(a) Small orifice sprinklers shall not be used on dry-pipe, pre-action or combined dry-pipe and pre-action systems.

Exception: Outside sprinklers for protection from exposure fires. See Chapter 6.

(b) An approved strainer shall be provided in the riser or feed main which supplies sprinklers having orifices smaller than 3/8 in. (9.5 mm).

3-16.5.3 For locations or conditions requiring more water than is discharged by a nominal 1/2 in. (12.7 mm) orifice sprinkler, a sprinkler having a larger orifice may be used. Large orifice sprinklers having 1/2 in. national pipe thread shall not be installed in new sprinkler systems.

3-16.6 Temperature Ratings, Classifications and Color Coding.

3-16.6.1 The standard temperature rtings of automatic sprinklers are shown in Table 3-16.6.1. Automatic sprinklers shall have their frame arms colored in accordance with the color code designated in Table 3-16.6.1 with the following exceptions:

Exception No. 1: The color identification for coated sprinklers may be a dot on the top of the deflector, the color of the coating material, or colored frame arms.

Exception No. 2: Color identification is not required for plated sprinklers, flush, recessed and concealed sprinklers or similar decorative types. (Add additional column to Table 3-16.6.1 entitled "Glass Bulb Colors" to read as follows from the top: Orange or Red, Yellow or Green, Blue, Purple, Black, Black.)

Table 3-16.6.1 (Present table with above extra column)

3-16.6.2 Ordinary temperature rated sprinklers shall be used throughout buildings.

Exception No. 1: Where maximum ceiling temperatures exceed 100°F (38°C), sprinklers with temperature ratings in accordance with the maximum ceiling temperatures of Table 3-16.6.1 shall be used.

Exception No. 2: Intermediate and high temperature sprinklers may be used throughout ordinary and extra hazard occupancies. Where situations involve high piled or rack storage refer to NFPA 231, Standard on Indoor General Storage and NFPA 231C, Standard for Rack Storage of Materials.

Exception No. 3: Sprinklers of intermediate and high temperature ratings shall be installed in specific locations as required by 3-16.6.4.

Include everything after present 3-16.6.4.

Renumber 3-16.6.4 and 3-16.6.5 as 3-16.6.3 and 3-16.6.4 respectively.

Retain 3-16.7, 3-16.8 as 3-16.9 without change.

COMMITTEE COMMENT: The revised wording should satisfy the Submitter's intent.

13- P100 - (3-16.2.5 and Table 3-16.5): Accept in Part

SUBMITTER: Ron Cote', Factory Mutual Research Corp.

RECOMMENDATION: Add asterisk after 3-16.2.5.

Add a new section A-3-16.2.5 to read:

A-3-16.2.5 Small orifice sprinklers should not be used as a substitute for standard 1/2 in. and large orifice sprinklers to take advantage of available high water pressures.

In Table 3-16.5 place a superscript "2" at the column heading "Nominal Orifice Size." Beneath the Table add Note 2 to read: "See A-3-16.2.5."

SUBSTANTIATION: Small orifice sprinklers have very limited application in a typical sprinkler system. Limited Factory Mutual testing with a small orifice sprinkler showed the fire control to be less than with a 1/2 in. sprinkler providing the same density.

COMMITTEE ACTION: Accept in Part.
In 3-16.2.5, in the first line delete "locations or conditions" and add "light hazard occupancies" and in the second line after "sprinkler" add "or as permitted in 7-4.3.1.5 and 7-4.3.1.6."
In Table 3-16.5, place a subscript 2 at the column heading, 'Nominal Orifice Size', beneath the Table add Note 2 to read: NOTE 2: See 3-16.2.5.
Add an Exception for 3-16.2.5 to read as follows:
Exception: See Chapter 6.
COMMITTEE COMMENT: The section has been clarified by deleting locations or conditions and adding light hazard occupancies and by referencing the sections in chapter 7 that pertain to the use of small orifice sprinklers in hydraulically calculated systems.

13- P101 - (3-16.2.11 (New)): Accept
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add a new section to read:
3-16.2.11 When plastic ceiling plates (escutcheons) are used they shall be listed.
SUBSTANTIATION: Unlisted plastic escutcheons present a severe threat to system reliability.
COMMITTEE ACTION: Accept.

13- P117 - (Table 3-16.5): Reject
SUBMITTER: Jack A. Wood, Viking Corp.
RECOMMENDATION: Add provisions for an extra large orifice sprinkler in Table 3-16.5.
Add a new entry from left to right as follows:
5/8, Extra Large, 10.6-11.4, 200, 1/2 in. NPT or 3/4 NPT, yes and yes.
SUBSTANTIATION: Sprinklers of this type are listed by UL and FM and offer advantages in systems which require high densities to control fires in high hazard commodities such as plastics and rolled paper.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: Insufficient data has been submitted to justify inclusion into Table 3-16.5. There are limitations on the use of this sprinkler in regards to spacing and pressure and test data exists on flammable liquid fires that has not been presented to the Subcommittee.

13- P102 - (Table 3-16.6.1): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: In the last line of Table 3-16.6.1 under the Ultra High temperature classification, change the temperature rating from "500 to 575" to "500 to 650 (260 to 343OC)."
SUBSTANTIATION: Increasing the Ultra High temperature rating to 650OF (343OC) agrees with the temperature rating allowed by Factory Mutual's Approval Standard for sprinklers. Ultra High sprinklers with temperature rating to 650OF (343OC) are FM Approved and are listed in the Factory Mutual Approval Guide.
COMMITTEE ACTION: Accept in Principle.
Accept the Submitter's change to Table 3-16.6.1 and delete section 3-16.6.2.
COMMITTEE COMMENT: The deletion of 3-16.6.2 should satisfy the Submitter's intent.

13- 306 - (3-16.6.1 Exception No. 2): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Revise Exception No. 2 to read as follows:
Exception No. 2: Color identification is not required for plated sprinklers, flush, recessed and concealed or similar decorative types.
SUBSTANTIATION: There is a need to change Exception No. 2 of section 3-16.6.1 to conform to present day sprinkler terminology.
COMMITTEE ACTION: Accept.

13- P58 - (3-17.3.4): Accept
SUBMITTER: Lewis H. Zimmerman, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Move second sentence to the Appendix.
SUBSTANTIATION: This is explanatory material only and should be in Appendix.
COMMITTEE ACTION: Accept.

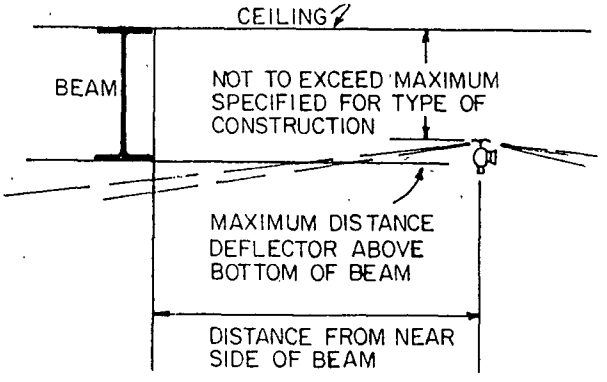
13- 01 - (3-17.6.2): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Add an Exception to read as follows:
Exception: Local electrical water flow alarms may be of the open circuit type.
SUBSTANTIATION: NFPA 72A allows the use of open circuit type local electrical water flow alarms.
COMMITTEE ACTION: Accept.

13- P41 - (3-17.6.2): Reject
SUBMITTER: Lewis H. Zimmerman, Adelphia Automatic Sprinkler Co.
RECOMMENDATION: Delete the last sentence.
SUBSTANTIATION: The reference to NFPA 72A is sufficient, and the last sentence may, or may not, conflict with NFPA 72A. Open, or closed circuitry should be determined by that Standard and not NFPA 13.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: See Committee Action on Proposal No. 01 on Section 3-17.6.2.

13- P38 - (4-1.1.5 (New)): Accept in Principle
SUBMITTER: Robert J. O'Laughlin, Union Carbide Corp.
RECOMMENDATION: Section 4-1.1 should be changed by adding section 4-1.1.5 as follows:
4-1.1.5 Clearance between sprinklers and ceiling for ceilings in excess of 30 ft may exceed the maximum specified in section 4-3 if approved by the authority having jurisdiction.
SUBSTANTIATION: The current design requirements of Chapter 4 of NFPA 13(1) create an undesirable, unnecessary and excessively costly restriction for industrial and commercial facilities (or other occupancies) with high ceiling supported by deep beams. This design restriction regards clearance of sprinklers from beams and ceilings.
Section 4-1.1.2 states, "...There will be arrangements of structural members not specifically detailed by the requirements. By applying the basic principles, layouts for such construction can vary from specific illustration, provided the maximum specified for spacing of sprinklers (Section 4-2) and Position of Sprinklers (Section 4-3) are not exceeded." Research in fire plume and ceiling jet modeling and numerous empirical tests indicate that the clearance from ceilings required in Section 4-3 are unnecessarily restrictive for high ceilings.
In no place does NFPA 13 consider the effects of ceiling height on sprinkler placement. Norman V. Thompson(2), in his book "Fire Behavior and Sprinklers," states, "Any significant delay in operation of sprinklers at the limit clearances seems rather small in view of the delay permitted by sprinkler location rules which are the same for a ceiling 15 ft high or 50 ft high." Additional testing over the last 20 years substantiate this point.
NFPA 13 Requirements for Beamed Ceilings.
Because of the massive construction of the ceiling assembly in many large industrial buildings, there is no practical way that all NFPA 13 sprinkler head spacing criteria can be met. Since beams and girders are often more than 22 in. in depth, heads placed below them cannot comply with Section 4-3.4.2. Section 4-3.4.1 specifies that heads placed within bays formed by panel construction should be within 18 in. of the ceiling deck. Sprinkler head placement is also constrained by the restrictions given in Table 4-2.4.6 of NFPA 13, shown below:

Table 4-2.4.6 Position of Deflector when Located Above Bottom of Beam.

Distance from Sprinkler to Side of Beam	Maximum Allowable Distance Deflector above Bottom of Beam
Less than 1 ft	0 in.
1 ft to less than 2 ft	1 in.
2 ft to less than 2 ft 6 in.	2 in.
2 ft 6 in. to less than 3 ft	3 in.
3 ft to less than 3 ft 6 in.	4 in.
3 ft 6 in. to less than 4 ft	6 in.
4 ft to less than 4 ft 6 in.	7 in.
4 ft 6 in. to less than 5 ft	9 in.
5 ft to less than 5 ft 6 in.	11 in.
5 ft 6 in. to less than 6 ft	14 in.



For some typical beam pockets in buildings, placing a sprinkler head within a bay in compliance with the spacing rules of Table 4-2.4.6 will cause a deviation from the 18 in. maximum ceiling deck clearance allowed by section 4-3.4.1. The relative importance of section 4-3.4.1 and 4-3.4.2 must be assessed in order to determine the optimum design for the system. The effects of various parameters on sprinkler sensitivity and performance must be examined in order to gauge the relative importance of each of the sprinkler spacing requirements.

Sprinkler Discharge Pattern.

In his book, Norman Thompson (2) assessed the importance of sprinkler discharge in terms of pattern and direction. He examined the results of the test conducted by Factory Mutual in 1953, comparing the performance of the standard sprinkler with the old style sprinkler. The old style sprinkler discharges 60% of its water upward against the ceiling to cool it directly. The water discharged against the ceiling falls to the floor as large droplets. A standard spray sprinkler discharges all of its water downward as a fine spray in a fairly uniform pattern. In fire tests, the standard spray sprinkler achieved vastly superior upper level cooling because its fine drops evaporated more easily than the large drops of the old style heads and absorbed more heat. These tests proved that it was not necessary to discharge water against the ceiling and structural members in order to cool them, and that the most efficient use of a sprinkler's water is to discharge all of it downward as small drops in a solid hemispherical pattern.

For the cases of concern in this proposal, if heads were placed within the beam pockets with a ceiling deck clearance of 18 in., in compliance with section 4-2.4.1 (in violation of Table 4-2.4.6), a great deal of interference with spray patterns would occur. If spray from a sprinkler discharges against structural members, the small droplets will condense on the steel to fall as large droplets and the discharge pattern will be deformed. Both of these effects will reduce the atmospheric cooling achieved by the standard spray sprinkler. Placing heads deep within beam pockets will result in interference with their spray patterns and drop sizes, thus reducing their atmospheric cooling effect, and this will mean less protection of structural steel.

The Factory Mutual tests clearly established that it was not necessary to discharge water against structural members in order to cool them. It was shown that the best way to achieve protection of structural members in order to cool them. It was shown that the best way to achieve protection of structural steel is to discharge all of a sprinkler's water downward as fine drops in a uniform pattern. The sprinkler spacing rules of Table 4-2.4.5 maintain an uninterrupted spray pattern and should take precedence over the requirement of section 4-3.4.1 for high ceiling areas. The relative importance of sections 4-3.4.1 and 4-3.4.2 must be examined in order to establish the most sensitive (responsive) sprinkler locations that comply with Table 4-2.4.6.

Ceiling Height and Clearance vs. Operating Time.

The effect of ceiling height on sprinkler sensitivity is demonstrated in the work of O'Dogherty and Young (3). A schematic of their test configuration is shown in Figure 1 on the following page. The joists were 12 in. wide, 19 in. deep, and were spaced 15 ft on centers. The test fires consisted of wood crib fires and the cribs were monitored for weight loss so that mass burning rates could be calculated.

Figure 2 demonstrates the effect that ceiling height has on the sensitivity of sprinklers. The temperature rise of bulb type sprinklers mounted 8, 16, and 24 in. below the joist (27, 35, and 43 in. below the ceiling) are plotted for various heat output fires at different ceiling heights. Since the curves flatten out with increased ceiling height, the bulb temperature rise (hence actuation time) of the sprinklers are less sensitive to depth of mounting with increased ceiling height. (See following page for Figure 2.)

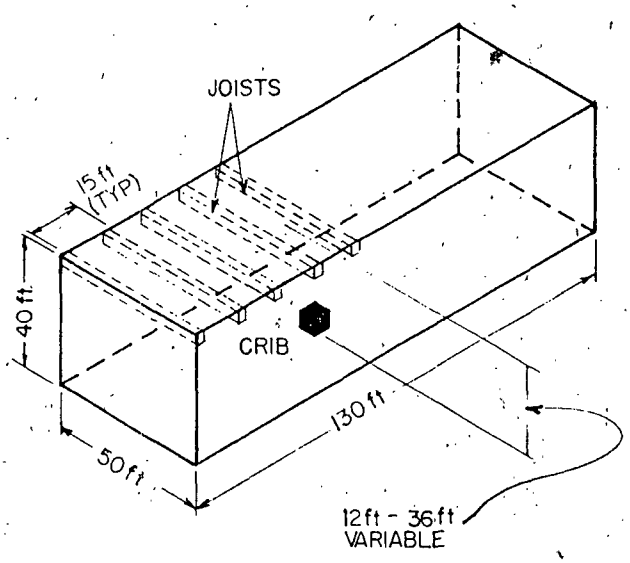


Figure 1

O'Dogherty and Young's Test Area

Fire Plume.

A discussion of plume fire characteristics yields some useful results concerning sprinkler head placement. Much research has been conducted to study and model this behavior of fire plumes. This information should be applied to develop improved engineering guides for sprinkler system design.

In the combustion zone, the highest temperatures within the plume are reached. As the heated gases leave the combustion zone, they flow upwards and cool air is entrained into the plume, reducing the gas temperature. With higher ceiling levels the plume gas temperatures are subsequently decreased at higher elevations because of the greater amount of cool air entrained into the plume. Maximum temperatures at any level in the plume occur at the centerline, but with a high ceiling the temperature distribution through the plume at ceiling level is fairly uniform because of the large amount of cool air that's been entrained. This is illustrated in Figure 3 on the following page.

R.L. Alpert,(4) of Factory Mutual Research Corporation, modeled plume fires in order to determine the response times of fire detectors and found that the radius (r) of a fire plume when it reached the ceiling was a function of the ceiling height (H); r = .18 * H. As an example, for a 33-ft high ceiling, a fire plume radius from a point source would be 5.9 ft. This means that the plume will encompass 109 sq ft of ceiling area. For 100 ft2 per head spacing, at least one head would be directly in the plume.

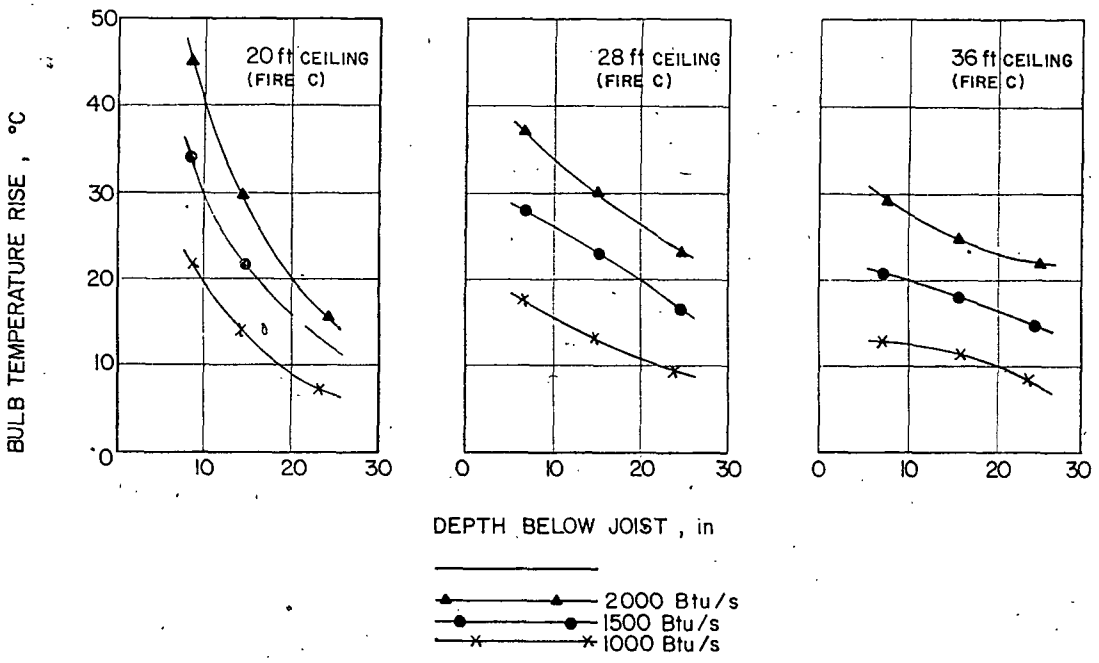


FIG. 2 VARIATION OF BULB TEMPERATURE RISE WITH DEPTH OF SPRINKLER CEILING JOIST, FOR DIFFERENT CEILING HEIGHTS, AT 5 FEET FROM FIRE

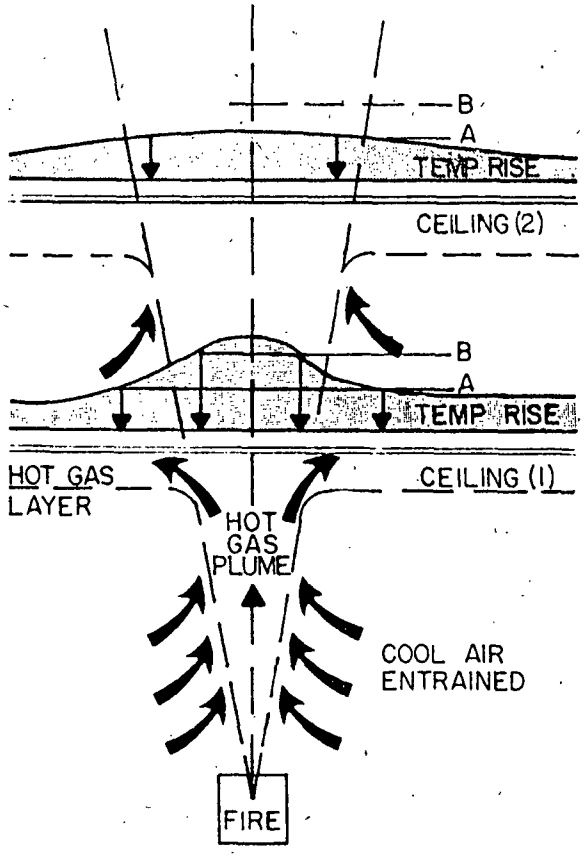


Figure 3

Diagram of Plume Characteristics and Effect of Ceiling Height on Temperature Profile

As long as a head is within the plume, depth below the ceiling is not a critical factor. The temperatures reached in the plume decrease with increased elevation because more cool air has been entrained into the plume in the upper reaches. Alpert discovered that the temperature remains fairly constant in the upper 12 percent of the plume and increases below this level. For the same example of a 33-ft high ceiling, this 12 percent corresponds to a constant temperature layer at the top of the plume 4 ft in depth.

The findings of O'Dogherty and Young (3) confirm Alpert's theory. Figure 4 plots the temperature rise monitored, in the bay and below the joists, at various ceiling heights. The same size fire was used for each of the ceiling heights and the temperatures were monitored directly above the center of the fire. The curves draw together when the ceiling height becomes large because the constant temperature layer described by Alpert becomes thick enough to encompass both temperature monitoring locations. Figure 5 shows similar findings at a distance 5 ft from the centerline of the plume (approaching the outer edge of the plume for a 33-ft ceiling height). Temperature rise of a bulb type sprinkler is monitored rather than air temperature as was the case in Figure 4. It is again observed that the curves draw together at the larger ceiling heights as the constant temperature layer becomes thick enough to encompass the head below the joist.

Ceiling Flow.

The spread of hot gases under a smooth ceiling has been modeled successfully.(5) The movement of hot gases under a ceiling that is broken up by structural members follows recognizable patterns but does not readily lend itself to the mathematical interpretations necessary for modeling.

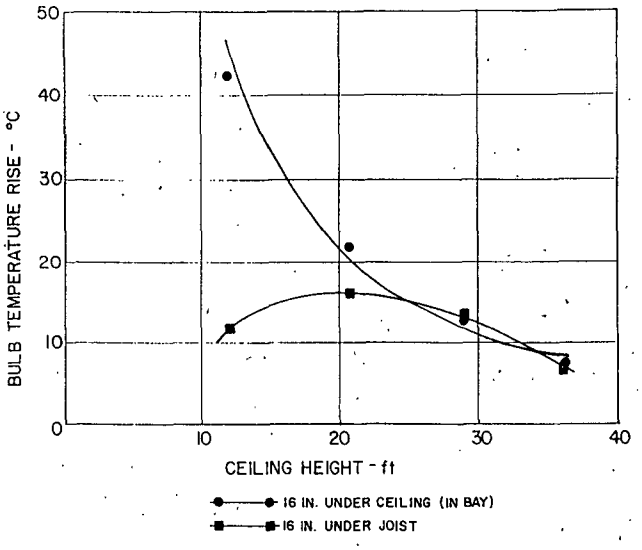


FIG 5 - VARIATION OF BULB TEMPERATURE RISE WITH CEILING HEIGHT FOR SPRINKLERS AT 5 FEET FROM FIRE AXIS

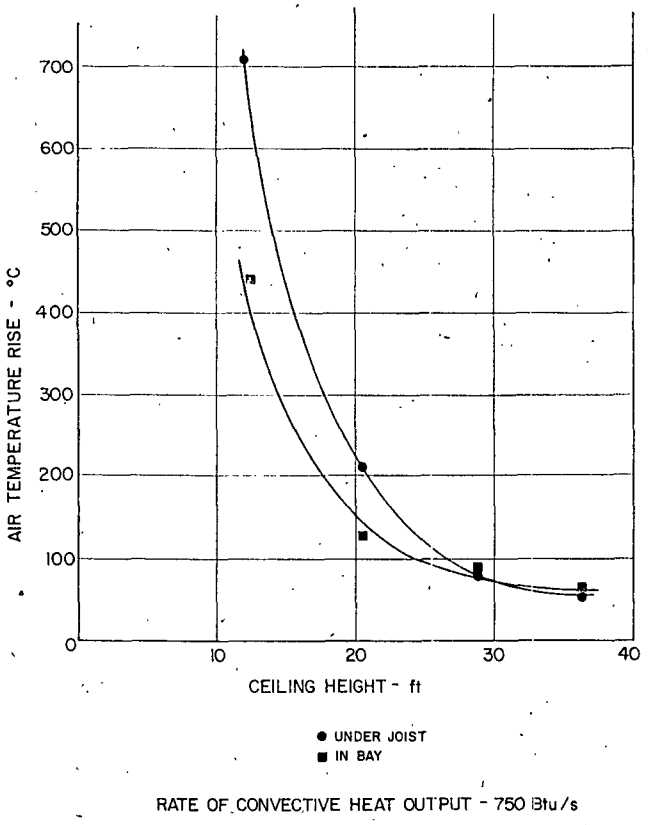


FIG 4 - VARIATION OF AIR TEMPERATURE RISE WITH CEILING HEIGHT FOR MEASUREMENTS ON FIRE AXIS

The most important parameter affecting hot gas flow under non-smooth ceilings is the buoyancy of the gases. Thompson (2) describes an analogy useful for understanding the flow of hot gases produced from the burning of ordinary combustibles under a "rough" ceiling: "The products of combustion from a fire tend to follow along the channels or bays just as water will run in a ditch rather than over its sides."

Hot gases from a large fire will be very buoyant because of the huge heat release rates of these fires. The flow of these highly buoyant gases beneath a fluid dynamically "rough" ceiling is analogous to wind movement across rugged terrain, except the hot gas flow is much more turbulent.

When a fire plume reaches the ceiling, the hot gases spread radially outward from the axis of the fire plume in a horizontal layer below the ceiling. The hot gas layer will be thicker but cooler for higher ceilings because more air has been entrained into the plume. When these hot gases are highly buoyant they will flow under a ceiling, following the path of least resistance. For the ceiling configuration described above, this will mean that the hot gas layer will flow below the level of the beams and girders. Eddy currents will carry a small fraction of the volume of fire gases into the beam pockets. These gases will stratify within the pocket in the classic fashion. The flow of the ceiling jet is highly turbulent, so cool air is entrained into the ceiling jet. Since more cool air will have been entrained into the jet with increasing radial distance from the fire plume, the temperatures reached within the ceiling jet decrease with increased radial distance.

These effects were demonstrated in a study performed by the National Automatic Sprinkler and Fire Control Association (6) in May 1968. These tests were performed to determine the sensitivity of sprinklers mounted at various depths below the ceiling and also to establish the effects produced by different ceiling configurations. The fire source used was a sizable flammable liquid pan fire. Figures 6 through 9 present the results of four tests run using a ceiling configuration similar to that frequently encountered in industry. Thirty-six in. (36 in.) deep I-beams with 12-in. flanges were spaced 6 ft on centers with a 26-ft ceiling height. Sprinkler heads were mounted at seven depths below the ceiling (2, 12, 16, 20, 24, 36, and 48 in.). These vertical banks of seven sprinklers each were mounted in eight different locations. Banks 1-4 were mounted in the centerline of a bay, spaced 2 ft apart, and sprinkler banks 5-8 were mounted similarly in an adjacent bay.

These tests correlate well for determining the behavior of the ceiling jet from a fire in a high ceiling area with closely spaced, deep beams. The test fires were sufficiently remote from the sprinkler locations so that ceiling jet, rather than plume characteristics, were observed. The test fires were flammable liquid fires, so the heated gases were highly buoyant.

The conclusions reached in the NASFCA report were that the areas of fastest operation are close to the ceiling deck (3-in. deflector distance) and below the bottom level of the beams. Tests were not conducted with heads mounted directly below a structural member; rather, all heads were mounted in the bays. Heads mounted below the bottom level of the beams will actuate quickly because they are in the ceiling jet. It should make no difference if heads are mounted below the bottoms of structural members or below the bays as long as their depth of mounting is such that they are below the bottom level of the beams.

SPRINKLER SENSITIVITY

TEST NO. 16 — SPRINKLER RATING 160 °F

CEILING TEMP. AT START 80 °F — WIND 10-SE — HUMIDITY 66 %

BEAM SPACING A = 6'-0" — BEAM DEPTH B = 36" — FLANGE WIDTH B' = 12"

SPK. SPACING F = 2'-0" — SPK. LOCATION C = 3'-0" D = 3'-0" E = 17'-0"

FIRE 9 FT² OF SOLOX 15 GALS. — FIRE LOCATION G = 13'-0" H = 20'-0"

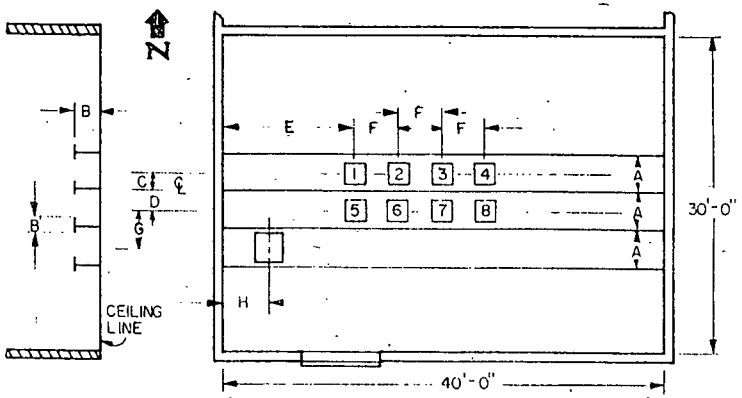
THERMOCOUPLES 7 @ CEILING (2, 6, 10) — MAX. TEMP. 200 °F

4 CEILING (3, 7, 11) — 205 °F

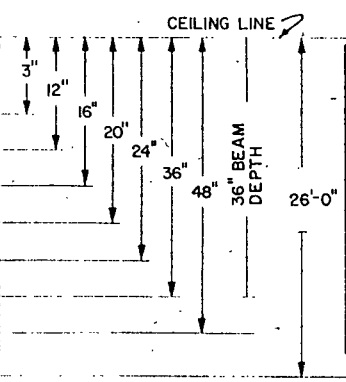
2 CEILING OVER FIRE (1, 5, 9) — 250 °F

1 NORTH BANK ℄ — 200 °F

4'-0", DOWN (4, 8, 12)



1	2	3	4	AVER.
7:45	8:23	9:10	8:30	8:27
10:35	9:25	9:45	9:70	9:46
11:14	10:22	10:30	10:55	10:45
11:31	12:03	11:34	11:35	11:40
11:32	11:33	11:46	11:25	11:34
9:16	9:41	10:31	9:41	9:47
9:37	8:44	9:20	9:10	8:57



5	6	7	8	AVER.
9:00	8:38	8:27	7:30	8:23
9:04	8:55	9:11	8:30	8:55
9:35	9:10	9:12	9:10	9:16
9:00	10:12	9:40	9:05	9:29
9:10	9:15	9:17	9:03	9:11
8:19	8:14	8:23	8:19	8:18
8:31	8:44	8:37	7:52	8:26

OPERATING TIME IN MINUTES

FIG. 6

SPRINKLER SENSITIVITY

TEST NO. 17 — SPRINKLER RATING 160°F

CEILING TEMP. AT START 100 °F — WIND 10-SE — HUMIDITY 66 %

BEAM SPACING A = 6'-0" — BEAM DEPTH B = 36" — FLANGE WIDTH B' = 12"

SPK. SPACING F = 2'-0" — SPK. LOCATION C = 3'-0" D = 3'-0" E = 17'-0"

FIRE 9 FT² OF SOLOX 10 GALS. — FIRE LOCATION G = 13'-0" H = 17'-0"

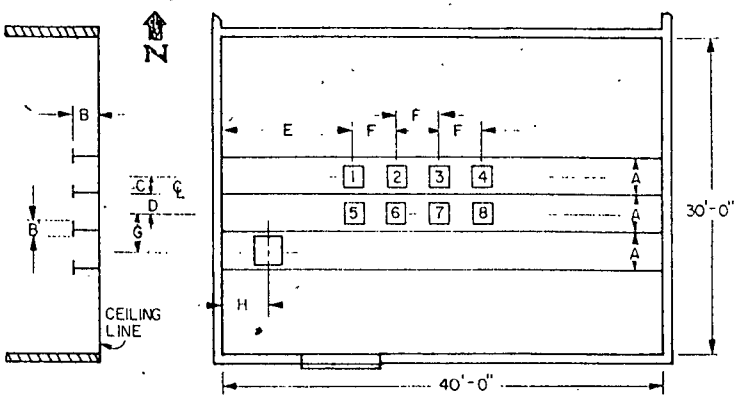
THERMOCOUPLES 7 @ CEILING (2, 6, 10) — MAX. TEMP. 210 °F

4 CEILING (3, 7, 11) — 215 °F

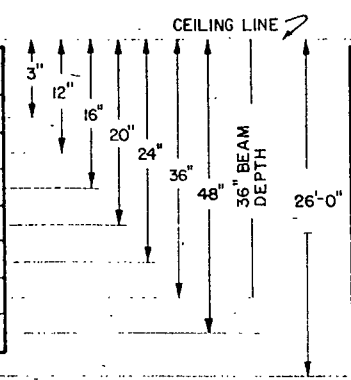
2 CEILING OVER FIRE (1, 5, 9) — 260 °F

1 NORTH BANK ℄ — 205 °F

4'-0" DOWN (4, 8, 12)



1	2	3	4	AVER.
5 50	5 38	6 10	6:43	6:05
7:00	7:36	6:50	6:55	7:05
8:21	8:57	8:29	8:00	8:26
8:15	8:42	8:53	8:37	8:36
8:25	8:56	8:45	8:31	8:39
:54	7:29	7:53	7:22	7:24
6:36	6:34	6:45	7:18	6:48



5	6	7	8	AVER.
7:06	7:06	6:48	6:18	6:49
7:15	7:15	7:20	6:39	7:07
7:10	7:37	6:44	7:50	7:20
6:38	7:40	6:48	6:28	6:53
6:35	6:50	7:15	6:48	6:52
6:30	6:43	6:18	5:50	6:20
6:15	5:55	5:51	6:17	6:04

OPERATING TIME IN MINUTES

FIG. 7

SPRINKLER SENSITIVITY

TEST NO. 18 SPRINKLER RATING 280 °F

CEILING TEMP. AT START 100 °F WIND 10-SE HUMIDITY 66 %

BEAM SPACING A= 6'-0" BEAM DEPTH B= 36" FLANGE WIDTH B'= 12"

SPK. SPACING F= 2'-0" SPK. LOCATION C= 3'-0" D= 3'-0" E= 17'-0"

FIRE 18 FT^2 OF SOLOX 30 GALS. FIRE LOCATION G= 13'-0" H= 20'-0"

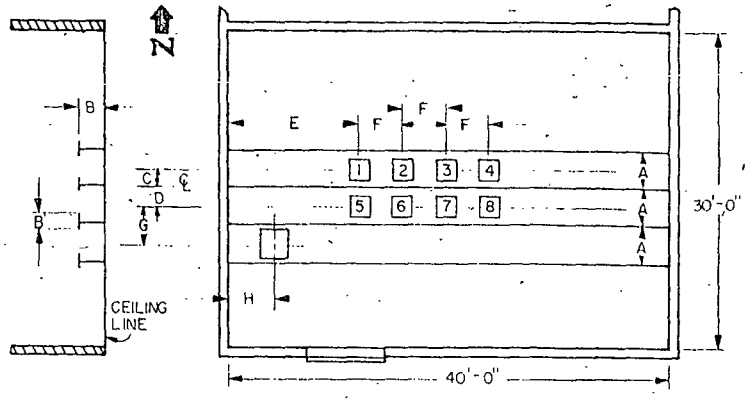
THERMOCOUPLES 7@ CEILING (2, 6, 10) MAX. TEMP. 310 °F

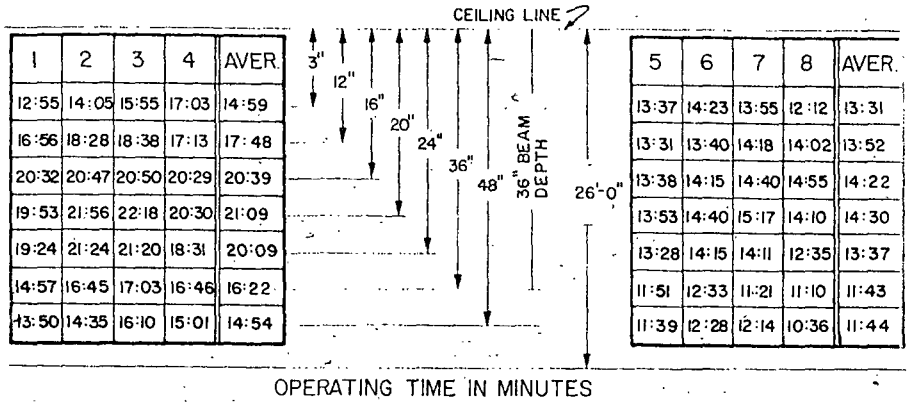
4 CEILING (3, 7, 11) 310 °F

2 CEILING OVER FIRE (1,5,9) 390 °F

1 NORTH BANK ℄ 310 °F

4'-0" DOWN (4, 8, 12)





1	2	3	4	AVER.
12:55	14:05	15:55	17:03	14:59
16:56	18:28	18:38	17:13	17:48
20:32	20:47	20:50	20:29	20:39
19:53	21:56	22:18	20:30	21:09
19:24	21:24	21:20	18:31	20:09
14:57	16:45	17:03	16:46	16:22
13:50	14:35	16:10	15:01	14:54

5	6	7	8	AVER.
13:37	14:23	13:55	12:12	13:31
13:31	13:40	14:18	14:02	13:52
13:38	14:15	14:40	14:55	14:22
13:53	14:40	15:17	14:10	14:30
13:28	14:15	14:11	12:35	13:37
11:51	12:33	11:21	11:10	11:43
11:39	12:28	12:14	10:36	11:44

OPERATING TIME IN MINUTES

FIG. 8

SPRINKLER SENSITIVITY

TEST NO. 19 SPRINKLER RATING 280 °F

CEILING TEMP. AT START 110 °F WIND 10-SE HUMIDITY 66 %

BEAM SPACING A= 6'-0" BEAM DEPTH B= 36" FLANGE WIDTH B'= 12"

SPK. SPACING F= 2'-0" SPK. LOCATION C= 3'-0" D= 3'-0" E= 17'-0"

FIRE 18 FT^2 OF SOLOX 30 GALS. FIRE LOCATION G= 13'-0" H= 20'-0"

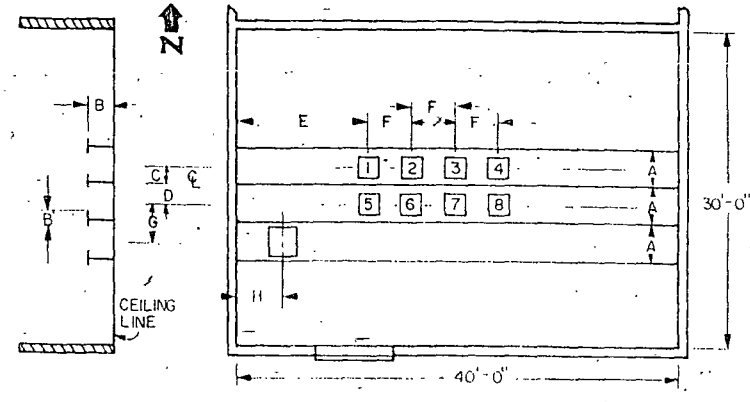
THERMOCOUPLES 7@ CEILING (2, 6, 10) MAX. TEMP. 320 °F

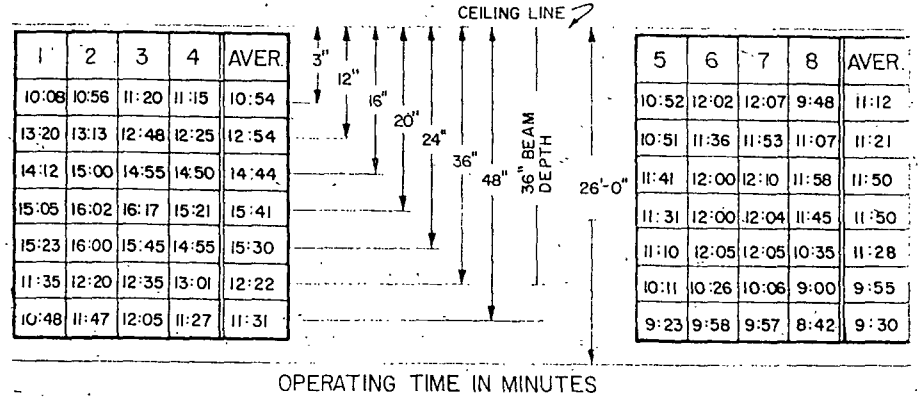
4 CEILING (3, 7, 11) 320 °F

2 CEILING OVER FIRE (1,5,9) 390 °F

1 NORTH BANK ℄ 315 °F

4'-0" DOWN (4, 8, 12)





1	2	3	4	AVER.
10:08	10:56	11:20	11:15	10:54
13:20	13:13	12:48	12:25	12:54
14:12	15:00	14:55	14:50	14:44
15:05	16:02	16:17	15:21	15:41
15:23	16:00	15:45	14:55	15:30
11:35	12:20	12:35	13:01	12:22
10:48	11:47	12:05	11:27	11:31

5	6	7	8	AVER.
10:52	12:02	12:07	9:48	11:12
10:51	11:36	11:53	11:07	11:21
11:41	12:00	12:10	11:58	11:50
11:31	12:00	12:04	11:45	11:50
11:10	12:05	12:05	10:35	11:28
10:11	10:26	10:06	9:00	9:55
9:23	9:58	9:57	8:42	9:30

OPERATING TIME IN MINUTES

FIG. 9

Summary.
1. Sprinklers should be mounted in compliance with Table 4-2.4.5 of NFPA 13. It is not necessary to discharge water directly on structural members to cool them. Interference with sprinkler discharge will result in less atmospheric cooling and less protection of structural steel.
2. A fire should engulf at least one sprinkler and probably two within the fire plume for ceiling heights in excess of 30 ft and for head spacing in accordance with current limits. Heads within the plume will be actuated at about the same time regardless of mounting depth.
3. Heads mounted below the bottom level of the beams will be situated within the ceiling jet and will actuate quickly. Heads can be mounted directly beneath structural members or below the bays and still be actuated quickly as long as they are below the bottom level of the beams.
Conclusions.
NFPA 13, section 4-1.1 should be changed by adding section 4-1.1.5, "Clearance between sprinklers and ceiling for ceilings in excess of 30 ft may exceed the maximum specified in Section 4-3 if approved by the authority having jurisdiction."
References.
1. NFPA 13, "Standard for the Installation of Sprinkler Systems," NFPA, Boston, MA (1978).
2. Norman J. Thompson, Fire Behavior and Sprinklers, NFPA, Boston, MA (1964).
3. M.J. O'Dogherty and R.A. Young, "The Effect of Ceiling Height, Rate of Fire Development and Sprinkler Position on Response to a Growing Fire," Joint Fire Research Organization.
4. R.L. Alpert, "Response Time of Ceiling Mounted Fire Detectors," Factory Mutual Research Corporation, Norwood, MA (1972).
5. R.L. Alpert, "Turbulent Ceiling Jet Induced by Large Scale Fires," Factory Mutual Research Corporation, Norwood, MA.
6. National Automatic Sprinkler and Fire Control Association, "Study of Sprinkler Sensitivity," May 1968.
COMMITTEE ACTION: Accept in Principle.
Add a new section 4-1.1.5* to read as follows:
4-1.1.5* Clearance between sprinklers and ceilings may exceed the maximum specified in 4-3 provided tests or calculations show comparable sensitivity and performance of the sprinklers to those installed in conformance with 4-3.
Add a new section A-4-1.1.5 to read as follows:
A-4-1.1.5 In determining equivalent performance through analytical or experimental methods, the sprinkler's sensitivity, spray distribution, fire size and droplet size penetration should be considered.
COMMITTEE COMMENT: Nothing in the Submitter's documentation substantiates the point of 30 ft as to nonperformance with the present requirement. The revised wording is written in performance terms and allows for variation from the specified requirements.

13- 404 - (4-1.3.8 (New), 4-3.6 (New), 4-4.4.2 Exception (New), and 4-4.21* (New): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Add a new section to read as follows:
4-1.3.8 Composite Wood Joist Construction. The term composite wood joist construction refers to wood joist construction with web thickness less than 2 in. (50 mm) nominal solid thickness.
Renumber existing 4-1.3.8 as 4-1.3.9.
Add a new section 4-3.6 to read as follows:
4-3.6 Composite Wood Joist Construction (as defined in section 4-1.3.8). In composite wood joist construction, sprinklers shall be positioned in the joist channels 1 to 10 in. (25 to 254 mm) below the deck (also see 4-4.2.1).
Renumber present 4-3.6 as 4-3.7.
Add an Exception to 4-4.4.2 below the first paragraph as follows:
Exception: Composite wood joist construction.
Add a new section 4-4.21* to read as follows:
4-4.21* Location of sprinklers in composite wood joist construction (as defined in 4-1.3.8). In composite wood joist construction, sprinklers shall be provided in every joist channel, staggered so that there is not more than 20 ft (6.0 m) between adjacent sprinklers in joist channels.
Add a new Figure A-4-4.21 Sprinkler Location in Composite wood Joist Construction.
SUBSTANTIATION: More guidance is needed on the use of wood joist construction. Also more guidance is needed on the use of new composite wood joist construction.
COMMITTEE ACTION: Accept.

13- 305 - (4-1.3.9): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Revise to read as follows:
4-1.3.9. High Piled Storage. High piled storage is defined as solid piled, palletized, bin box, shelf or rack storage in excess of 12 ft (3.7 m). See Appendix D for availability of information for sprinkler protection of high piled storage.
SUBSTANTIATION: There is a need to correlate NFPA 13, Standard for the Installation of Sprinkler Systems with NFPA 231, Standard for Indoor General Storage.
COMMITTEE ACTION: Accept.

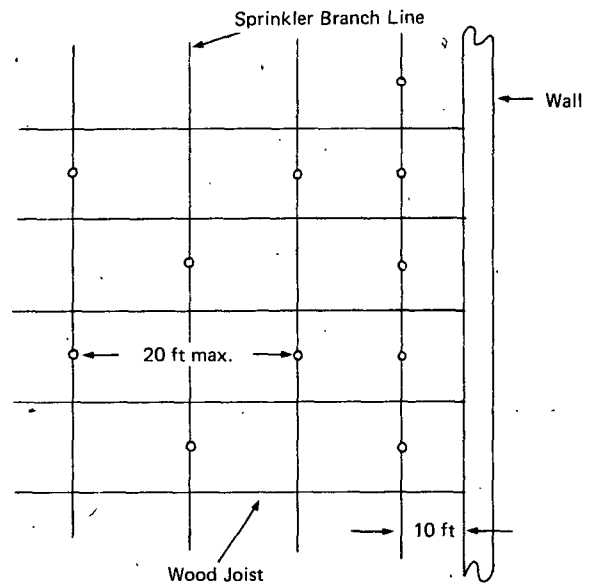


Figure A-4-4.21 Sprinkler Location in Composite Wood Joist Construction

13- 403 - (4-2.5 and 4-2.5.2* (New)): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Revise section 4-2.5 to read as follows: Make a title to read as follows:
4-2.5 Clear Space Below Sprinklers.
Take existing material without the title and renumber as 4-2.5.1.
Add a new section 4-2.5.2 to read as follows:
4-2.5.2* The clearance from pendent and upright sprinklers to privacy curtains, free standing partitions or room dividers shall be not less than the distances given in Table 4-2.5.2 as measured in Figure 4-2.5.2(a). For sidewall sprinklers the top of the privacy curtain, free standing partition or room divider shall not extend higher than the horizontal plane of the center line of the sprinklers as shown in Figure 4-2.5.2(b).
Add a Table 4-2.5.2 to read as follows:

Horizontal Distance	Minimum Vertical Distance Below Deflector
6 in.	3 in.
9 in.	4 in.
12 in.	6 in.
15 in.	8 in.
18 in.	9 1/2 in.
24 in.	12 1/2 in.
30 in.	15 1/2 in.
Greater than or equal to 36 in.	18 in.

Add Figures 4-2.5.2(a), Minimum Horizontal and Vertical Distance for Pendent Sprinklers, and 4-2.5.2(b), Minimum Height of Room Divider for Horizontal Sidewall Sprinklers.
Add a new section A-4-2.5.2 to read as follows:
A-4-2.5.2 The distances given in Table 4-2.5.2 were determined through tests in which privacy curtains with either a solid fabric or close mesh 1/4 in. (0.6 mm) top panel were installed. For broader mesh top panels (e.g., 1/2 (12.5 mm) the obstruction of the sprinkler spray is not likely to be severe and the authority having jurisdiction may not need to apply the requirements in 4-2.5.2. (See following page for Figure 4-2.5.2(a) and Figure 4-2.5.2(b).)
SUBSTANTIATION: NBS Report NBSIR 80-2097, Full Scale Fire TEsts with Automatic Sprinklers in a Patient Room, Phase II was presented to the Committee and gives technical justification for the action.
COMMITTEE ACTION: Accept.

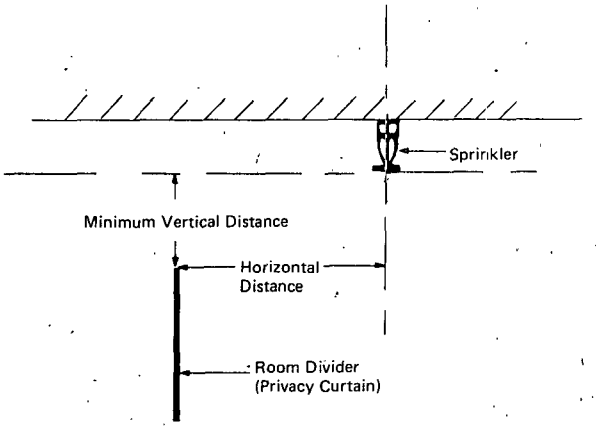


Figure 4-2.5.2(a) Standard Spinkler Installed Near Privacy Curtain

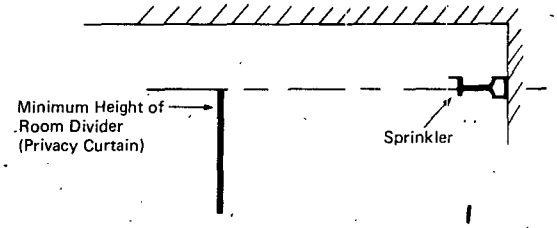


Figure 4-2.5.2(b) Sidewall Spinkler Installed Near Privacy Curtain

13- P14 - (4-3.1.1): Accept in Principle
SUBMITTER: L.R. Milam, Automatic Sprinkler Corp. of America
RECOMMENDATION: In the second line, after the word "or" revise the remainder of the paragraph to read: "...1 in. to 12 in. (25 mm to 305 mm) below noncombustible ceilings."
SUBSTANTIATION: This is an editorial change to eliminate any misunderstanding as to the intent of the paragraph.
COMMITTEE ACTION: Accept in Principle.
Apply the Submitter's proposal to section 4-3.1.
COMMITTEE COMMENT: The Submitter's recommendation is applied to section 4-3.1 because section 4-3.1.1 was deleted in the 1980 edition.

13- 03 - (4-3.2.3): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Revise to read as follows:
4-3.2.3 Deflectors of sprinklers under concrete tee construction with stems spaced less than 7 1/2 ft (2.3 m) but more than 3 ft (0.9 m) on centers shall, regardless of the depth of the tee, be located at or above a plane 1 in. (25 mm) below the level of the bottom of the stems of the tees and comply with Table 4-2.4.6.
SUBSTANTIATION: Guidance is needed to remove an apparent inconsistency if a sprinkler is located below the stem of a tee. In this case 4-3.2.2 would limit the depth of a sprinkler below a deck to 20 in. (508 mm), but for sprinklers located between stems, the maximum distance from the deck is not specified.
COMMITTEE ACTION: Accept.

13- P118 - (4-4.3(d)): Accept in Principle
SUBMITTER: S.R. Hoover, Kemper Group
RECOMMENDATION: Revise 4-4.3(d) to say:
(d) No flammable liquids (or commodities that may shield a fire and convert to a flammable liquid) are processed, handled or stored on the floor above.
SUBSTANTIATION: This proposal reflects the consequences of several factors: Lack of sprinklers below the ground floor, a shielded fire, and a combustible which can be transformed into a flammable liquid by the fire itself. The committee initially rejected this proposal saying that if all four steps outlined in section 4-4.2 are followed, then sprinklers can be eliminated in the space below. However, the only type commodity mentioned in the four steps is flammable liquids. Obviously, most people think only in terms of flammable liquids since that is what is mentioned in the standard; however, the standard should be revised to make everyone aware that there are commodities, such as rubber tires or plastics, which pose the unique problem of shielding an internal fire as well as the ability to convert into a flammable liquid. Only by giving examples of that type of material in the standard will we remind engineers and contractors that there is another consideration that must be made.
COMMITTEE ACTION: Accept in Principle.
Revise 4-4.3(d) as follows:
(d) No combustible or flammable liquids or materials that under fire conditions may convert into combustible or flammable liquids are processed, handled or stored on the floor above.
COMMITTEE COMMENT: Revised wording should satisfy the Submitter's intent.

13- 401 - (4-4.4.2(d)): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Add a new 4-4.4.2(d) to read as follows:
(d) When the exposed surfaces have a flame spread rating less than 25 and the surface materials have been demonstrated not to propagate fire in the form in which they are installed in the space.
SUBSTANTIATION: Provision is needed to permit fire retardant treated wood or similar materials to be used in concealed spaces without sprinkler protection.
COMMITTEE ACTION: Accept.

13- P61 - (4-4.4.3(b)): Accept
SUBMITTER: R.P. Fleming, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Add "on center" after "not over 12 ft (3.7 m)."
SUBSTANTIATION: Editorial clarification.
COMMITTEE ACTION: Accept.

13- P46 - (4-4.8): Reject
SUBMITTER: T.G. Collinge, Insurers' Advisory Organization of Canada
RECOMMENDATION: Revise 4-4.8 as follows:
4-4.8 Vertical Openings and Shafts.
4-4.8.1* Unenclosed Openings.
4-4.8.1.1* Unenclosed floor openings shall be protected by draft stops in combination with close-spaced sprinklers.
Exception No. 1: Balconies or galleries of noncombustible construction and not over 8 ft (2.4 m) wide affording only pedestrian access to small rooms of light hazard occupancy as defined in 4-4.20.
Exception No. 2: Noncombustible partition walls adjacent to the vertical opening with not over 10 percent wall area as permanently sealed glass windows. Doors, if any, giving access to balconies or galleries described in Exception No. 1 shall be automatic closing or self closing type.
Exception No. 3: Floor openings not exceeding 200 sq ft (18.6 m^2) that are normally closed but which may be open from time to time, such as equipment hoistways, or which are protected by a sprinklered noncombustible enclosure immediately above such as conveyor openings. In such cases sprinklers at ceiling level of the floor below the opening shall be placed close to the opening so as to fully cover the area below it.
Renumber existing 4-4.8.1, Vertical Shafts, as 4-4.8.2.
Renumber existing 4-4.8.1.1 as 4-4.8.2.1.
Delete existing 4-4.8.1.2.
Add new 4-4.8.2.2:
4-4.8.2.2 Vertical shafts having noncombustible sides but which contain combustible contents shall be sprinklered at the top of the shaft.
Renumber existing 4-4.8.2, Stairways, as 4-4.8.3.
Renumber existing 4-4.8.2.1 as 4-4.8.3.1.
Renumber existing 4-4.8.2.2 as 4-4.8.3.2.
Renumber existing 4-4.8.3 as 4-4.8.3.3.
Delete existing 4-4.8.2.3*.
Renumber existing A-4-4.8.2 as A-4-4.8.1 and revise:
(a) Floor or wall openings tending to create vertical or horizontal drafts, or other structural conditions that would delay the prompt operation of automatic sprinklers by preventing the banking up of heated air from a fire, should be properly closed or stopped by construction materials of appropriate fire resistance rating in order to permit control of fire at any point by local sprinklers.
(b) Examples of unenclosed openings include atriums, escalators or moving sidewalks, staircases, covered light wells, and decorative or monumental openings.
(c) Where areas adjacent to vertical openings are separated from the openings by ordinary glass windows exceeding 10 percent of wall area, openable windows, doors that are neither automatic- or self-closing, or similar features whose fire performance cannot be relied on to permit fire control by local sprinklers, the vertical opening should be considered unenclosed.
Renumber existing Figure A-4-4.8.2.3 as Figure A-4-4.8.1.1.
Renumber existing A-4-4.8.2.3 as A-4-4.8.1.1 and revise.
Add new second sentence: "Beams, door and window lintels, and similar structural features may be utilized as draft stops."
Revise existing third sentence: "Sprinklers in this water curtain....3 gal per min per lineal ft ((37 L/min)/m) of water curtain to a maximum of the most hydraulically remote 120 linear ft (18.3 m) or the length of the largest fire compartment fronting on the opening, whichever is less, with no sprinkler...."

Revise last sentence: "(See Figure A-4-4.8.1.1.)"
SUBSTANTIATION: Reorganization of 4-4.8: For some time, covered malls of multi story shopping centers have featured floor openings per se without staircases or escalators. The atrium design concept is also being used in tall buildings. Many authorities such as the National Research Council of Canada (in the National Building Code) are accepting the protection described in existing 4-4.8.2.3 and A-4-4.8.2.3 as sufficient for such openings in fully sprinklered buildings. Some local authorities in Canada, however, consider these openings as requiring no protection whatever, on the grounds that they do not contain staircases, etc. Reorganizing 4-4.8 as suggested would eliminate this conflict.

Proposed 4-4.8.1.1* Exception No. 1: It seems excessive to require this protection at balcony or gallery perimeters when the design of the small rooms they serve will promote fire control by sprinklers in the rooms themselves; as in hotel rooms around an atrium.

Exception No. 2: Offices for example may overlook an atrium or a light well via windows. The limited use of glass should still allow fire control by local sprinklers. Self or automatic-closing doors in perimeter partitions would fill the same role (although it is arguable that they belong in Exception No. 1).

Exception No. 3: It also seems excessive to require perimeter protection around an equipment hoistway that may be used in the maintenance context only a few hours per year. The sprinklered enclosure technique has been used in the past with apparent success where conveyors are concerned.

Delete existing 4-4.8.1.2: This wording has been incorporated in Exception No. 3 above with some revision in an attempt to clarify intent.

New 4-4.8.2.2: Contents such as electric power or telephone wiring, or piping with combustible insulation, are contemplated here. Fires in such service shafts are rare but are difficult to extinguish when they occur.

Delete existing 4-4.8.2.3*: Incorporated in proposed 4-4.8.1.1*.

Renumbered A-4-4.8.1(a) (formerly A-4-4.8.2): The concept of fire resistance rating is introduced since this section is quite general and could refer to fire separations -- or even fire walls.

A-4-4.8.1(b): For guidance as to what constitutes an "unenclosed opening."

A-4-4.8.1(c): Again guidance, this time as to when "enclosure" of a vertical opening is not sufficient to eliminate the need for further protection.

Renumbered A-4-4.8.1.1 (existing A-4-4.2.8.3) revisions:

Proposed new second sentence: countenances what is already being done.

Revised third sentence: Assuming that the draft stop - close spaced sprinkler technique for general vertical opening protection is acceptable, "around the opening" unqualified can represent a very large water demand indeed since the openings themselves can be quite large. Their sheer size, however, makes it extremely unlikely that all sprinklers around them would operate in a fire - if they did, the building would be well on its way to a total loss - so some limit on the number of sprinklers required to be calculated seems in order. 120 ft is suggested as representing a fairly large fire front in context.

COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: See Committee Action on Proposal No. 04 on 4-4.8.2.4 and No. P64 on A-4-4.8.2.3.

13- P21 - (4-4.8.1.1): Accept in Principle
SUBMITTER: Dennis Kirson, Brookhaven National Laboratory
RECOMMENDATION: Revise section to read:
4-4.8.1.1 In addition to sprinklers at the tops of shafts, within vertical shafts having combustible sides, sprinklers shall also be provided for each 200 sq ft of combustible surface.
SUBSTANTIATION: Section 4-4.8.1.1 ends with the parenthetical phrase, "in addition to sprinklers at the tops of shafts." Grammatically, it is unclear as to what this phrase modifies. Thus, this section could be interpreted as either requiring sprinklers at the top of shafts in addition to those at intermediate levels only when shafts are of combustible construction, or always at the top of shafts, with additional intermediate level sprinklers when the shaft is of combustible construction. It is understood that the latter is the proper interpretation.
COMMITTEE ACTION: Accept in Principle.
Revise 4-4.8.1.1 to read as follows:
4-4.8.1.1 In addition to sprinklers at the top of vertical shafts, sprinklers shall be provided for each 200 sq ft (18.6 m^2) of combustible surface, when shafts have combustible sides. Sprinklers shall be installed at each floor level shut-off by floor level trap doors.
COMMITTEE COMMENT: The revised wording should satisfy the Submitter's intent. Guidance on trapped shaft is needed.

13- P62 - (4-4.8.2.3): Reject
SUBMITTER: R.P. Fleming, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Delete the words "draft stops in combination with." Move this section out from within 4-4.8.2 and retitle as "Stairways and Atriums."
SUBSTANTIATION: We are unaware of any technical justification for requiring draft stops around vertical openings requiring sprinkler protection. In any event, protection methods for vertical openings should apply to atriums as well as stairways.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: See Committee Action on Proposal 04 on 4-4.8.2.4 and Proposal P64 on A-4-4.8.2.3.

13- 04 - (4-4.8.2.4): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Renumber 4-4.8.3 as 4-4.8.2.4 and add an Exception to 4-4.8.2.3 to read as follows:
Exception: Large openings such as those found in shopping malls, open atrium buildings or similar structures where all adjoining levels and spaces are protected with automatic sprinklers in accordance with this standard.
Add a new sentence to 4-4.8.1.2 to read as follows:
Also see 4-4.8.2.3.
Change the title of 4-4.8 to read as follows:
4-4.8 Elevators, Stairs and Floor Openings.
SUBSTANTIATION: Fire experience does not indicate a need to use draft stops in combination with closely spaced sprinklers in fully sprinklered buildings.
COMMITTEE ACTION: Accept.

13- P22 - (4-4.8.3): Accept in Principle
SUBMITTER: Dennis Kirson, Brookhaven National Laboratory
RECOMMENDATION: Revise section 4-4.8.3 to read:
4-4.8.3 Noncombustible stair shafts ordinarily will require sprinklers only at the top and lower landings.
Exception: When serving two or more separate fire divisions separated by 4-hour fire walls, sprinklers will also be required at each floor landing.
SUBSTANTIATION: Section 4-4.8.3 is unclear inasmuch as it uses terms (tier, fire section) which are not defined elsewhere in the standard.
COMMITTEE ACTION: Accept in Principle.
Revise 4-4.8.3 and renumber as 4-4.8.2.4* to read as follows:
4-4.8.2.4* In noncombustible stair shafts, sprinklers shall be installed at the top and under the first landing above the lowest level. When the stair shaft serves two or more separate fire sections sprinklers shall also be installed at each floor landing.
Add to the Appendix Figure A-4-4.8.2.4(a) Noncombustible Stair Shaft Serving Two Fire Sections and Figure A-4-4.8.2.4(b) Noncombustible Stair Shaft Serving One Fire Section.

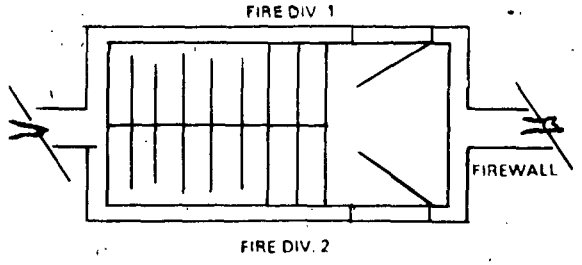


Figure A-4-4.8.2.4(a) Noncombustible Stair Shaft Serving Two Fire Sections

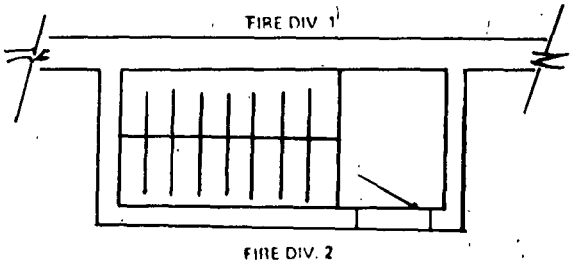


Figure A-4-4.8.2.4(b) Noncombustible Stair Shaft Serving One Fire Sections

COMMITTEE COMMENT: The revised wording is in accordance with the NFPA Manual of Style and has been renumbered for editorial clarification. The rating of the fire walls for the separation of fire sections is up to the appropriate building code.
Also see Proposal No. 04 on 4-4.8.2.4.

13- P23 - (4-4.8.3): Reject
SUBMITTER: Dennis Kirson, Brookhaven National Laboratory
RECOMMENDATION: Revise section 4-4.8.3 to read:
4-4.8.3 In all stair shafts, a sprinkler head shall be provided above each landing, and beneath the lowest landing where the space beneath the lowest landing is unenclosed.
SUBSTANTIATION: In noncombustible stair shafts, the sprinkler head required by section 4-4.8.3, at the top of the stair shaft, conforms to the intent of section 4-4.8.1.1. It is further understood that the intent of the sprinkler head required at the lowest landing is to take care of any improper storage beneath the stairs. However, to omit sprinkler heads at all other landings, in noncombustible stair shafts, appears inconsistent with other sections which require sprinklers beneath obstructions (i.e., stair landings) to sprinkler discharge.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: See Committee Action on Proposal P22 on section 4-4.8.2.4. Stair shafts should not contain combustibles.

13- P105 - (4-4.16.4* (New)): Accept
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add a new section to read:
4-4.16.4* Sprinklers shall not be installed beneath drop-out ceilings.
Add a new section to Appendix to read:
A-4-4.16.4 The ceiling tiles may drop before sprinkler operation. Delayed operation may occur because heat must then bank down from the deck above before sprinklers will operate.
SUBSTANTIATION: The problem, its effects, and solution are described above in the proposed wording.
COMMITTEE ACTION: Accept.

13- P65 - (4-4.17.3): Accept
SUBMITTER: Charles Barnett, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Change "approved" to "listed."
SUBSTANTIATION: Conformance with NFPA definitions.
COMMITTEE ACTION: Accept.

13- P115 - (4-4.18): Reject
SUBMITTER: Miles R. Suchomel, Underwriters Laboratories Inc.
RECOMMENDATION: Delete entire section.
SUBSTANTIATION: A review of test data justifying this section indicates the device used is a spray nozzle and not a sprinkler. Therefore this section belongs within the purview of the committee on NFPA 15, Water Spray Fixed Systems.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: The use of both automatic sprinklers and automatic spray nozzles was verified by tests performed by the NAS & FCA 8/8/66.

13- P66 - (4-4.20): Accept
SUBMITTER: L.R. Milam, Automatic Sprinkler Corp. of America
RECOMMENDATION: Make the following editorial change in the index by adding:

	Reference
Small Rooms.	4-4.20, A-4-4.20

SUBSTANTIATION: There is a frequent need to reference this subsection. At present, there is no reference to it in the index, however.
COMMITTEE ACTION: Accept.

13- P67 - (4-4.21 (New)): Accept in Principle
SUBMITTER: R.P. Fleming, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Add a new section as follows:
4-4.21 Theater Stages. Sprinklers shall be installed under the roof at the ceiling in usable spaces under the stage; in all auxiliary spaces and dressing rooms, storerooms, and workshops. When openings are provided in the stage floor for stage lifts, trap doors, or stairs, such openings shall be protected in accordance with section 4-4.8.2.3. Where proscenium opening protection is required, a deluge system shall be provided within 3 ft of the stage side of the proscenium arch, with open standard sprinklers spaced up to a maximum of 10 ft on center and designed to provide a discharge of 3 gpm per lineal ft of water curtain, with no sprinkler discharging less than 15 gpm.
SUBSTANTIATION: Guidance is needed for the protection of stage areas. NFPA 101® and the model building codes have been including requirements which often conflict due to lack of guidance.
COMMITTEE ACTION: Accept in Principle.
Add a new section to read as follows:
4-4.22 Theater Stages. Sprinklers shall be installed under the roof at the ceiling, in usable spaces under the stage; in all adjacent spaces and dressing rooms, storerooms, and workshops. When openings are provided in the stage floor for stage lifts, trap doors, or stairs, such openings shall be protected in accordance with 4-4.8.2.3. When proscenium opening protection is required a deluge system shall be provided within 3 ft (0.9 m) of the stage side of the proscenium arch, with open standard sprinklers spaced up to a maximum of 6 ft (1.8 m) on center and designed to provide a discharge of 3 gpm/lineal foot ((37L/min)/m) of water curtain, with no sprinkler discharging less than 15 gpm (56.8 L/min).
COMMITTEE COMMENT: The word adjacent better expresses the committee's intent than auxiliary. The sprinklers should be close spaced rather than 10 ft apart.
The Committee has added a new section 4-4.21 and renumbered the Submitter's section as 4-4.22.

13- P01 - (4-5.2.2): Accept in Principle
SUBMITTER: Peter B. McOrmond, Insurance Services Office
RECOMMENDATION: Add the following Exception after section 4-5.2.2:
Exception: New combustible smooth ceiling spacing is permitted under 5/8 in. plaster board attached to the bottom of wood joists or other combustible construction.
SUBSTANTIATION: The February 1978 "Interpretation" appears to contradict the statement, "....combustible smooth ceiling sheathed with plaster board...."
COMMITTEE ACTION: Accept in Principle.
Add an Exception to 4-5.2.2 to read as follows:
Exception: Noncombustible smooth ceiling spacing is permitted beneath gypsum wallboard attached to the bottom of wood joist or other combustible construction.
COMMITTEE COMMENT: The revised wording better expresses the Committee's intent and should satisfy the Submitter.

13- P02 - (4-5.3.2 (New)): Accept in Principle
SUBMITTER: Peter B. McOrmond, Insurance Services Office
RECOMMENDATION: Add the following Exception after section 4-5.3.2:
Exception: New combustible smooth ceiling spacing is permitted under 5/8 in. plaster board attached to the bottom of wood joists or other combustible construction.
SUBSTANTIATION: The February 1978 "Interpretation" appears to contradict the statement, "....combustible smooth ceiling sheathed with plaster board...."
To be consistent with section 4-5.2.2.
COMMITTEE ACTION: Accept in Principle.
Add an Exception to 4-5.3.2 to read as follows:
Exception: Noncombustible smooth ceiling spacing is permitted beneath gypsum wallboard attached to the bottom of wood joist or other combustible construction.
COMMITTEE COMMENT: The revised wording better expresses the committee's intent and should satisfy the Submitter.

13- P18 - (5-2.6.4 and Note (New)): Reject
SUBMITTER: Frank D. Harrisson, Lavino Shipping Co.
RECOMMENDATION: A. Exchange "cold storage plants" with "All facilities with systems that require air for operation or supervision, i.e., dry pipe valve, preaction valve, H.A.D. Aero Systems."
B. Add after "freezers of lowest temperature..." the words "or outside of the heated control house that is ambient to the outside weather whichever is colder or reasonably available."
C. Add Note:
NOTE: This is of particular interest to waterfront facilities or facilities that are located in high humidity and temperature vacillating environment.
SUBSTANTIATION: Moisture laden compressed air is a serious problem when it freezes in the air supply line or collects at a pipe fitting. We have found that mounting the compressor on the roof of the valve house or extend the piping outside of the control house or through the wall into the freezer building when adjacent to, has solved the problem to the fact that cold air sustains and contains less moisture.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: Section 5-2.6.4 is specifically designed to accommodate a severe condition present in cold storage plants. These provisions are not justified in all other dry-pipe system applications. In many situations, locating the compressor intake outside of the valve enclosure will have little effect on the dry system.

13- 501 - (5-2.7.3): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Add to the last sentence as follows: "and shall remain closed unless filling the system."
SUBSTANTIATION: There is a need to give guidance on the shut-off valve in the air filling connection.
COMMITTEE ACTION: Accept.

13- P68 - (5-2.7.3): Reject
SUBMITTER: R.P. Fleming, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: The connection pipe from the air compressor shall be not less than 1/2 in. steel, brass, or copper, and shall enter the system above the priming water level of the dry pipe valve. If an air maintenance device is not used, the connection shall contain a 1/8 in. brass orifice restriction. A check valve shall be installed in the air line and a shutoff valve of renewable disc type shall be installed on the supply side of this check valve.
SUBSTANTIATION: Some requirement for the pipe material is needed and a requirement is needed for a line restriction for those systems where air maintenance devices are not used. There have been field problems reported where a compressor has been able to make up the pressure loss caused by an open sprinkler, preventing the dry valve from opening.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: Steel and copper materials are presently permitted in the standard.
It is not practical to install 1/8 in. orifice in air supply piping to all systems where air maintenance devices are not present. This restriction would not allow system fill time required by the standard.

13- P15 - (5-2.7.7 and A-5.3.3): Accept
SUBMITTER: R.P. Fleming, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: In section 5-2.7.7 delete "....when available, or 20 lb psi (1.4 bars) in excess of the calculated trip pressure of the dry-pipe valve...."
Delete last paragraph of A-5.3.3.
SUBSTANTIATION: Excessive delays in the delivery of water to the inspector's test connection in dry systems have been partially attributed to excessive system air pressures. For systems with low water pressures, arbitrarily adding 20 psi above the calculated trip pressure or providing 50 psi air will delay valve tripping. Manufacturers instructions should be followed.
COMMITTEE ACTION: Accept.

13- P24 - (5-2.7.9 (New)): Reject
SUBMITTER: Dennis Kirson, Brookhaven National Laboratory
RECOMMENDATION: Add a new section 5-2.7.9 substantially as follows:
5-2.7.9 Air or nitrogen pressure shall be supervised to provide two separate and distinctive signals. One signal shall indicate that the required pressure has been decreased or increased beyond acceptable limits, and the other indicating restoration of the pressure to its normal value.
SUBSTANTIATION: There appears to me to be lack of coordination between NFPA 13, Standard for the Installation of Sprinkler Systems, and the NFPA 71, 72A, 72C and 72D, standards for protective signaling systems, and lack of clarity concerning requirements for pre-action sprinkler systems. The signaling system standards (NFPA 71) section 3-4.3.3(b); (NFPA 72A) section 3-6.2.1(b); (NFPA 72C) section 3-1.4.3(b); and (NFPA 72D) section 3-4.4.3(b) require that supervision of air or nitrogen pressure in dry pipe sprinkler systems indicate both high "and" low pressure conditions. This is not spelled out anywhere in NFPA 13 and in fact the entire subject of supervision of sprinkler systems in NFPA 13 appears extremely vague.
Approved high/low pressure supervision switches are available. However, sprinkler system equipment manufacturers, suppliers and installers are not generally familiar with the NFPA signaling system standards, and as a result, I find that sprinkler contractors only supply low pressure supervisory switches.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: It is not the intent of this standard to require supervision of air pressure in all dry-pipe systems. NFPA 71, 72A, 73C, and 72D are standards which apply when supervision is provided. They do not in themselves require supervision.

13- 405 - (5-3.4): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Revise 5-3.4 to read as follows:
5-3.4 Location and Spacing of Fire Detection Devices. Spacing of fire detection devices other than automatic sprinklers shall be in accordance with their listing by testing laboratories or in acordance with manufacturer's specifications. When automatic sprinklers are used as detectors, the distance between detectors and the area per detector shall not exceed the maximum permitted for supression sprinklers as specified in 4-2.1 and 4-2.2; they shall be positioned in accordance with 4-3, but need not conform with the clearance requirements of 4-2.4.
SUBSTANTIATION: More guidance is needed on the spacing of pilot sprinklers.
COMMITTEE ACTION: Accept.

13- P08 - (5-3.5): Reject
SUBMITTER: M.C. Diliberto, Stearns-Roger Engineering Corp.
RECOMMENDATION: It is recommended an additional clarifying statement be added to NFPA 13, section 5-3.5, Pre-Action Systems.
5-3.5.4 Pipe Fittings. See NFPA 15, Water Spray Fixed Systems, Section 2-5, Fittings.
Present section 5-3.5.4 should be renumbered 5-3.5.5, Pendent Sprinklers.
SUBSTANTIATION: As a result of the use of pre-action sprinkler systems for protection of coal conveying systems in coal-fired power plants constructed by my firm, our fire protection specifications, typically refer to compliance with the latest issues of NFPA 13 and 15 when such systems are part of the Scope of Work. Over the years, many fire protection contractors of national reputation have submitted designs using cast iron fittings as opposed to malleable iron fittings. NFPA 13, section 5-3.2, Descriptions, states "Pre-action and deluge systems are normally without water in the piping...." This section makes reference to both pre-action and deluge systems and since the statement is made regarding the similarity of the two types of systems (i.e., "without water"), it is my feeling the design criteria should be identical when exposure and installation conditions warrant. Since the general design and utilization of both systems are generally the same, i.e., hydraulically calculated and no water in the piping, all design parameters applicable to deluge systems should likewise apply to pre-action systems design.
NFPA 15, Section 2-5, Fittings, 2-5.1 states "All fittings shall be of steel, malleable iron or ductile iron in "dry sections" of the piping exposed to possible fire or in self-supporting systems...."
(In quotes for emphasis by this writer.)
Since the intent of section 2-5.1 is to eliminate the possibility of thermal shock cracking fittings in dry sections of piping which are heated due to fire exposure, the use of cast iron fittings is not accepted. Because of this consideration given in NFPA 15, in order to insure a reliable system design, similar consideration should be given to pre-action systems since they are generally exposed to the same conditions as deluge systems.
It is felt such modifications would eliminate the present confusion on the design parameters for pre-action sprinkler systems and for this reason consideration should be given to the recommended modification.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: There is insufficient adverse field experience to justify a change in type fitting permitted by this standard.

13- P106 - (5-3.5.1): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Insert new 5-3.5.1 to read:
5-3.5.1 All components of pneumatic, hydraulic or electrical pre-action systems shall be compatible as determined by their listings.
Renumber 5-3.5.1 through 5-3.5.4 as 5-3.5.2 through 5-3.5.5.
SUBSTANTIATION: A pre-action system must work as a "system." Compatibility of components should be determined by the listing agency, based on testing, and made available as part of the listing of the component.
COMMITTEE ACTION: Accept in Principle.
Add a new 5-3.5.1 to read as follows:
5-3.5.1 All components of pneumatic, hydraulic or electrical pre-action systems shall be compatible.
COMMITTEE COMMENT: The deletion of the proposed words "as determined by their listing" is needed to achieve uniformity for all listing laboratories.

13- P107 - (5-5.6 and Figure 5-5.6 (New)): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add a new section to read:
5-5.6 Small loading docks, covered platforms, ducts, or similar small unheated areas may be protected by dry pendent sprinklers extending through the wall from wet sprinkler piping in an adjacent heated area, as shown in Figure 5-5.6.

Where possible, the dry pendent sprinkler shall extend down at a 45° angle. The width of the area to be protected shall not exceed 7 1/2 ft (2.3 m). Sprinklers shall be spaced not over 12 ft (3.7 m) apart.

Add a new Figure 5-5.6

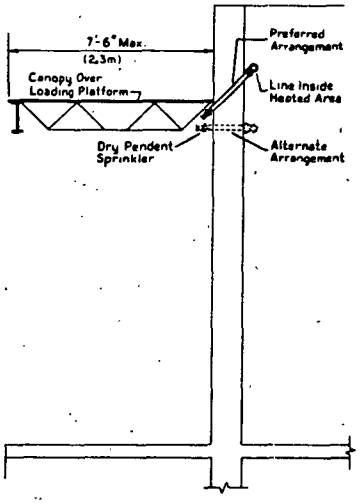


Figure 5-5.6 Dry Pendent Sprinklers for Protection of Covered Platforms, Shipping Docks, and Similar Areas.

SUBSTANTIATION: The above proposed alternative provides a workable solution where antifreeze systems are prohibited.

COMMITTEE ACTION: Accept in Principle.

Use the proposal as submitted but delete the alternate arrangement shown on the submitted sketch.

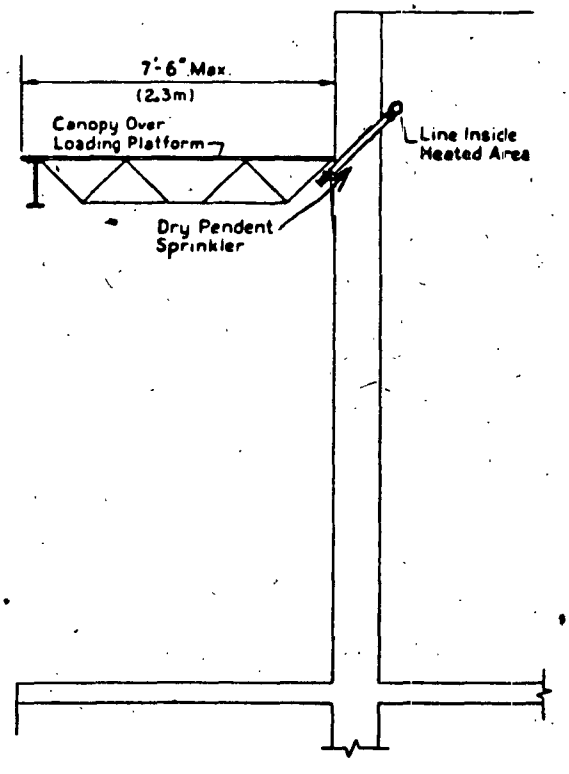


Figure 5-5.6 Dry Pendent Sprinklers for Protection of Covered Platforms, Shipping Docks, and Similar Areas.

COMMITTEE COMMENT: The Committee agrees with the Submitter but is deleting the alternate arrangement because this is contrary to the listing of some dry pendent sprinklers.

13- P108 - (5-6.1.2.3 and 5-6.1.12(a)): Accept in Principle

SUBMITTER: Ron Cote', Factory Mutual Research Corp.

RECOMMENDATION: Reword section 5-6.1.2.3 to read:

5-6.1.2.3 Other auxiliary devices shall be listed for sprinkler service. These devices such as pumps, circulating pumps, heat exchanges, radiators, luminaires shall also be pressure rated at 175 or 300 psi (12.1 or 20.7 bars) (rupture pressure of 5 x rated water working pressure), to match required rating of sprinkler system components.

Change section 5-6.1.12(a) to read:

(a) Certification that all auxiliary devices, such as heat pumps, circulating pumps, heat exchanges, radiators, and luminaires have a pressure rating of 175 or 300 psi (12.1 or 20.7 bars), and are listed.

SUBSTANTIATION: Unlisted components attached to the sprinkler system, some at ceiling sprinkler level, seriously threaten the integrity of the fire protection sprinkler system. Sprinkler piping and fittings, if manufactured to the specifications and standards of Tables 3-13.1.1, are acceptable for sprinkler system use; but all other components must be listed.

An unlisted luminaire, for example, possibly complete with plastic parts and untried hangers, could fail in a fire situation and affect sprinkler system performance. Listed components will be evaluated for such possible failure modes. The integrity of a fire protection sprinkler system can be affected by anything attached to it.

COMMITTEE ACTION: Accept in Principle.

Revise 5-6.1.2 as follows: Add a new 5-6.1.2.1 to read as follows:

5-6.1.2.1 Basic Principle. A circulating closed loop system is primarily a sprinkler system, and all provisions of this standard such as control valves, area limitation of a system, alarms, fire department connections, sprinkler spacing, etc., are to be satisfied.

Exception: Items as specifically detailed within 5-6.1.

Revise present 5-6.1.2.1 and renumber.

5-6.1.2.2 Piping, fittings, valves and pipe hangers for all auxiliary components which conduct water through the sprinkler system shall meet requirements specified in Chapter 3.

Renumber present 5-6.1.2.2 as 5-6.1.2.3.

Add a new sentence to present 5-6.1.2.3 to read as follows: "All connections, pipe, and system components for auxiliary functions which do not conform to material and performance specifications of this standard shall be listed for sprinkler service."

Renumber present 5-6.1.2.3 through 5-6.1.2.12 as 5-6.1.2.4 through 5-6.1.2.13.

COMMITTEE COMMENT: The addition of the new 5-6.1.2.1, the revision of 5-6.1.2.2 and the addition of the new sentence to 5-6.1.2.4 should satisfy the Submitter's intent about the quality of material to be installed in sprinkler systems.

13- P109 - (7-1.2): Accept in Part

SUBMITTER: Ron Cote', Factory Mutual Research Corp.

RECOMMENDATION: In section 7-1.2, delete the first ten words of the first sentence, i.e., the ten words prior to the comma such that the section reads:

7-1.?* Nameplate Data. The installer shall properly identify a hydraulically designed automatic sprinkler system by a permanently attached placard....

Also, add the following: The placard shall be minimum 25 gage (0.021 in., 0.53 mm) corrosion resistant metal and of a minimum 5 in. x 7 in. (127 mm x 178 mm) size. If made of a corrodable metal such as steel, the placard shall be of the same minimum dimensions and gage and completely porcelain enameled. Hydraulic design information shall be steel-stamped or otherwise permanently marked, e.g., enameled lettering in a contrasting color, in characters at least 1/5 in. (5 mm) high. Embossed plastic tape, pencil, ink, crayon, etc. shall not be considered permanent markings. The pressure values shall be rounded to the nearest psi (0.1 bar) and discharge flow to the nearest 5 gpm (10 liter/min) increment. The placard shall be secured to the riser with non-corrosive wire, chain, etc.

SUBSTANTIATION: The proliferation of non-permanent nameplate placards, complete with meaningless numbers of "significant" digits, requires additional guidance with respect to the materials and form of the nameplate.

COMMITTEE ACTION: Accept in Part.

Revise 7-1.2 as follows:

7-1.2 The installer shall properly identify a hydraulically designed automatic sprinkler system by a permanently attached placard indicating the location, and the basis of design (discharge density over designed area of discharge, including gallons per minute and residual pressure demand at base of riser). Such signs shall be placed at the controlling alarm valve, or dry-pipe valve, for the system containing the hydraulically designed layout.

Add a new A-7-1.2 Embossed plastic tape, pencil, ink, crayon, etc. should not be considered permanent markings. The pressure values should be rounded to the nearest psi (0.1 bar) and discharge flow to the nearest 5 gpm (20 L/min) increment. The placard should be secured to the riser with durable wire, chain or equivalent.

COMMITTEE COMMENT: The proposed wording on the size of the placard is too prescriptive.

13- 701 - (7-4.2): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Revise 7-4.2 as follows:
7-4.2 Equivalent Pipe Lengths of Valves and Fittings.
7-4.2.1 Table 7-4.2 shall be used to determine the equivalent length of pipe for fittings and devices unless manufacturer's test data indicate other factors are appropriate. For saddle type fittings having friction loss greater than that shown in Table 7-4.2, the increased friction loss shall be included in hydraulic calculations.
7-4.2.2 Use Table 7-4.2 with Hazen and Williams C = 120 only. For other values of C, the values in Table 7-4.2 shall be multiplied by the factors indicated below:

Value of C	100	120	130	140	150
Multiplying Factor	0.713	1.00	1.16	1.33	1.51

(This is based upon the friction loss through the fitting being independent of the C factor available to the piping.)
7-4.2.3 Specific friction loss values or equivalent pipe lengths for alarm valves, dry-pipe valves deluge valves, strainers and other devices shall be made available to the authority having jurisdiction.
Delete all the Notes down to the asterisk note at the bottom of Table 7-4.2.
SUBSTANTIATION: This section needs editorial reorganization to conform to the NFPA Manual of Style. Guidance is needed for friction loss through saddle type fitting. Testing laboratory reports indicate the friction loss through these fittings is much greater than through standard screwed or soldered fittings.
COMMITTEE ACTION: Accept.

13- P114 - (Table 7-4.2*): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: In Table 7-4.2, add two new entries under the column headed Fittings and Valves: "Coupling Joining Roll Grooved Pipe" and "Tee or Cross (Straight Through Flow) Joining Roll Grooved Pipe." For the "Coupling" carry the value of one equivalent foot across the table for all pipe sizes. For the "Tee," carry the value of two equivalent feet across the table for all pipe sizes.
Beneath the Table add Note 1 to read:
NOTE 1: For each coupling joining a grooved fitting (elbows; tee or cross with flow turned 90o) to roll grooved pipe add two equivalent feet to the equivalent length found in the above Table (see A-7-4.2 for example).
At the bottom of the first column of the table, change the asterisk to a superscript "2." Beneath the table, change Note* to Note 2.
Add an Appendix section A-7-4.2 to read:
A-7-4.2 Example: For 4 in. grooved 90o standard elbow joined at each end by couplings to roll grooved pipe the equivalent length is:

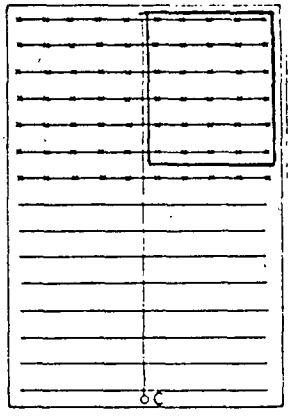
elbow	10
2 couplings @ 2 ft each	4
Total equivalent length	14 ft

SUBSTANTIATION: Roll grooved pipe connections, characterized by displaced pipe wall material protruding into the waterway, experience friction loss in excess of that measured for threaded connections. In systems making extensive use of roll grooved pipe sections, as much as 5 to 10 percent of the fluid friction loss goes unquantified in current hydraulic calculations. The excess loss should be quantified and included in the system hydraulic calculations.
Factory Mutual research Technical Report OF3G3.CP, "Fluid Friction Losses in Black Steel Pipe and Pipe Connections" helps document the above proposal.
COMMITTEE ACTION: Accept in Principle.
In Table 7-4.2, add two new entries under the column headed Fittings and Valves: "Coupling Joining Roll Grooved Pipe" and "Tee or Cross (Straight Through Flow) Joining Roll Grooved Pipe." For the "Coupling" carry the value of one equivalent foot across the table for all pipe sizes. For the "Tee," carry the value of two equivalent feet across the table for all pipe sizes.
Add a new 7-4.2.4 to read as follows:
7-4.2.4 For each coupling joining a grooved fitting (elbows; tee or cross with flow turned 90o) to roll grooved pipe add two equivalent feet to the equivalent length found in the above Table (see A-7-4.2 for example).
Add an Appendix section A-7-4.2 to read:
A-7-4.2 Example: For 4 in. grooved 90o standard elbow joined at each end by couplings to roll grooved pipe the equivalent length is:

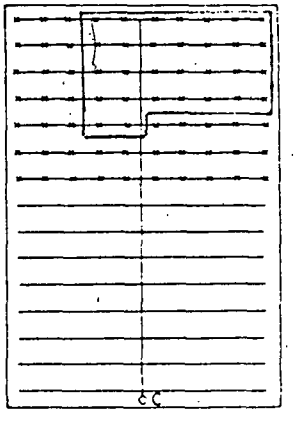
elbow	10
2 couplings @ 2 ft each	4
Total equivalent length	14 ft

Add an Exception to 7-4.3.1.4(b) to read as follows:
Exception: For fittings joining roll grooved pipe the fitting loss for straight through flow shall be included. (See Table 7-4.2.)
COMMITTEE COMMENT: The Committee agrees with the Submitter and believes the addition of the Exception to 7-4.3.1.4(b) strengthens the requirement.

13- P27 - (7-4.3.1* Exception No. 2 and 7-4.3.1.2*): Accept in Principle
SUBMITTER: S.R. Hoover, Kemper Group
RECOMMENDATION: A. Delete Exception 2 in section 7-4.3.1*.
B. Add a new section as follows:
7-4.3.1.2* For straight line systems having branch lines with insufficient sprinklers to fulfill the 1.2 A criteria, the design area shall be extended (parallel to the branch lines) to include sprinklers on branch lines on both sides of the cross main, until the 1.2 A criteria is satisfied.
C. Renumber the remaining sections as needed.
D. Add section A-7-4.3.1.2.
A-7-4.3.1.2 Several sets of calculations may be required to establish the hydraulically most demanding area. The system configuration, sprinkler spacing, branch line length, and design area all contribute. In some cases the hydraulically most demanding area will straddle the cross main.
SUBSTANTIATION: The deletion of the Exception and the addition of new section 7-4.3.1.2* will clarify the intent of section 7-4.3.1 as it applies to straight line (tree) systems. With present wording, where a large design area is involved (3000 sq ft or more) with typical 100 sq ft spacing per sprinkler, the 1.2 A criteria would require a long side to the design area of 65.7 ft or 7 sprinklers. Unable to comply with the criteria (5 sprinkler lines in system C) one might design as follows:



This is not the hydraulically most demanding rectangle required by section 7-4.3.1. I do not believe this was the intent of the committee or Mr. McFadden, but Exception No. 2 could be interpreted to allow it. Adoption of the new section would require extension of the design area parallel to the branch lines, when needed, as follows:



This would provide the hydraulically most demanding rectangle.
Also this should not be an Exception but a subordinate section. Exception No. 1 refers to a corridor, a distinctly different remote area, however, Exception No. 2 simply provides a different shape and should be subordinate as I have shown it.
The Appendix item provides guidance to the user.

COMMITTEE ACTION: Accept in Principle.
Before the last sentence of 7-4.3.1 add a new sentence to read as follows: "This may include sprinklers on both sides of the cross main."
Add a revised Figure A-7-4.3.1(b).

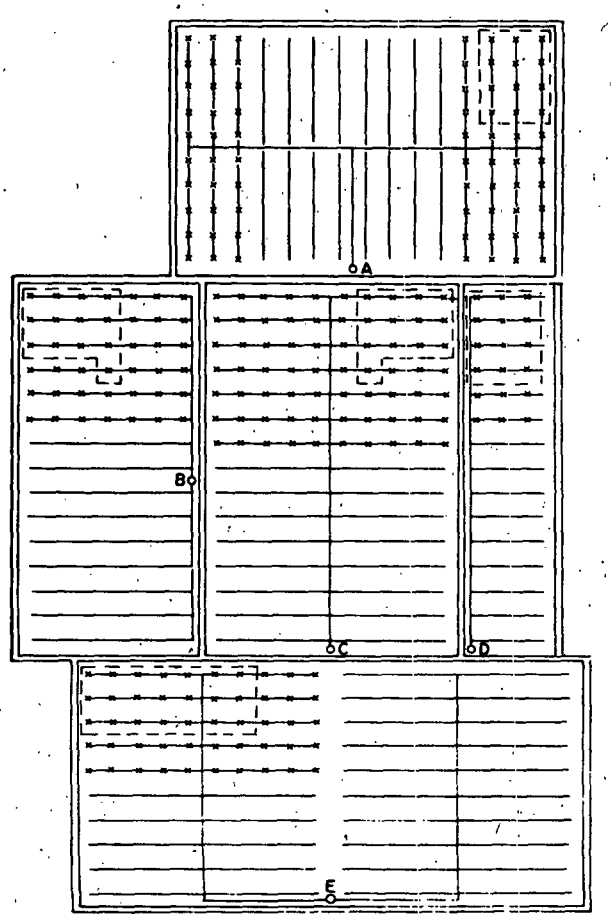


Figure A-7-4.3.1(b) Example of Hydraulically Most Demanding Area

COMMITTEE COMMENT: The addition of the new sentence to 7-4.3.1 should clarify the Submitter's intent.

13- P07 - (7-4.3.1.1*): Reject
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Revise as follows:
Change present Exception to "Exception No. 1."
Add Exception No. 2.
Exception No. 2: For regular gridded systems, the location of design area determined by the following formula shall be acceptable when accompanied by one set of calculations:

$$SKEW = \left(\frac{\text{No. branch lines in design area}}{\text{No. branch lines outside design area}}\right)^{1.85} \times \frac{LT}{H\text{-}H} \times \frac{1}{2}$$

where:

"SKEW" is the number of sprinklers by which the center line of the design area is offset, towards the far crossmain, from the center of the branch line.
"H-H" is the head to head spacing.
"LT" is the total length of the branch line including fittings.

In determining the "number of branch lines in the design area," if any design area branch lines have fewer design sprinklers than the majority of the design area branch lines (such as those branch lines used to complete a design area; see branch line 4, Figure A-7-4.3.1.1(a)) include the fractional equivalent of these lines. See Appendix example.

If the number of branch lines in the design area exceeds the "number of branch lines outside the design area," the design area shall be located in the corner of the system farthest from the riser.

NOTE 1: The formula applies to "regular" gridded systems which are those where:
- the near and far crossmains are within two pipe sizes of one another;
- all branch lines are the same diameter and equal in length;
- the spacing of branch lines and sprinklers is consistent;
- the orifice size of the sprinklers is constant;
- outrigger (dead ended) branch lines are not present.

Change caption "Figure A-7-4.3.1.1" to "Figure A-7-4.3.1.1(a)."
Add to section A-7-4.3.1.1 the following: "Example of Use of Design Area Location Formula."
System Information

Design Area:	3000 ft2
Number of lines in system:	15
Branch line length:	120 ft
Fittings: 2 tee's:	+ 12 ft
Total length:	132 ft
Area per sprinkler:	100 ft2

Operating Sprinklers in Design Area.
Section 7-4.3.1 requires that design area include 30 sprinklers: 4 branch lines with 7 sprinklers each and 1 branch line with 2 sprinklers.

Number of Branch Lines in Design Area.
= 4 + 2/7 = 4.29

Number of Branch Lines Outside Design Area.
= 15 - 5 = 10

SKEW = ((4.29/10) 1.85/10) x (132/2)
= 1.38; round up to 2
Center of design area is located 2 sprinklers from the center of the system. See Figure A-7-4.3.1.1(b)

Add Figure A-7-4.3.1.1(b).

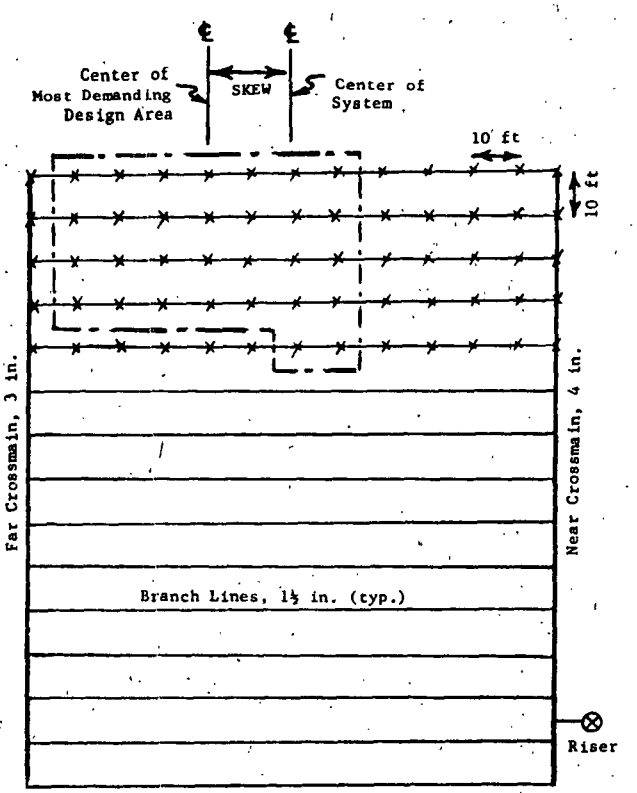


Figure A-7-4.3.1.1(b)
Example of Design Area Location.

SUBSTANTIATION: A method of locating the design area is needed for situations where the results of three sets of calculations do not definitively locate the most demanding design area. For example, the results of three calculations could be:

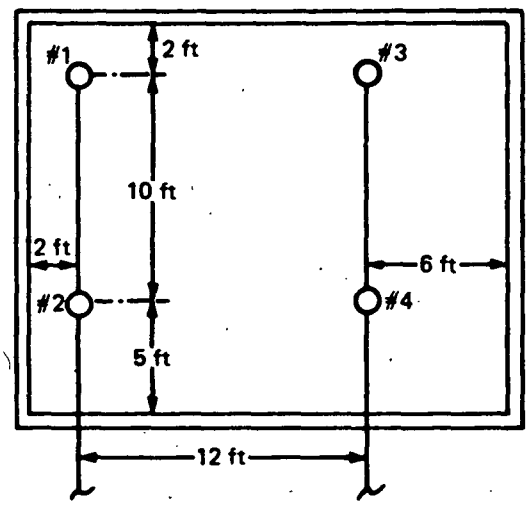
384.3 gpm at 31.6 psi (Center)
385.2 gpm at 31.5 psi (Right Shift)
384.1 gpm at 31.3 psi (Left Shift)

Notice that the flow sometimes rises as the pressure drops. Notice that the shift pressure differential is 0.1 psi. (In systems with balancing criteria greater than 0.1 psi, one might not even see the difference, or a false difference might occur.)

COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: The material submitted has limited application and does not belong in the standard.

13- P110 - (7-4.3.1.2(a)*): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Reword section 7-4.3.1.2(a)* to read:
7-4.3.1.2* The density shall be calculated on the basis of floor area. The area covered by any sprinkler for use in hydraulic design and calculations shall be determined as follows:
1. Along Branch Lines. Determine distance to next sprinkler (or to wall in case of end sprinkler on branch line) upstream and downstream. Choose larger of the two distances. Call this S.
2. Between Branch Lines. Determine perpendicular distance to branch lines (or to wall in case of last branch line) on each side of branch line on which the subject sprinkler is positioned. Choose larger of the two distances. Call this X.
3. Design area for Sprinkler = S x X.
Add a section A-7-4.3.1.2(a) to read:
Example: Design Area for Sprinkler 1 (see Figure A-7-4.3.1.2)

1. Along Branch Lines --	2 ft, 10 ft S=10	(0.6 m, 3.0 m) (S=3.0)
2. Between Branch Lines	2 ft, 12 ft X=12	(0.6 m, 3.7 m) (X=3.7)
3. Design Area - 10 X 12 = 120 sq ft		(3.0 X 3.7 = 11.1 m2)

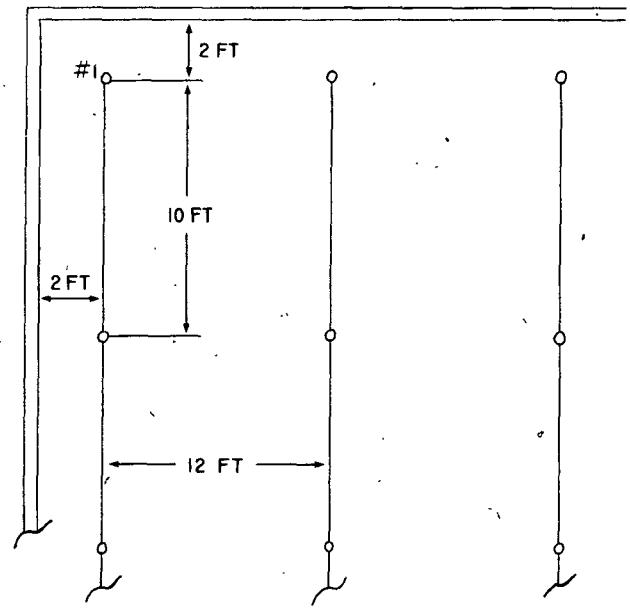


(For SI Units: 1 ft - 0.3048 m)

Figure A-7-4.3.1.2 Sprinkler Design Area

SUBSTANTIATION: A recent Formal Interpretation indicates that the above guidance is necessary in determining the area covered by an individual sprinkler.
COMMITTEE ACTION: Accept in Principle.
Reword section 7-4.3.1.2(a)* to read:
(a) The density shall be calculated on the basis of floor area. The area covered by any sprinkler for use in hydraulic design and calculations shall be determined as follows:
1. Along Branch Lines. Determine distance to next sprinkler (or to wall in case of end sprinkler on branch line) upstream and downstream. Choose larger of either twice the distance to the wall or distance to the next sprinkler. Call this "S".
2. Between Branch Lines. Determine perpendicular distance to branch lines (or to wall in case of the last branch line) on each side of branch on which the subject sprinkler is positioned. Choose the larger of (1) the larger distance to the next branch line, or (2) in the case of the last branch line, twice the distance to the wall. Call this "L".
3. Design Area for Sprinkler = S x L.
Exception: This does not apply to small rooms. (See 4-4.20.)
Add a section A-7-4.3.1.2(a) to read:
Example: Design Area for Sprinkler 1 (see Figure A-7-4.3.1.2).

1. Along Branch Lines --	2 ft, 10 ft S=10	(0.6 m, 3.0 m) (S=3.0)
2. Between Branch Lines --	2 ft, 12 ft L=12	(0.6 m, 3.7 m) (L=3.7)
3. Design Area --	10 x 12 = 120 sq ft	(3.0 X 3.7 = 11.1 m2)



(For SI Units: 1 ft - 0.3048 m)

Figure A-7-4.3.1.2 Sprinkler Design Area

COMMITTEE COMMENT: The revised wording should satisfy the Submitter's intent.

13- 05 - (7-4.3.1.2(c)): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Add a new 7-4.3.1.2(c) to read as follows:
(c) When sprinklers are installed above and below temporary obstructions such as overhead doors and such sprinklers are supplied from a common set of branch lines, the branch lines and the supply shall be calculated to supply the sprinklers both above and below the temporary obstruction.
SUBSTANTIATION: Guidance is needed for the hydraulic design of systems where temporary obstructions such as overhead doors may be present.
COMMITTEE ACTION: Accept.

13- P69 - (7-4.3.1.2(c)): Reject
SUBMITTER: Alma L. Wilcock, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: When sprinklers are installed above and below overhead doors and such sprinklers are supplied from a common set of branch lines, the branch lines and supply shall be calculated to supply the largest area of operation either above or below.
SUBSTANTIATION: Guidance is needed for hydraulic design of systems for overhead doors. If the doors are in the open position, only the sprinklers below the doors should open. If in the closed position, the sprinklers at the roof should operate first, preventing the lower sprinklers from opening.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: There is no assurance that both sets of sprinklers will not operate whether the overhead door is up or down. See Committee Action on Proposal No. 05 on 7-4.3.1.2(c).

13- P70 - (Table 7-4.3.1.4): Reject
SUBMITTER: L.R. Milam, Automatic Sprinkler Corp. of America
RECOMMENDATION: In the Table, under the heading "Pipe or Tube," after the listing "Copper Tube," add: "or Stainless Steel."
SUBSTANTIATION: Increasingly, stainless steel is being used in special sprinkler systems. Therefore, NFPA 13 needs to provide guidance on the C value to use in the hydraulic calculations for such systems.
It is recommended that stainless steel be assigned the same C value as copper pipe: C = 150. This recommendation is based on the following:
1. As manufactured, stainless steel is at least as smooth or smoother than copper tube.
2. Stainless steel is at least equal or superior to copper in its ability to resist internal corrosion.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: Inadequate substantiation was submitted with the proposal to change the Table at the present time.

13- P112 - (7-4.3.1.4(d) Exception (New)): Reject
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add an Exception to section 7-4.3.1.4(d) to read:
Exception: Friction loss shall be included for the fitting directly connected to a sprinkler if the fitting experiences friction loss in excess of that of a standard tee of the same nominal size.
SUBSTANTIATION: Quick-connect fittings and other similar type devices are sometimes bushed-down to a size smaller than their rated nominal size and thus experience excess friction loss. The excess friction loss should be quantified and accounted for in the hydraulic calculations.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: Insufficient data was submitted to substantiate that the loss for a single sprinkler attached to a tee has excessive friction loss.

13- P113 - (7-4.3.3 (New)): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add a new section 7-4.3.3 to read:
7-4.3.3 Designers shall come to an agreement with the authority having jurisdiction on the water supply to be used in system calculations prior to system design and calculation.
SUBSTANTIATION: Agreement on the water supply to be used in systems calculations is a very important starting point prior to calculation. Contractors often present plans to the authority having jurisdiction based on an invalid water test. Reliability considerations, as described in section A-2-3.1.1, may change the recommended water supply. A dialogue and agreement between the designer and the authority having jurisdiction is necessary.
COMMITTEE ACTION: Accept in Principle.
Add a new section A-7-4.2.3 to read as follows:
A-7-4.2.3 Designers should consult with the authority having jurisdiction on the water supply to be used in system calculations prior to system design and calculation.
COMMITTEE COMMENT: The section is better located in the Appendix as advisory material because of the difficulty of making the requirement mandatory.

13- P75 - (Chapter 9 (New)): Reject
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Revise Chapter 9, Sprinkler Systems Using Large-Drop Sprinklers, as follows:
9-1 General.
9-1.1 Scope. This chapter provides guidelines for the installation of large-drop sprinklers. Listed "extra large orifice" sprinklers with nominal 0.64 in. (16.3 mm) orifice, unless also listed as large-drop sprinklers, are not covered by this chapter.
9-1.2* Definition. Large Drop Sprinkler. A listed sprinkler characterized by a nominal 0.64 in. (16.3 mm) orifice, K factor between 11.0 and 11.5, and proven ability to meet prescribed penetration, cooling and distribution criteria. The water discharge constituting the spray pattern of large-drop sprinklers contains a higher percentage of "large" drops than that of standard nominal 1/2 and 17/32 in. (13 and 14 mm) orifice automatic sprinklers. Such large drops are considered to be more effective in penetrating the fire plume.
9-1.3* Applicability.
9-1.3.1* Large-drop sprinklers shall be used only for the protection of high challenge, severe occupancy hazards.
Exception: Ordinary and Extra Hazard Occupancies when proven by large scale fire testing.
9-1.3.2* Large-drop sprinklers shall not be used to compensate for weak water supplies by taking advantage of the increased discharge capacity.
9-1.3.3 All of NFPA 13 applies except those portions dealing with subjects specifically addressed by this chapter.
9-1.3.4 Deviations from these installation rules shall not be made.
Exception: Deviations shown to be acceptable by large scale fire testing.
9-2 Installation.
9-2.1 Operating Pressure.
9-2.1.1 Large-drop sprinkler systems shall be designed such that the minimum operating pressure is not less than 25 psi (1.7 bar).
9-2.1.2 With the required number of sprinklers operating, the maximum pressure on the hydraulically most remote sprinkler shall be limited to 95 psi (6.5 bar).
9-2.2 Type of System.
9-2.2.1 Large-drop sprinkler systems shall be limited to wet pipe or preaction systems which are hydraulically designed.
9-2.2.2 Galvanized steel or copper pipe and fittings shall be used with preaction systems to avoid scale accumulation.
9-2.3 System Design.
9-2.3.1 Pipe shall be sized by hydraulic calculation to meet at least the minimum pressure requirements.
9-2.3.2 The nominal diameter of branch line pipes (including riser nipples) shall be not less than 1 1/4 in. nor greater than 2 in., except starter pieces which may be 2 1/2 in.
9-2.3.3 Sprinkler riser nipples, regardless of length, and associated fittings shall be included in the hydraulic calculations.
9-2.3.4 In the hydraulic calculations the design area shall include the number of operating sprinklers specified in the appropriate NFPA standard for the hazard being protected.
9-2.3.5 Design area sprinklers shall be arranged in the rectangular pattern, with proper dimensions and hydraulically most demanding location, specified in Chapter 7.
9-2.3.6 For design purposes a K value of 11.2 shall be used in the hydraulic calculations.
9-2.4 Temperature Rating. Only sprinklers nominally rated at 286OF (141OC) shall be used.
Exception: Ordinary temperature rated sprinklers when proven by large scale fire testing (see 9-1.3.4, Exception).
9-2.5* Spacing.
9-2.5.1 The area of coverage shall be limited to a minimum of 80 ft2 (7.4 m2) and a maximum of 100 ft2 (9.3 m2).
9-2.5.2 The distance between branch lines and between sprinklers on the branch lines shall be limited to not more than 12 ft (3.7 m) nor less than 8 ft (2.4 m).
Exception: Under open wood joist construction, the maximum distance shall be limited to 10 ft (3.0 m).
9-2.6 Clear Space Below Sprinklers. At least 36 in. (914 mm) shall be maintained between sprinkler deflectors and the top of storage.
9-2.7* Distance Below Ceiling. Sprinklers shall be positioned so that the tops of deflectors are 7 in. (178 mm) below the ceiling.
Exception No. 1: 3 1/2 in. (89 mm) below the bottom of joists in open wood joist construction.
Exception No. 2: Per the positioning ranges of Table 9-2.7 when practical considerations of installation require greater or lesser clearances.

Table 9-2.7 Minimum and Maximum Distances of Deflectors Below Ceiling for Various Construction Types

Construction Type'	Minimum Distance, in. (mm)	Maximum Distance, in. (mm)
Smooth ceiling and bar joist	6 (152)	8 (203)
Beam and girder	6 (152)	12 (305)
Panel up to 300 ft² (27.9 m²)	6 (152)	14 (356)
Open wood joist	1 (25) below bottom of joists	6 (152) below bottom of joists

NOTE 1: See Chapter 4 for definitions of construction types.

9-2.8 Location of Sprinklers in Beam and Girder and Panel Construction.
9-2.8.1 Under beam and girder construction and under panel construction, the branch lines may run across the beams, but sprinklers shall be located in the bays and not under the beams.
9-2.8.2 The maximum distance of deflector above the bottom of beams shall be limited to the values specified in Table 9-2.8.2. See Figure 9-2.8.2.

Table 9-2.8.2 Position of Deflector When Located Above Bottom of Beam or Other Obstruction

Distance from Sprinkler to Side of Beam or Other Obstruction	Maximum Distance Deflector above Bottom of Beam or Other Obstruction, in. (mm)
Less than 1 ft (0.3 m)	0 (0)
1 ft (0.3 m) to less than 1½ ft (0.5 m)	1½ (38)
1½ ft (0.5 m) to less than 2 ft (0.6 m)	3 (76)
2 ft (0.6 m) to less than 2½ ft (0.8 m)	5½ (140)
2½ ft (0.8 m) to less than 3 ft (0.9 m)	8 (203)
3 ft (0.9 m) to less than 3½ ft (1.1 m)	10 (254)
3½ ft (1.1 m) to less than 4 ft (1.2 m)	12 (305)
4 ft (1.2 m) to less than 4½ ft (1.4 m)	15 (381)
4½ ft (1.4 m) to less than 5 ft (1.5 m)	18 (457)
5 ft (1.5 m) to less than 5½ ft (1.7 m)	22 (559)
5½ ft (1.7 m) to less than 6 ft (1.8 m)	26 (660)
6 ft (1.8 m)	31 (787)

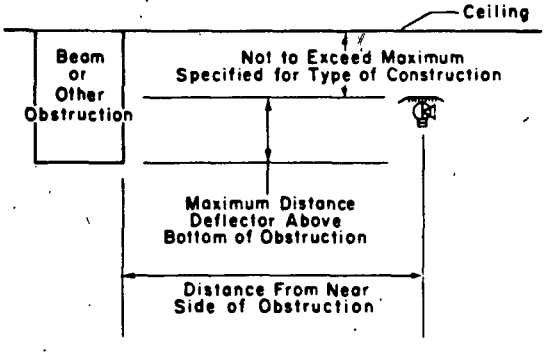


Figure 9-2.8.2 Position of Deflector When Located Above Bottom of Beam or Other Obstruction Located at the Ceiling (To be used with Table 9-2.8.2)

9-2.9* Obstructions in Piping.
9-2.9.1 Double removable intake screens shall be provided on the inlet to pipe supplied from water supplies directly connected to rivers, lakes, ponds, reservoirs, uncovered tanks and similar sources.
9-2.9.2 Screens shall be cleaned and serviced at least annually and after any work has been performed on nearby underground mains.
9-2.9.3* Visual and/or flushing investigations shall be conducted of all systems for foreign material at intervals not exceeding five years.

9-2.10* Obstructions to Distribution.
9-2.10.1 Obstructions to the distribution or interference with the discharge pattern shall be avoided.
9-2.10.2 Obstruction Located at the Ceiling. When sprinkler deflectors are located above the bottom of beams, girders, ducts, fluorescent lighting fixtures, or other obstructions located at the ceiling, the sprinklers shall be positioned so that the maximum distance from the bottom of the obstruction to the deflectors does not exceed the value specified in Table 9-2.8.2. See Figure 9-2.8.2.
9-2.10.3 Obstructions Located Below the Sprinklers.
9-2.10.3.1 Sprinklers shall be positioned with respect to fluorescent lighting fixtures, ducts and obstructions located entirely below the sprinklers so that the minimum horizontal distance from the near side of the obstruction to the center of the sprinkler is not less than the value specified in Table 9-2.10.3. See Figure 9-2.10.3(a).

Table 9-2.10.3 Position of Sprinklers in Relation to Obstructions Located Entirely Below the Sprinklers

Distance Deflector Above Bottom of Obstruction	Minimum Distance to Side of Obstruction, ft (m)
Less than 6 in. (152 mm)	1½ (0.5)
6 in. (152 mm) to less than 12 in. (305 mm)	3 (0.9)
12 in. (305 mm) to less than 18 in. (457 mm)	4 (1.2)
18 in. (457 mm) to less than 24 in. (610 mm)	5 (1.5)
24 in. (610 mm) to less than 30 in. (762 mm)	5½ (1.7)
30 in. (762 mm) to less than 36 in. (914 mm)	6 (1.8)

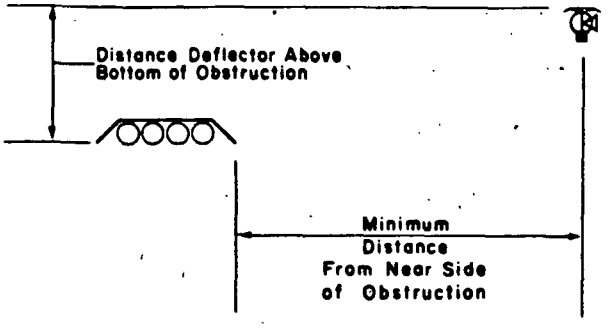


Figure 9-2.10.3(a) Position of Sprinklers in Relation to Obstructions Located Entirely below the Sprinklers (To be used with Table 9-2.10.3)

9-2.10.3.2 When the bottom of the obstruction is located 36 in. (914 mm) or more below the sprinkler deflectors:
(a) Sprinklers shall be positioned so that the obstruction is centered between adjacent sprinklers. See Figure 9-2.10.3(b).
(b) The obstruction shall be limited to a maximum width of 24 in. (610 mm). See Figure 9-2.10.3(b).
Exception: When obstruction is greater than 24 in. (610 mm) wide, one or more lines of sprinklers shall be installed below the obstruction.
(c) The obstruction shall not extend more than 12 in. (305 mm) to either side of the midpoint between sprinklers. See Figure 9-2.10.3(b).
Exception: When extensions exceed 12 in. (305 mm), one or more lines of sprinklers shall be installed below the obstruction.
(d) At least 18 in. (457 mm) clearance shall be maintained between the top of storage and the bottom of the obstruction. See Figure 9-2.10.3(b).

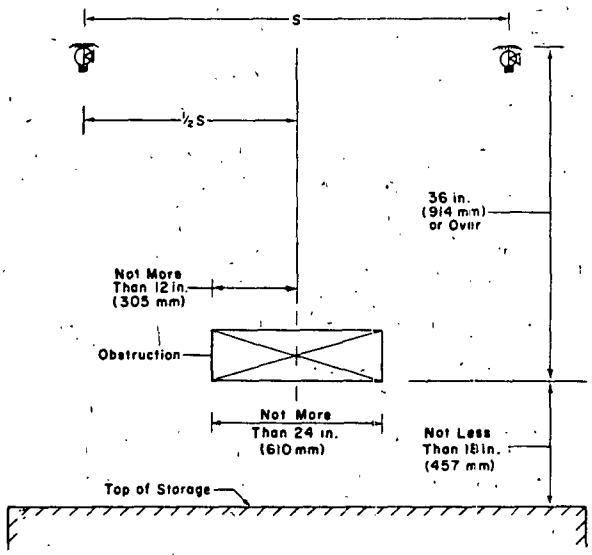


Figure 9-2.10.3(b) Position of Sprinklers in Relation to Obstructions Located 36 in. (914 mm) or More Below Deflectors

9-2.10.4 Obstructions Parallel to and Directly below Branch Lines. In the special case of an obstruction running parallel to and directly below a branch line:

(a) the sprinkler shall be located at least 36 in. (914 mm) above the top of the obstrution. See Figure 9-2.10.4.

(b) The obstruction shall be limited to a maximum width of 12 in. (305 mm). See Figure 9-2.10.4.

(c) The obstruction shall be limited to a maximum extension of 6 in. (152 mm) to either side of the centerline of the branch line. See Figure 9-2.10.4.

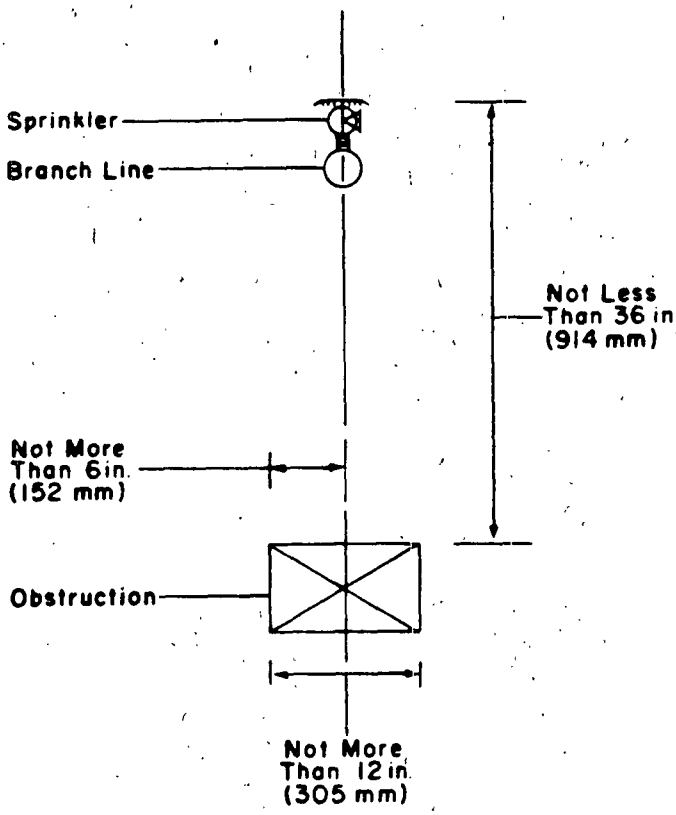


Figure 9-2.10.4 Position of Sprinklers in Relation to Obstructions Running Parallel to and Directly Below Branch Lines

9-2.11 Alarms. Local, central station, auxiliary, remote station, or proprietary sprinkler waterflow alarms shall be provided.

9-3* Protection Requirements.

9-3.1* Protection, as specified for the use of large-drop sprinklers in the appropriate NFPA standard for the hazard, in terms of minimum operating pressure and the number of sprinklers to be included in the design area, shall be provided.

9-3.2* Interpolation shall not be made between the pressure and number of design sprinklers specified in the appropriate NFPA standard.

9-3.3 Hose demands for all occupancies are the same as those for systems with standard and large orifice sprinklers.

A-9-1.2 Large-drop sprinkler development began with the idea that a sprinkler which would produce a high proportion of large drops would be more effective against high challenge fires. Large drops are better able to fight their way through the strong updraft generated by a severe fire (hence the name large-drop sprinkler). The general philosophy behind this idea was to create an offensive weapon for direct attack against the burning fuel, but with as little diminution of defensive capability as possible. As originally conceived, it was supposed that the large drops were the predominate reason for increased effectiveness. It later became evident, however, that other factors such as distribution and pressure play an equal (and possibly more important) role. A consideration of all characteristics indicated that the desired sprinkler would provide high penetration, adequate cooling, reasonable distribution, low skipping potential, and increased discharge capacity.

The discharge pattern for an acceptable large-drop sprinkler is shown in Figure A-9-1.2. The pattern for a typical 17/32 in. (14 mm) sprinkler has been included for comparison. The diagram indicates the limit of effective discharge; stray drops may be thrown further, but in such small quantities as to be ineffective. The pattern is somewhat narrower than that of a standard sprinkler.

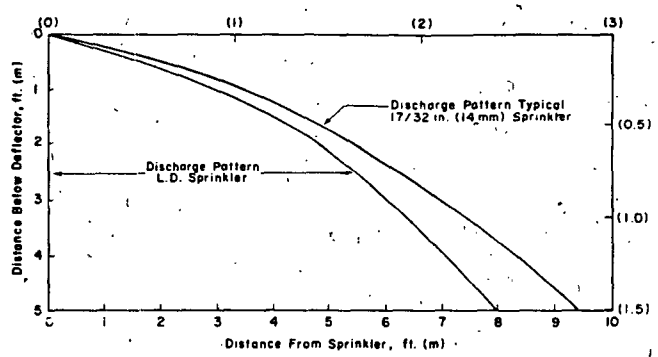


Figure A-9-1.2 Discharge Patterns, Large-drop and 17/32 in. (14 mm) Sprinklers.

A-9-1.3 Large-drop sprinklers were developed for use against severe fire challenges requiring sprinkler discharges of 60 gal/min. (227 liter/min) per sprinkler or more. The sprinklers were designed to deliver a heavy discharge through the strong updrafts generated by high challenge fires. They depend primarily on direct attack of the burning fuel to gain rapid control of the fire, and to a lesser extent on prewetting and cooling.

Large-drop sprinklers will provide excellent protection against high challenge fires, but careful design and close adherence to the rules given in this chapter are required. This is especially important because experimental findings indicate that the characteristics of large-drop sprinklers are not the same as those attributed to standard sprinklers.

A-9-1.3.1 Fire tests have not been conducted with large-drop sprinklers over Ordinary and Extra Hazard Occupancies. Therefore, the protection requirements remain unknown.

A-9-1.3.2 At a given pressure, large-drop sprinklers will discharge approximately 100 percent and 40 percent more water than standard (1/2 in., 13 mm) and large orifice (17/32 in., 14 mm) sprinklers, respectively.

Large-drop sprinklers were designed to cope with high challenge fires where high levels of penetration and cooling are required. Since both characteristics fall off sharply at low pressures, large-drop sprinklers cannot be used effectively to compensate for weak water supplies by taking advantage of the increased discharge capacity.

A-9-2.5 It is important that sprinklers in the immediate vicinity of the fire center not skip and this requirement imposes certain restrictions on the spacing.

A-9-2.7 If all other factors are held constant, the operating time of the first sprinkler will vary exponentially with the distance between the ceiling and deflector. At distances greater than 7 in. (178 mm), the delayed operating time will permit the fire to gain headway, with the result that substantially more sprinklers operate. At distances less than 7 in. (178 mm), other effects come into play. Changes in distribution, penetration, and cooling nullify the advantage gained by faster operation. The net result is again increased fire damage accompanied by an inrease in

the number of sprinklers operated. The optimum clearance between deflectors and ceiling is, therefore, 7 in. (178 mm).

A-9-2.9 The plugging of a single sprinkler in the vicinity of the fire origin can cause a significant increase in the number of operating sprinklers as well as an increase in fire damage. Therefore, it is essential that the sprinkler piping be kept free of obstructing material.

Fouling or plugging of piping or heads may be prevented by several methods: sound installation practices, including the provision of screens or strainers when necessary; avoidance of dry-pipe systems with their history of plugging; and a high level of maintenance.

A-9-2.9.3 Investigations should be conducted more frequently when justified by local conditions.

A-9-2.10 To a great extent, large-drop sprinklers rely on direct attack to gain rapid control of both the burning fuel and ceiling temperatures. Therefore, interference with the discharge pattern and obstructions to the distribution should be avoided.

A-9-3 Large scale fire testing has shown that large-drop sprinkler systems designed per the rules of Chapter 9 to provide the minimum operating pressures for the number of design sprinklers for the specific hazards of Table A-9-3, will adequately control the fire.

Table A-9-3 Pressure and Number of Design Sprinklers for Various Hazards

Minimum Operating Pressure, psi (bar)	25 (1.7)	50 (3.4)	75 (5.2)
HAZARD2	NUMBER DESIGN SPRINKLERS		
Palletized Storage			
Class I, II and III commodities up to 25 ft (7.6 m) with maximum 10ft (3.0 m) clearance to ceiling	15	Note 3	Note 3
Class IV commodities up to 20 ft (6.1 m) with maximum 10 ft (3.0 m) clearance to ceiling	15	Note 3	Note 3
Plastics up to 20 ft (6.1 m) with maximum 10 ft (3.0 m) clearance to ceiling	20	Note 3	Note 3
Idle Wood Pallets up to 20 ft (6.1 m) with maximum 10 ft (3.0 m) clearance to ceiling	15	Note 3	Note 3
Solid-Piled Storage			
Class I, II and III commodities up to 20 ft (6.1 m) with maximum 10 ft (3.0 m) clearance to ceiling	15	Note 3	Note 3
Class IV commodities and plastics up to 20 ft (6.1 m) with maximum 10 ft (3.0 m) clearance to ceiling	Does not apply	15	Note 3
Double-Row Rack Storage4 with Minimum 5 1/2 ft (1.7 m) Aisle Width			
Class I, II and III commodities up to 25 ft (7.6 m) with maximum 5 ft (1.5 m) clearance to ceiling	20	Note 3	Note 3
Class IV commodity up to 25 ft (7.6 m) with maximum 5 ft (1.5 m) clearance to ceiling	Does not apply	30	Note 3
Plastics up to 25 ft (7.6 m) with maximum 5 ft (1.5 m) clearance to ceiling	Does not apply	45	Note 3
Class I, II and III commodities up to 20 ft (6.1 m) with maximum 10 ft (3.0 m) clearance to ceiling	15	Note 3	Note 3
Class IV commodities up to 20 ft (6.1 m) with maximum 10 ft (3.0 m) clearance to ceiling	Does not apply	20	15
Plastics up to 20 ft (6.1 m) with maximum 10 ft (3.0 m) clearance to ceiling	Does not apply	30	20
Class IV commodities and Plastics up to 20 ft (6.1 m) with maximum 5 ft (1.5 m) clearance to ceiling	Does not apply	15	Note 3
On-End Storage of Roll Paper			
Kraft linerboard, banded in open array or unbanded with stacks butted in at least one direction, up to 26 ft (7.9 m) with maximum 34 ft (10.4 m) clearance to ceiling	Does not apply	15	Note 3
Any grade of paper, EXCEPT TISSUE and CREPE, with stacks butted in at least one direction, up to 20 ft (6.1 m) with maximum 10 ft (3.0 m) clearance to ceiling	Does not apply	15	Note 3
Newsprint, completely wrapped (sides and ends) in kraft linerboard, with stacks butted in at least one direction, up to 26 ft (7.9 m) with maximum 34 ft (10.4 m) clearance to ceiling	Does not apply	15	Note 3
Record Storage			
Paper records and/or computer tapes in multitier steel shelving up to 5 ft (1.5 m) in width and with aisles 30 in. (76 cm) or wider, without catwalks in the aisles, up to 15 ft (4.6 m) with maximum 5 ft (1.5 m) clearance to ceiling	15	Note 3	Note 3
Same as above, but with catwalks, of expanded metal or metal grid with minimum 60 percent open area, in the aisles	Does not apply	15	Note 3

NOTES:

1. Open Wood Joist Construction. Testing with open wood joist construction showed that each joist channel should be fully firestopped to its full depth at intervals not exceeding 20 ft (6.1 m). In unfirestopped open wood joist construction, or if firestops are installed at intervals exceeding 20 ft (6.1 m), the minimum operating pressures should be increased by 40 percent.
2. Building steel required no special protection for the occupancies listed.
3. The higher pressure will successfully control the fire, but the required number of design sprinklers should not be reduced from that required for the lower pressure.
4. In addition to the transverse flue spaces required by NFPA 231C, minimum 6 in. (152 mm) longitudinal flue spaces were maintained.

A-9-3.1 In testing where discharge density and all other conditions (except pressure and spacing) remained constant sprinkler demand area, steel temperatures, and fire damage all exhibited a marked increase as the spacing was decreased. The importance of these findings cannot be overemphasized. They state clearly that the term "density" has no meaning when applied to large-drop sprinklers and it (density) cannot be used as a design parameter.

A-9-3.2 In testing the effect of discharge pressure, series of tests were run with two different fuel types. Although the relationship of decreased number of operated sprinklers with increased pressure held, the associated curves did not parallel each other. Therefore, it is not possible to extrapolate the protection requirements from one hazard to a higher hazard, not is it possible to develop a curve from one test point. However, the protection requirements developed for a particular hazard (through large scale fire tests) may be applied safely to hazards known to be less severe, provided that the less severe hazards are arranged in the same configuration. For example, the protection specified for palletized storage of plastics may be applied to Class III (a lesser hazard) commodities when arranged in the same way and stored to the same or lesser height, provided that the clearance is not greater than the maximum value specified for the hazard by the appropriate NFPA standard.

SUBSTANTIATION: The large drop sprinkler is a new device. Factory Mutual testing has demonstrated both 1) its superior performance when compared to ordinary and large orifice sprinklers over specific high challenge occupancy fires, and 2) its characteristic behavior which differs from that of the standard and large orifice sprinklers, especially with respect to the concept of sprinkler density. As such, the sprinkler has potential which should be made available to the users of NFPA 13, but requires its own special set of installation rules. Thus Chapter 9 is proposed. As field experience is gained, it may be possible in a later edition of NFPA 13 to move the large drop sprinkler installation rules into the existing chapters, mainly chapters 3 and 4, using "Exceptions" where necessary.

Listed "extra large orifice" sprinklers which are not dual listed as large-drop sprinklers (as characterized by having successfully passed prescribed penetration, cooling, distribution, and other tests) would be outside the Scope of Chapter 9.

COMMITTEE ACTION: Reject.

COMMITTEE COMMENT: The Committee feels the concept of large drop sprinklers has definite promise for the protection of property but because of the complexity of the concept of large drop sprinklers it needs further study and substantiation. A Subcommittee has been formed to study the matter further. Public comment and input is solicited by the Committee.

13- 06 - (A-1-3): Accept.
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Add an asterisk at 1-3 Sprinkler System.
Add a new Appendix section to read as follows:
A-1-3 A sprinkler system is considered to have a single system riser control valve.
SUBSTANTIATION: More guidance is needed as to the number of control valves for a single sprinkler system.
COMMITTEE ACTION: Accept.

13- 103 - (A-1-7.1 (New)): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Add an asterisk at 1-7.1 and add a new A-1-7.1 to read as follows:
A-1.7.1 Occupancy examples in the listings as shown in the various hazard classifications are intended to represent the norm for those occupancy types. Unusual or abnormal fuel loadings or combustible characteristics and susceptibility for changes in these characteristics, for a particular occupancy, are considerations that should be weighed in the selection and classification.
The light hazard classification is intended to encompass residential occupancies; however, this is not intended to preclude the use of listed residential sprinklers in residential occupancies or residential portions of other occupancies.
SUBSTANTIATION: There is a need to give guidance for the proper classification of occupancy hazards.
Additional guidance is needed for the installation of residential sprinklers in residential portions of occupancies other than one and two family dwellings and mobile homes.
COMMITTEE ACTION: Accept.

13- P13 - (A-1.7.2.1): Reject
SUBMITTER: A.J. Hill, M&M Protection Consultants
RECOMMENDATION: Revise wording as follows:
Churches
Clubs
Eaves and overhangs, if combustible construction with no combustibles beneath
Educational
Electronic data processing
Areas including under
Raised floors
Hospitals
Etc.
SUBSTANTIATION: Include electronic data processing rooms and their underfloor areas for sprinkler protection. Many wet and preaction systems have already been installed and loss history is excellent.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: Data processing and their underfloor areas are adequately covered by the example "offices, including data processing" currently in A-1-7.2.1.

13- P78 - (A-2-3.1.1): Accept
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Reword the present A-2.3.1.1 to read:
A-2-3.1.1 Care should be taken in making water tests to be used in designing or evaluating the capability of sprinkler systems. The water supply tested should be representative of the supply that may be available at the time of a fire. For example, testing of public water supplies should be done at times of normal demand on the system. Public water supplies are likely to fluctuate widely from season to season and even within a 24 hour period. Allowance should be made for seasonal or daily fluctuations, for drought conditions, for possibility of interruption by flood, or for ice conditions in winter. Testing of water supplies also normally used for industrial-use should be done while water is being drawn for industrial use. The range of industrial-use demand should be taken into account.
Future changes in water supplies should be considered. For example, a large, established urban supply is not likely to change greatly within a few years. However, the supply in a growing suburban industrial park may deteriorate quite rapidly as greater numbers of plants draw more water.
SUBSTANTIATION: Additional guidance is needed on measuring and judging the adequacy of water supplies. The additional verbiage stresses the areas needing additional consideration.
COMMITTEE ACTION: Accept.

13- P80 - (A-3-1.1.1 (New)): Reject
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add a new section A-3-1.1.1 to read:
A-3-1.1.1 Pipe and tube manufactured to other recognized standards (e.g., European standards) may be acceptable for sprinkler system use. To judge acceptability, the standards should be compared, on a case by case basis, to the standards of Table 3-1.1.1.
SUBSTANTIATION: Although it is impossible to list all the foreign standards which may be equivalent to or surpass the requirements of the standards of Table 3-1.1.1, some guidance with respect to the possible acceptability of the standards should be provided. For example, copper nickel tube is commonly used on offshore petroleum drilling equipment for full strength seawater service. When manufactured to a standard such as BS 2871 (British Standard - Specification for Copper and Copper Alloys - Tubes - Part Two) it is acceptable for sprinkler system use.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: The Submitter's intent is adequately covered in section 3-1.1.1.

13- P82 - (Table A-3-1.1.2 (New)): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add proposed Table A-3-1.1.2, Steel Pipe Dimensions, as follows: (See following page for Table A-3-1.1.2.)
SUBSTANTIATION: Sections 3-1.1.2 and 3-1.1.3 make reference to various schedules of pipe, wall thicknesses, and ASTM standards. Proposed Table A-3-1.1.2 pulls all the information with respect to diameters, wall thicknesses and schedules together in one table. It will provide guidelines to the user without having to search out the appropriate standards referenced in Table 3-1.1.1.
COMMITTEE ACTION: Accept in Principle.
Accept as revised by deleting the millimeter column after pipe size.
COMMITTEE COMMENT: The use of equivalent SI dimensions for pipe is contrary to usual custom.

13- P81 - (A-3-1.1.2 (New)): Reject
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add a new section A-3-1.1.2 to read:
A-3-1.1.2 Schedule 10 pipe, as covered by ASTM A-135, should not be used in areas of high corrosion or where the water supply is corrosive.
SUBSTANTIATION: A recent sprinkler leakage loss due to thin wall pipe, installed in a metal pickling area, corroding and leaking, points out the importance of matching materials to the environment and the intended use. An Appendix Guideline is needed.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: The problem of protection of pipes against corrosion is adequately covered in 3-10.2.1.

13- P83 - (A-3-1.1.4 (New)): Accept
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add proposed Table A-3-1.1.4 as follows: (See following page for Table A-3-1.1.4.)
SUBSTANTIATION: Section 3-1.1.4 references wall thicknesses for various types of copper tube. Proposed Table A-3-1.1.4 pulls together all the information on diameters and wall thicknesses for the various types of copper tube specified by the standard. It will provide necessary guidance to the user without having to go back to the standards referenced in Table 3-1.1.1.
COMMITTEE ACTION: Accept.

13- 309 - (A-3-8.6 (New)): Accept
SUBMITTER: Technical Committee on Automatic Supinklers
RECOMMENDATION: Add a new section to read as follows:
A-3-8.6 One and one-half (1 1/2) in. hose connections for use in storage occupancies and other locations where standpipe systems are not required are covered by this standard. When Class II standpipe systems are required see the appropriate provisions of NFPA 14, Standard for the Installation of Standpipe and Hose Systems, with respect to hose stations and water supply for hose connections from sprinkler systems.
SUBSTANTIATION: Guidance is needed on what standard should be used in regard to hose stations.
COMMITTEE ACTION: Accept.

Table A-3-1.1.2

Steel Pipe Dimensions

Nominal Pipe Size		Outside Diameter		Schedule 10[1]				Schedule 30				Schedule 40			
				Inside Diameter		Wall Thickness		Inside Diameter		Wall Thickness		Inside Diameter		Wall Thickness	
in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
1	(25)	1.315	(33.4)	1.097	(27.9)	0.109	(2.8)	-		-		1.049	(26.6)	0.133	(3.4)
1-1/4	(32)	1.660	(42.2)	1.442	(36.6)	0.109	(2.8)	-		-		1.380	(35.1)	0.140	(3.6)
1-1/2	(38)	1.900	(48.3)	1.682	(42.7)	0.109	(2.8)	-		-		1.610	(40.9)	0.145	(3.7)
2	(51)	2.375	(60.3)	2.157	(54.8)	0.109	(2.8)	-		-		2.067	(52.5)	0.154	(3.9)
2-1/2	(64)	2.875	(73.0)	2.635	(66.9)	0.120	(3.0)	-		-		2.469	(62.7)	0.203	(5.2)
3	(76)	3.500	(88.9)	3.260	(82.8)	0.120	(3.0)	-		-		3.068	(77.9)	0.216	(5.5)
3-1/2	(89)	4.000	(101.6)	3.760	(95.5)	0.120	(3.0)	-		-		3.548	(90.1)	0.226	(5.7)
4	(102)	4.500	(114.3)	4.260	(108.2)	0.120	(3.0)	-		-		4.026	(102.3)	0.237	(6.0)
5	(127)	5.563	(141.3)	5.295	(134.5)	0.134	(3.4)	-		-		5.047	(128.2)	0.258	(6.6)
6	(152)	6.625	(168.3)	6.357	(161.5)	0.134[2]	(3.4)	-		-		6.065	(154.1)	0.280	(7.1)
8	(203)	8.625	(219.1)	8.249	(209.5)	0.188[2]	(4.8)	8.071	(205.0)	0.277	(7.0)	-		-	
10	(254)	10.75	(273.1)	10.37	(263.4)	0.188[2]	(4.8)	10.14	(257.6)	0.307	(7.8)	-		-	

NOTE 1: Schedule 10 defined to 5 in. (127 mm) nominal pipe size by ASTM A 135.
NOTE 2: Wall thickness specified in paragraph 3-1.1.2.

Table A-3-1.1.4

Copper Tube Dimensions

Nominal Pipe Size		Outside Diameter		Type K				Type L				Type M			
				Inside Diameter		Wall Thickness		Inside Diameter		Wall Thickness		Inside Diameter		Wall Thickness	
in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
3/4	(19)	0.875	(22.2)	0.745	(18.9)	0.065	(1.7)	0.785	(19.9)	0.045	(1.1)	0.811	(20.6)	0.032	(0.8)
1	(25)	1.125	(28.6)	0.995	(25.3)	0.065	(1.7)	1.025	(26.0)	0.050	(1.3)	1.055	(26.8)	0.035	(0.9)
1-1/4	(32)	1.375	(34.9)	1.245	(31.6)	0.065	(1.7)	1.265	(32.1)	0.055	(1.4)	1.291	(32.8)	0.042	(1.1)
1-1/2	(38)	1.625	(41.3)	1.481	(37.6)	0.072	(1.8)	1.505	(38.2)	0.060	(1.5)	1.527	(38.8)	0.049	(1.2)
2	(51)	2.125	(54.0)	1.959	(49.8)	0.083	(2.1)	1.985	(50.4)	0.070	(1.8)	2.009	(51.0)	0.058	(1.5)
2-1/2	(64)	2.625	(66.7)	2.435	(61.8)	0.095	(2.4)	2.465	(62.6)	0.080	(2.0)	2.495	(63.4)	0.065	(1.7)
3	(76)	3.125	(79.4)	2.907	(73.8)	0.109	(2.8)	2.945	(74.8)	0.090	(2.3)	2.981	(75.7)	0.072	(1.8)
3-1/2	(89)	3.625	(92.1)	3.385	(86.0)	0.120	(3.0)	3.425	(87.0)	0.100	(2.5)	3.459	(87.9)	0.083	(2.1)
4	(102)	4.125	(104.8)	3.857	(98.0)	0.134	(3.4)	3.905	(99.2)	0.110	(2.8)	3.935	(99.9)	0.095	(2.4)
5	(127)	5.125	(130.2)	4.805	(122.0)	0.160	(4.1)	4.875	(123.8)	0.125	(3.2)	4.907	(124.6)	0.109	(2.8)
6	(152)	6.125	(155.6)	5.741	(145.8)	0.192	(4.9)	5.845	(148.5)	0.140	(3.6)	5.881	(149.4)	0.122	(3.1)
8	(203)	8.125	(206.4)	7.583	(192.6)	0.271	(6.9)	7.725	(196.2)	0.200	(5.1)	7.785	(197.7)	0.170	(4.3)
10	(254)	10.13	(257.3)	9.449	(240.0)	0.338	(8.6)	9.625	(244.5)	0.250	(6.4)	9.701	(246.4)	0.212	(5.4)

13- 07 - (A-3-8.7): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Add a new section to read as follows:
A-3-8.7 Combined automatic sprinkler and standpipe risers should not be interconnected by sprinkler system piping.
SUBSTANTIATION: When risers are used to supply combination sprinkler and standpipe systems, guidance is needed to avoid confusion when systems are controlled by more than one valve in remotely located areas. When repairs or alterations are necessary, this could lead to extensive water damage. No appreciable improvement in reliability is realized by cross connection.
COMMITTEE ACTION: Accept.

13- P09 - (A-3-9.2): Reject
SUBMITTER: W.J. Malone, W.J. Malone Assoc., Inc.
RECOMMENDATION: Delete entire reference to dry pipe type inspector's test pipes and allow same to be installed just as wet pipe test connections are.
SUBSTANTIATION: Installing test valves at the ceiling to prevent trapped sections of pipe may have been O.K. in older buildings that seldom exceeded 12 ft - 15 ft in floor to roof height, but in modern buildings that are usually 22 ft min., often 25 ft - 30 ft and sometimes 40 ft floor to roof this almost guarantees inaccessibility of the test valve. Even if one is fortunate enough to find a ladder handy to reach the valve often storage on the floor will prevent placement of the ladder to reach the valve.
Net result is these valves are seldom used and an alternate way of trip testing the dry pipe valve is used, even by experienced inspectors, which leads to an improper or meaningless test.
We feel that having the inspector test line trapped is no different than having a drum drip on other trapped sections. If the committee feels that two valves in series on the test pipe drop leg (making it, in effect a drum drip) is in order, this would still be preferable to an inaccessible ceiling valve.
The potential hazard of not properly trip testing the dry valve exceeds the hazard of freezing in the drop leg.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: The section as written does not prohibit location of the inspector's test valve as the Submitter recommends. Also see Proposal No. 307 on 3-9.

13- 304 - (A-3-10.1.2) Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Add a new section to read as follows:
A-3-10.1.2 In areas subject to freezing climates, when piping extends through an exterior wall, as for fire department connections, system test pipes, or drains, a minimum of 4 ft (1.2 m) of pipe should be maintained between the wall and the section of piping containing water.
Add a new Figure A-3-10.1.2 to illustrate the condition.
Add an asterisk to 3-10.1.2.
SUBSTANTIATION: Guidance is needed for the length of piping required to provide a frost break.
COMMITTEE ACTION: Accept.

13- P92 - (A-3-13.1.1 (New)): Reject
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add a new section A-3-13.1.1 to read:
A-3-13.1.1 Fittings manufactured to other recognized standards (e.g., European standards), may be acceptable for sprinkler system use. To judge acceptability, the standards should be compared, on a case by case basis, to the standards of Table 3-13.1.1.
SUBSTANTIATION: Although impossible to list all the foreign standards which may be equivalent to or surpass the standards listed in Table 3-13.1.1, some guidance with respect to their acceptability should be provided.
For example, copper alloy fittings manufactured to a standard such as BS 864 (British Standard - Specification for Capillary and Compression Tube Fittings of Copper and Copper Alloy - Part 2) are acceptable for sprinkler system use.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: The problem of using standards from other countries is adequately covered in this section as presently written. The chemical properties, physical properties and dimensions of materials listed in Tables 3-13.1.1 shall be at least equivalent to standards cited in the Table.

13- P93 - (A-3-13.1.2 (New)): Accept in Principle
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add asterisk after 3-13.1.2 and add a new section A-3-13.1.2 to read:
A-3-13.1.2 Rubber gasketed pipe fittings and couplings should not be installed where ambient temperatures can be expected to exceed 225oF (107oC). If the manufacturer further limits a given gasket compound, those recommendations should be followed.
SUBSTANTIATION: Listed gasketing materials do not assure the user of integrity at temperatures exceeding 225oF (107oC). Guidance in the form of the verbiage proposed above is needed.
COMMITTEE ACTION: Accept in Principle.
In the recommended text change "225oF" to "150oF" and change "107oC" to "66oC" and at the end of this sentence add "unless listed for this service." In the statement of the problem, delete "225oF" (107oC) and add 150o (66oC).
COMMITTEE COMMENT: One hundred and fifty degrees (150o) is within the maximum temperature range of currently listed gaskets.

13- 08 - (A-3-16.2): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Add a new section to read as follows:
A-3-16.2 Residential sprinklers may be used in residential portions of residential occupancies provided they are installed in conformance with the listing and positioning requirements of NFPA 13D.
Add an asterisk to 3-16.2.
SUBSTANTIATION: Guidance is needed for the installation of residential sprinklers in residential portions of occupancies other than one and two family dwellings and mobile homes.
COMMITTEE ACTION: Accept.

13- P103 - (A-3-17.2): Reject
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: In section A-3-17.2, after the section labeled Identification Signs, add a paragraph to read: "The identification sign should be minimum 25 gage (0.021 in., 0.53 mm) corrosion resistant metal. If made of a corrodable metal, such as steel, the sign should be of the same minimum gage and completely porcelain enameled."
SUBSTANTIATION: The proliferation of non-permanent type signs justifies the additional appendix guidelines.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: The wording as proposed is too restrictive. Other signs can be used to accomplish the intended purpose.

13- P16 - (A-3-17.5): Accept
SUBMITTER: R.P. Fleming, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Delete final sentence of this section.
SUBSTANTIATION: Increasing the size of the pipe line is not necessary to compensate for hydraulic friction loss, and creates additional piping volume which must be filled prior to sounding an alarm. (Reference material submitted to Committee.)
COMMITTEE ACTION: Accept.

13- P60 - (A-4-1.2): Accept in Principle
SUBMITTER: R.P. Fleming, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Add additional language to present section as follows: "When sprinklers are provided for corridors only with no protection of adjacent rooms, sprinklers should be spaced up to a maximum of 15 ft, with one sprinkler opposite the center of any door opening onto the corridor, and with an additional sprinkler placed inside the adjacent room above the door opening."
SUBSTANTIATION: The standard does not prohibit partial systems, and corridor-only systems are required for multi-unit dwellings by HUD and are referenced by the NFPA LIFE SAFETY CODE®. Testing at the NBS and elsewhere has demonstrated the need in such cases for a sprinkler to be located directly outside each opening onto the corridor.
COMMITTEE ACTION: Accept in Principle.
Add a new paragraph to A-4-1.2 to read as follows: "When sprinklers are installed in corridors only, sprinklers should be spaced up to the maximum of 15 ft (4.5 m) along the corridor, with one sprinkler opposite the center of any door or pair of adjacent doors opening onto the corridor, and with an additional sprinkler spaced inside each adjacent room above the door opening."
COMMITTEE COMMENT: The Submitter's wording has been revised editorially to better express his intent.

13- P104 - (A-4-3.6 (New)): Reject
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: Add an asterisk to section 4-3.6.
Add a new section A-4-3.6 to read:
A-4-3.6 The prompt operation of sprinklers beneath a suspended ceiling relies on the ceiling surface acting as a continuous heat collector. Light suspended ceiling panels (excluding dropout ceilings, see section 4-4.16) should be secured to avoid movement by fire-generated air turbulence. Clips or weights should be used to secure the panels.
SUBSTANTIATION: The problem and its solution are described in the above proposed verbiage.

COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: The Submitter has not submitted adequate substantiation that securing light suspended ceilings is a field problem.

13- 402 - (A-4-4.8.2.3): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Delete A-4-4.8.2.3 and asterisk at 4-4.8.2.3 and revise to read as follows:
4-4.8.2.3 The draft stops shall be located immediately adjacent to the opening, shall be at least 18 in. (457 mm) deep and shall be of substantially noncombustible material which will stay in place before and during sprinkler operation. Sprinklers, spaced not more than 6 ft (1.8 m) apart, shall be placed 6 to 12 in. (152 mm to 305 mm) from the draft stop on the side away from the opening to form a water curtain. Sprinklers in this water curtain shall be hydraulically designed to provide a discharge of 3 gpm/min per lineal foot ((37 L/min)/m) of water curtain, with no sprinklers discharging less than 15 gpm (56.8 L/min). The number of sprinklers calculated in this water curtain shall be the number in the length corresponding to the length parallel to the branch lines in the design area determined by 7-4.3.1. These sprinklers shall be added to the design area when considering the hydraulic design. Nominal 1/2 in. (12.7 mm) orifice closed head systems using sprinklers of Ordinary Temperature Classification are adequate for this purpose. When sprinklers are closer than 6 ft (1.8 m), cross baffles shall be provided in accordance with 4-4.19. When sprinklers in the normal pattern are closer than 6 ft (1.8 m) from the water curtain, it may be preferrable to locate the water curtain sprinklers in recessed baffle pockets. (See Figure A-4-4.8.2.3.)
SUBSTANTIATION: There is a need to give guidance on the number of sprinklers calculated in the water curtain. Also there is a need to make the advisory material in A-4-4.8.2.3 mandatory. The method of protecting open moving stairways or similar floor openings according to this section has been used successfully for many years.
COMMITTEE ACTION: Accept.

13- P64 - (A-4-4.8.2.3): Accept in Principle
SUBMITTER: R.P. Fleming, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Replace "should" with "shall" throughout and move this section and figure to body of standard.
SUBSTANTIATION: Present section 4-4.8.2.3 is not sufficient in calling for draft stops and closely spaced sprinklers. The requirements of the present Appendix material are needed.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE COMMENT: See Committee Action on Proposal No. 402 on 4-4.8.2.3.

13- P29 - (A-5-2.1): Accept in Principle
SUBMITTER: Bruce R. Pinkney, Care Construction Corp.
RECOMMENDATION: Change first sentence of the first paragraph to read: "A wet pipe system should be installed where ever practical; however, in rooms, buildings or where sprinkler piping passes through interstitial spaces that are not properly heated, a dry sprinkler system should be installed."
SUBSTANTIATION: Although Appendix A is not a part of this NFPA standard, it is advisory and therefore, on a practical basis it is used as a part of the standard. The word "impractical" in the first sentence has been arbitrarily interpreted to the extent the design of a building has been altered to achieve heated spaces to accommodate a wet pipe system. Therefore, the question arises, is it impractical to heat an attic or add heated chassis for wet piping?
COMMITTEE ACTION: Accept in Principle.
Change first sentence as follows: "A dry-pipe system should be installed only where heat is not adequate to prevent freezing of water in all or sections of the system."
Add the following third paragraph: "When adequate heat is present in sections of the dry-pipe system, consideration should be given to dividing the system into a separate wet-pipe system and dry-pipe system. Minimized use of dry-pipe systems is desirable where speed of operation is of particular concern such as nursing homes and hospitals where occupants are not easily evacuated."
COMMITTEE COMMENT: The Committee agrees with the Submitter and has eliminated the word "impractical" and given additional guidance on the use of dry-pipe systems with the addition of the new third paragraph.

13- P05 - (A-5-5.2): Accept in Principle
SUBMITTER: R.W. McCloughan, Economy Mechanical Industries, Inc.
RECOMMENDATION: Change second sentence of first paragraph to read: "Antifreeze solutions are recommended only for systems not exceeding a 60 gal capacity."
SUBSTANTIATION: The present recommended limit of 20 sprinklers is restrictive and not economical. Attached are examples of systems designed for maximum spacing and sized on a pipe schedule basis in accordance with 13-1978 sections 3-5.1 (Exception), 3-6.1 (Exception), and 3-7.1. Computer studies indicate the capacities vary from 1.09 to 2.11 gal per sprinkler or an average of 1.59 gal per sprinkler.

If those same systems were hydraulically calculated, the piping could be smaller, particularly with an antifreeze loop (C=120 vs. C=100).

Cost studies based on current labor and material prices, assuming a 20 sprinkler system of 40 gal capacity, compared small dry pipe systems with glycerine filled antifreeze systems set for -22oF:

3 in. dry pipe valve with automatic air maintenance device and compressor	$1,720.00	2 1/2 in. dry pipe valve with automatic air maintenance device and compressor	$1,668.00
3 in. antifreeze loop including $205 for glycerine savings	$1,119.00	2 1/4 in. antifreeze loop including $205 for glycerine savings	$1,045.00
	$ 601.00		$ 623.00

If a propylene glycol solution was used, the antifreeze loops would cost $105.00 less.

The cost comparison ignored perpetual electric utility charges for the air compressor and high-low air supervisory costs for the dry pipe valve. Annual labor costs for trip-testing and resetting the dry valve have historically been higher than those for testing and replenishing the antifreeze solution in accordance with section A-5-5.5. It is rare that the antifreeze solution has been totally replenished except as the result of a fire opening the sprinklers on that system.
COMMITTEE ACTION: Accept in Principle.
In the first and second paragraph change "20 sprinklers" to "40 gallons."
COMMITTEE COMMENT: Committee agrees volume limitation for antifreeze systems should replace recommended limit of twenty (20) sprinklers. However, Committee recommends limit of forty (40) gallons capacity. The Submitter's data supports this limit.

13- P28 - (Appendix Chapter 7): Accept in Principle
SUBMITTER: S.R. Hoover/G.M. Hidzick, Kemper Group
RECOMMENDATION: a) Add section A-7-4.3.
A-7-4.3 Sprinkler system performance criteria have been based on test data. The factors of safety are generally small and are not definitive and can depend on expected (but not guaranteed) inherent characteristics of the sprinkler systems involved. These inherent factors of safety consist of the following:

1. The flow-declining pressure characteristic of sprinkler systems whereby the initial operating sprinklers discharge at a higher flow than with all sprinklers operating within the designated area.
2. The flow declining pressure characteristic of water supplies. This is particularly steep where fire pumps are the water source. This characteristic similarly produces higher than design discharge at the initially operating sprinklers.

The user of these standards may elect an additional factor of safety if the inherent factors are not considered adequate.

"Performance specified sprinkler systems" as opposed to scheduled systems can be designed to take advantage of multiple loops or gridded configurations. This results in minimum line losses at expanded sprinkler spacing, in contrast to the older "tree-type" configurations where advantage cannot be taken of two-way type flows.

Where the water supply characteristic is relatively flat with pressures being only slightly above the required sprinkler pressure at the spacing selected, gridded systems with piping designed for minimal economic line losses can all but eliminate the inherent flow-declining pressure characteristic generally assumed to exist in sprinkler systems. In contrast, economic design of a "tree-type" system would likely favor a system design with closer sprinkler spacing and greater line losses, demonstrating the inherent flow-declining pressure characteristic of the piping system.

There are seven considerations or elements that enter into the "design" of sprinkler systems:

1. Selection of Density and Area of Application.
2. Geometry of the Area of Application (Remote Area).
3. Permitted Pressure Range at Sprinklers.
4. Determination of the Water Supply Available.
5. Ability to Predict Expected Performance from Calculated Performance.
6. Future Upgrading of System Performance.
7. Size of Sprinkler Systems.

In developing sprinkler specifications, each of these elements needs to be considered individually. The most conservative design will be based on the application of the more stringent conditions for each of the elements.

b) Add section A-7-4.3.1.3.

A-7-4.3.1.3 Selection of Density and Area of Application. Specifications for density and area of application are developed from NFPA and other standards. It is desirable to specify densities rounded upward to 0.05 gpm.

Prudent design should consider reasonable-to-expect variations in occupancy. This would include not only variations in types of occupancy, but, in the case of warehousing the anticipated future range of materials to be stored, clearances, types of arrays, packing, pile height and pile stability as well as other factors.

Design also considers some degree of "adversity at the time of a fire." To take this into account, the density and/or area of application may be increased. Another way is to use a dual performance specification where, in addition to the normal primary specifications, a secondary density and area of application is specified. The objective of such a selection is to control the declining pressure-flow characteristic of the sprinkler system beyond the primary design flow.

A case can be made for designing feed and cross mains to lower velocities than branch lines to achieve the same result as specifying a second density and area of application.

Geometry of the Area of Application (Remote Area). It is expected that over any portion of the sprinkler system equivalent in size to the "area of application," the system will achieve the minimum specified density for each sprinkler within that area.

Where a system is computer designed, ideally the program should verify the entire system by shifting the area of application the equivalent of one sprinkler at a time so as to cover all portions of the system. Such a complete computer verification of performance of the system is most desirable, but unfortunately not all available computer verification programs currently do this.

c) Change 7-4.3.1.5 to 7-4.3.1.5*.

d) Add section A-7-4.3.1.5.

A-7-4.3.1.5 The selection of the proper Hazen-Williams coefficient is important. New unlined steel pipe has a Hazen-Williams coefficient close to 140. However, it quickly deteriorates to 130, and after a few years' usage, to 120. Hence, the basis for normal design is a Hazen-Williams coefficient of 120 for steel piped wet systems. A Hazen-Williams coefficient of 100 is generally used for dry pipe systems because of the increased tendency for deposits and corrosion in these systems. However, it should be realized that a new system will have less line losses than calculated, and the distribution pattern will be affected accordingly.

Conservatism can also be built into systems by intentionally designing to lower Hazen-Williams coefficient than those indicated.

e) Add (d) and (e) to A-7-4.3.1.7.

(d) Ability to Predict Expected Performance from Calculated Performance. Ability to accurately predict the performance of a complex array of sprinklers on piping is basically a function of the pipe line "velocity." The greater the velocity the greater is the impact on difficult-to-assess pressure losses. These pressure losses are presently determined by empirical means which lose validity as velocities increase. This is especially true for fittings with unequal and more than two flowing ports. Some guidelines call for a limitation of 20 ft per second on overhead piping and 16 ft per second on underground piping. Other guidelines permit velocities up to 32 ft per second on underground piping. Other guidelines permit velocities up to 32 ft per second in overhead piping if velocity pressures are included in the calculations. These velocity limitations should be considered the upper limits for conservative design. Pipeline velocities of 50 or 75 percent of the indicated figures are often used in water works systems.

The inclusion of velocity pressures in hydraulic calculations improves the predictability of the actual sprinkler system performance.

The absence of "velocity pressures" in calculations will normally result in a calculated demand greater than that actually needed. On this basis, some authorities discourage inclusion of velocity pressures in hydraulic calculations on the basis that their exclusion produces a more "conservative" design. However, this is a questionable approach. Calculations should come as close as practicable to predicting actual performance. Conservatism in design should be arrived at intenticnally by known and deliberate means. It should not be left to chance.

(e) Future Upgrading of System Performance. It may be desirable in some cases to build into the system the capability to achieve a higher level of sprinkler performance than needed at present. If this is to be a consideration in conservatism, consideration needs to be given to maintaining sprinkler operating pressures on the lower side of the optimum operating range, and/or by designing for low pipe line velocities, particularly on feed and cross mains, to facilitate future reinforcement.

f) Add section A-7-4.3.2.

A-7-4.3.2 Permitted Pressure Range at Sprinklers. Recent fire test work has shown that for most combustible storage occupancies, an "optimum range" of sprinkler droplet sizes is likely in the pressure range of 30-60 psig for 1/2 in. and 17/32 in. orifice sprinklers. This pressure range limits the discharge for 1/2 in. orifice sprinklers between 30 and 45 gpm and for 17/32 in. sprinklers between 40 to 60 gpm.

SUBSTANTIATION: Inadequate or incomplete specifications can result in wide differences in sprinkler system design, largely based on the conservatism contemplated in the design. Guidance is needed to assure that the standard user, the property owner, and the designing contractor understand the factors bearing on conservatism (safety factor), similar to the considerations of conservatism for other critical engineering designs.

COMMITTEE ACTION: Accept in Principle.

Add a new Appendix section B-7 Sprinkler System Performance Criteria to read as follows:

B-7-1 Sprinkler system performance criteria have been based on test data. The factors of safety are generally small and are not definitive and can depend on expected (but not guaranteed) inherent characteristics of the sprinkler systems involved. These inherent factors of safety consist of the following:

1. The flow-declining pressure characteristic of sprinkler systems whereby the initial operating sprinklers discharge at a higher flow than with all sprinklers operating within the designated area.
2. The flow declining pressure characteristic of water supplies. This is particularly steep where fire pumps are the water source. This characteristic similarly produces higher than design discharge at the initially operating sprinklers.

The user of these standards may elect an additional factor of safety if the inherent factors are not considered adequate.

B-7.1.1 Performance specified sprinkler systems as opposed to scheduled systems can be designed to take advantage of multiple loops or gridded configurations. This results in minimum line losses at expanded sprinkler spacing, in contrast to the older "tree-type" configurations where advantage cannot be taken of two-way type flows.

Where the water supply characteristics is relatively flat with pressures being only slightly above the required sprinkler pressure at the spacing selected, gridded systems with piping designed for minimal economic line losses can all but eliminate the inherent flow-declining pressure characteristic generally assumed to exist in sprinkler systems. In contrast, economic design of a "tree-type" system would likley favor a system design with closer sprinkler spacing and greater line losses, demonstrating the inherent flow-declining pressure characteristic of the piping system.

Elements that enter into the design of sprinkler systems include:

1. Selection of Density and Area of Application
2. Geometry of the Area of Application (Remote Area)
3. Permitted Pressure Range at Sprinklers
4. Determination of the Water Supply Available
5. Ability to Predict Expected Performance from Calculated Performance
6. Future Upgrading of System Performance
7. Size of Sprinkler Systems

In developing sprinkler specifications, each of these elements needs to be considered individually. The most conservative design will be based on the application of the most stringent conditions for each of the elements.

B-7-1.2 Selection of Density and Area of Application: Specifications for density and area of application are developed from NFPA and other standards. It is desirable to specify densities rounded upward to 0.05 gpm.

Prudent design should consider reasonable-to-expect variations in occupancy. This would include not only variations in types of occupancy, but, in the case of warehousing the anticipated future range of materials to be stored, clearances, types or arrays, packaging, pile height and pile stability as well as other factors.

Design also considers some degree of adversity at the time of a fire. To take this into account, the density and/or area of application may be increased. Another way is to use a dual performance specification where, in addition to the normal primary specifications, a secondary density and area of application is specified. The objective of such a selection is to control the declining pressure-flow characteristic of the sprinkler system beyond the primary design flow.

A case can be made for designing feed and cross mains to lower velocities than branch lines to achieve the same result as specifying a second density and area of application.

B-7-1.3 Geometry of the Area of Application (Remote Area): It is expected that over any portion of the sprinkler system equivalent in size to the "area of application," the system will achieve the minimum specified density for each sprinkler within that area.

Where a system is computer designed, ideally the program should verify the entire system by shifting the area of application the equivalent of one sprinkler at a time so as to cover all portions of the system. such a complete computer verification of performance of the system is most desirable, but unfortunately not all available computer verification programs currently do this.

The selection of the proper Hazen-Williams coefficient is important. New unlined steel pipe has a Hazen-Williams coefficient close to 140. However, it quickly deteriorates to 130, and after a few years' usage, to 120. Hence, the basis for normal design is a Hazen-Williams coefficient of 120 for steel piped wet systems. A Hazen-Williams coefficient of 100 is generally used for dry pipe systems because of the increased tendency for deposits and corrosion in these systems. However, it should be realized that a new system will have less line losses than calculated, and the distribution pattern will be affected accordingly.

Conservatism can also be built into systems by intentionally designing to lower Hazen-Williams coefficient than those indicated.

B-7-1.4 Ability to Predict Expected Performance from Calculated Performance. Ability to accurately preduct the performance of a complex array of sprinklers on piping is basically a function of the pipe line velocity. The greater the velocity the greater is the impact on difficult-to-assess pressure losses. These pressure losses are presently determined by empirical means which lose validity as velocities increase. This is especially true for fittings with unequal and more than two flowing ports.

The inclusion of velocity presures in hydraulic calculations improves the predictability of the actual sprinkler system performance. Calculations should come as close as practicable to predicting actual performance. Conservatism in design should be arrived at intentionally by known and deliberate means. It should not be left to chance.

B-7-1.6 Future Upgrading of System Performance: It may be desirable in some cases to build into the system the capability to achieve a higher level of sprinkler performance than needed at present. If this is to be a consideration in conservatism, consideration needs to be given to maintaining sprinkler operating pressures on the lower side of the optimum operating range, and/or by designing for low pipe line velocities, particularly on feed and cross mains, to facilitate future reinforcement.

COMMITTEE COMMENT: The material on limiting velocities has not been verified. The balance of the material is a good guide to sprinkler design but more appropriately belongs in Appendix B than in Appendix A.

13- P111 - (A-7-4.3.1.2(b)): Reject
SUBMITTER: Ron Cote', Factory Mutual Research Corp.
RECOMMENDATION: At the end of section A-7-4.3.1.2 add the following: "For the system design to be based only on sprinklers above or below the ceiling, voids in the ceiling surface should not exist. Suspended ceiling panels should fit properly against suspending grid with no missing panels. Judgment should be carefully used in evaluating the potential for heat to operate sprinklers above and/or below the ceiling surface."
SUBSTANTIATION: The problem, its effects, and controlling guidelines are presented above.
COMMITTEE ACTION: Reject.
COMMITTEE COMMENT: The present wording is adequate.

13- 203 - (B-2-3.4): Accept
SUBMITTER: Technical Committee on Automatic Sprinklers
RECOMMENDATION: Move "Pressure Regulating Valves. Pressure regulating valves should not be used except with permission of the authority having jurisdiction" from A-2-3.1.1 and renumber as B-2-3.4.
SUBSTANTIATION: This section needs editorial revision.
COMMITTEE ACTION: Accept.

13- P71 - (D-1.1): Accept
SUBMITTER: L.R. Milam, Automatic Sprinkler Corp. of America
RECOMMENDATION: Add "NFPA 72A-1979."
SUBSTANTIATION: Reference necessary since standard is cited in section 3-17.6.2.
COMMITTEE ACTION: Accept.

13- P72 - (D-1.2): Accept
SUBMITTER: L.R. Milam, Automatic Sprinkler Corp. of America
RECOMMENDATION: Change "ANSI B16.3-1971, Malleable Iron Screwed Fittings, 150 and 300 lb" to read "ANSI B16.3-1977, Malleable Iron Threaded Fittings, Class 150 and 300."

Change "ANSI B16.4-1971, Cast Iron Screwed Fittings, 125 and 250 lb" to read "ANSI B16.4-1977, Cast Iron Threaded Fittings, Class 125 and 250."
SUBSTANTIATION: The latest edition of the referenced standards is dated 1977. Also the title and fitting designation should be the same as that used by the standard.
COMMITTEE ACTION: Accept.

13- P73 - (Index): Accept
SUBMITTER: Charles Barnett, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Remove "shields...A-3-16.8" from index under the word HEAT.
SUBSTANTIATION: Neither section 3-16.8 nor A-3-16.8 addresses thermal considerations. Both of these paragraphs address mechanical protection only.

Canopies or shields as an aid to heat collection so as to aid the thermal performance of a sprinkler was discussed with UL, FM, NBS, IRI and Kemper. None of the persons contacted knew of any work which attempted to show the thermal performance of such shields.

None of the persons contacted believed that the thermal performance of the sprinkler was improved by a canopy or shield.

Several were willing to say that shields of the size used on rack storage sprinklers would probably not affect the thermal performance of a sprinkler.
COMMITTEE ACTION: Accept.

13- P74 - (Index): Accept
SUBMITTER: Charles Barnett, National Automatic Sprinkler & Fire Control Assoc.
RECOMMENDATION: Under title "Shields" remove "heat collecting...A-3-16.8."

Add section number A-3-16.8 to "sprinkler...3-16.8" so as to read "sprinkler...3-16.8, A-3-16.8."

Also, editorial change needed for A-3-16.8. Should read "gratings" not "ratings."
SUBSTANTIATION: Neither section 3-16.8 nor A-3-16.8 addresses thermal consideration. Both of these sections address mechanical protection only.

Canopies or shields as an aid to heat collection so as to aid the thermal performance of a sprinkler was discussed with UL, FM, NBS, IRI and Kemper. None of the persons contacted knew of any work which attempted to show the thermal performance of such shields.

None of the persons contacted believed that the thermal performance of the sprinkler was improved by a canopy or shield.

Several were willing to say that shields of the size used on rack storage sprinklers would probably not affect the thermal performance of a sprinkler.
COMMITTEE ACTION: Accept.

Editorial Changes

In addition the committee has made the following editorial corrections.

3-1.1.3 In the fifth line delete "in Table A2 of ASTM A53."
3-1.1.4 In the second line delete "fire protection" and add "sprinkler".

3-3.1 In the last paragraph, delete "A" in NFPA 231A.

3-3.1 In the second line of the Exception change "15 ft (4.6 m)" to "12 ft (3.7 m)."

3-5.3.1 In the third line, delete "5" and add "3".

3-6.2 Exception No. 1: In the first line, change 15 ft (4.6 m) to 12 ft (3.7 m).

3-10.3.5.3 In the third line delete "referred to as No. 1".

3-12.2.1 In the last line change "E" to "D".

3-12.5 Change the fourth word in the first line to "types".

3-15.4.2 In the second line change "Table 3-12.4.2" to "3-15.4.2".

Table 3-16.5 in Note 1, remove the period after formula and move the next entry to immediately follow the word formula.

3-16.6.1 In Exception No. 2 delete "ceiling" and add "flush, recessed or concealed" before "sprinklers."

4-1.2 Delete the title "Partial Installations".

4-1.3.8 In the second line change "15 ft (4.6 m)" to "12 ft (3.7 m)."

4-3.6 Delete "4-3.1.1 and 4-3.1.3" and add "4-3.1."

4-4.1 In the sixth line, delete "blind" and add "concealed".

4-4.3 In the third line, before 'authority' change the first letter to "t" to read "the".

4-5.2.1 In the second line delete "allotted."

4-5.2.2 In the second and sixth line delete "allotted."

5-5 Title, add a hyphen between 'anti' and 'freeze'.

5-5.3 Add a hyphen between 'anti' and 'freeze'.

7-2.4.4 In the second line after "application" add ", in rack sprinkler demand,".

7-3.3 Add a new item "(j) In rack sprinkler demand", renumber (j) through (n) as (k) through (o).

7-3.4 In the third line after "graph paper" add "(Q1.85)". In the second line after hose add "and in rack sprinkler."

7-4.1.2 In the third line change "0.001 123" to "0.001123".

8-1 In the title, delete "and Scope".

A-2-8.2 In the last line delete "B-3-2" and add "B-3.1."

A-3-9.1.2 At the left the drawing, delete "sprinkler" and before "riser" add "system".

A-3-10 In the sixth line delete "heat" and add "heavy."

A-3-11.4.1 The second word of the second line should read "outside".

A-3-15.3.1 Delete "Power" and add "Powder."

A-3-16.5 In the third line delete "io" and add "to."

A-3-16.8 In the first line, add the letter "g" before 'ratings' to spell "gratings".

A-3-16.9.2 In the second line, add the letter "p" before 'arts' to read 'parts'.

A-4-4.11 In the third line, add the letter 'g' before rating to spell 'grating'.

A-5-3.2 Renumber A-3-3.2 and A-5-3.2

A-5-3.3 In the fourth paragraph spell "corrosive" correctly.

Figure A-7-4.3(b) Change "650 GPM" to "52 GPM."

Figure A-7-4.3(c) In the "THRU UNDG TO CITY MAIN" entry delete "@ 122.3," change 0 "400" to "277.7," change ".136" to ".069" and "11.2" to "5.7". In the last entry, change "67.6" to "62.1" and delete "*See Table 2-2.1(B)."

figure A-7-4.3(d) Change the slope of system demand line from "400 GPM @ 67.6 psi" to "277.7 GPM @ 62.1 psi".

Appendix C - in the last entry in the Table change "4-3.4" to "4-3.5".

In the Index under Draft stops delete the word "requirements" and change the reference from A-4-4.8.3 to A-4-4.8.2.3.

In the Index, add a new item after "Cornice" to read as follows: "Corridors, 7-4.3.1".

In the Index change the entry for Mezzanines from "3-4.5" to "3-4.4."

In the Index under "Shields-sprinkler" add "and A-3-16.8".

In the Index, under sprinklers - small orifice, change "A-15.2.5" to "3-16.5.2".

Draft Standard on the
Installation of Limited Protection Sprinkler Systems

for Small Buildings

Proposed NFPA 13S

Preface

The Small Building Sprinkler System concept is based on existing statistics which show that a high percentage of fires, 70 to 90 percent, operated four standard sprinklers or less.* Studies of the economics of the Small Building Sprinkler System specified in this standard show that in existing structures this system costs substantially less than an NFPA 13 system.**

NFPA statistics state that 43 percent of businesses that experience fire do not resume their business and that an additional 28 percent of these businesses which had experienced a fire fail within three years for a total failure rate of 71 percent. With a sprinkler which is 80 percent effective, only 20 percent of these businesses would experience a 71 percent failure rate for an overall failure rate of 14 percent (.20 x .71 x 100 = 14 percent).

*W.R. Powers, P.E., "Sprinkler Experience in High Rise Buildings (1969-1979)," SFPE Technology Report 79-1.

Comite Europeen des Assurances, "Report on the Operation of Sprinkler Systems" (Standing Technical Committee) (1968 to 1977).

H.W. Marryatt, "Fire-Automatic Sprinkler Performance in Australia-New Zealand 1886-1968," Australian Fire Protection Association.

**For new construction, the cost of an NFPA 13 system is approximately equal to the Small Building Sprinkler System because underground piping of appropriate size can be installed initially. The fire protection provided by the NFPA 13 system is considered superior; hence, an NFPA 13 system is recommended for new construction.

It is recognized that this Small Building Sprinkler System concept accepts a lower probability of success than that associated with present NFPA 13 systems. However, it is anticipated that Small Building Sprinkler Systems can reduce national fire losses by millions of dollars because such systems can be purchased by people who heretofore considered sprinkler fire protection too expensive. The Small Building Sprinkler System is offered as a reasonable balance between cost and fire control.

Draft Standard on the
Installation of Limited Protection Sprinkler Systems

for Small Buildings

Proposed NFPA 13S

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

For information on referenced publications see Appendix B.

Chapter 1 General

1-1 Scope. This standard describes the design and installation requirements of automatic sprinkler systems for limited fire protection in single-story industrial/commercial buildings with a floor area up to 12,000 ft2 maximum. The Small Building Sprinkler System described herein is limited to Light Hazard and Ordinary Hazard, Groups I and II occupancies as described in NFPA 13, Installation of Sprinkler Systems.

1-2 Purpose. The purpose of this standard is to provide a reasonable degree of life and property protection from fire based upon sound engineering principles, test data, and field experience. This standard provides the specifications of an automatic sprinkler system for small buildings only where the installation of an NFPA 13 sprinkler system is not economically feasible.

Although the water supply for a Small Building Sprinkler System is less than that provided by an NFPA 13 system, the Small Building Sprinkler System provides a fire department connection which, when connected to a pumper, provides the water requirements approaching that of an NFPA 13 system.

NOTE: A sprinkler system is a specialized fire protection system and requires knowledgeable and experienced design and installation.

1-3 Definitions. Unless expressly stated elsewhere, the following terms will, for the purpose of this standard, have the meanings given.

Automatic Sprinkler System. An integrated system of specialized fire protection devices and piping, connected to an adequate and reliable water supply (see also Section 1-3 of NFPA 13). This system is specifically designed to discharge water, at the flow rate(s) and over the area prescribed herein, when temperatures at the sprinklers exceed their operating temperature rating.

Sprinkler. A listed thermally actuated device specifically designed to:

(a) Open at a specified design temperature and allow a specific water discharge.

(b) Distribute the water discharge in a pattern conducive to fire control.

Small Building. A single-story enclosed structure with basement having a floor area at grade not to exceed 12,000 sq. ft. and a clear interior height not to exceed 15 ft.

Listed. Equipment or materials included in a list published by an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The "authority having jurisdiction" should utilize the system employed by the listing organization to identify a listed product.

1-4 Maintenance.

1-4.1 A sprinkler system installed under this standard shall be properly maintained for efficient service. The owner is responsible for the condition of his sprinkler system and shall use due diligence in keeping the system in good operating condition.

1-4.2 The installing contractor shall provide the owner with a copy of the publication entitled NFPA 13A, Inspection, Testing and Maintenance of Sprinkler Systems.

Chapter 2 System Components

2-1 Pipe, Pipe Hangers, Tubing and Fittings.

2-1.1 Pipe, pipe hangers and their means of attachment, fittings and joining methods used in sprinkler systems shall be in accordance with NFPA 13.

Exception No. 1: Minimum size for copper tubing shall be 1 in. nominal, and for steel pipe shall be 1 1/4 in. nominal.

Exception No. 2: All pipe sizes shall be verified by hydraulic calculations as specified herein.

Exception No. 3: Copper tubing joints shall be connected either by:

(a) Brazing Filler Metal (Classification BC_uP-3 or BC_uP-4), AWS A5.8

(b) Solder Metal 95-5 (Tin-Antimony Grade 95TA), ASTM B32, for Light Hazard wet systems only in accordance with 3-12.4 of NFPA 13.

2-1.2 Open flame methods shall not be used for soldering or brazing within the building being protected.

2-2 Sprinklers.

2-2.1 Sprinklers used in systems covered by this standard shall be in accordance with NFPA 13.

2-2.2 Sprinklers shall have a temperature rating not less than 160oF. Other temperature ratings shall be in accordance with NFPA 13.

2-3 Valves. Devices such as control valves, drain valves, check valves, alarm actuating devices, and alarms shall be in accordance with NFPA 13.

2-4* Nameplates. The installer shall properly identify each small building automatic sprinkler system by a permanently attached placard indicating the location, and the basis of design (discharge density over designed area of discharge, including gallons per minute and residual pressure demand at base of

riser). Such signs shall be placed at the controlling alarm valve, or dry-pipe valve, for the system containing the hydraulically designed layout.

Chapter 3 Hydraulic Design

3-1 The system shall be designed so that the available water supply shall adequately support continuous simultaneous flow to the sprinklers protecting the most hydraulically demanding 400 sq ft at the minimum density specified in Sections 3-2 and 3-3, and a minimum of 25 gpm for domestic consumption. The 25 gpm minimum domestic consumption allowance shall be added to system hydraulic calculations at the point of system connection to the service main.

3-1.1 The 25 gpm domestic consumption allowance is for rest rooms, a small kitchen, and drinking fountains only. If other water demands exist, such as a manufacturing process, a lawn watering system, etc., such additional demands shall be added to the system hydraulic calculations at the point of system connection to the service main.

3-1.2 For dry-pipe systems, the most hydraulically demanding area shall be increased to 600 sq ft.

3-2 For occupancies classified by NFPA 13 as Light Hazard, the minimum density shall be 0.15 gpm/ft^2.

3-3 For occupancies classified as Ordinary Hazard, Groups 1 or 2, the minimum density shall be 0.20 gpm/ft^2.

3-4 Hydraulic calculations shall be in accordance with NFPA 13.

Exception No. 1: Minimum pipe sizes shall be 1 in. copper or 1 1/4 in. steel.

Exception No. 2: For gridded systems, the design area shall be those hydraulically most demanding adjacent sprinklers on the most remote line from the riser connection.

Chapter 4 Spacing and Location of Sprinklers

4-1 For all classes of occupancy and ceiling construction, the maximum horizontal spacing between sprinklers shall be 12 ft (6 ft maximum to walls and partitions), and the maximum floor area protected by any sprinkler shall be 100 sq ft.

Exception: Small rooms having areas not exceeding 120 sq ft may be served by a single sprinkler located not more than 6 ft from any wall.

Chapter 5 Water Supplies

5-1 The minimum acceptable water supply shall be a connection to a public water supply or other source as specified in NFPA 13.

5-2 The minimum connection and supply size shall be nominal 1 1/2 in. copper tubing or 2 in. steel pipe.

5-3 Larger connections may be required to satisfy hydraulic design requirements. Allowance for meter losses and additional demand for simultaneous domestic consumption must also be included as part of the hydraulic design calculations.

5-4 The flow and pressure available at the system side of a water meter shall be verified by the installer by means of a flow test prior to system approval.

Chapter 6 Alarm and Control Valve Arrangement

6-1 The minimum wet-pipe riser configuration shall consist of a check valve, an indicating type control valve, a pressure gage, a fire department connection, a water flow alarm device, and a system drain arranged as shown in Figure 6-1.

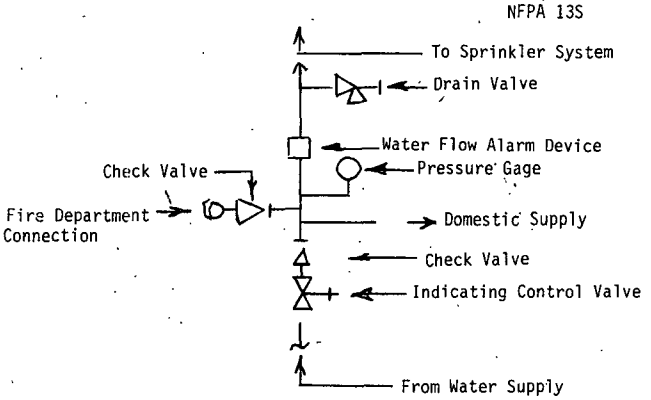


Figure 6-1 Minimum riser configuration, wet-pipe system.

6-2 The drain shall be a minimum of 1 in., shall be equipped with a drain valve, and shall discharge to a safe location.

6-3 The water flow alarm device shall be connected to a bell, horn, or siren mounted on the most public exterior wall. A sign describing the alarm function shall be located on or adjacent to the alarm sounding device.

6-4 An inspector's test connection in accordance with NFPA 13 is required and shall discharge in a safe location.

Chapter 7 Testing

7-1 Water supply testing shall be in accordance with NFPA 13.

7-2 Hydrostatic testing of each system shall be in accordance with NFPA 13.

Appendix A

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

A-2-4 A nameplate should be installed in a conspicuous location to identify each Small Building Sprinkler System.

SMALL BUILDING SPRINKLER SYSTEM
(DESIGNED IN ACCORDANCE WITH NFPA 13S)

This system as shown on.....company

print no.....dated.....

for.....

at.....contract no.....

is designed to discharge at a rate of ..... gpm

(L/min) per sq ft of floor area over a maximum

area of.....sq ft (m^2) when supplied

with water at a rate of .....gpm (L/min)

at.....psi (bars) at the base of the riser.

NFPA 133

Appendix B Referenced Publications

B-1 This portion of the Appendix lists publications referenced within this NFPA document . . . and thus is considered part of the requirements of the document.

B-1.1 NFPA Publications. The following publications are available from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NFPA 13-1980, Installation of Sprinkler Systems

NFPA 13A-1981, Inspection, Testing and Maintenance of Sprinkler Systems

B-1.2 Other Publications. This portion of the Appendix lists publications which are referenced within this NFPA document for information purposes only . . . and thus is not considered part of the requirements of the document.

AWS A5.8-1969, Brazing Filler Material. Available from American Welding Society, 2501 N.W. 7th Street, Miami, FL. 33125

ASTM B32-1970, Solder Metal 95-5 (Tin-Antimony - Grade 95TA). Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

16A- 1 - (New Standard): Accept
SUBMITTER: Technical Committee on Foam-Water Sprinklers
RECOMMENDATION: The Technical Committee on Foam-Water Sprinklers recommends adoption of a new NFPA 16A-1983, Recommended Practice for the Installation of Closed-Head Foam-Water Sprinkler Systems.
SUBSTANTIATION: The need for a Recommended Practice for the Installation of Closed-Head Foam-Water SprinklerSystems was brought to the attention of the Technical Committee on Foam-Water Sprinklers by several members who were users of the systems and manufacturers of the agent. During recent years many of these systems have been installed. The lack of a national standard has made designing, installing and purchasing a closed head foam-water sprinkler system an expensive undertaking sometimes resulting in substandard fire protection. The Standards Council was petitioned to determine which committee should write the new recommended practice and the Council assigned the project to the Technical Committee on Foam-Water Sprinklers.
COMMITTEE ACTION: Accept.

Recommended Practice for the Installation of Closed-Head Foam-Water Sprinkler Systems

NFPA 16A-1983

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

Information on referenced publications can be found in Appendix B.

Foreword

Aqueous Film Forming Foams (AFFF) have the capability of generating effective foam when discharged through standard sprinklers of the type referred to in NFPA 13, Standard for the Installation of Sprinkler Systems. Design standards for AFFF foam-water deluge systems incorporating standard sprinklers are found in NFPA 16, Standard for the Installation of Foam-Water Sprinkler Systems and Foam-Water Spray Systems, and NFPA 409, Standard on Aircraft Hangars.

Investigations have been conducted which show that it is feasible to extend this technology to closed-head sprinkler systems, and a number of closed-head AFFF systems are now in use in industrial installations. One such closed-head system is described in the Appendix of NFPA 30, Flammable and Combustible Liquids Code, covering the specific occupancy of racked storage of flammable liquids. Although there is insufficient experience with closed-head systems upon which to base installation standards, there is enough interest that guidelines should be provided for design and installation. Therefore, this document, based on available data and experience, provides recommended practices for design and installation of closed-head AFFF foam-water sprinkler systems.

Chapter 1 General Information

1-1 Scope.

1-1.1 This recommended practice outlines minimum design criteria for the installation of closed-head foam-water sprinkler systems. These systems may be designed with the required density for either foam or water application as the controlling factor, depending on the design purpose of the system.

1-1.2 This recommended practice is not applicable where separate foam, water sprinkler or deluge foam-water sprinkler systems are to be installed. Reference should be made to either NFPA 11, Standard for Foam Extinguishing Systems; NFPA 11B, Standard for Synthetic Foam and Combined Agent Systems; NFPA 11A, Standard for High Expansion Foam Systems; NFPA 13, Standard for the Installation of Sprinkler Systems; or NFPA 16, Standard for the Installation of Deluge Foam-Water Sprinkler Systems and Foam-Water Spray Systems.

1-2 Purpose. The purpose of this recommended practice is to provide a reasonable degree of protection for life and property by establishing guidelines for the installation of closed-head foam-water sprinkler systems based upon sound engineering principles, test data, and field experience. Nothing in this recommended practice is intended to restrict new technologies or alternate arrangements, providing the level of safety prescribed by the recommended practice is not lowered.

1-3 Definitions.

Air Foam. Air foam is an aggregation of air-filled bubbles of lower specific gravity than flammable liquids or water. In the cases of the systems covered by this recommended practice, it extinguishes fires by resisting flame and heat attack in the process of falling from an overhead sprinkler type system where it is formed initially, to a burning flammable or combustible liquid surface where it flows freely, progressively removing heat, forming an air-excluding continuous blanket or film over the fuel, thus sealing volatile combustible vapors from access to air or reignition. The air foam produced by these systems possesses qualities of lower expansion, higher fluidity, and more rapid foam solution drainage than foams generated in other foam systems.

Air Foam Concentrate. Air foam concentrate is a concentrated liquid foaming agent as received from the manufacturer.

Air Foam Solution. A mixture consisting of an air foam concentrate in suitable proportions in either fresh or salt water.

Approved. Acceptable to the "authority having jurisdiction."

NOTE: The National Fire Protection Association does not approve, inspect or certify any installations, procedures, equipment, or materials nor does it approve or evaluate testing laboratories. In determining the acceptability of installations or procedures, equipment or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization concerned with product evaluations which is in a position to determine compliance with appropriate standards for the current production of listed items.

Authority Having Jurisdiction. The "authority having jurisdiction" is the organization, office or individual responsible for "approving" equipment, an installation or a procedure.

NOTE: The phrase "authority having jurisdiction" is used in NFPA documents in a broad manner since jurisdictions and "approval" agencies vary as do their responsibilities. Where public safety is primary, the "authority having jurisdiction" may be a federal, state, local or other regional department or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department, health department, building official, electrical inspector, or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the "authority having jurisdiction." In many circumstances the property owner or his designated agent assumes the role of the "authority having jurisdiction"; at government installations, the commanding officer or departmental official may be the "authority having jurisdiction."

Aqueous Film Forming Foam (AFFF) Concentrates. These foam concentrates consist of a fluorinated surfactant with suitable foam stabilizers and additives. Foams formed from these concentrates act as a barrier to exclude air or oxygen and they develop aqueous films on most hydrocarbon fuel surfaces which are capable of suppressing the evolution of fuel vapors.

Class A fires. Fires in ordinary combustible materials such as wood, cloth, paper, rubber and many plastics.

Class B fires. Fires in flammable liquids, oils, greases, tars, oil base paints, lacquers, and flammable gases.

Density. This term refers to the unit rate of liquid application to an area and is expressed in gal per minute per sq ft ((L/min)/m2). The term "density" is used in this recommended practice with reference to application of water in some cases and in others to application of air foam solution.

Discharge Devices - Standard Sprinklers. These discharge devices are the standard closed sprinklers referred to in NFPA 13, Standard for the Installation of Sprinkler Systems, and they are non-air-aspirating. When they are supplied with AFFF solution, a foam discharge pattern is produced closely conforming to the water discharge pattern of these sprinklers. Care must be exercised to ensure that the choice of concentrate and discharge device are listed for use together.

Closed-Head Foam-Water Sprinkler System. A closed-head foam-water sprinkler system is a combination of fusible or frangible element standard sprinklers and associated piping which is filled with air, water or air-foam solution up to the closed-head sprinklers and which discharges air foam or water directly onto the fire after the fusible or frangible links are activated.

Listed. Equipment or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

Rate. This term refers to the total flow of liquid per unit of time and is expressed in gallons per minute (L/min) in this document.

Recommended Practice. A Document containing only advisory provisions (using the word "should" to indicate recommendations) in the body of the text.

Should. Indicates a recommendation or that which is advised but not required.

1-4 System Design.

1-4.1 Types of Systems. There are three types of systems which technically could be used for AFFF closed head applications. They are wet-pipe, dry-pipe and pre-action.

1-4.1.1 Wet-Pipe Systems.

1-4.1.1.1 These systems have the piping normally filled with water so that there is an immediate discharge of water when the sprinkler operates. They are the fastest, simplest and most reliable of all types of sprinkler systems.

1-4.1.1.2 In AFFF service, these systems should be pre-primed with foam solution. This solution would remain in the piping until the system is called on to operate.

1-4.1.1.3 AFFF solution reacts with steel pipe in such a way that over a period of time the solution loses its capability to produce a fire resistant foam. Therefore, in a wet-pipe system there could be a delay in the discharge of effective foam until all the pre-primed solution has been flushed out and fresh solution reaches the opened sprinklers, unless corrective steps are taken.

1-4.1.1.4 The system should be drained or flushed and reprimed on a fixed schedule which would depend on system size (see 7-1.3). This procedure will require periodic investment in both time and material and it is questionable if this will be carried out indefinitely.

1-4.1.2 Dry-Pipe Systems.

1-4.1.2.1 These systems have air under pressure in the piping which holds the water control valve closed.

1-4.1.2.2 When a sprinkler operates, the air pressure bleeds down until it is low enough for the valve to open and release water into the system piping.

1-4.1.2.3 Dry-pipe systems are inherently slower in operation and have a tendency to develop internal scale.

1-4.1.2.4 Since the solution would be proportioned into the system on operation, the first discharge would be an effective foam. However, due to the slower operation, this should be considered the least desirable type of system for AFFF applications.

1-4.1.3 Pre-Action Systems.

1-4.1.3.1 These systems combine the features of both wet-pipe and dry-pipe systems. The piping is empty of water and may, or may not, contain air under low pressure for supervision of the piping. There is a separate detection system which operates the water control valve to release water into the piping. This detection system must be more sensitive than the sprinkler elements.

1-4.1.3.2 With this arrangement, water is usually released into the piping before the sprinklers operate so that, when they do, there is an immediate discharge as with the wet-pipe system. To ensure this, supervision of the actuation system is recommended.

1-4.1.3.3 Foam solution would be proportioned into the system on operation so there is no need for pre-priming. Overall response time generally approaches that of a wet-pipe system. Actual time of foam discharge would depend on the type of separate detection system used and the type of fire. With a very rapidly developing fire, the sprinkler heads may operate very close to the operation of the separate detection system and the piping may not have had time to fill with solution to achieve immediate discharge. With a slowly developing fire, there would be sufficient time to fill the piping and there would be a discharge of fresh foam on sprinkler operation.

1-4.1.3.4 These systems are more complex than dry-pipe and wet-pipe systems and this factor should be considered.

NOTE: All test work and evaluation of the effectiveness of AFFF closed-head systems has been done with fresh foam solution at the sprinklers and there has been no determination of the effect that a delay in the discharge of effective foam would have on fire control.

1-4.2 These closed-head systems are inherently automatic in operation because of the use of closed-head sprinklers.

1-4.3 Systems should deliver air foam for a definite time period at given densities (gal per minute of air foam solution per sq ft) ((L/min)/m2) to the hazards which they protect, either prior to water discharge or following water discharge, depending upon system-design purpose.

1-4.4 Following completion of discharge of air foam to the hazards protected, these special systems discharge water until manually shut off.

1-4.5 Authorities having jurisdiction should be consulted as to the means by which a reserve supply of air foam concentrate should be made available. The purpose of a reserve supply of concentrate is to have available the means for returning systems to service-ready condition following system operation. Reserve supply should be listed for use with system components (see 2-1.2.3).

1-5 Uses and Limitations.

1-5.1 Air foam concentrates and discharge devices for closed-head foam-water sprinkler systems should be listed as compatible for production of foam.

1-5.2 Systems of this type discharge air foam or water from the same discharge devices. In view of this dual extinguishing agent discharge characteristic, these systems are selectively applicable to combination Class A and Class B fires.

NOTE: Caution must be exercised when auxiliary extinguishing equipment is used with these systems. Some extinguishing agents may be incompatible with some air foams. The manufacturer should be consulted.

1-5.3 Most foams are not considered suitable extinguishing agents on fires involving liquefied or compressed gases, e.g., butane, butadiene, propane, etc., nor on materials which will react violently with water (e.g., metallic sodium) or which produce hazardous materials by reacting with water, nor on fires involving electrical equipment where the electrical nonconductivity of the extinguishing agent is of first importance.

1-5.4* Some types of foam are not suitable for use on fires in water-soluble solvents and polar solvents. Special "alcohol-type" concentrates are available for production of air foams for protection of such hazards. These concentrates should be specifically listed for this method of application.

1-5.5 The use of pendent sprinklers or drop nipples in dry-pipe and pre-action systems should be avoided.

1-6 Approvals. Prior to designing a system under consideration, the authority having jurisdiction should be consulted. All plans and specifications pertinent to the installation should be approved by the authority having jurisdiction prior to installation and such authority should be consulted as to devices and materials used in system construction and in selection of the air foam concentrate to be provided for system use. All equipment and concentrates should be approved for the particular application intended.

1-7 Units. Metric units of measurement in this standard are in accordance with the modernized metric system known as the International System of Units (SI). Two units (liter and bar), outside of but recognized by SI, are commonly used in international fire protection. These units are listed in Table 1-7 with conversion factors.

Table 1-7

Name of Unit	Unit Symbol	Conversion Factor
liter	L	1 gal = 3.785 L
liter per minute per sq meter	(L/min)/m2	1 gpm/ft2 = 40.746 (L/min)/m2
millimeter per minute	mm/min	1 gpm/ft2 = 40.746 mm/min
cubic decimeter	dm^3	1 gal = 3.785 dm^3
pascal	Pa	1 psi = 6894.757 Pa
bar	bar	1 psi = 0.0689 bar
bar	bar	1 bar = 10^5 Pa

For additional conversions and information, see ASTM E380, Standard for Metric Practice.

1-7.1 If a value for measurement as given in this standard is followed by an equivalent value in other units, the first stated is to be regarded as the requirement. A given equivalent value may be approximate.

1-7.2 The conversion procedure for the SI units has been to multiply the quantity by the conversion factor and then round the result to the appropriate number of significant digits.

Chapter 2 System Components

2-1 Approved Devices and Materials.

2-1.1 Component Parts. All component parts including air foam concentrates of foam-water sprinkler systems should be listed.

2-1.2 Air Foam Concentrates.

2-1.2.1 Air foam concentrates should be of types listed for use with the concentrate-proportioning equipment and with the discharge devices with which a given system is equipped. Replacement supplies of concentrates should be listed for use with system components. Different types and brands of concentrates may be incompatible and should not be mixed in storage.

2-1.2.2 The quantities of air foam concentrates to be provided should be sufficient to maintain the discharge densities for the application time period used as a base in system design. (See 4-2.2, 4-2.3 and 4-2.4.)

2-1.2.3 There should be a readily available reserve supply of air foam concentrate sufficient to meet the design requirements of the system to put the system back in service after operation. This supply may be in separate tanks or compartments, in drums or cans on the premises, or available from an outside source within 24 hours.

2-1.3 Air Foam Concentrate Proportioning Means.

2-1.3.1 Balanced pressure injection is the preferred method for introduction of air foam concentrates into the water flowing through the supply piping to the system.

2-1.3.2* Balanced pressure injection methods can be one of the following:

(a) A balanced pressure proportioning system utilizing an air foam concentrate pump discharging through a metering orifice into a proportioning controller with the air foam concentrate and water pressures automatically maintained equal by the use of a pressure balancing valve.

(b) A balanced pressure proportioning system utilizing a pressure proportioning tank with a diaphragm or bladder to separate the water and foam concentrate discharging through a metering orifice into a proportioning controller.

(c) An in-line balanced proportioning system utilizing an air foam concentrate pump discharging through a pressure regulating balancing valve and a metering orifice into a proportioning controller. A pressure regulating valve placed in the pump return line maintains constant pressure in the air foam concentrate supply line at all design flow rates. This constant pressure must be greater than the maximum water pressure under all conditions. This type of design is suitable when using multiple proportioning controllers located away from the central air foam concentrate supply. A common air foam concentrate supply line carries concentrate to each proportioning controller.

NOTE: The proportioning device selected should be capable of providing a nominal concentration of air foam concentrate over the range of flows and pressures for the hazard being protected. Balanced pressure proportioning systems utilizing foam concentrate pumps will tend to proportion at a higher percentage than anticipated when operating at low flow rates. However, diaphragm or bladder tank type systems will proportion at a significantly reduced percentage at low flow rates and therefore should not be used below their minimum design flow range. (See 5-3.)

2-1.3.3 Orifice plates should have "tell-tale" indicators giving orifice diameters and indicating flow direction if flow characteristics vary with flow direction.

2-1.4 Pumps.

2-1.4.1 Air foam concentrate pumps and water pumps should have adequate capacities to meet the maximum needs of the system on which they are used. (See Section 3-2 for water supply requirements.) To ensure positive injection of concentrates, the discharge pressure ratings of pumps at the design discharge capacity should be suitably in excess of the maximum water pressure available under any condition at the point of concentrate injection.

2-1.4.2 Air foam concentrate pumps should be carefully chosen for this special service since listed pumps are normally not available. Special attention should be paid to the type of seals and packing used with regard to the type concentrate being pumped.

2-1.4.3 Provision should be made to shut off the air foam concentrate pump after the foam supply is exhausted.

2-1.5 Power Supply.

2-1.5.1 Power supply for the drivers of air foam concentrate pumps and water pumps should be of maximum reliability. Compliance with the applicable requirements of NFPA 20, Standard for the Installation of Centrifugal Fire Pumps, covering the reliability of power supply for fire-pump drivers, is considered as meeting the intent of this chapter.

2-1.5.2 Controllers governing the starting of air foam concentrate pumps should be of approved types. Where control equipment listed for fire protection service is not available, suitable listed industrial control equipment should be used.

2-1.6 Air Foam Concentrate Storage Tanks.

2-1.6.1 General.

2-1.6.1.1 Storage tanks for air foam concentrates should be of construction suitable for the liquid, solidly mounted, and permanently located.

2-1.6.1.2 Storage temperatures at which air foam concentrates are listed should be considered in locating storage tanks.

2-1.6.2 Atmospheric Type.

2-1.6.2.1 Storage tanks should have capacities to accommodate only the needed quantities of air foam concentrate plus adequate space for thermal expansion, the latter preferably to be accomplished by means of a vertical riser or expansion dome. Tanks meeting this requirement would have minimum surface areas in contact with air and liquid concentrates at the liquid level and thus minimize the possibility of interior corrosion of tanks. Air foam concentrate outlets from tanks should be raised above the bottoms of the tanks to provide adequate sediment pockets.

2-1.6.2.2 In determining the quantity of foam concentrates, the volume of the sediment pocket should be added to the quantity needed for system operation.

2-1.6.2.3 Tanks should be equipped with suitable vacuum/pressure conservation type vents of adequate capacity; access handholes or manholes located to provide for inspection of interior tank surfaces; connections for pump suction; relief and testing lines; protected sight gages or other liquid level devices; and adequate filling and draining connections.

2-1.6.2.4 Tanks should be located to furnish a positive head on the pump suction.

2-1.6.3 Pressure Type. Pressure proportioning tanks should have means for filling, for gaging the level of concentrates, and for drainage, cleaning and inspection of interior surfaces, and of the concentrate holding bladder or diaphragm, if provided. These tanks normally are ASME unfired pressure vessels code stamped.

2-1.7 Pressure on Air Foam Concentrate Lines. Where air foam concentrate lines to the protective-system injection points are run underground or where they run aboveground for more than 50 ft (15 m), these lines should be maintained full and a means of checking on the tightness of the system should be provided, and the lines maintained in the proper temperature range.

2-1.8 Location of System-Control Equipment. Equipment items, such as storage tanks and proportioners for air foam concentrates; pumps for water and air foam concentrates; and control valves for water, concentrates, and air foam solution, should be located as near as possible to the hazard or hazards they protect but should not be exposed to a fire in a manner that is likely to impair system performance.

2-1.9 Alarms. Alarms should be provided in accordance with the requirements of NFPA 13, Standard for the Installation of Sprinkler Systems.

2-1.10 Strainers for Air-Foam Concentrates.

2-1.10.1 Strainers should be installed in liquid concentrate lines upstream of metering orifices or proportioning devices. Where listed strainers of the proper size are not available, strainers having a ratio of open-basket area to inlet pipe size of at least 10 to 1 should be used.

Exception: Diaphragm tanks using proportioners with metering orifices 3/8 in. (9.6 mm) diameter or larger do not require strainers.

2-1.10.2 Strainers should be capable of removing all solids of sufficient size to obstruct system components. Normally 1/8-in. (3.2-mm) perforations are suitable. Strainers should be installed so as to be accessible for cleaning (flushing) while maintaining system discharge during an emergency.

2-1.11 Supervision.

2-1.11.1 Main water and foam solution valves should be supervised in accordance with NFPA 26, Recommended Practices for the Supervision of Valves Controlling Water Supplies for Fire Protection.

2-1.11.2 Detection and actuation circuitry should be supervised through a listed panel.

Chapter 3 Water Supplies

3.1 Types of Water.

3-1.1* Water supplied to closed-head foam-water sprinkler systems should be compatible with the foam concentrate to be used.

3-1.2 Water containing solids of size likely to clog orifices in discharge devices but otherwise acceptable from the foam making standpoint may be used after passing through line strainers. Strainers should be installed so as to be accessible for cleaning (flushing) while maintaining system discharge during an emergency.

3-2 Water Supply Capacity and Pressure.

3-2.1 Water supplies should have sufficient capacity and pressure to maintain foam discharge or water discharge or both for the required period of time at the design density for the total number of sprinklers contemplated by the design to operate simultaneously.

3-2.2 Where water supply is dependent on public water sources, attention should be given to the pollution hazard introduced by the use of air foam concentrate and should be cleared with Public Health Agencies concerned.

3-2.3 Water supplies should be capable of supplying the system at the design discharge rate for at least 60 minutes.

Chapter 4 System Design and Installation

4-1 Plans and Specifications. The design and installation of closed-head foam-water sprinkler systems should be entrusted to experienced and responsible persons. Before such systems are installed, complete working plans and specifications should be prepared. Working plans should be drawn to scale, show all essential details, and be easily reproduced. Working plans and specifications should provide information on the discharge densities and period of discharge; hydraulic calculations; details of tests of available water supply, detailed layout of the piping, type of discharge devices to be installed, location and spacing of discharge devices; pipe hanger installation details; an accurate and complete layout of the buildings or hazards to be protected; and other pertinent data to provide a clear explanation of the proposed design.

4-1.1 In addition to the items listed in 4-1.1, plans and specifications should indicate the quantity of air foam concentrate to be stored, including the quantity in reserve, and the concentration designation.

4-1.2 The specifications should indicate the specific tests to be conducted and the test supply connections.

4-1.3 Complete plans and detailed data describing pumps, drivers, controllers, power supply, fittings, suction and discharge connections, and suction conditions should be submitted by the engineer or contractor to the authority having jurisdiction for approval before installation.

4-1.4 Charts showing head delivery, efficiency and brake horsepower curves of pumps should be furnished by the contractor.

4-2 Design Guides.

4-2.1 Closed-head foam-water sprinkler system designs should conform to all the applicable requirements of the following standards of the National Fire Protection Association except where otherwise specified herein:

Title	NFPA Standard Numbers
Synthetic Foam Combined Agent	11B
Sprinkler Systems	13
Standpipe and Hose Systems	14
Deluge Foam-Water Sprinkler Systems and Spray Systems	16
Centrifugal Fire Pumps	20
Water Tanks for Private Fire Protection Service	22
Private Fire Service Mains and Their Appurtenances	24
NATIONAL ELECTRICAL CODE®	70
Automatic Fire Detectors	72E

NOTE: Refer to NFPA occupancy standards where applicable.

4-2.2 The design discharge rates for air foam solution should provide densities of not less than 0.16 gal per minute per sq ft (6.5 (L/min)/m^2) over the demand area.

4-2.2.1 Where water is the controlling design criterion, the appropriate NFPA standard should be consulted.

4-2.3* The total number of sprinklers expected to operate over the demand area is to be determined by occupancy standards or by the authority having jurisdiction. Some factors to be considered in determining demand area are the increased efficiency of aqueous film forming foam over plain water which may justify a reduction in area, the slower operation of dry-pipe systems, time required for fresh foam solution to reach the open discharge devices, and the height and configuration of the building roof or ceiling as it affects heat flow and temperature rating of the sprinklers.

4-2.4 The foam discharge should continue for a period of 10 minutes at the design rate specified in 4-2.2. If the system discharges at a rate above the minimum specified in 4-2.2, then the operating time may be reduced proportionately, but should not be less than 7 min.

4-2.5 The temperature rating of sprinklers should be within the range 250-300°F (121-149°C) when they are located at the roof or ceiling. When sprinklers are located at an intermediate level, the temperature rating should be within the range 135-170°F (57-77°C), unless ambient conditions require a higher rating.

4-3 Piping, Valves, Pipe Fittings, and Hangers.

4-3.1 Applicable parts of Chapter 3 of NFPA 13, Standard for the Installation of Sprinkler Systems, should be consulted for requirements applicable to piping, valves, pipe fittings and hangers, including corrosion protection coatings. Since the systems herein covered are required to be hydraulically designed, the pipe size tables of NFPA 13, Standard for the Installation of Sprinkler Systems, are not applicable.

4-3.2 Pipe and fittings should be of a material compatible with the particular air foam concentrate, solution or water as applicable.

4-4 Drainage. Facilities should be provided for the safe removal or retention of the largest anticipated flammable liquid spill, plus the solution reaching the floor from the fixed fire protection system, as well as the discharge from hose streams.

4-5 Hydraulic Calculations.

4-5.1 System piping should be hydraulically calculated and sized in order to obtain reasonably uniform air foam and water distribution and to allow for loss of head in water supply piping. The adjustment in pipe sizes should be based on a maximum variation of 15 percent above the specified discharge rate per sprinkler or nozzle.

4-5.1.1 On retrofitted systems, the existing piping should be calculated to determine that the minimum density required can be met. The air foam concentrate supply required should be based on the actual density of the system as determined by the calculations and the required operating time.

4-5.2 Pipe sizes should be adjusted according to detailed friction loss calculations. These calculations should show the relation between the water supply and system demand.

4-5.3 Hydraulic calculations for determining the air foam solution and water flow characteristics of systems covered by this standard should be in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems. Friction loss characteristics for air foam solution piping can be considered the same as if it were carrying plain water.

4-5.4 The friction losses in piping carrying air foam concentrate should be calculated using the Darcy formula (also known as the Fanning formula). Friction factors for use with this formula should be selected from the charts, Friction Factors for Commercial Steel and Cast Iron Pipe (see Appendix of NFPA 16 for formula and charts). In calculating the Reynolds Number for selecting friction factors from the charts, the actual density (or specific gravity) of the air foam concentrate to be used in the system should be used. The viscosity used should be the actual viscosity of the air foam concentrate at the lowest anticipated storage temperature.

Chapter 5 Acceptance Tests

5-1 Flushing of Supply Piping.

5-1.1 Supply Piping. Underground mains and lead-in connections to system risers should be flushed thoroughly before connection is made to system piping, in order to remove foreign materials which may have entered the underground during the course of the installation or which may have been present in existing piping. The minimum rate of flow should be not less than the water demand rate of the system which is determined by the system design, or not less than that necessary to provide a velocity of 10 ft per second (3 m/s), whichever is greater. For all systems, the flushing operations should be continued for a sufficient time to ensure thorough cleaning. When planning the flushing operations, consideration should be given to disposal of the water issuing from the test outlets.

Flow Required to Produce a Velocity of 10 Ft Per Second (3 m/s) in Pipes

Pipe Size (Inches)	Flow (Gal per Minute)	(L/min)
4	390	1 476
6	880	3 331
8	1560	5 905
10	2440	9 235
12	3520	13 323

5-2 Hydrostatic Pressure Tests.

5-2.1 All piping, including yard piping, air foam concentrate lines and the system piping, should be tested hydrostatically at not less than 200 lb per sq in. (13.8 bars) pressure for 2 hours or at 50 lb per sq in. (3.4 bars) in excess of the maximum static pressure when the maximum static pressure is in excess of 150 lb per sq in. (10.3 bars).

NOTE: It is recommended that air foam concentrate lines be tested using liquid foam concentrate as the testing medium.

5-2.2* The amount of leakage in underground water piping should be measured at the specific test pressure by pumping from a calibrated container. Leakage should not exceed two quarts per hour (1.89 L/h) per 100 joints irrespective of pipe diameter. See NFPA 24, Standard for Private Fire Service Mains and Their Appurtenances, Chapter 8, Rules for Laying Pipe.

5-2.3 Air foam concentrate piping should be shown to be leak-tight during hydrostatic pressure tests.

5-3 Proportioning System Testing. Operation of proportioning equipment should be verified by flow test at both the high and low ends of the expected design rate. The concentration of foam liquid in solution should be determined. During the tests, the pressure at the discharge devices should be at least equal to the minimum design operating pressure of the system or systems tested. Percentage of all foam concentrates injected into the water should be within the following limits: 3 percent to 4 percent for nominal 3 percent concentrates and 5 percent to 7 percent for nominal 6 percent concentrates. The rate of solution discharge may be computed from hydraulic calculations utilizing recorded inlet and/or end-of-system operating pressure. The foam liquid concentrate consumption rate may be calculated by timing a given displacement from the storage tank or by refractometric means. The calculated concentration and the foam solution pressure should be within the operating limit recommended by the authority having jurisdiction.

5-3.1 System test connections should be sized with the low flow design range of the proportioner used in the system.

Chapter 6 Periodic Testing

6-1* Testing and Inspection of Air Foam Concentrate Injection Systems. Air foam concentrate injection systems should be so arranged that periodic tests and inspections can be made without discharging air foam solution to the system piping in order to check operation of all mechanical and electrical components of the system. The system should be so arranged that tests can be performed with as little loss of air foam concentrate as practical.

6-2* Inspection of Air Foam Concentrates. Periodic inspection should be made of air foam concentrates and their containers for evidence of excessive sludging or deterioration. Inspection should include a qualitative test of the air foam concentrate normally conducted by the manufacturer. Presence of specified quantities of concentrates in system storage equipment in service ready position and the quantities of reserve concentrates on hand should be checked with requirements for same.

Chapter 7 Maintenance

7-1 Closed-Head Foam-Water Sprinkler Systems.

7-1.1* Systems should be serviced by personnel experienced in this work at periodic intervals, preferably semi-annually, but at least annually.

7-1.2 Proportioning devices and strainers should be thoroughly inspected and cleaned after each operation or flow test.

7-1.3 Preprimed systems should be flushed yearly through a minimum 2-in. connection to replenish the solution in 4-in. or larger pipes.

7-2 Operating and Maintenance Instructions and Layouts. Operating and maintenance instructions, piping and electrical schematics should be readily available at the control equipment and at the plant fire headquarters. Selected plant personnel should be trained and assigned the task of operating and maintaining the equipment.

Appendix A

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

A-1-5.4 Several AFFF concentrates have been listed with standard sprinkler heads for use on nonmiscible hydrocarbons such as heptane, gasoline, fuel oil, crude oils, etc.; and, therefore, may be used on these products. Polar solvents in depth, such as acetone, methyl ethyl ketone, methyl isobutyl ketone, methanol, ethanol and isopropanol have been successfully extinguished with special alcohol-type concentrates and standard sprinkler heads. In all cases the agent to be used should be determined to be effective on the particular hazardous product by means of listing tests or special testing by the manufacturer when necessary. Application rates may be higher than the 0.16 gpm/ft2 (6.5 (L/min)/m2) for some specific polar solvents.

Figures A-2-1.3.2(a), (b) and (c) are schematic arrangements of equipment to illustrate the principle of operation of various proportioning methods. Other arrangements or components may also be used to accomplish the same purpose.

NFPA 16A

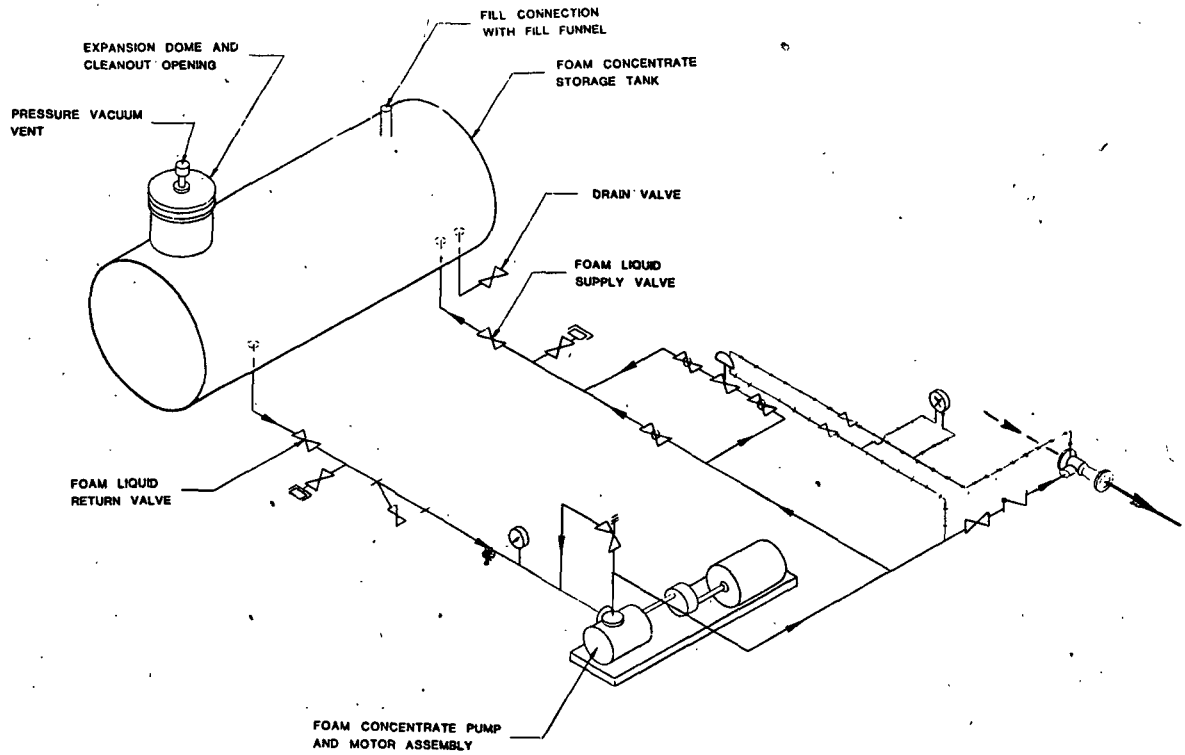


Figure A-2-1.3.2(a) Balanced Pressure Proportioners (with Concentrate Pump)

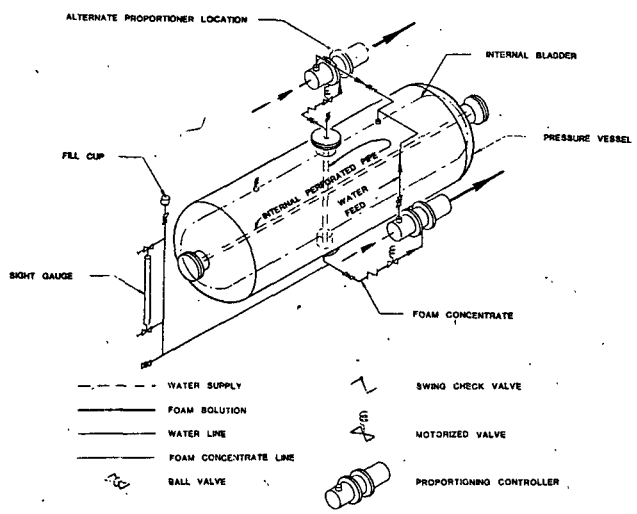


Figure A-2-1.3.2(b) Balanced Pressure Proportioning (Bladder System)

NFPA 16A

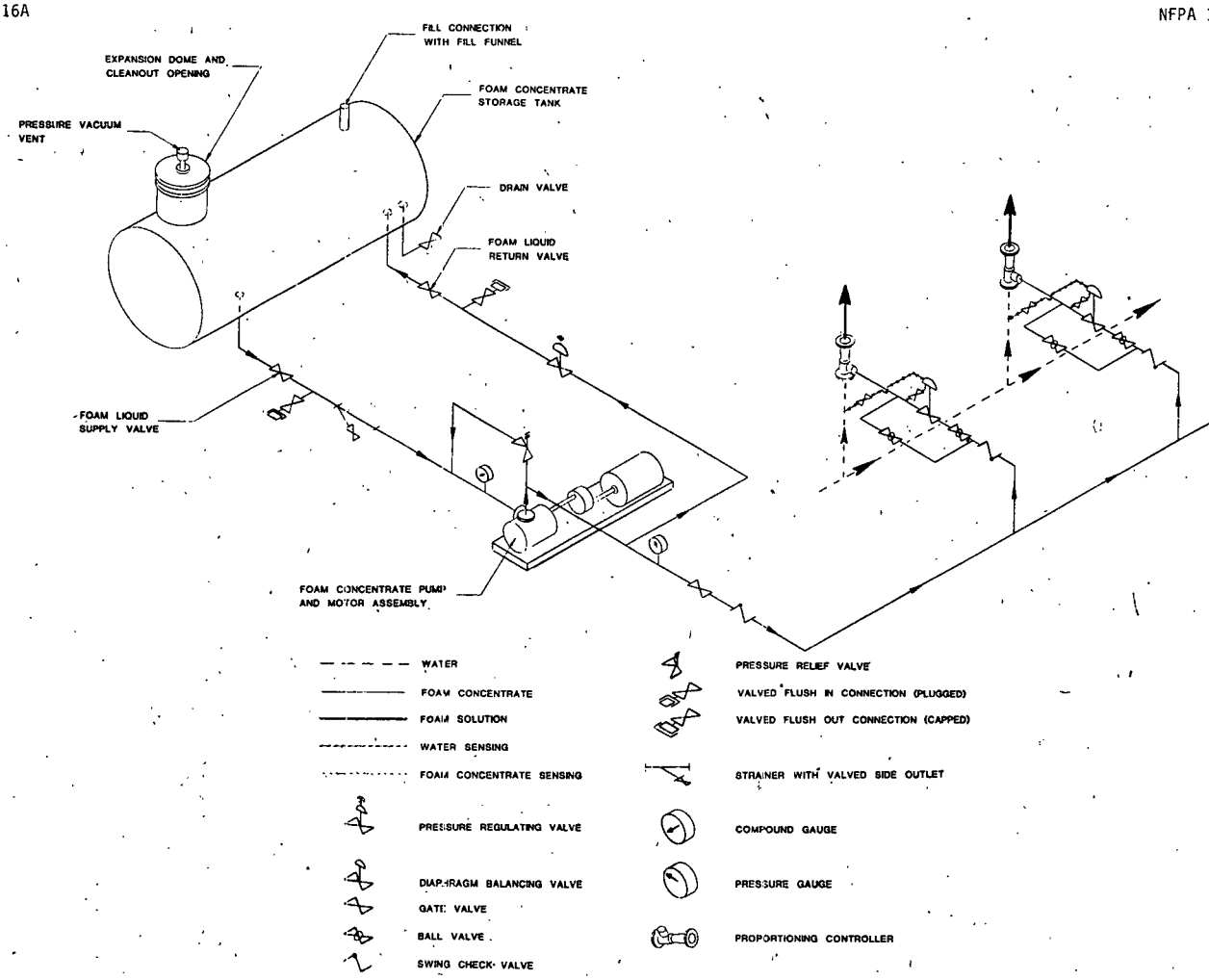


Figure A-2-1.3.2(c) In-line Balanced Pressure Proportioning System

A-3-1.1 Fire fighting efficiency of air foams is not significantly affected by water temperature between 35oF - 120oF (2-49oC) although some reduction in expansion occurs with very cold water.

Table A-4-2.3 Number of Sprinkler Heads Activated Under Various Test Conditions

*Orifice Size	Head Temperature oF.	Fuel Spill Rate (gpm)	Application Density (gpm/ft2)	Heads Activated	Max. Area of Activation (ft2)
1/2"	280	30	0.30	10	1000
3/8"	280	30	0.18	17	1700
3/8"	160	25	0.18	31	3100

*The above data was gathered with open spills of heptane on a flat surface with the heads on a 10 ft x 10 ft spacing. Additional tests involving rack storage of 55 gal drums of Class I flammable liquids have led to a maximum area of activation of 1500 ft2 when .30 gpm/ft2 density and intermediate rack level sprinklers are used. This recommendation may be found in the Appendix of NFPA 30.

For SI Units

1 in. = 25.4 mm
oC = (oF - 32) x 5/9
1 gpm/ft2 = 40.746 (L/min)/m2
1 ft2 = 0.0929 m2
1 gal = 3.785L

The above tests were run with preprimed systems. If the solution in the piping is not flushed on a regular basis and new solution is added, the solution may degrade and time delays will occur.

A-5-2.2 To prevent the possibility of serious water damage in case of a break, pressure should be maintained during the 2-hour test period by a small capacity pump, the main controlling gate being closed tight during this period.

A-6-1 In order to provide a means of periodically checking the performance of the proportioners used in AFFF sprinkler systems, a test connection should be provided. Typical test connections are indicated in Figure A-6-1. Two options are possible in locating the proportioning controller in the sprinkler riser: before the main sprinkler valve or after the main sprinkler valve. If the proportioning controller is located after the main sprinkler valve, an additional supervised O.S.&Y valve is required in order to isolate the sprinkler overhead during the proportioner test. This is done to eliminate the problems caused by air cushions in wet-pipe sprinkler systems or the servicing delays caused when charging and draining pre-action or deluge sprinkler systems. The test connection should be routed to a drain area for easy disposal of the solution produced during the test.

NFPA 16A

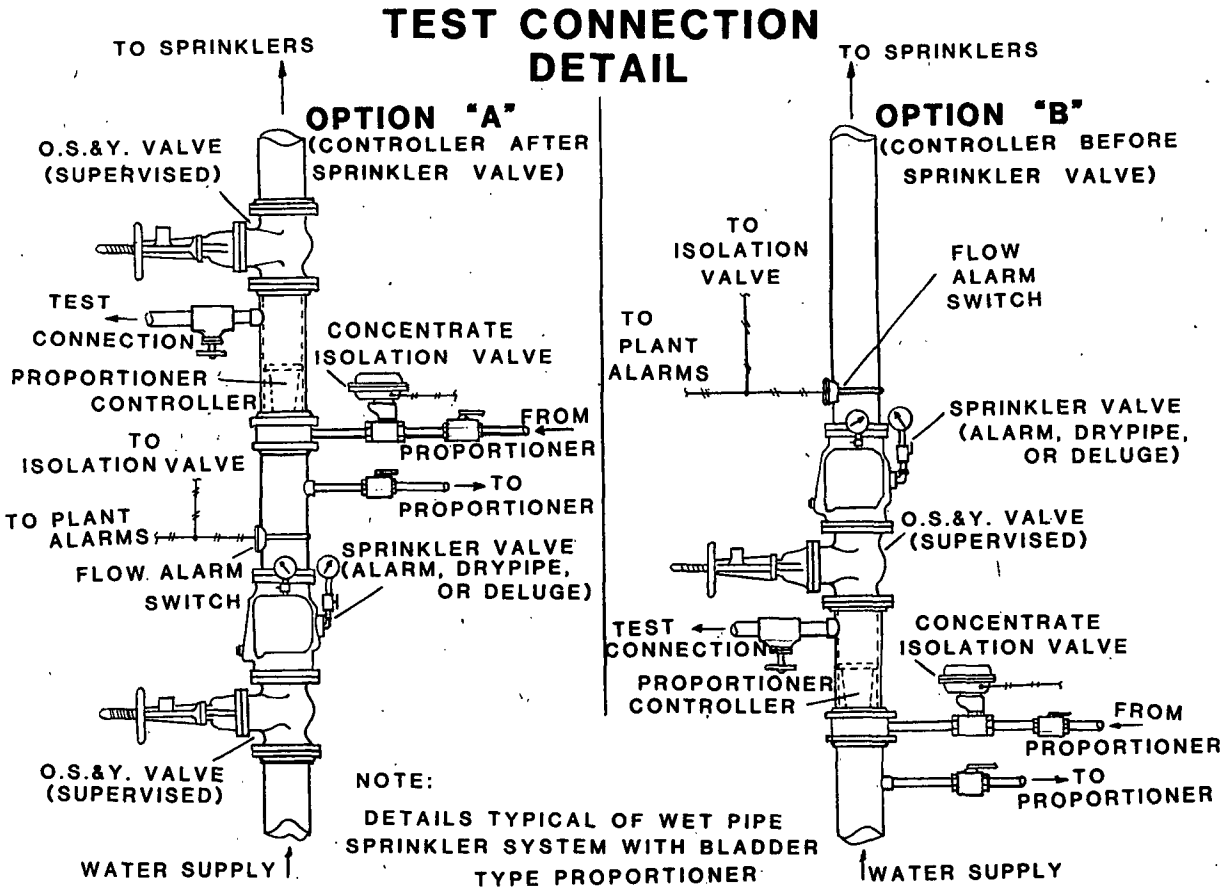


Figure A-6-1

A-6-2 Samples of liquid concentrates should be referred to their manufacturer for check of condition annually.

A-7-1.1 An inspection contract with the installer of the equipment for service tests and operation at regular intervals is recommended and may be required by the authority having jurisdiction.

Appendix B - Referenced Publications

B-1 This portion of the Appendix lists publications referenced within this NFPA document . . . and thus is considered part of the recommendations of the document.

B-1.1 NFPA Publications. The following publications are available from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NFPA 11-1978, Standard for Foam Extinguishing Systems.

NFPA 11B-1977, Standard on Synthetic Foam and Combined Agent Systems.

NFPA 13-1980, Standard for the Installation of Sprinkler Systems.

NFPA 14-1980, Standard for the Installation of Standpipe and Hose Systems.

NFPA 15-1979, Standard for Water Spray Fixed System for Fire Protection.

NFPA 16-1980, Standard for the Installation of Deluge Foam-Water Sprinkler Systems and Foam-Water Spray Systems.

NFPA 20-1980, Standard for the Installation of Centrifugal Fire Pumps.

NFPA 22-1981, Standard for Water Tanks for Private Fire Protection.

NFPA 24-1981, Standard for Private Fire Service Mains and Their Appurtenances.

NFPA 26-1976, Recommended Practices for the Supervision of Valves Controlling Water for Fire Protection.

NFPA 30-1981, Flammable and Combustible Liquids Code.

NFPA 70-1981, NATIONAL ELECTRICAL CODE.

B-1-2 Other Publications.

ASTM E380-1976, Standard for Metric Practice, American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

PART IV

26 - 1 - (Entire Document): Accept
SUBMITTER: Technical Committee on Private Water Supply Piping Systems
RECOMMENDATION: Reconfirm NFPA 26-1976, Recommended Practice for the Supervision of Valves Controlling Water Supplies for Fire Protection. Update references to existing NFPA documents.
SUBSTANTIATION: The present edition is still current and a viable document without any changes other than editorial.
COMMITTEE ACTION: Accept.

PART V

291 - 1 - (Entire Document): Accept
SUBMITTER: Technical Committee on Private Water Supply Piping Systems
RECOMMENDATION: Reconfirm NFPA 291-1977, Recommended Practice for the Fire Flow Testing and Marking of Hydrants. Update references to existing NFPA documents.
SUBSTANTIATION: The present edition is still current and useable in its present form without any changes other than editorial.
COMMITTEE ACTION: Accept.

14-1- (1-6.1.2 Exception (New)): Accept
SUBMITTER: Technical Committee on Standpipes
RECOMMENDATION: Add an Exception to 1-6.1.2 to read as follows:
Exception: Hose smaller than 1 1/2 in. may be used for Class II service when investigated and listed for this service.
Delete the present section A-1-6.1.2.
SUBSTANTIATION: Because hose smaller than 1 1/2 in. has been used successfully both domestically and in other countries for many years, this section should be moved from the Appendix to the body of the standard.
COMMITTEE ACTION: Accept.

14-2- (1-7.1.2, 1-7.1.3, 1-7.1.4 and 5-2.1): Accept
SUBMITTER: Technical Committee on Standpipes
RECOMMENDATION: Add the word "dry" in the beginning of sections 1-7.1.2 and 1-7.1.3.
Add the words "of this type" to the end of section 1-7.1.4.
Revise the first sentence of section 5-2.1 to read as follows: "Standpipe systems, other than those dry standpipes which have no permanent water supply, shall have an approved water supply."
SUBSTANTIATION: Clarification of the term dry standpipe is necessary since BOCA has acted to require dry standpipe systems of these types in unheated building areas.
COMMITTEE ACTION: Accept.

14-3- (1-9.2): Accept
SUBMITTER: Technical Committee on Standpipes
RECOMMENDATION: Revise to read as follows:
1-9.2 When a "break glass" type protective cover for a latching device is provided, the device provided to break the glass panel shall be securely attached in the immediate area of the "break glass" panel and shall be so arranged that the device cannot be used to break other glass panels in the cabinet door.
SUBSTANTIATION: The requirement for the maximum area of glass panel is unnecessary. UL 38, Manually Actuated Signaling Boxes for use with Fire Protection Signaling Systems contains neither a minimum nor a maximum size of glass making the need for a maximum size unnecessary.
COMMITTEE ACTION: Accept.

14-4- (2-1.2 Through 2-1.10): Accept
SUBMITTER: Technical Committee on Standpipes
RECOMMENDATION: Move section 2-1.10 to become section 2-1.3.
Renumber present sections 2-1.3 through 2-1.9 as 2-1.4 through 2-1.10.
Add bold face "Class I and Class III" to the beginning of section 2-1.2.
Add bold face "Class 2" at the beginning of new section 2-1.3.
SUBSTANTIATION: These changes are editorial in nature. They should help clarify that sections 2-1.3 through 2-1.9 apply to all classes of standpipes.
COMMITTEE ACTION: Accept.

14-5- (2-1.3 Exception): Accept
SUBMITTER: Technical Committee on Standpipes
RECOMMENDATION: Revise Exception to 2-1.3 to read as follows:
Exception: Standpipe zone heights up to 400 ft (122 m) are permitted when all pipe, fittings and devices are rated for not less than the maximum system pressure and when the provisions of section 4-7 are followed.
SUBSTANTIATION: This section needs editorial revision to remove the pressure limitation provisions and reference the new section 4-7.
COMMITTEE ACTION: Accept.

14-6- (4-4.3.1 Exception and Exception No. 2 (New)): Accept
SUBMITTER: Technical Committee on Standpipes
RECOMMENDATION: Renumber present Exception as Exception No. 1 and add a new Exception No. 2 to read as follows:
Exception No. 2: Listed small hose shall be installed in accordance with its listing.
SUBSTANTIATION: This section needs revision to conform to the new Exception to section 1-6.1.2.
COMMITTEE ACTION: Accept.

14-7- (4-7 (New)): Accept
SUBMITTER: Technical Committee on Standpipes
RECOMMENDATION: Add a new section 4-7 to read as follows:
4-7 Pressure Limitations.
4-7.1 Where flowing pressures at any hose valve outlet exceed 100 psi (6.9 bars), an approved device shall be installed at the outlet to reduce the pressure with required flow at the outlet to 100 psi (6.9 bars). For Class I and Class III systems the approved device shall not be capable of being adjusted to provide pressures higher than 100 psi (6.9 bars) if available, unless specified by the fire department.
4-7.2 Where system pressures at any hose valve outlet exceed 150 psi (10.3 bars), an appropriate warning sign shall be provided at each such outlet unless a pressure regulating device is provided.
4-7.3 Where system pressures exceed 175 psi (12.1 bars), a listed pressure regulating device which regulates pressure under flow and no-flow conditions shall be installed at the hose valve outlet. The pressure on the inlet side of the pressure regulating device shall not exceed the rated working pressure of the device. The pressure regulating device shall be so arranged to regulate pressure at the hose valve outlet to a pressure not exceeding 100 psi (6.9 bars).
Delete sections 4-2.2, 4-4.3.5 and A-4-4.3.5.
Renumber section A-4-2.2 as A-4-7.1.
SUBSTANTIATION: These sections need editorial revisions to spell out pressure limitations on standpipes, hose valves and nozzles.
COMMITTEE ACTION: Accept.

14-8- (5-6.5): Accept
SUBMITTER: Technical Committee on Standpipes
RECOMMENDATION: Revise 5-6.5 to read as follows:
5-6.5 A listed and approved check valve shall be installed in each fire department connection, located as near as practicable to the point where it joins the system.
SUBSTANTIATION: The term "straightway" should be removed. In order to insure that reliable check valves are used in the fire department connection, they should be approved and listed.
COMMITTEE ACTION: Accept.

14-9- (6-4): Accept
SUBMITTER: Technical Committee on Standpipes
RECOMMENDATION: Delete the words "the larger of."
SUBSTANTIATION: For a combined system in an ordinary hazard building equipped with only one sprinkler, the present wording requires an additional water supply of 500 gpm. There is no need to add more than the hydraulically calculated sprinkler demand to the standpipe supply. The 150 gpm (light hazard) or 500 gpm (ordinary hazard) alternatives should remain for the designer who chooses not to hydraulically design the system.
COMMITTEE ACTION: Accept.

14-10- (7-2.5): Accept
SUBMITTER: Technical Committee on Standpipes
RECOMMENDATION: Revise to read as follows:
7-2.5 Valves shall be rated for working pressures not less than the maximum pressure to be developed at that point in the system under any condition including the pressure measured when a permanently installed fire pump is operating at shut-off.
SUBSTANTIATION: This section needs to be written in performance rather than specification terms.
COMMITTEE ACTION: Accept.

14-11- (Table 7-5.1.1): Accept
SUBMITTER: L.R. Milam, National Automatic Sprinkler and Fire Control Assn.
RECOMMENDATION: Under the item "Cast Iron Screwed Fittings" replace "125 and 250 lb" with "Class 125 and 250."
Under the term "Malleable Iron Screwed Fittings" replace "150 lb" with "Class 150 and 300."
SUBSTANTIATION: The purpose of this change is to bring NFPA 14 up to date with the latest revision of ANSI standards B16.4 and B16.3.
In 1977 both of the referenced standards were revised. One of the changes was the means by which fittings were designated. This was done to eliminate confusion which existed (and continues to exist in some quarters) between the so-called "standard weight" and "extra heavy" fittings. For example, in the 1971 edition B16.3 designated malleable iron fittings as 150 lb class and 300 lb class (see Table 1). In most of the texts, this was shortened, the fittings simply being referred as 150 lb and 300 lb respectively. In fact, these shortened designations were used on the cover of the standard and, of course, they are the designations presently shown in NFPA 14-1980.

In the 1977 edition of B16.3 the abbreviation "lb" was dropped (since it was misleading) and the fittings were redesignated as Class 150 and Class 300 respectively. The change in B16.4 for Cast Iron Fittings was comparable. The designations in that standard are now Class 125 and Class 250 and of course, these new designations appear on the cover of both standards (see attachments).

To see how confusion can exist when the old designations are used, refer to Table 1 in the 1977 edition of B16.3. In the temperature range at which fittings are normally used in a sprinkler system, the pressure rating of a class 150 fitting is 300 psig. If a specification were to call for a 300 lb standard malleable iron fitting, does it mean a Class 150 with a 300 psi WWP? Or does it mean a Class 300, the old "300 lb" designation used in the "standard"? If the heavier fitting is required, the new designation is more definitive. NFPA 14 can help specification writers by using the latest ANSI designation in Table 7-5.1.1.

COMMITTEE ACTION: Accept.

14-12- (8-1.1): Accept

SUBMITTER: Technical Committee on Standpipes

RECOMMENDATION: Add a new sentence after the first sentence to read as follows: "The hydrostatic test pressure shall be measured at the low point of the individual system or zone being tested."

Add a new paragraph to A-8-1.1 to read as follows:

Example of Required Hydrostatic Test Pressure: A sprinkler system has for its water supply the connection to a public water service main. A 100 psi (6.9 bars) rated pump is installed in the connection. With a maximum normal public water supply pressure of 70 psi (4.9 bars) at the low point of the system or zone being tested and a 120 psi (8.3 bars) pump (churn) pressure the hydrostatic test pressure is 70 + 120 + 50 or 240 psi (16.6 bars).

SUBSTANTIATION: There is a need to correlate the point at which the hydrostatic test pressure is measured with NFPA 13 for consistency when combined standpipe and sprinkler systems are used.

COMMITTEE ACTION: Accept.

14-13- (A-4-3.1): Accept

SUBMITTER: Technical Committee on Standpipes

RECOMMENDATION: Renumber present A-4-3.1 as A-4-3.1(b).

Add a new section to read as follows:

A-4-3.1(a) Hose connections may be located at intermediate landings between floors provided each such landing is equipped with a hose connection.

SUBSTANTIATION: Locating the hose connections at the intermediate landings will in some cases allow less exits to be blocked during fire conditions.

COMMITTEE ACTION: Accept.

14-14- (A-6-3): Accept

SUBMITTER: D.H. Featherstonhaugh, Vipond Automatic Sprinkler Co.

RECOMMENDATION: Add definitions of Ordinary Hazard Occupancies (Group II) and Ordinary Hazard Occupancies (Group III) to read as follows:

Ordinary Hazard (Group II). Occupancies or portions of other occupancies where quantity and combustibility of conterts is moderate, stockpiles do not exceed 12 ft (3.7 m) and fires with moderate rate of heat release are expected.

Ordinary Hazard (Group III). Occupancies or portions of other occupancies where quantity and/or combustibility of contents is high, and fires of high rate of heat release are expected.

SUBSTANTIATION: Definitions of Ordinary Hazard Group II and Ordinary Hazard Group III were not given but examples are cited. Include definitions.

COMMITTEE ACTION: Accept.

14-15- (B-1.2): Accept

SUBMITTER: L.R. Milam, National Automatic Sprinkler and Fire Control Assn.

RECOMMENDATION: Under ANSI B16.3-1977, change "Malleable Iron Screwed Fittings, 150 and 300 lb" to read "Malleable Iron Threaded Fittings, Class 150 and 300."

Under ANSI B16.4-1977, change "Cast Iron Screwed Fittings, 125 and 250 lb" to read "Cast Iron Threaded Fittings, Class 125 and 250."

SUBSTANTIATION: In the 1977 revisions the referenced ANSI standards changed the fitting designations. The new designations which now appear on the cover of the standard should be used in the title rather than the obsolete ones. A copy of the title page of ANSI B16.4 was attached by the Submitter. Also, the title of the standard should be the same as that for the standard itself.

COMMITTEE ACTION: Accept.

Editorial Changes

1-3 In the second line change "outlets" to "connectors," in the third line change "outlets" to "the hose connections," in the fifth line add "attached" after "through" and delete "attached to such hose outlet" and in the last line change "outlets" to "connectors."

9-1.1.6 Delete the word "carried" and add the word "extended."

Figure A-2-1A, break the horizontal dimension lines so that they do not appear as part of the schematic.

Figure A-2-1B, break the horizontal dimension lines so that they do not appear as part of the schematic.

Figure A-2-1C, break the single horizontal dimension line at grade so that it does not appear as part of the schematic.

A-4-2.2 In the second line of the P_1 and P_2 entries, change 500 gpm to 250 gpm for the customary units. In the second line of the P_1 and P_2 entries, change 1893 L/min to 946 L/min for the SI Units.

A-4-3.1 In the second line, change 9946 to 946.

B-1-2 ANSI B16.3 Change "Screwed" to "Threaded" and change "150 and 300 lb" to Class 150 and 300." ANSI B16.4 changed "Screwed" to "Threaded" and change "125 and 250 lb" to "Class 125 and 250." ANSI B16.5 add "Class 125 and 250."