ANSI/NFPA 1961 An American National Standard February 12, 1987

NFPA 1961
Fire Hose
1987 Edition

National Fire Protection Association Batterymarch Park, Quincy, MA 02269

NOTICE

All questions or other communications relating to this document should be sent only to NFPA Headquarters, addressed to the attention of the Committee responsible for the document.

For information on the procedures for requesting Technical Committees to issue Formal Interpretations, proposing Tentative Interim Amendments, proposing amendments for Committee consideration, and appeals on matters relating to the content of the document, write to the Secretary, Standards Council, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

A statement, written or oral, that is not processed in accordance with Section 16 of the Regulations Governing Committee Projects shall not be considered the official position of NFPA or any of its Committees and shall not be considered to be, nor be relied upon as, a Formal Interpretation.

Users of this document should consult applicable Federal, State and local laws and regulations. NFPA does not, by the publication of this document, intend to urge action which is not in compliance with applicable laws and this document may not be construed as doing so.

Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

Statement on NFPA Procedures

This material has been developed under the published procedures of the National Fire Protection Association, which are designed to assure the appointment of technically competent Committees having balanced representation. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

NFPA has no power or authority to police or enforce compliance with the contents of this document and any certification of products stating compliance with requirements of this document is made at the peril of the certifier.

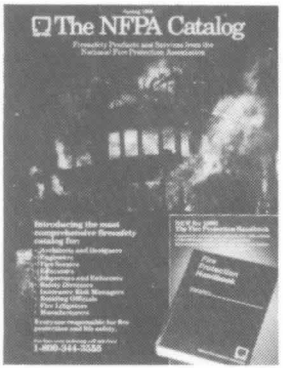
SC FM-86

FREE! Send today for the NFPA Catalog.

The National Fire Protection Association publishes a 100 page catalog of all its Firesafety Products and Services.

If you ever need firesafety codes and standards, Fire Service training programs and firesafety education materials this catalog is a necessity.

To receive your free copy of the NFPA Catalog, just mail in this postage paid card today! Or call toll-free 1-800-344-3555 and ask one of our Customer Service Reps to send you one. (M6)



(Please Print)

Name _____ Title _____

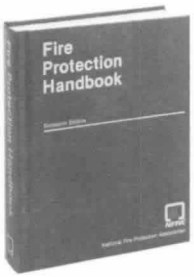
Business _____

Address _____ Phone _____

City _____ State _____ Zip _____

☐ I am also interested in NFPA membership.

NEED QUICK ANSWERS TO A WIDE RANGE OF FIRESAFETY QUESTIONS?



Save your time — put the leading **one-volume** firesafety "Library" on your bookshelf! — the new 16th edition of NFPA's **FIRE PROTECTION HANDBOOK**

You need to preplan a response to a hazardous waste emergency . . . quench an oil fire in a hurry . . . OK the design of a state-of-the-art sprinkler system . . . fireproof a robotics installation . . . inspect an aerosol charging outfit . . .

WHERE CAN YOU TURN FOR QUICK ANSWERS AND DIRECTION? THE RIGHT ANSWERS? RIGHT AWAY?

Do what thousands of fire-safety professionals do . . . keep a copy of the world's leading one-volume firesafety "library" close at hand. No other fire reference comes close to matching the colossal coverage of NFPA's FIRE PROTECTION HANDBOOK. Or to matching its ease of use, either. *And the new 16th edition is better equipped than ever to meet your fire protection and prevention needs — with over 600 pages of all-new or updated information!* (M3-FPH1686) **$75.00 Members $67.50**

NEW 16TH EDITION LET US SEND YOU A COPY FOR 30 DAYS FREE EXAMINATION

Simply complete and mail this card today for free trial copy of *FIRE PROTECTION HANDBOOK*. Then either keep it and pay our bill for $75.00 plus $2.85 for handling, or return it within 30 days and owe nothing.

Name _____ NFPA Member I.D.# _____

Organization _____

Address _____

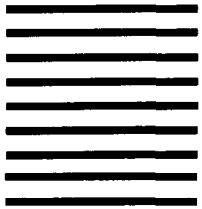
City _____ State _____ Zip _____

Phone _____

FOR FASTER SERVICE CALL TOLL-FREE 1-800-344-3555

NFPA®

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY CARD
FIRST CLASS PERMIT NO 3376 QUINCY, MA

POSTAGE WILL BE PAID BY ADDRESSEE

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269-9904

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD
FIRST CLASS PERMIT NO 3376 QUINCY, MA

POSTAGE WILL BE PAID BY ADDRESSEE

National Fire Protection Association
Batterymarch Park
Quincy, MA 02269-9904

NFPA 1961

Standard on

Fire Hose

1987 Edition

This edition of NFPA 1961, *Standard on Fire Hose*, was prepared by the Technical Committee on Fire Hose, and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 17-20, 1986, in Denver, Colorado. It was issued by the Standards Council on January 23, 1987, with an effective date of February 12, 1987, and supersedes all previous editions.

The 1987 edition of this standard has been approved by the American National Standards Institute.

Origin and Development of NFPA 1961

Action on this subject by the National Fire Protection Association dates from 1897, with various editions, the history of which may be found in the NFPA Proceedings. Standards for fire hose both for mill use and for fire department use were among the earliest standards adopted by NFPA.

This *Standard for Fire Hose* is designed to provide users of fire hose with a good, practical standard for woven-jacketed, rubber-lined fire hose of either single or multiple jacket construction. The standard is not intended to serve as a detailed manufacturers' specification.

Details regarding standard threads for all standard nominal sizes of fire hose connections appear in NFPA 1963, *Screw Threads and Gaskets for Fire Hose Connections*, and NFPA 1962 is the *Standard for the Care, Use, and Maintenance of Fire Hose Including Connections and Nozzles*.

The present standard was adopted at the 1986 Fall Meeting in November 1986.

Committee on Fire Hose

Herbert C. Fothergill, *Chairman*
Chelsea Fire Department
(Rep. IAFC)

Duane Barker, *Secretary*
Amerock Corp.
(Rep. NFPA IFPS)

William Barnes, Akron Brass Co.
Robert Ely, San Diego Fire Dept.
Charles S. Genthner, Imperial Fire Hose Co.
(Rep. FEMA)
Justin George, Klamath County Fire Dist. #1
Maurice Gioseffi, Broward Fire Equipment & Service Inc.
(Rep. NAFED)
Paul R. Hill, U.S. Forest Service
Philip W. Johnson, Factory Mutual Research Corp.
William J. Patterson, FEMA/U.S. Fire Administration
William Stamm, Milwaukee Fire Dept. Headquarters
(Rep. Int'l. Assn. of Fire Chiefs)
Sherman Stark, Nat'l. Fire Hose Corp.
(Rep. RMA)
L. M. Walker, Underwriters Laboratories Inc.
F. Derek Wood, Angus Fire Armour Corp.

Alternates

Patrick E. Begley, Andersen Fire Equipment Co. Inc.
(Alternate to M. Gioseffi)
Thomas J. Brown, Jr., Factory Mutual Research Corp.
(Alternate to P. W. Johnson)
Robert L. Richardson, Niedner Ltd.
(Alternate to C. S. Genthner)
L. G. Sheffer, Underwriters Laboratories Inc.
(Alternate to L. M. Walker)
J. P. Spollen, AT&T RMC
(Alternate to D. Barker)

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.

NOTE: Membership on a Committee shall not in and of itself constitute an endorsement of the Association or any document developed by the Committee on which the member serves.

Contents

NFPA 1961

Standard on

Fire Hose

1987 Edition

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 Chapter 6 and Appendix B.

Chapter 1 Administration

1-1 Scope. The requirements of this standard shall apply to design, and design verification testing of new fire hose, specified as attack hose, rack and reel hose, forestry hose, and supply hose.

1-2 Purpose.

1-2.1 The purpose of this standard is to specify minimum requirements for hose manufacturers and for those responsible for preparing purchase specifications for hose.

1-2.2 This standard may be referenced in purchase specifications. The standard is not intended to serve as a detailed manufacturing specification.

1-2.3 The test requirements specified in this standard are intended to be performed under controlled laboratory conditions by the hose manufacturers or testing laboratories, and are not intended to be performed by users in uncontrolled, nonlaboratory situations.

1-2.4 The provisions of this standard reflect conditions and expert opinion prevalent at the time the standard was issued.

It is not intended that the provisions of this standard be applied to facilities, equipment, structures, or installations prior to the effective date of this standard.

Exception: Where specific requirements for existing facilities, equipment, structures or installations are contained in this standard, or where the authority having jurisdiction rules that the existing situation presents a distinct hazard to life or property.

1-3 Definitions.

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.

Attack Hose. Hose designed to be used to combat fires beyond the incipient stage by trained fire fighters and fire brigade members. It is designed to supply hand line nozzles, distributor nozzles, master stream appliances, portable hydrants, manifolds, standpipe and sprinkler systems, pumps, and fire department pumpers as a supply hose.

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."

Coating. A jacket in which the yarn is impregnated or saturated with the protective materials or coated with the protective material so the outside of the jacket is relatively smooth.

Covered (other than rubber covered). Jacket covered and lined with a continuous synthetic rubber or plastic, this cover usually being thicker than that of a coating.

Fire Hose. A woven-jacket, lined, flexible conduit for conveying water for fire fighting purposes.

Forestry Fire Hose. A hose designed to meet specialized requirements for fighting wildland fires.

Labeled. Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Large-Diameter Hose. A hose of 3½-in. (90-mm) size and larger designed to move large volumes of water to supply master stream appliances, portable hydrants, manifolds, standpipe and sprinkler systems, and fire department pumpers from hydrants and in relay.

Large-Diameter Supply Hose. A hose that may be used at operating pressures not to exceed 185 psi (1275 kPa) to supply fire department pumpers from hydrants and in relay from pumper to pumper, to directly supply attack lines, master stream appliances, portable

hydrants, manifolds, and standpipe and sprinkler systems.

Lined Hose. A hose having an approved nonpermeable lining.

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.

May. This term is used to state a permissive use or an alternative method to a specified requirement.

Rack and Reel Hose. A hose designed for fighting incipient fires.

Shall. This term indicates a mandatory requirement.

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

1-4 Units. In this standard, values for measurement are followed by an equivalent in SI units, but only the first stated value shall be regarded as the requirement. Equivalent values in SI units shall not be considered as the requirement as these values may be approximate.

Table 1-4 SI Conversions

Quantity	US Unit/ Symbol	SI Unit/ Symbol	Conversion Factor
Length	inch/in. foot/ft	millimeter/mm meter/m	1 in. = 25.4 mm 1 ft = 0.305 m
Volume	gallon/gal	liter/L	1 gal = 3.785 L
Flow Rate	gallon per minute/gpm	liter per minute/L/m	1 gpm = 3.785 L/m
Pressure	pounds per square inch/psi	kilopascal/kPa	1 psi = 6.894757 kPa
Mass	pounds/lb	kilograms/kg	1 lb = .454 kg

Chapter 2 Design Requirements

2-1 Requirements for All Hose.

2-1.1 The purchaser shall specify the service test pressure for the hose, but in any case the service test pressure shall not be less than as specified in this chapter for each type of hose. The purchaser shall specify a service test pressure of at least 10 percent greater than the normal highest operating pressure at which the hose is expected to be used.

2-1.2 The proof test pressure shall not be less than 2 times the specified service test pressure.

2-1.3 The burst test pressure shall not be less than 3 times the specified service test pressure.

2-1.4 The kink test pressure shall not be less than 1½ times the specified service test pressure.

2-2 Requirements for Attack Hose.

2-2.1 The minimum trade size for attack hose shall be 1½ in (38 mm).

2-2.2 Attack hose shall have a minimum design service test pressure of 300 psi (2070 kPa) to meet the 275 psi (1895 kPa) normal highest operating pressure as defined in 2-1.1.

2-2.2.1 For design service test pressures greater than 300 psi (2070 kPa), the proof test pressure, burst test pressure, and kink test pressure shall be calculated as specified in Section 2-1 of this chapter.

2-2.3 For the minimum design service test pressure of 300 psi (2070 kPa), the minimum pressure for the proof test pressure shall be 600 psi (4140 kPa), when tested as specified in Section 4-2 of this standard. The hose shall withstand the test pressure without movement of couplings, leakage, or breaking of any thread in the jacket(s).

2-2.4 For the minimum design service test pressure of 300 psi (2070 kPa), the minimum burst test pressure shall be 900 psi (6205 kPa), when tested as specified in Section 4-5 of this standard. The test sample shall withstand the test pressure without failure.

2-2.5 For the minimum design service test pressure of 300 psi (2070 kPa), the minimum kink test pressure shall be 450 psi (3100 kPa), when tested as specified in Section 4-4 of this standard. The full length of hose, while kinked, shall withstand the test pressure without breaking any thread in the jacket.

2-2.6 The maximum elongation shall not exceed 8 percent for 1½- through 2½-in. (38- through 65-mm) size hose, 10 percent for 3-in. (76-mm) size hose, and 13 percent for 3½-in. (89-mm) or larger size hose when tested as specified in Section 4-3 of this standard.

2-2.7 The maximum twist in turns per 50 ft (15 m) shall not exceed 4¼ for 1½- through 2-in. (38- through 51-mm) size hose, and 1¾ for 2½-in. (65-mm) or larger size hose. The final twist shall be in a direction that shall tighten the couplings when tested as specified in Section 4-3 of this standard.

2-2.8 The maximum warp shall not exceed 20 in. (0.6 m) when tested as specified in Section 4-3 of this standard.

2-2.9 There shall be no rise permitted when tested as specified in Section 4-3 of this standard.

2-3 Requirements for Large-Diameter Supply Hose.

2-3.1 The minimum trade size for large-diameter hose shall be 3½ in. (89 mm).

2-3.2* Supply hose shall have minimum design service test pressure of 200 psi (1380 kPa) to meet the 185 psi (1275 kPa) normal highest operating pressure.

2-3.2.1 For design service test pressures greater than 200 psi (1380 kPa), the proof test pressure, burst test pressure, and kink test pressure shall be calculated as specified in Section 2-1 of this chapter.

2-3.3 For the minimum design service test pressure of 200 psi (1380 kPa), the minimum pressure for the proof test pressure shall be 400 psi (2760 kPa), when tested as specified in Section 4-2 of this standard. The hose shall withstand the test pressure without movement of couplings, leakage, or breakage of any thread in the jacket(s).

2-3.4 For the minimum design service test pressure of 200 psi (1380 kPa), the minimum burst test pressure shall be 600 psi (4140 kPa), when tested as specified in Section 4-5 of this standard. The test sample shall withstand the test pressure without failure.

2-3.5 For the minimum design service test pressure of 200 psi (1380 kPa), the minimum kink test pressure shall be 300 psi (2070 kPa), when tested as specified in Section 4-4 of this standard. The full length of hose, while kinked, shall withstand the test pressure without breaking any thread in the jacket.

2-3.6 The maximum elongation shall not exceed 10 percent when tested as specified in Section 4-3 of this standard.

2-3.7 The maximum twist in turns per 50 ft (15 m) shall not exceed 1¾. The final twist shall be in a direction that shall tighten the couplings when tested as specified in Section 4-3 of this standard.

2-3.8 The maximum warp shall not exceed 20 in. (0.6 m) when tested as specified in Section 4-3 of this standard.

2-3.9 There shall be no rise permitted when tested as specified in Section 4-3 of this standard.

2-4 Requirements for Rack and Reel Hose.

2-4.1 The minimum trade size for rack and reel hose shall be 1½ in. (38 mm).

2-4.2 Rack and reel hose shall have a minimum design service test pressure of 150 psi (1034 kPa) to meet the 135-psi (930-kPa) normal highest operating pressure as defined in Section 2-1.1.

2-4.2.1 For design service test pressures greater than 150 psi (1034 kPa), the proof test pressure, burst test pressure, and kink test pressure shall be calculated as specified in Section 2-1 of this chapter.

2-4.3 For the minimum design service test pressure of 150 psi (1034 kPa), the minimum proof test pressure shall be 300 psi (2070 kPa), when tested as specified in Section 4-2 of this standard. The hose shall withstand the test pressure without movement of couplings, leakage, or breakage of any thread in the jacket(s).

2-4.4 For the minimum design service test pressure of 150 psi (1034 kPa), the minimum burst test pressure shall be 450 psi (3100 kPa), when tested as specified in Section 4-6 of this standard. The test sample shall withstand the test pressure without failure.

2-4.5 For the minimum design service test pressure of 150 psi (1034 kPa), the minimum kink test pressure shall be 225 psi (1550 kPa), when tested as specified in Section 4-4 of this standard. The full length of hose, while kinked, shall withstand the test pressure without breaking any thread in the jacket.

2-4.6 The maximum elongation shall not exceed 10 percent when tested as specified in Section 4-3 of this standard.

2-4.7 The maximum twist in turns per 50 ft (15 m) shall not exceed 7½. The final twist shall be in a direction that shall tighten the couplings when tested as specified in Section 4-3 of this standard.

2-4.8 The maximum warp shall not exceed 20 in. (0.6 m) when tested as specified in Section 4-3 of this standard.

2-4.9 There shall be no rise greater than 7-in. (178-mm) rise permitted when tested as specified in Section 4-3 of this standard.

2-5 Requirements for Forestry Hose.

2-5.1 The trade sizes for forestry hose shall be 1 in. (25 mm) and 1½ in. (38 mm).

2-5.1.1 The maximum weight per 50 ft (15 m) of 1-in. (25-mm) hose shall be 10 lb (4.5 kg) and maximum weight per 50 ft (15 m) of 1½-in. (38-mm) hose shall be 13 lb (6 kg) when tested as specified in Section 4-3.2 of USDA Forest Service Specification 5100-186b.

2-5.2 Forestry hose shall have a minimum design service test pressure of 300 psi (2070 kPa), to meet the 250-psi (1723-kPa) normal highest operating pressure as defined in Section 2-1.1.

2-5.2.1 For design service test pressures greater than 300 psi (2070 kPa), the proof test pressure, burst test pressure, and kink test pressure shall be calculated as specified in Section 2-1 of this chapter.

2-5.3 For the minimum design service test pressure of 300 psi (2070 kPa), the minimum pressure for the proof test pressure shall be 600 psi (4140 kPa), when tested as specified in Section 4-2 of this standard. The hose shall

withstand the test pressure without movement of couplings, leakage, or breakage of any thread in the jacket(s).

2-5.4 For the minimum design service test pressure of 300 psi (2070 kPa), the minimum pressure for the burst test pressure shall be 900 psi (6205 kPa), when tested as specified in Section 4-5 of this standard. The test sample shall withstand the test pressure without failure.

2-5.5 For the minimum design service test pressure of 300 psi (2070 kPa), the minimum kink test pressure shall be 450 psi (3100 kPa), when tested as specified in Section 4-4 of this standard. The full length of hose, while kinked, shall withstand the test pressure without breaking any thread in the jacket.

2-5.6 The maximum elongation shall not exceed 10 percent when tested as specified in Section 4-3 of this standard.

2-5.7 The maximum twist in turns per 50 ft (15 m) shall not exceed 12 turns. The final twist shall be in a direction that shall tighten the couplings when tested as specified in Section 4-3 of this standard.

2-5.8 The maximum warp shall not exceed 25 in. (635 mm) when tested as specified in Section 4-3 of this standard.

2-5.9 There shall be no rise greater than 8 in. (203 mm) permitted when tested as specified in Section 4-3 of this standard.

2-5.10 For flexibility and compressibility the maximum applied load shall not exceed 100 lb (45.4 kg) for 1-in. (25-mm) hose and 125 lb (56.75 kg) for 1½-in. (38-mm) hose when tested in accordance with Section 4-3.8 of USDA Forest Service Specification 5100-186b.

Chapter 3 Construction Requirements

3-1 Size.

3-1.1 Diameter.

3-1.1.1 The hose shall have an internal diameter of not less than the trade size of the hose; however, the internal diameter for 2½-in. (65-mm) hose shall be at least 2$^{9}/_{16}$ in. (65 mm) when measured as specified in 4-2.1 of this standard.

3-1.2 Length.

3-1.2.1 The hose shall be in lengths averaging not less than 50 ft (15 m) unless the purchaser specifies 75 ft (22.5 m) or 100 ft (30 m) and shall not include the length from which the burst test sample is taken.

3-1.2.1.1 Supply hose or attack hose used to connect a pumper to a hydrant may be in lengths of not less than 10 ft (3.05 m).

3-1.2.2 No nominal 50-ft (15-m) length shall be less than 48 ft (14.6 m), other than the length from which a burst test sample was taken, which shall not be less than 47 ft (14.3 m).

3-1.2.3 No nominal 75-ft (22.5-m) length shall be less than 73 ft (22.3 m), other than the length from which a burst test sample was taken, which shall not be less than 72 ft (22 m). The hose shall be in lengths averaging not less than 75 ft (22.5 m).

3-1.2.4 No nominal 100-ft (30-m) length shall be less than 98 ft (29.9 m), other than the length from which a burst test sample was taken, which shall not be less than 97 ft (29.6 m). The hose shall be in lengths averaging not less than 100 ft (30 m).

3-1.2.5 Each length shall be measured as specified in 4-2.1 of this standard.

3-2 Jackets.

3-2.1* Jackets shall be made from one of the following materials, and the material shall be approved:

(a) natural thread;

(b) synthetic thread;

(c) combination of natural and synthetic thread.

3-2.2 Samples of hose made from the threads selected as specified in 3-2.1 shall have been submitted to an approved testing laboratory, and shall be determined by the testing laboratory to be suitable as jackets for fire hose.

3-2.3 Jackets shall be well, evenly, and firmly woven, and as free from unsightly defects, dirt, knots, lumps, and irregularities of twist as is consistent with good manufacturing practice.

3-2.4 All knots shall be tucked under the warp threads.

3-2.5* Each jacket shall be seamless and shall have the filling woven around the hose throughout its length and the warps interwoven with and substantially covering the filling.

3-2.6 When mildew treatment for the jacket is specified by the purchaser, the hose manufacturer shall certify that the mildew treatment meets the requirements of USDA Forest Service Specification 5100-186b.

3-3 Linings and Cover.

3-3.1 All fire hose shall be lined.

3-3.2 Liners, and covers if provided, shall be made from one of the following materials, and the material shall be approved:

(a) rubber compound;

(b) thermoplastic material;

(c) blends of rubber compounds and thermoplastic material;

(d) natural rubber-latex-coated fabric.

3-3.3 Samples of hose with liners, and covers if provided, made from the materials selected as specified in

3-3.2 shall be submitted to an approved testing laboratory. The testing laboratory shall determine whether the material and thickness are suitable for specified types of fire hose.

3-3.4 The lining shall be of uniform thickness of standard commercial quality.

3-3.5 The waterway surface of the lining shall be free from pitting, irregularities, or other imperfections.

3-3.6 Lining Adhesion.

3-3.6.1 The adhesion between the lining and the jacket shall be such that the rate of separation of a 1½-in. (38-mm) strip of the lining from the jacket shall be not greater than 1 in. (25.4 mm) per minute with a weight of 12 lb (5.4 kg), when tested in accordance with 4-6.1, 4-6.2, 4-6.3, and 4-6.4. If a rubber backing is used between the lining and the jacket, the adhesion between the lining and the backing and between the backing and the jacket shall be such that the rate of separation of a 1½-in. (38-mm) strip shall be not greater than 1 in. (25.4 mm) per minute with a weight of 12 lb (5.4 kg), as specified in 4-6.5 of this standard.

3-3.6.2 The requirement of 3-3.6.1 shall not exclude a construction that provides no adhesion between the jacket and lining along the fold, if the surface over which there is no adhesion is not greater than 35 percent of the total surface.

3-3.7 Cover Adhesion. The adhesion between the cover and the woven jacket shall be such that the rate of separation of a 1½-in. (38-mm) strip of the cover from the jacket shall be not greater than 1 in. (25.4 mm) per minute with a weight of 10 lb (4.5 kg).

3-3.8 Tensile Strength and Ultimate Elongation.

3-3.8.1 The tensile strength and ultimate elongation of specimens taken from the lining and cover, if provided, shall not be less than as specified in Table 3-3.8 when tested as specified in Section 4-7 of this standard.

Table 3-3.8

Material	Tensile Strength (psi)	Ultimate Elongation (%)
Natural and Synthetic Rubber	1200	400
Latex Rubber	1800	700
Thermoplastic	2000	400
All	1200	400

3-3.8.2 The ultimate elongation of liners and covers of neoprene compounds shall not be less than 250 percent provided the tensile strength and ultimate elongation do not decrease more than 50 percent when subjected to the oil immersion test specified in Section 4-12 of this standard.

3-3.8.3 The tensile strength of liners for forestry hose shall not be less than 1800 psi (12 411 kPa).

3-3.8.4 The tensile strength and ultimate elongation of specimens subjected to the oven aging test, as specified in Section 4-8 of this standard, shall not be less than 75 percent of specimens not subjected to this test.

3-3.9 For hose marked as ozone-resistant, the hose linings, and covers if provided, shall show no visible signs of cracking where subjected to the ozone test specified in Section 4-9 of this standard.

3-3.10 Cold Resistance Test.

3-3.10.1 Hose marked by the manufacturer for use down to minus 65 °F (minus 54 °C) shall show no apparent damage to the jacket or lining when subjected to the cold bending test specified in Section 4-10 of this standard. Following the cold bending test as specified in Section 4-10 of this standard, the hose shall not leak nor show breakage of any thread in the jacket when subjected to the proof test pressure as specified in Section 4-2 of this standard.

3-3.10.2 It shall be possible for one person to uncoil and lay out a 50-ft (15-m) length of hose immediately after it has been subjected to the cold test as specified in 4-10.2 of this standard.

3-3.11 Test for Free Sulfur. The free sulfur in unmilled latex lining or fabric-reinforced latex lining shall be not more than 0.1 percent by weight, as specified in Section 4-11 of this standard.

3-4 Marking.

3-4.1 Each length of fire hose shall be indelibly marked in letters and figures at least 1 in. (25.4 mm) high with the manufacturer's identification, the month and the year of manufacture, and the words "SERVICE TEST TO (the service test pressure specified in Section 2-1 of this standard) PSI PER NFPA 1962."

3-4.1.1 These markings shall be in two places on each length of hose, beginning 5 ft (1.52 m) ± 6 in. (152 mm) from the ends of the hose.

3-4.2 Each length of large-diameter supply hose shall be indelibly marked lengthwise in letters at least 2 in. (50.8 mm) high with the words "SUPPLY HOSE."

3-4.2.1 The marking shall be centered in the first 5 ft (1.52 m) ± 6 in. (152 mm) from each end of the hose and shall be marked twice, 180 degrees apart.

3-4.3 No markings referring to pressure other than the service test pressure specified in 3-4.1 of this standard shall appear on the hose.

Chapter 4 Test Methods for Manufacturers' Hose Certification

4-1 Hydrostatic Tests.

4-1.1 Tests shall be conducted by the hose manufacturer, or at an approved testing facility designated by the manufacturer.

4-1.2 All nondestructive hydrostatic tests shall be conducted on hose equipped with couplings to be delivered.

4-2 Proof Test Pressure.

4-2.1 The test shall be conducted on a test table that shall have a clear space of at least 20 in. (0.6 m) on each side of a line drawn through the center of the supply connection parallel to the edges of the test table. To facilitate the complete removal of air from the hose, the surface of the test table shall be inclined with the supply at the low end. The hose shall be filled with water until all air has been exhausted. The valve shall be closed and the pressure adjusted to 10 psi (69 kPa). While at 10 psi (69 kPa) the hose shall be straightened out and the length of the hose between couplings shall be measured and recorded to the nearest inch (25.4 mm). The pressure in the hose shall be increased at a rate of not less than 300 psi (2.1 MPa) nor more than 1000 psi (6.9 MPa) per minute until the required test pressure is reached. Proof test pressure shall be held for at least 15 seconds and not more than one minute.

4-2.2 The hose shall be marked behind the coupling before the proof test pressure and examined for movement after the test.

4-3 Elongation, Twist, Warp, and Rise Test Methods.

4-3.1 The elongation of the hose shall be calculated from the initial measurement of 10 psi (69 kPa) and final measurement taken at the proof test pressure.

4-3.2 The amount of twist shall be measured by following the color line or by noting, in the period during which the pressure is being applied, the turns of the fitting at the free end of the hose. The amount of twist shall be recorded to the nearest one-eighth turn or 45 degrees.

4-3.2.1 The direction of twist shall be reported as right or left. A right twist shall be in the direction that would tend to tighten couplings.

4-3.3* When the hose warps to any appreciable extent and particularly when the allowable limit of elongation is approached, the length at final pressure shall be measured by following the contour of the hose. For hose that does not warp to any extent, the measurement may be taken parallel to the edge of the test table. All measurements shall be taken from the inside edges of the fittings.

4-3.4 For hose having nominal length of 50 ft (15 m), the amount of warping shall be the maximum deviation of any portion of the hose from a straight line drawn from center to center of the fittings. For hose having nominal length greater than 50 ft (15 m) and up to 100 ft (30 m), the amount of warping shall be the maximum deviation of any 50-ft (15-m) portion of the hose from an initial straight line drawn from the center of the fittings at each end of the hose.

4-3.5* The warp shall be measured as the distance from the referenced straight line to the center line of the hose at the point of maximum deviation.

4-3.6 Rise shall be measured to the nearest inch (25.4 mm) and is that distance that the hose rises above the test table when subjected to the proof test pressure specified in this chapter.

4-4 Kink Test.

4-4.1 The test shall be conducted on a test table that shall have a clear space of at least 20 in. (0.6 m) on each side of a line drawn through the center of the supply connection parallel to the edges of the test table. To facilitate the complete removal of air from the hose, the surface of the test table shall be inclined with the supply at the low end. The hose shall be filled with water until all air has been exhausted. The valve shall be closed and the pressure adjusted to 10 psi (69 kPa).

4-4.2 The hose shall be sharply kinked 18 in. (0.5 m) from the free end by tying the hose back against itself as close to the fittings as practicable. The pressure shall be raised as described in Section 4-2, "Proof Test Pressure," to the test pressure and immediately released.

4-5* Burst Test. A 3-ft (0.9-m) sample shall be cut from a length of hose submitted for test before the hose is subjected to the proof test pressure. The 3-ft (0.9-m) samples shall be tested alternately while lying straight, or curved on a surface having a radius of 27 in. (0.7 m). Protective enclosure shall be used. The 3-ft (0.9-m) sample shall be connected to the water supply, the air expelled, and the pressure raised until the specified burst pressure is reached.

4-6 Adhesion Test.

4-6.1 The apparatus required for this test shall consist of a supporting frame, clamps, weights, weight holders, and a timer. The supporting frame shall be of such design that specimens, with weights attached, may be suspended vertically and hang freely during the progress of the test.

4-6.2 The specimen for the adhesion test shall be cut transversely.

4-6.3 The specimen shall be 2 in. (51 mm) wide and shall be cut through so as to give a rectangular sample 2 in. (51 mm) wide and the full circumference of the hose in length. A strip of lining, or cover if provided, 1½ in. (38 mm) wide shall be cut out accurately, the cut extending through the rubber but not entirely through the woven jacket. This strip shall be started at one end to the extent of about 1½ in. (38 mm), and a reference mark shall be placed on the jacket at the juncture of the jacket and the lining. The free end of the woven jacket and the free end of the strip of rubber shall be secured in suitable clamps.

4-6.4 With the separated jacket gripped in a stationary clamp, the separated rubber shall be gripped in a freely suspended clamp hanging vertically, to which the prescribed weight shall be attached with suitable provision for supporting and releasing it slowly without jerking. The distance through which separation takes place shall be noted for a period of 10 minutes, or until complete separation occurs. The adhesion to the jacket shall be

taken as the rate obtained by dividing the total distance separated by inches (mm), to the nearest 0.1 in. (2.54 mm), by the elapsed time in minutes.

4-6.5 If a rubber backing is used between the lining and the jacket, the adhesion between the lining and the backing, and the adhesion between the backing and the jacket shall be determined using the methods specified in this section. If the adhesion between the lining and the backing or between the backing and the jacket cannot be determined because the backing has a tendency to tear during the test, the rate of separation between the separating members shall be considered the adhesion.

4-7 Tensile Strength and Elongation.

4-7.1 Tensile strength and elongation shall be determined in accordance with the test methods specified in ASTM D 412, *Test Method for Rubber Properties in Tension*, Method A.

4-7.2 Three dumbbell specimens shall be die cut and have a constricted portion 0.250 in. (6.4 mm) wide and 1.30 in. (33 mm) long. The enlarged ends shall be 1 in. (25.4 mm) wide.

4-7.3 The constricted portion of each specimen may be buffed to remove fabric impressions or other surface irregularities. Samples shall be buffed prior to cutting with the die. If the nature or thickness of the lining is such that buffing cannot be accomplished without damaging the lining, unbuffed specimens may be used for the tensile strength and elongation tests.

4-7.4 The specimens shall be cut transversely from the sample.

4-7.5 Three measurements for thickness shall be made in the constricted portion of each specimen. The minimum value obtained shall be used as the thickness of the specimen in calculating the tensile strength. The average tensile strength of the three specimens shall be considered the tensile strength of the rubber lining or cover.

4-7.6 Two benchmarks 1 in. (25.4 mm) apart shall be stamped centrally on the constricted portion of each specimen.

4-7.7 If a dumbbell test specimen breaks outside the benchmarks, or if the result of either tensile strength or elongation based on the average of three specimens is not acceptable, another set of three specimens is to be tested, and the results from this set shall be considered final. Results of tests of specimens that break in the curved portion just outside the benchmarks may be accepted if within the minimum requirements.

4-8 Oven Aging Test. Three specimens shall be prepared, other than for stamping the 1 in. (25.4 mm) apart benchmarks, in the same manner as for the Tensile Strength and Elongation Test, Section 4-7, before placing the specimens in the oven. The 1 in. (25.4 mm) apart benchmarks shall be stamped on the specimens after conditioning. The test shall be conducted in accordance with the test procedures described in ASTM D 573, *Test Method for Rubber Deterioration in an Air Oven*.

4-9 Ozone Resistance. Three specimens, 3¾ in. (85 mm) long by 1 in. (25.4 mm) wide (or as close to 1 in. wide as possible from small-diameter hose) shall be cut longitudinally from the liner, and cover if provided, of the sample and mounted in the specimen holder in a looped position in accordance with the procedures outlined in ASTM D 518, *Test Method for Rubber Deterioration — Surface Cracking*, Procedure B. The ozone test chamber shall be regulated to give an ozone concentration of 100 ppm and a temperature of 40 ± 1°C (104 ± 1.8°F). When constant test conditions have been obtained in the ozone test chamber, and after the mounted specimens have remained in an ozone-free atmosphere for 24 hours, the mounted specimens shall be placed in the test chamber and allowed to remain for 70 hours. After the test exposure, the specimens shall be removed from the test chamber and examined with a 7-power hand magnifying glass.

4-10 Test for Cold Resistance.

4-10.1 A cold box capable of maintaining a temperature of minus 54 ± 2°C (minus 65 ± 3.6°F) and of sufficient capacity to accommodate the test specimens shall be used.

4-10.2 A 3-ft (0.9-m) sample of the hose, provided with the test fittings, shall be immersed in the water bath at room temperature for 24 hours. The hose then shall be removed from the water bath, exposed to room atmosphere for 15 minutes, and thereafter placed in the cold box maintained at minus 54 ± 2°C (minus 65 ± 3.6°F). After 24 hours in the cold box, the hose shall be removed from the box and immediately bent double on itself, 180 degrees, first one way and then the other. The hose shall then be allowed to thaw at room temperature for 24 hours, and thereafter subjected to the proof test pressure as specified in Section 4-2 of this standard.

4-10.3 A 50-ft (15-m) length of dry hose shall be firmly coiled and placed in the cold box at minus 54 ± 2°C (minus 65 ± 3.6°F) for a duration of 24 hours. Immediately after removal of the hose from the cold box, an attempt shall be made by one operator to uncoil and lay out the hose.

4-11 Free Sulfur. The free sulfur shall be determined using the apparatus and test methods described in ASTM D 297, *Chemical Analysis — Rubber Products*.

4-12 Oil Immersion Test.

4-12.1 A sample of the liner shall be immersed in a petroleum-base oil at 121 ± 1°C (49.5 ± .5°F) for 18 hours and the tensile strength and elongation determined as specified in Section 4-7 of this standard.

4-12.2 The oil used in this test shall be a medium-swelling petroleum-base oil with a viscosity of 100 ± 5 Saybolt Universal seconds at 98.9°C (210°F), an aniline point of 93° ± 3°C (199.4° ± 5.4°F), and an open cup flash point of 246.1° ± 5.6°C (475° ± 10°F).

Chapter 5 Sampling, Inspection, and Tests

5-1 General Inspection and Tests.

5-1.1 The manufacturer shall be responsible for performance of all inspection requirements. Manufacturers may utilize their own facilities, or any approved laboratory.

5-1.2 Records of inspection and tests shall be kept complete and available to the purchaser.

5-1.3 In case of factory inspections, the manufacturer shall furnish the inspector all reasonable facilities for performing the work. During any inspection, the inspector may take from the lot one or more samples and submit them to an independent laboratory for inspection and tests.

5-1.4 The purchaser reserves the right to perform any test deemed necessary to verify that the product offered meets all the requirements of this standard.

5-1.5 All hoses of similar diameter and length presented together in one delivery shall be considered one lot for the purpose of inspection.

5-1.6 Samples of the hoses ready for acceptance shall be selected from each lot for inspection of visual and dimensional characteristics.

5-1.7 All hoses offered in a lot shall be subjected to elongation, twist, warp, rise, and proof tests performed in accordance with Sections 4-2 and 4-3 of this standard.

5-1.8 Samples shall be taken from the lot for kink, burst, jacket adhesion, and tensile strength and elongation.

5-1.9 The purchaser shall specify if any of the other tests specified in Sections 4-8 through 4-12 of this standard are required.

5-1.10 When requested, the manufacturer shall provide the purchaser a certification that the hose furnished has been tested and is in compliance with the provisions as outlined in this standard.

Chapter 6 Referenced Publications

6-1 The following documents or portions thereof are referenced within this standard and shall be considered part of the requirements of this document. The edition indicated for each reference shall be the current edition as of the date of the NFPA issuance of this document. These references shall be listed separately to facilitate updating to the latest edition by the user.

6-1.1 ASTM Publications. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D 573-1981, *Test Method for Rubber Deterioration in an Air Oven*

ASTM D 297-1981, *Methods for Rubber Products — Chemical Analysis*

ASTM D 412-1980, *Test Method for Rubber Properties in Tension*

ASTM D 518-1974, *Test Method for Rubber Deterioration — Surface Cracking.*

6-1.2 USDA Publication. Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

USDA Forest Service Specification 5100-186b.

Appendix A

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

A-2-3.2 Whenever large-diameter supply hose is being used to supply attack lines, master stream appliances, portable hydrants, manifolds, and standpipe and sprinkler systems, a pressure relief device with a maximum setting of 200 psi (1380 kPa) should be used.

A-3-2.1 Hose with a jacket of all-synthetic threads is much lighter in weight than the all-cotton jacket hose and is considerably more flexible; therefore, a greater amount can be carried on apparatus or at standpipes.

A-3-2.5 The abrasion characteristics of fire hose are not included in this standard but should be an important consideration in the selection of fire hose. In areas where the hose could be subjected to rough usage, double-jacketed or rubber-covered hose should be considered.

A-4-3.3 For this purpose, an edge of the table should be marked off in feet and inches (m, and cm or mm). Warping in hose tests is the deviation from a straight line drawn from fitting to fitting in a plane parallel to the surface on which the hose rests.

A-4-3.5 As an alternate method of test, when desired by the manufacturer, the position of the hose relative to the water supply may be reversed, end for end, following the first measurement of warping, and the test for warping then repeated.

A-4-5 CAUTION: Hose meeting the requirements of this standard may be supplied with a coupling that will not be capable of complying with the burst test requirements of the hose. The purchaser should request information on the failure point of couplings supplied with the hose.

Appendix B Referenced Publications

B-1 The following documents or portions thereof are referenced within this standard for informational pur-

poses only and thus are not considered part of the requirements of this document. The edition indicated for each reference should be the current edition as of the date of the NFPA issuance of this document. These references should be listed separately to facilitate updating to the latest edition by the user.

B-1.1 NFPA Publications. National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NFPA 1962-1979, *Standard for the Care, Use, and Maintenance of Fire Hose Including Connections and Nozzles*

NFPA 1963-1985, *Standard for Screw Threads and Gaskets for Fire Hose Connections.*

Index

SUBMITTING PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Contact NFPA Standards Administration for final date for receipt of proposals on a specific document.

INSTRUCTIONS

Please use the forms which follow for submitting proposed amendments. Use a separate form for each proposal.

1. For each document on which you are proposing amendment indicate:
   (a) The number and title of the document
   (b) The specific section or paragraph.

2. Check the box indicating whether or not this proposal recommends new text, revised text, or to delete text.

3. In the space identified as "Proposal" include the wording you propose as new or revised text, or indicate if you wish to delete text.

4. In the space titled "Statement of Problem and Substantiation for Proposal" state the problem which will be resolved by your recommendation and give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If a statement is more than 200 words in length, the technical committee is authorized to abstract it for the Technical Committee Report.

5. Check the box indicating whether or not this proposal is original material, and if it is not, indicate source.

6. If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee.

NOTE: The NFPA Regulations Governing Committee Projects in Paragraph 10-10 state: Each proposal shall be submitted to the Council Secretary and shall include:

(a) identification of the submitter and his affiliation (Committee, organization, company) where appropriate, and

(b) identification of the document, paragraph of the document to which the proposal is directed, and

(c) a statement of the problem and substantiation for the proposal, and

(d) proposed text of proposal, including the wording to be added, revised (and how revised), or deleted.

FORM FOR PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Mail to: Secretary, Standards Council
National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269

Date 5/18/85 **Name** John B. Smith **Tel. No.** 617-555-1212

Address 9 Seattle St., Seattle, WA 02255

Representing (Please indicate organization, company or self) Fire Marshals Assn. of North America

1. a) **Document Title:** Protective Signaling Systems **NFPA No. & Year** NFPA 72D

   b) **Section/Paragraph:** 2-7.1 (Exception)

2. **Proposal recommends: (Check one)**
   - ☐ new text
   - ☐ revised text
   - ☒ deleted text.

3. **Proposal (include proposed new or revised wording, or identification of wording to be deleted):**

   Delete exception.

4. **Statement of Problem and Substantiation for Proposal:**

   A properly installed and maintained system should be free of ground faults. The occurrence of one or more ground faults should be required to cause a "trouble" signal because it indicates a condition that could contribute to future malfunction of the system. Ground fault protection has been widely available on these systems for years and its cost is negligible. Requiring it on all systems will promote better installations, maintenance and reliability.

5. ☒ **This Proposal is original material.**
   ☐ **This Proposal is not original material; its source (if known) is as follows:** _____

(Note Original material is considered to be the submitter's own idea based on or as a result of his own experience, thought, or research and, to the best of his knowledge, is not copied from another source.)

I agree to give NFPA all and full rights, including rights of copyright, in this Proposal and I understand that I acquire no rights in any publication of NFPA in which this Proposal in this or another similar or analogous form is used.

John B. Smith
Signature

PLEASE USE SEPARATE FORM FOR EACH PROPOSAL