

NFPA 1961

Standard on Fire Hose

1997 Edition



National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

Copyright ©
National Fire Protection Association, Inc.
One Batterymarch Park
Quincy, Massachusetts 02269

IMPORTANT NOTICE ABOUT THIS DOCUMENT

NFPA codes, standards, recommended practices, and guides, of which the document contained herein is one, are developed through a consensus standards development process approved by the American National Standards Institute. This process brings together volunteers representing varied viewpoints and interests to achieve consensus on fire and other safety issues. While the NFPA administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards.

The NFPA disclaims liability for any personal injury, property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on this document. The NFPA also makes no guaranty or warranty as to the accuracy or completeness of any information published herein.

In issuing and making this document available, the NFPA is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the NFPA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

The NFPA has no power, nor does it undertake, to police or enforce compliance with the contents of this document. Nor does the NFPA list, certify, test or inspect products, designs, or installations for compliance with this document. Any certification or other statement of compliance with the requirements of this document shall not be attributable to the NFPA and is solely the responsibility of the certifier or maker of the statement.

NOTICES

All questions or other communications relating to this document and all requests for information on NFPA procedures governing its codes and standards development process, including information on the procedures for requesting Formal Interpretations, for proposing Tentative Interim Amendments, and for proposing revisions to NFPA documents during regular revision cycles, should be sent to NFPA headquarters, addressed to the attention of the Secretary, Standards Council, National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

Users of this document should be aware that this document may be amended from time to time through the issuance of Tentative Interim Amendments, and that an official NFPA document at any point in time consists of the current edition of the document together with any Tentative Interim Amendments then in effect. In order to determine whether this document is the current edition and whether it has been amended through the issuance of Tentative Interim Amendments, consult appropriate NFPA publications such as the *National Fire Codes*® Subscription Service, visit the NFPA website at www.nfpa.org, or contact the NFPA at the address listed above.

A statement, written or oral, that is not processed in accordance with Section 5 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.

The NFPA does not take any position with respect to the validity of any patent rights asserted in connection with any items which are mentioned in or are the subject of this document, and the NFPA disclaims liability for the infringement of any patent resulting from the use of or reliance on this document. Users of this document are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

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 that is not in compliance with applicable laws, and this document may not be construed as doing so.

Licensing Policy

This document is copyrighted by the National Fire Protection Association (NFPA). By making this document available for use and adoption by public authorities and others, the NFPA does not waive any rights in copyright to this document.

1. Adoption by Reference—Public authorities and others are urged to reference this document in laws, ordinances, regulations, administrative orders, or similar instruments. Any deletions, additions, and changes desired by the adopting authority must be noted separately. Those using this method are requested to notify the NFPA (Attention: Secretary, Standards Council) in writing of such use. The term "adoption by reference" means the citing of title and publishing information only.

2. Adoption by Transcription—**A.** Public authorities with lawmaking or rule-making powers only, upon written notice to the NFPA (Attention: Secretary, Standards Council), will be granted a royalty-free license to print and republish this document in whole or in part, with changes and additions, if any, noted separately, in laws, ordinances, regulations, administrative orders, or similar instruments having the force of law, provided that: (1) due notice of NFPA's copyright is contained in each law and in each copy thereof; and (2) that such printing and republication is limited to numbers sufficient to satisfy the jurisdiction's lawmaking or rule-making process. **B.** Once this NFPA Code or Standard has been adopted into law, all printings of this document by public authorities with lawmaking or rule-making powers or any other persons desiring to reproduce this document or its contents as adopted by the jurisdiction in whole or in part, in any form, upon written request to NFPA (Attention: Secretary, Standards Council), will be granted a nonexclusive license to print, republish, and vend this document in whole or in part, with changes and additions, if any, noted separately, provided that due notice of NFPA's copyright is contained in each copy. Such license shall be granted only upon agreement to pay NFPA a royalty. This royalty is required to provide funds for the research and development necessary to continue the work of NFPA and its volunteers in continually updating and revising NFPA standards. Under certain circumstances, public authorities with lawmaking or rule-making powers may apply for and may receive a special royalty where the public interest will be served thereby.

3. Scope of License Grant—The terms and conditions set forth above do not extend to the index of this document.

(For further explanation, see the Policy Concerning the Adoption, Printing, and Publication of NFPA Documents, which is available upon request from the NFPA.)

Copyright © 1997 NFPA, All Rights Reserved

NFPA 1961

Standard on

Fire Hose

1997 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 18–20, 1996, in Nashville, TN. It was issued by the Standards Council on January 17, 1997, with an effective date of February 7, 1997, and supersedes all previous editions.

This edition of NFPA 1961 was approved as an American National Standard on February 7, 1997.

Origin and Development of NFPA 1961

Standards on fire hose for both industrial use and for fire department use were among the earliest standards issued by the NFPA with the first standard issued in 1898. NFPA 196 was issued in 1934 as *Standard Specification for Cotton Rubber-Lined Fire Hose for Public and Private Fire Department Use*. That standard remained in existence until 1958 when the Fire Hose Committee was again constituted to update the requirements. A tentative standard was issued in 1958, and the official standard was issued in 1960 recognizing the newer synthetic materials that were being used in the manufacture of fire hose. The 1960 standard covered fire hose in the 1 in., 1 1/2 in., 2 in., and 2 1/2 in. sizes for single or multiple jacket hose and 3 in. and 3 1/2 in. sizes for multiple jacket hose.

In the 1972 edition, the concept of single jacket relay supply hose in the trade sizes of 3 1/2 in., 4 in., 4 1/2 in., 5 in., and 6 in. was introduced. In 1979 the standard was renumbered from NFPA 196 to NFPA 1961 to coincide with a general renumbering of the fire service standards. In the 1992 edition, the term “rack and reel hose” was changed to “occupant use hose,” the requirements for forestry hose were updated, and the requirements for suction hose were added to the standard.

This 1997 edition is a reconfirmation of the text of the 1992 edition.

Technical Committee on Fire Hose

John W. Stacey, *Chair*
Bellevue Fire Dept., NE [E]
Rep. International Association of Fire Chiefs

Frank T. Blackburn, PWSS Co. Ltd, CA [SE]

Robert Ely, San Diego, CA [SE]

Thomas G. Farruggia, Illinois Fire Extinguisher Co., Inc., IL [IM]

Rep. National Association of Fire Equipment Distributors Inc.

Philip W. Johnson, Factory Mutual Research Corp., RI [I]

Paul Robert Kaveler, Union Electric Co., MO [U]

Rep. Edison Electric Institute

Allen Leach, Jaffrey Fire Protection Co., NH [M]

Larry Linton, Washington Township Volunteer Fire Dept., IN [L]

William E. Patterson, Snap-tite Hose, Inc., PA [M]

Rep. Fire Equipment Manufacturers' Assn., Inc.

William J. Patterson, Federal Emergency Management Agency, CA [SE]

David J. Pritchard, Apex, NC [SE]

Mark Saner, Akron Brass, OH [M]

Sherman Stark, North American Fire Hose, CO [M]

Leon M. Walker, Underwriters Laboratories Inc., IL [RT]

Halbert C. Weill, Hazards, Inc., NC [SE]

Alternates

George E. Laverick, Underwriters Laboratories Inc., IL [RT]
(Alt. to L. M. Walker)

David A. Lord, Niedner Ltd., PQ [M]
(Alt. to W. E. Patterson)

Carl E. Peterson, NFPA Staff Liaison

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. A key to classifications is found at the front of the book.

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.

Committee Scope: This Committee shall have primary responsibility for documents on the size and design of fire hose connections, and the performance, maintenance, and selection of all types of fire hose, couplings, nozzles, and accessory equipment.

Contents

Chapter 1 Administration	1961- 4	4-2 Proof Test Pressure	1961- 8
1-1 Scope	1961- 4	4-3 Elongation, Twist, Warp, and Rise Test Methods	1961- 8
1-2 Purpose	1961- 4	4-4 Kink Test	1961- 9
1-3 Definitions	1961- 4	4-5 Burst Test	1961- 9
1-4 Units	1961- 4	4-6 Adhesion Test	1961- 9
Chapter 2 Design Requirements	1961- 5	4-7 Tensile Strength and Elongation	1961- 9
2-1 Requirements for All Hose	1961- 5	4-8 Oven Aging Test	1961-10
2-2 Requirements for Attack Hose	1961- 5	4-9 Ozone Resistance	1961-10
2-3 Requirements for Large-Diameter Supply Hose	1961- 5	4-10 Test for Cold Resistance	1961-10
2-4 Requirements for Occupant Use Hose . . .	1961- 5	4-11 Oil Immersion Test	1961-10
2-5 Requirements for Forestry Hose	1961- 6	Chapter 5 Sampling, Inspection, and Tests	1961-10
2-6 Requirements for Suction Hose	1961- 6	5-1 General Inspection and Tests	1961-10
Chapter 3 Construction Requirements	1961- 7	Chapter 6 Referenced Publications	1961-10
3-1 Size	1961- 7	Appendix A Explanatory Material	1961-11
3-2 Jackets	1961- 7	Appendix B Referenced Publications	1961-12
3-3 Linings and Covers	1961- 7	Index	1961-13
3-4 Marking	1961- 8		
Chapter 4 Test Methods for Manufacturers' Hose Certification	1961- 8		
4-1 Hydrostatic Tests	1961- 8		

NFPA 1961**Standard on****Fire Hose****1997 Edition**

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found 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, occupant use 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 can 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.

Attack Hose. Hose designed to be used by trained fire fighters and fire brigade members to combat fires beyond the incipient stage. Attack hose is designed to convey water to handline nozzles, distributor nozzles, master stream appliances, portable hydrants, manifolds, standpipe and sprinkler systems, and pumps used by the fire department.

Authority Having Jurisdiction.* The organization, office, or individual responsible for approving equipment, an installation, or a procedure.

Coating. A jacket consisting of yarn that is impregnated or saturated with the protective materials or coated with the protective materials so the outside of the jacket is relatively smooth.

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

Fire Hose. A flexible conduit constructed with a woven jacket and an approved nonpermeable lining.

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

Hard Suction Hose. A hose used for drafting water from static supplies (lakes, rivers, wells, etc.). It can also be used for supplying pumpers from a hydrant if designed for that purpose. The hose contains a semi-rigid or rigid reinforcement designed to prevent collapse of the hose under vacuum.

Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is 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 or larger. Supply hose is designed to be used at operating pressures not exceeding 185 psi (1275 kPa). Attack hose is designed for use at operating pressures of at least 275 psi (1895 kPa).

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

Occupant Use Hose. Fire hose designed to be used by the building's occupants to fight incipient fires prior to the arrival of trained fire fighters or fire brigade members.

Shall. 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 can be approximate.

Table 1-4 SI Conversions

Quantity	US Unit/Symbol	SI Unit/Symbol	Conversion Factor
Length	inch/in.	millimeter/mm	1 in. = 25 mm
	foot/ft	meter/m	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 = 6.895 kPa
Mass	pounds/lb	kilograms/kg	1 lb = 0.454 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 $1\frac{1}{2}$ times the specified service test pressure.

2-2 Requirements for Attack Hose.

2-2.1 The minimum trade size for attack hose shall be $1\frac{1}{2}$ in. (38 mm).

2-2.2* Attack hose shall have a minimum design service test pressure of 300 psi (2070 kPa). 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.

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. 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. 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. 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 $1\frac{1}{2}$ -in. through $2\frac{1}{2}$ -in. (38-mm through 65-mm) size hose, 10 percent for 3-in. (76-mm) size hose, and 13 percent for $3\frac{1}{2}$ -in. (89-mm) or larger size hose when tested as specified in Section 4-3.

2-2.7 The maximum twist in turns per 50 ft (15 m) shall not exceed $4\frac{1}{4}$ turns for $1\frac{1}{2}$ -in. through 2-in. (38-mm through 51-mm) size hose, and $1\frac{3}{4}$ turns for $2\frac{1}{2}$ -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.

2-2.8 The maximum warp shall not exceed 20 in. (508 mm) when tested as specified in Section 4-3.

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

2-3 Requirements for Large-Diameter Supply Hose.

2-3.1 The minimum trade size for large-diameter hose shall be $3\frac{1}{2}$ in. (89 mm).

2-3.2* Supply hose shall have a minimum design service test pressure of 200 psi (1380 kPa). 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.

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. 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. 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. 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.

2-3.7 The maximum twist in turns per 50 ft (15 m) shall not exceed $1\frac{3}{4}$ turns. The final twist shall be in a direction that shall tighten the couplings when tested as specified in Section 4-3.

2-3.8 The maximum warp shall not exceed 20 in. (508 mm) when tested as specified in Section 4-3.

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

2-4 Requirements for Occupant Use Hose.

2-4.1 The minimum trade size for occupant use hose shall be $1\frac{1}{2}$ in. (38 mm).

2-4.2* Occupant use hose shall have a minimum design service test pressure of 150 psi (1034 kPa). 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.

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. 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 4-5. 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. 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.

2-4.7 The maximum twist in turns per 50 ft (15 m) shall not exceed $7\frac{1}{2}$ turns. The final twist shall be in a direction that shall tighten the couplings when tested as specified in Section 4-3.

2-4.8 The maximum warp shall not exceed 20 in. (508 mm) when tested as specified in Section 4-3.

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

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 lined, cotton-synthetic jacketed forestry fire hose shall be 10 lb (4.5 kg) for 1-in. (25-mm) hose, and the maximum weight shall be 13 lb (6 kg) for 1½-in. (38-mm) hose as required in U.S.D.A. Forest Service Specification 5100-186, *Lined, Cotton-Synthetic Jacketed Fire Hose*.

2-5.1.2 The maximum weight per 50 ft (15 m) of lined, synthetic woven jacket forestry fire hose shall be 5 lb (2.3 kg) for 1-in. (25-mm) hose, and the maximum weight shall be 8 lb (3.6 kg) for 1½-in. (38-mm) hose as required in U.S.D.A. Forest Service Specification 5100-187, *Lined, Synthetic Woven Jacket Fire Hose*.

2-5.2* Forestry hose shall have a minimum design service test pressure of 300 psi (2070 kPa). 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.

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. 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. 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. 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.

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.

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

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

2-5.10 Flexibility and Compressibility Testing.

2-5.10.1 For flexibility and compressibility the maximum applied load for lined, cotton-synthetic jacketed fire hose 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 U.S.D.A. Forest Service Specification 5100-186, *Lined, Cotton-Synthetic Jacketed Fire Hose*.

2-5.10.2 For flexibility and compressibility the maximum applied load for lined, synthetic woven jacket fire hose 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 U.S.D.A. Forest Service Specification 5100-187, *Lined, Synthetic Woven Jacket Fire Hose*.

2-6 Requirements for Suction Hose. The requirements of Chapters 3, 4, and 5 shall not apply to suction hose except as specified herein.

2-6.1 All suction hose shall meet the requirements of 2-6.2 through 2-6.13. If the suction hose is intended for use under positive pressure, it also shall meet the requirements of 2-6.14.

2-6.2 Minimum trade size for suction hose shall be 1½ in. (38 mm).

2-6.3 The internal diameter of the suction hose shall comply with 3-1.1.

2-6.4 The internal surface of the suction hose shall be smooth and free of corrugations.

2-6.5 The linings and covers of suction hose, if provided, shall be made from one of the following materials, and the material shall be approved:

- (a) Rubber compound
- (b) Thermoplastic compound
- (c) Blends of rubber and thermoplastic compounds

2-6.6 If a lining is provided, it shall meet the requirements of 3-3.6.1.

2-6.7 If a cover is provided, it shall meet the requirements given in 3-3.7.

2-6.8 The suction hose shall be constructed to withstand an internal vacuum of at least 23 in. Hg (78 kPa) without failure, including the collapse of the liner or the cuffed (soft) ends, when applicable in the coupling bowl area.

2-6.9 The hose shall be designed for use in ambient conditions ranging from -30°F to 140°F (-34°C to 60°C).

2-6.9.1 The tensile strength of the tube and the cover, if provided, shall not decrease by more than 20 percent of the original value, and the elongation shall not decrease by more than 50 percent when tested in accordance with Section 4-7.

2-6.9.2 The material used for the tube and the cover, if provided, shall pass the Low-Temperature Test on Tube and Cover of ASTM D 380, *Standard Test Methods for Rubber Hose*, when subjected to the cold chamber for 5 hours at -30°F (-34°C).

2-6.10 The tensile strength and ultimate elongation shall meet the requirements of 3-3.8.1, 3-3.8.2, and 3-3.8.4.

2-6.11 The linings and covers of the suction hose, if provided, shall show no visible signs of cracking when subjected to the ozone test specified in Section 4-9.

2-6.12 Marking.

2-6.12.1 If the suction hose is designed for use under vacuum only, it shall be indelibly marked at 5 ft (1.5 m) intervals in letters at least 2 in. (51 mm) high with the words "FOR VACUUM USE ONLY." Each length also shall be indelibly marked in letters at least 1 in. (25 mm) high with the words "SERVICE TEST TO 22 IN. HG VACUUM PER NFPA 1962."

2-6.12.2 If the suction hose is designed for use under positive pressure, each length shall be indelibly marked in letters at least 1 in. (25 mm) high with the words "SERVICE TEST TO (the service test pressure the hose is designed to) AND 22 IN. HG VACUUM PER NFPA 1962."

2-6.13 After the hose has been coupled, it shall be subjected to a vacuum of 23 in. Hg (78 kPa). Once the vacuum has been established, the hose shall maintain that vacuum for 5 minutes with no loss of vacuum. The vacuum pump shall not be used to maintain the vacuum during the 5-minute period. After the test has been completed, the lining shall be visually inspected for any sign of collapse or failure.

2-6.14 Positive Pressure Requirements for Suction Hose.

2-6.14.1* Suction hose shall have a minimum design service test pressure of 165 psi (1138 kPa).

2-6.14.2 For design service test pressures greater than 165 psi (1138 kPa), the proof test and burst test pressures shall be calculated as defined in Section 2-1.

2-6.14.3 For the minimum design service test pressure of 165 psi (1138 kPa), the minimum pressure for the proof test pressure shall be 330 psi (2275 kPa) when tested as specified in Section 4-2. The hose shall withstand the test pressure without movement of couplings, leakage, breakage, or showing any signs of deformity.

2-6.14.4 For the minimum design service test pressure of 165 psi (1138 kPa), the minimum burst test pressure shall be 495 psi (3413 kPa) when tested as specified in Section 4-5. The test sample shall withstand the test pressure without failure.

Chapter 3 Construction Requirements

3-1 Size.

3-1.1* Diameter. 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 2⅞ in. (65 mm).

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.

Supply hose or attack hose used to connect a pumper to a hydrant shall be permitted to 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.

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 be 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 U.S.D.A. Forest Service Specification 5100-186, *Lined, Cotton-Synthetic Jacketed Fire Hose*.

3-3 Linings and Covers.

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 not be greater than 1 in. (25 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 not be greater than 1 in. (25 mm) per minute with a weight of 12 lb (5.4 kg), as specified in 4-6.5.

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 where 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 1 1/2-in. (38-mm) strip of the cover from the jacket shall not be greater than 1 in. (25 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 stated in Table 3-3.8 when tested as specified in Section 4-7.

Table 3-3.8

Material	Tensile Strength		Ultimate Elongation
	(psi)	(kPa)	(%)
Natural and synthetic rubber	1200	8275	400
Latex rubber	1800	12410	700
Thermoplastic	2000	13790	400
All	1200	8275	400

3-3.8.2 If oil-resistant liners or covers are required, the ultimate elongation shall not be less than 250 percent provided that the tensile strength and ultimate elongation do not decrease more than 50 percent when tested in accordance with Section 4-11.

3-3.8.3 The tensile strength of liners for forestry hose shall not be less than 1800 psi (12,410 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, shall not be less than 75 percent of the tensile strength and ultimate elongation 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 when subjected to the ozone test specified in Section 4-9.

3-3.10 Cold Resistance Test.

3-3.10.1 Hose marked by the manufacturer for use down to -65°F (-54°C) shall show no apparent damage to the jacket or lining when subjected to the cold bending test specified in Section 4-10. Following the cold bending test as specified in Section 4-10, 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.

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.

3-4 Marking.

3-4.1 Each length of fire hose shall be indelibly marked in letters and figures at least 1 in. (25 mm) high with the manufacturer's identification, the month and the year of manu-

facture, and the words "SERVICE TEST TO (the service test pressure specified in Section 2-1 of this standard) PSI PER NFPA 1962."

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* Large-Diameter Hose.

3-4.2.1 Each length of large-diameter supply hose meeting the requirements of Section 2-3 shall be indelibly marked lengthwise in letters at least 2 in. (51 mm) high with the words "SUPPLY HOSE."

3-4.2.2 Each length of large-diameter attack hose meeting the requirements of Section 2-2 shall be indelibly marked lengthwise in letters at least 2 in. (51 mm) high with the words "ATTACK HOSE."

3-4.2.3 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 in two places, 180 degrees apart.

3-4.3 No markings referring to pressure, other than the service test pressure specified in 3-4.1, 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. (508 mm) 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 mm). The pressure in the hose shall be increased at a rate of not less than 300 psi (2070 kPa) nor more than 1000 psi (6895 kPa) per minute until the required test pressure is reached. Proof test pressure shall be held for at least 15 seconds and not more than 1 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.

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 shall be permitted to 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 the center of the fittings at one end to the center of the fittings at the other end of the hose. 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. If the first measurement of warping is excessive, the position of the hose relative to the water supply shall be permitted to be reversed, end for end, and the test for warping repeated.

4-3.6 Rise shall be measured to the nearest inch (25 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. (508 mm) 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. (457 mm) 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 to the test pressure and immediately released.

4-5* Burst Test. One 3-ft (0.9-m) sample shall be cut from the end of two lengths of hose and submitted for testing before the hose is subjected to the proof pressure test. One of the samples shall be tested while lying straight and the other while lying curved on a surface having a radius of 27 in. (685 mm). A protective enclosure shall be used.

The 3-ft (0.9-m) samples 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, can 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, 1 1/2 in. (38 mm) wide shall be cut out accurately, with 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 1 1/2 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 shall have a constricted portion 0.25 in. × 1.30 in. (6.4 mm × 33 mm). The enlarged ends shall be 1 in. (25 mm) wide.

4-7.3 The constricted portion of each specimen shall be permitted to 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 shall be permitted to be used for the tensile strength and elongation tests.

4-7.4 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 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 shall be permitted to be accepted if within the minimum requirements.

4-8 Oven Aging Test. Three specimens shall be prepared as described in 4-7.2 through 4-7.5. The specimens shall be conditioned in an oven for 96 hours at $70^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($158^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$) following the procedures described in ASTM D 573, *Test Method for Rubber Deterioration in an Air Oven*. Two benchmarks 1 in. (25 mm) apart shall be stamped centrally on the constricted portion of each specimen after the conditioning. The specimens shall then be tested in accordance with ASTM D 412, *Test Method for Rubber Properties in Tension*, Method A.

4-9 Ozone Resistance. Three specimens, sized $3\frac{3}{4}$ in. $\times$ 1 in. (85 mm $\times$ 25 mm) (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 $40^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ($104^{\circ}\text{F} \pm 1.8^{\circ}\text{F}$). 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 magnifying glass.

4-10 Test for Cold Resistance.

4-10.1 A cold box capable of maintaining a temperature of $-54^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($-65^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$) 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. Then the hose shall be removed from the water bath, exposed to room atmosphere for 15 minutes, and then placed in the cold box maintained at $-54^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($-65^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$). 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 then be subjected to the proof test pressure as specified in Section 4-2.

4-10.3 A 50-ft (15-m) length of dry hose shall be firmly coiled and placed in the cold box at $-54^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($-65^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$) for 24 hours. Immediately after removing the hose from the cold box, an attempt shall be made by one operator to uncoil and lay out the hose.

4-11 Oil Immersion Test.

4-11.1 A sample of the liner shall be immersed in a petroleum-base oil at $121^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ($250^{\circ}\text{F} \pm 1.8^{\circ}\text{F}$) for 18 hours and the tensile strength and elongation determined as specified in Section 4-7.

4-11.2 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 $93^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($199.4^{\circ}\text{F} \pm 5.4^{\circ}\text{F}$), and an open cup flash point of $246.1^{\circ}\text{C} \pm 5.6^{\circ}\text{C}$ ($475^{\circ}\text{F} \pm 10^{\circ}\text{F}$).

Chapter 5 Sampling, Inspection, and Tests

5-1 General Inspection and Tests.

5-1.1 The manufacturer shall be responsible for performing all inspection requirements. Manufacturers shall be permitted to 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 shall be permitted to 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.

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

5-1.9 The purchaser shall specify if any of the other tests specified in Sections 4-8 through 4-11 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 as mandatory requirements and shall be considered part of the requirements of this standard. The edition indicated for each referenced mandatory document is the current edition as of the date of the NFPA issuance of this standard. Some of these mandatory documents might also be referenced in this standard for specific informational purposes and, therefore, are also listed in Appendix B.

6-1.1 NFPA Publication. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 1962, *Standard for the Care, Use, and Service Testing of Fire Hose Including Couplings and Nozzles*, 1993 edition.

6-1.2 ASTM Publications. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D 380, *Standard Test Methods for Rubber Hose*, 1994.

ASTM D 412, *Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers — Tension*, 1992.

ASTM D 518, *Standard Test Method for Rubber Deterioration — Surface Cracking*, 1986.

ASTM D 573, *Standard Test Method for Rubber Deterioration in an Air Oven*, 1988.

6-1.3 U.S.D.A. Publications. U.S. Forest Service, San Dimas Technology and Development Center, San Dimas, CA 91773.

U.S.D.A. Forest Service Specification 5100-186, *Lined, Cotton-Synthetic Jacketed Fire Hose*.

U.S.D.A. Forest Service Specification 5100-187, *Lined, Synthetic Woven Jacket Fire Hose*.

Appendix A Explanatory Material

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

A-1-3 Approved. 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, 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 that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A-1-3 Authority Having Jurisdiction. 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, or 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 or her 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.

A-1-3 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations 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.

A-2-2.2 A minimum design service test pressure of 300 psi (2070 kPa) for attack hose provides a normal highest operating pressure of 275 psi (1895 kPa). If a higher operating pressure is needed, see 2-1.1 for determining the required design service test pressure.

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 minimum design service test pressure of 200 psi (1380 kPa) for supply hose provides a normal highest operating pressure of 185 psi (1275 kPa). If a higher operating pressure is needed, see 2-1.1 for determining the required design service test pressure.

A-2-4.2 A minimum design service test pressure of 150 psi (1034 kPa) for occupant use hose provides a normal highest operating pressure of 135 psi (930 kPa). If a higher operating pressure is needed, see 2-1.1 for determining the required design service test pressure.

A-2-5.2 A minimum design service test pressure of 300 psi (2070 kPa) for forestry hose provides a normal highest operating pressure of 250 psi (1723 kPa). If a higher operating pressure is needed, see 2-1.1 for determining the required design service test pressure.

A-2-6.14.1 A minimum design service test pressure of 165 psi (1138 kPa) for suction hose provides a normal highest operating pressure of 150 psi (1034 kPa). If a higher operating pressure is needed, see 2-1.1 for determining the required design service test pressure.

A-3-1.1 The friction loss characteristics of fire hoses are not included in this standard but are an important consideration in the selection of hose. Friction loss varies considerably depending on the construction and design of the hose, the roughness of the lining, and its internal diameter, which may be different for different grades of hose. The type of couplings can also affect the friction loss.

Where friction loss is important, side-by-side comparisons are recommended. The following test is recommended.

All comparative tests should use 300 ft (92 m) of each type of hose to be tested laid side-by-side on a level surface. Commercially available line pressure gauges should be installed at the inlet and the outlet of the first 300 ft (92 m) of hose to be tested.

A smooth bore nozzle of the recommended size is to be used for the tests. Pressurize the test hose while the nozzle is fully open until the inlet line gauge reads 150 psi (1034 kPa). Read the pressure shown on the outlet line gauge. Subtract the outlet pressure from the inlet pressure and divide by 3 to determine the friction loss per 100 ft (31 m) of hose. Repeat the test for the next type hose to be tested. The hose with the lowest friction loss will flow the most amount of water for a given inlet pressure.

Recommended Hose Size		Smooth Bore Nozzle Size	
(in.)	(mm)	(in.)	(mm)
1 1/2 in.	(38 mm)	3/8 in.	(16 mm)
1 3/4 in.	(44 mm)	3/8 in.	(16 mm)
2 in.	(51 mm)	3/4 in.	(19 mm)
2 1/2 in.	(65 mm)	1 in.	(25 mm)
3 in.	(76 mm)	1 1/4 in.	(32 mm)
3 1/2 in.	(88 mm)	1 1/2 in.	(38 mm)
4 in.	(100 mm)	2 in.	(51 mm)
4 1/2 in.	(113 mm)	2 in.	(51 mm)
5 in.	(125 mm)	2 1/4 in.	(57 mm)
6 in.	(150 mm)	2 1/4 in.	(57 mm)

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-3-3.1 Fire hose should not be used for the conveyance of potable water. There are hoses specifically designed for this purpose such as hoses designed to Federal Specifications ZZ-H-451, *Hose, Fire, Woven-Jacketed Rubber — or Latex or Rubber Coated Fabric-Lined, with Couplings*; MIL-H-24606, *Hose Assemblies, Chlorosulfonated Polyethylene Impregnated, Double Synthetic Jacket, with Couplings, Fire Fighting and Other Water Service*; and MIL-H-53027, *Hose Assembly, Rubber: Lightweight Collapsible, 6-inch for Drinking (Potable) Water*.

Linings for these hoses should be approved to NSF 14, *Plastic Piping Components and Related Materials*, or Title 21 (Food and Drug Administration), Part 177.2600, Chapter 1, of the *Code of Federal Regulations*.

A-3-4.2 Hose manufactured before 1987 will not have the service test pressure stenciled on the hose. Users wishing to mark their existing hose should contact the hose manufacturer for the correct designation prior to marking their hose.

A-4-3.3 For this purpose, an edge of the table should be marked off in ft and in. (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-4-5 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 purposes only and are thus not considered part of the requirements of this standard unless also listed in Chapter 6. The edition indicated here for each reference is the current edition as of the date of the NFPA issuance of this standard.

B-1.1 Code of Federal Regulations. Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

Code of Federal Regulations, Title 21, Part 177.2600, "Rubber Articles Intended for Repeated Use."

B-1.2 Military and Federal Specifications. Naval Publications and Forms Center, 5801 Tabor Ave., Attn: NPODS, Philadelphia, PA 19120-5094.

MIL-H-24606, *Hose Fire, Synthetic Fiber, Double Jacketed, Treated for Abrasion Resistance, with Couplings, Fire Fighting and Other Water Service*, Revision B, August 12, 1994.

MIL-H-53027, *Hose Assembly, Rubber: Lightweight Collapsible, 6-inch for Drinking (Potable) Water*, Revision A, December 18, 1990.

ZZ-H-451, *Hose, Fire, Woven-Jacketed Rubber — or Latex or Rubber Coated Fabric-Lined, with Couplings*, Revision G, January 13, 1984.

B-1.3 NSF Publication. National Sanitation Foundation, 3475 Plymouth Rd, P.O. Box 1468, Ann Arbor, MI 48106.

NSF 14, *Plastic Piping Components and Related Materials*, 1990.