NFPA 1962

Standard for the Care, Use, and Service Testing of Fire Hose Including Couplings and Nozzles

1998 Edition

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

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This edition of NFPA 1962, *Standard for the Care, Use, and Service Testing of Fire Hose Including Couplings and Nozzles*, 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 17–19, 1997, in Kansas City, MO. It was issued by the Standards Council on January 16, 1998, with an effective date of February 6, 1998, and supersedes all previous editions.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

This edition of NFPA 1962 was approved as an American National Standard on February 6, 1998.

Origin and Development of NFPA 1962

NFPA originally developed a Recommended Practice for the care, maintenance, and use of fire hose in 1936 through its Committee on Field Practices. This document was designated NFPA 198 and was revised extensively through the years. In 1954, the Fire Hose Committee assumed the responsibility for the document.

In 1979, NFPA 1962 was issued as a new standard. The standard was completely rewritten but still contained portions of NFPA 198. The requirements were carefully developed to ensure a reasonable level of reliability for fire hose that is in service.

The 1993 edition added requirements for service testing hose before it is placed in service to ensure that there is no damage during shipment or while in storage. That edition recognized that 6-in. (150-mm) supply hose can only be used to 135 psi (930 kPa) working pressure and 150 psi (1035 kPa) service pressure. The term *rack and reel hose* was changed to *occupant-use hose* to be consistent with NFPA 1961. The increased use of hose testing machines was recognized in the test procedure section. The test requirements for booster and suction hose were revised by incorporating the information in the standard rather than referring to a different standard.

This 1998 edition adds requirements that booster and suction hose be tested within 90 days prior to being placed in service and defines a separate test procedure when using a hose testing machine from the procedure when using a stationary fire pump or pumper as the pressure source. It also requires that unlined fire hose be replaced with lined fire hose when the unlined fire hose comes due for testing.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in membership may have occurred. A key to classifications is found at the back of this document.

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

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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. This standard shall apply to the care of all types of fire hose, coupling assemblies, and nozzles while in service, in use, and after use, including record keeping, inspecting, and service testing.

1-2 Purpose.

1-2.1 The purpose of this standard is to provide a reasonable level of safety for users of fire hose and a reasonable degree of assurance that the hose, coupling assemblies, and nozzles will perform as designed.

1-2.2 Unless otherwise noted, it is intended that the provisions of this standard be applied to equipment or installations that were existing or approved for construction or installation prior to the effective date of the standard.

1-3 Definitions.

Approved.* Acceptable to the authority having jurisdiction.

Attack Hose. Hose designed for use by trained fire fighters and fire brigade members to combat fires beyond the incipient stage. The 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 fire departments.

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

Booster Hose. A hose having a rubber tube, a braided or spiraled reinforcement, and an outer protective cover. The hose is manufactured in sizes up to $1^1/_2$ in. (38 mm) and is intended for use on fire apparatus.

Braided Reinforcement. A hose reinforcement consisting of one or more layers of interlaced spiraled strands of yarn or wire, with a layer of rubber between each braid.

Coating. A protective material that impregnates or saturates the yarn of the jacket so the outside of the jacket is relatively smooth.

Covered Hose. A hose with a jacket covered and lined with a continuous synthetic rubber or plastic. The cover is usually thicker than a coating.

Fire Hose. A flexible conduit constructed with one or more reinforcements (jackets), with or without a coating or covering but with an approved nonpermeable lining, or with an inner reinforcement between a protective cover and an approved nonpermeable lining.

Fold. A transverse bend (fold) occurring where the hose is lengthwise doubled over on itself, as on a pin rack.

Forestry 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 pumps on fire apparatus from hydrants if designed for that purpose. The hose contains a semirigid or rigid reinforcement designed to prevent collapse of the hose under vacuum.

In Service. Hose ready for use and kept in hose houses, on racks or reels, or on fire apparatus, but not including hose in storage where it is not readily available to be put into service at an incident.

In Storage. Hose that is not readily available for use because it is not at the scene of an incident and not loaded on a vehicle that can transport it to the scene.

In Use. Hose being used during fire suppression or during training.

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 $3^1/_2$-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 up to at least 275 psi (1896 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.

Multiple Jacket. A construction consisting of a combination of two separately woven jackets (double jacket) or two or more jackets interwoven.

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.

Psi. Pounds per square inch shown in this document as gauge pressure.

Relay-Supply Hose. A single-jacket fire hose of 3-in. (90-mm) diameter or larger used to move large volumes of water at low pressure and manufactured prior to January 1987 to meet the requirements of the 1979 and prior editions of NFPA 1961, *Standard for Fire Hose.*

Service Test. Hydrostatic test conducted by users on all in-service hose to determine suitability for continued service.

Shall. Indicates a mandatory requirement.

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

Single Jacket. A construction consisting of one woven jacket.

Soft Suction Hose. Collapsible hose used to supply pumpers from hydrants.

Spiral Reinforcement. A hose reinforcement consisting of pairs of layers of yarn spiraled with no interlacing between the individual layers. The layers of yarn in each pair are spirally wound in opposite directions. A layer of rubber separates each pair of spiraled layers.

Unlined Hose. A hose consisting of only a woven jacket that is usually of linen yarns and is of such quality that the yarn swells when wet, tending to seal the hose.

Water Hammer.* The surge of pressure caused when a high-velocity flow of water is abruptly shut off. The pressure exerted by the flowing water against the closed system can be seven or more times that of the static pressure.

1-4 Units of Measurement.

1-4.1* Metric units of measurement in this standard are in accordance with the modernized metric system known as the International System of Units (SI). The liter, a unit that is outside of but recognized by SI, is commonly used in international fire protection. The SI units used in this standard are listed in Table 1-4.1 with their conversion factors.

Table 1-4.1 SI Conversions

Quantity	U.S. Unit (Symbol)	SI Unit (Symbol)	Conversion Factor
Length	inch (in.)	millimeter (mm)	1 in. = 25.4 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/min)	1 gpm = 3.785 L/min
Pressure	pounds per sq inch (psi)	kilopascal (kPa)	1 psi = 6.895 kPa

1-4.2 In this standard, U.S. values for measurements are followed by an equivalent in SI units. The U.S. value shall be regarded as the requirement because the SI equivalent value can be approximate. However, as all $2\frac{1}{2}$-in. hose shall have an internal waterway of $2\frac{9}{16}$ in., as specified in NFPA 1961, *Standard on Fire Hose*, the SI unit value for $2\frac{9}{16}$ in. (65 mm) is required.

Chapter 2 Care and Use of Fire Hose

2-1 Attack Hose, Supply Hose, and Forestry Hose.

2-1.1* Hose shall be inspected and service-tested as specified in Chapter 5 within 90 days prior to being placed in service for the first time and at least annually thereafter.

2-1.2* Hose carried on fire apparatus shall be loaded in such a way that air can circulate under the hose load to eliminate or reduce the growth of mildew in the hose jackets and rust and corrosion in the hose compartment. Only clean, dry hose shall be placed into service. Wet hose accelerates mildew growth and rusting; therefore, hose shall be thoroughly dried before being placed in service.

2-1.3* Hose shall be removed from the apparatus and reloaded so that the folds occur at different positions with sufficient frequency to prevent damage and permanent folds setting in the rubber lining.

2-1.4* Large-diameter hose used to supply a pumper from a hydrant shall be repacked in a different position after each use to avoid folds and strains occurring at the same location.

2-1.5 Large-diameter hose used to supply a pumper from a hydrant shall be protected from chafing with chafing blocks or similar protection where it comes in contact with pavement or curbing. When connecting a pumper to a hydrant, the hose shall be bent slightly to avoid kinks when the water is turned on.

2-1.6 Large-Diameter Supply Hose.

2-1.6.1 Large-diameter hose marked SUPPLY HOSE shall not be used at operating pressures exceeding 185 psi (1275 kPa) when supplying fire department pumpers from hydrants; when relaying water from pumper to pumper; and when directly supplying attack lines, master stream appliances, portable hydrants, manifolds, and standpipe and sprinkler systems.

Exception: Six-inch (152-mm) supply hose shall not be used at operating pressures exceeding 135 psi (930 kPa).

2-1.6.2* A pressure and volume relief device with adequate capabilities and a maximum setting, not to exceed the service test pressure of the hose being used, shall be used on the discharge side of the pump when large-diameter supply hose is being used to supply attack lines, manifolds, and standpipe and sprinkler systems. Rapid closing or opening valves shall not be used with large-diameter supply hose.

2-1.6.3 Where large-diameter hose marked SUPPLY HOSE is used in relay between fire department pumpers, the suction of each receiving pumper shall be equipped with a relief valve. The maximum pressure setting of the relief valve(s) shall be not more than 10 psi (69 kPa) over the static pressure of the water source to which it is connected or not more than 10 psi (69 kPa) over the discharge pressure of a supply pumper in a relay. In no event shall it exceed the working pressure of the hose used with the system.

2-1.7* Hose, while in use, shall be positioned to minimize mechanical damage and heat exposure; nozzles and valves shall be opened and closed slowly to prevent pressure surges and water hammer that can burst the hose and in turn cause injury to people or damage to the pump. Care shall be taken to prevent the hose from chafing.

2-1.8 When hose is in use during subfreezing weather, care shall be taken to prevent water from freezing inside the hose. To help prevent freezing once the water is turned on, some water shall be left running through the hose until the line is no longer needed. When the line is no longer needed, it shall be uncoupled and drained before the water freezes.

2-1.9* Hose that has frozen during use shall be thawed and service-tested as specified in Chapter 5 before being put back in service or in storage.

2-1.10* After each use and before being placed in storage or back in service, the hose shall be drained, cleaned, dried, and inspected as specified in Sections 2-5 and 2-6.

2-2* Relay-Supply Hose. This section shall apply only to relay-supply hose manufactured to the requirements of the 1979 and prior editions of NFPA 1961, *Standard for Fire Hose.*

2-2.1 In-service hose shall be inspected and service-tested as specified in Chapter 5 at least annually.

2-2.2 Hose carried on fire apparatus shall be loaded in such a way that air can circulate under the hose load to eliminate or reduce the growth of mildew in the hose jackets and rust and corrosion in the hose compartment. Only clean, dry hose shall be placed into service. Wet hose accelerates mildew growth and rusting and shall be thoroughly dried before being placed in service.

2-2.3 Hose shall be removed from the apparatus and reloaded so that the folds occur at different positions with sufficient frequency to prevent damage and permanent folds setting in the rubber lining.

2-2.4 Relay-supply hose used to supply a pumper from a hydrant shall be repacked in a different position after each use to avoid folds and strains occurring at the same location.

2-2.5 Relay-supply hose used to supply a pumper from a hydrant shall be protected from chafing with chafing blocks or similar protection where it comes in contact with pavement or curbing. When connecting a pumper to a hydrant, the hose shall be bent slightly to avoid kinks when the water is turned on.

2-2.6 Relay-supply hose shall not be used at operating pressures exceeding 185 psi (1275 kPa) when supplying fire department pumpers from hydrants; when relaying water from pumper to pumper; and when directly supplying attack lines, master stream appliances, portable hydrants, manifolds, and standpipe and sprinkler systems.

Exception: Six-inch (152-mm) relay-supply hose shall not be used at operating pressures exceeding 135 psi (930 kPa).

2-2.7* Fire departments shall establish operational procedures for relay-supply operations. Special precautions shall be used when relaying water from a pump at a water source to a pump near the fire ground or to other pumps in a relay in order to control pressure surges and water hammer. The pump receiving the relay shall be provided with a relay-relief valve on the inlet (suction) to which the relay-supply hose is attached. The maximum pressure setting of the relief valve(s) shall be not more than 10 psi (69 kPa) over the static pressure of the water source to which it is connected, and in no event shall it exceed the working pressure of the hose used within the system.

2-2.8 Care shall be taken to avoid dragging the hose. If the hose must be dragged, it shall be dragged flat.

2-2.9* Vehicles shall not be driven over relay-supply lines unless the hose is bridged.

2-2.10 When hose is in use during subfreezing weather, care shall be taken to prevent water from freezing inside the hose. To help prevent freezing once the water is turned on, some water shall be left running through the hose until the line is no longer needed. When the line is no longer needed, it shall be uncoupled and drained before the water freezes.

2-2.11 Hose that has frozen during use shall be thawed and service-tested as specified in Chapter 5 before being put back in service or in storage.

2-2.12 After use and before being placed in storage or back in service, the hose shall be drained, cleaned, dried, and inspected as specified in Sections 2-5 and 2-6.

2-3* Occupant-Use Hose.

2-3.1 Occupant-use hose shall be service-tested as specified in Chapter 5 within the 90 days prior to being put in service.

2-3.2 In-service hose designed for occupant use only shall be removed and service-tested as specified in Chapter 5 at intervals not exceeding 5 years after installation and every 3 years thereafter.

2-3.3 In-service hose shall be unracked, unreeled, or unrolled and physically inspected as specified in Section 2-5 at least annually. Hose shall be reracked, rereeled, or rerolled so that any folds do not occur at the same position on the hose.

2-3.4* Hose stored on racks or reels shall be protected from the weather and any local environmental condition that can be harmful to the hose. Hose shall be protected from mechanical damage and exposure to heat. Enclosures for occupant-use hose shall be constructed and the hose stored in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances.*

2-3.5 In areas where rodents can pose a problem, the hose shall be visually inspected more frequently for rodent damage.

2-3.6 After each use and before being placed back in service, the hose shall be inspected as specified in Section 2-5, service-tested as specified in Chapter 5, and cleaned and dried as specified in Section 2-6.

2-4 Booster and Suction Hose.

2-4.1 The hose shall be service-tested as specified in Section 5-4 within 90 days prior to being placed in service for the first time and at least annually.

2-4.2* Hose shall be stored out of direct sunlight and as recommended by the manufacturer. The hose shall not be stored kinked and, if stored on a reel, care shall be taken to avoid twisting the hose when rolling it onto the reel.

2-4.3 Hose that has the reinforcement exposed shall be removed from service and repaired or condemned. The defective section shall be permitted to be cut out and the length recoupled and service-tested as specified in Section 5-4.

2-4.4 Foreign objects of any kind, including items of equipment, shall not be carried inside the hose.

2-5 Inspecting.

2-5.1 Physical inspection shall determine that the hose, couplings, and any nozzle have not been vandalized; are free of debris; and exhibit no evidence of mildew, rot, or damage by chemicals, burns, cuts, abrasion, and vermin.

2-5.2 If the hose fails the physical inspection, it shall be removed from service, repaired as necessary, and service-tested as specified in Chapter 5 or condemned.

2-5.3 The couplings shall be inspected as specified in 4-2.1.

2-5.4 Where nozzles are required on occupant-use hose, they shall be inspected as specified in 4-1.1, 4-1.2, and 4-1.3.

2-6 Cleaning and Drying.

2-6.1* After each use, all hose shall be cleaned. If the dirt cannot be thoroughly brushed from it or if it has come in contact with harmful materials, the hose shall be washed.

2-6.2 If, during use, the hose has been exposed to hazardous materials, it shall be decontaminated by the method approved for the contaminate.

2-6.3* All hose shall be drained and thoroughly dried before being placed in service or in storage. Covered hose shall be permitted to be wiped dry. Hose shall not be dried on hot pavements or under intense sunlight.

2-7 Storage.

2-7.1* Hose in storage shall be kept out of direct sunlight and in a well-ventilated location. Hose shall be stored only after it has been properly inspected, service-tested if required, cleaned, dried, and rolled.

2-7.2 Hose that is out of service for repair shall be properly tagged as specified in Chapter 3 and kept separated from any hose that is in storage and ready for service.

Chapter 3 Hose Records

3-1 Attack Hose, Supply Hose, and Occupant-Use Hose.

3-1.1* Accurate hose records shall be established and maintained.

3-1.2* Each length of hose shall be assigned an identification number for use in recording its history throughout its service life. The identification number shall be stenciled on the jacket or cover using an ink or paint that is not harmful to the hose. The identification number shall be permitted to be stamped on the bowl or swivel of the female coupling in a manner that prevents damage to the coupling.

3-1.3* Records of hose used by fire departments shall be kept as part of the department's or individual company's complete equipment inventory.

3-1.4 Records for hose on racks or reels or in enclosures shall be kept at the hose location or at a control location on the premises where the hose is located.

3-1.5* The following information shall be included for each length of hose:

(a) Assigned identification number
(b) Manufacturer and part number
(c) Vendor
(d) Size (internal diameter of waterway)
(e) Length
(f) Type of hose
(g) Construction
(h) Date received and date put in service
(i) The date of each service test and the service test pressure
(j) Repairs and new length if shortened
(k) Actual damage
(l) Exposure to possible damage
(m) Reason removed from service
(n) Reason condemned
(o) Indication that the hose has been removed from service or condemned within the warranty period because of an in-warranty failure

3-1.6* Out-of-service hose shall be properly tagged with the reason for removal from service noted on the tag.

3-1.7 Personnel responsible for the repair and maintenance of fire hose shall ensure that a report of the work performed to repair each length is recorded on the permanent hose record.

3-2 Forestry Hose.

3-2.1* The authority having jurisdiction shall determine the records necessary to achieve an effective hose management program for forestry hose.

Chapter 4 Nozzles, Couplings, and Gaskets

4-1 Nozzles.

4-1.1 Nozzle valves attached to in-service hose shall be kept in the closed position.

4-1.2* All nozzles shall be inspected after each use and at least annually. The nozzle inspection shall include verification of the following:

(a) Waterway clear of obstructions
(b) No damage to tip
(c) Full operation of adjustments such as pattern selection and so forth
(d) Proper operation of shutoff valve, if so equipped
(e) No missing parts
(f) Thread gasket in good condition in accordance with 4-3.1

4-1.3 If the nozzle fails the inspection for any reason, it shall be removed from service and repaired or replaced.

4-1.4 If, during use, there is an obstruction that cannot be removed by flushing the nozzle, the nozzle shall be taken from the hose line and the obstruction removed through the connection end as soon as is practicable, since any further attempt to force the obstruction out through the tip can damage the nozzle.

4-1.5 Care shall be taken to avoid dents or nicks in nozzle tips, as these can seriously affect the reach of the stream. To prevent mechanical damage, nozzles shall be handled with care. They shall not be dropped or thrown.

4-1.6 Nozzle control valves shall be opened and closed slowly to eliminate unnecessary strain on the hose and couplings and reduce pressure surges.

4-1.7* After each use, all nozzles shall be thoroughly washed and inspected in accordance with 4-1.2 before being placed back in service.

4-2 Couplings.

4-2.1* Couplings shall be kept in serviceable condition. After each use, and during each hose service test, they shall be visually inspected for the following:

(a) Damaged threads
(b) Corrosion
(c) Slippage on the hose
(d) Out-of-round
(e) Swivel not rotating freely
(f) Missing lugs
(g) Loose external collar
(h) Internal gasket in accordance with Section 4-3
(i) Other defects that impair operation

Defective couplings shall be removed from service and repaired or replaced. The internal gasket shall be inspected as specified in 4-2.8. A lubricant specified by the coupling manufacturer shall be permitted to be used on coupling swivels and threads.

4-2.2* Care shall be taken not to drop the couplings on pavement or other hard surfaces that can cause damage to the swivel section or exposed threads.

4-2.3 Care shall be taken to prevent vehicles from driving over couplings.

4-2.4 Special care shall be taken where couplings of dissimilar metals are connected, as corrosion can occur due to this difference and moisture tends to accelerate this corrosion. Where couplings of dissimilar metals are left connected, they shall be disconnected and inspected at least quarterly. If corrosion exists, the couplings shall be cleaned and an anticorrosive lubricant specified by the coupling manufacturer shall be applied to the threads. Anticorrosive lubricant shall be applied at the time of each service test.

4-2.5* When attaching new or used couplings, care shall be taken to have the hose fit properly in the bowl of the coupling. The outside diameter of the hose shall fit snugly in the internal diameter of the bowl of the coupling. The expansion ring shall be of the proper size and length for the coupling used. A new tail gasket shall be used.

4-2.6* When couplings are attached or reattached to hose, the hose shall be tested at its service test pressure in accordance with Chapter 5.

Warning: Retesting repaired or recoupled fire hose can be extremely dangerous. Extreme care shall be taken to prevent exposure of anyone to the hose during the test.

4-2.7 The date and nature of the repair or recoupling and the identity of the person performing the repair shall be recorded for each length of hose as specified in 3-1.5.

4-2.8 The socket head cap screws on shank-type couplings shall be checked at least annually to ensure they are torqued to the manufacturer's specified tolerance.

4-3 Gaskets.

4-3.1* The thread gasket in couplings and nozzles shall be inspected for presence, tight fit, and lack of deterioration. If defective, it shall be replaced with a new gasket.

4-3.2* Gaskets shall not protrude into the waterway.

Chapter 5 Service Testing

Warning: Service testing of hose is undertaken to confirm its suitability for continued use. Because there is a potential for catastrophic failure during these tests, it is vital that adequate safety precautions be taken.

5-1 Service Test Pressure.

5-1.1 Hose Manufactured Prior to July 1987.

5-1.1.1 The service test pressure for hose manufactured prior to July 1987 to meet the requirements of the 1979 and previous editions of NFPA 1961, *Standard for Fire Hose,* shall be determined from Table 5-1.1.1 based on the type of hose and the acceptance or proof test pressure that is stenciled on each length of hose and reads "Tested to . . . PSI."

5-1.1.2 The acceptance or proof test pressure that is stenciled on hose manufactured prior to July 1987 shall not be used for the service test pressure.

5-1.2 Hose Manufactured July 1987 and After.

5-1.2.1 The service test pressure for hose manufactured in July 1987 and after to meet the requirements of the 1987 and subsequent editions of NFPA 1961, *Standard on Fire Hose,* is stenciled on each length of hose and reads "Service Test to . . . PSI per NFPA 1962."

5-1.2.2 New proof pressure tests for hoses shall only be conducted at the point of manufacture or at a facility properly equipped to perform these tests. Tests in the field shall not subject the hose to its proof test pressure.

5-1.3* After determining the correct service test pressure for each length of hose to be tested, the service test shall be conducted as specified in Section 5-2.

Table 5-1.1.1 Service Test Pressures for Hose Manufactured Prior to July 1987

Trade Size in. (mm)	Jackets	New Hose Rated Acceptance Test Pressure psi (kPa)	Service Test Pressure psi (kPa)
Lined industrial, standpipe, and fire department			
$1^1/_2$–$2^1/_2$ (38–65)*	Single	300 (2070)	150 (1030)
$1^1/_2$–$4^1/_2$ (38–114)	Single	400 (2760)	250 (1720)
$1^1/_2$–$2^1/_2$ (38–65)	Single	500 (3450)	250 (1720)
$1^1/_2$–4 (38–100)	Multiple	400 (2760)	250 (1720)
$1^1/_2$–4 (38–100)	Multiple	600 (4140)	250 (1720)
Unlined standpipe			
$1^1/_2$ and $2^1/_2$ (38 and 65)	Single		150 (1030)
Lined forestry			
1 and $1^1/_2$ (25 and 38)	Single	450 (3100)	250 (1720)
Unlined Forestry			
1 and $1^1/_2$ (25 and 38)	Single	450 (3100)	250 (1720)
Relay supply			
$3^1/_2$–5 (90–125)	Single	400 (2760)	200 (1380)
6 (150)	Single	300 (2070)	150 (1030)
Pumper Supply (soft suction)			
4–6 (100–150)	Multiple	400 (2760)	200 (1380)

*$1^1/_2$–$2^1/_2$-in. (38–65-mm) single-jacket hose with a new hose rated acceptance test pressure of 300 psi (2070 kPa) shall not be maintained on fire apparatus for fire-fighting purposes.

5-2 Service Test Procedure.

5-2.1 Each length of hose to be service-tested shall be inspected as specified in Section 2-5. Any length of hose that fails the inspection shall be removed from the service test area and repaired as necessary or condemned.

5-2.2* Each length of hose to be tested simultaneously shall be of the same service test pressure and, collectively, shall be considered the hose test layout. The total length of any hose line in the hose test layout to be service-tested shall not exceed 300 ft (91 m). The hose test layout shall be straight, without kinks or twists.

Exception: Hose that has been repaired or recoupled shall be tested one length at a time.

5-2.3 All $3^1/_2$-in. (89-mm) and larger diameter hose shall be service-tested while lying flat. A short length of smaller diameter hose with the same or higher proof pressure shall be used to connect the pressure source to the hose being tested.

5-2.4 A test location shall be selected that allows connection of the hose testing apparatus (pressure source) to an adequate water source.

5-2.5* A hose testing machine, a stationary pump, or a pump on a fire department apparatus shall be used as a pressure source. If a hose testing machine is used, the procedure defined in Section 5-5 shall be used. If a stationary pump or a pump on a fire department apparatus is used, the procedure defined in Section 5-6 shall be used.

5-2.6 At the conclusion of the test, the hose records specified in Chapter 3 shall be updated to indicate the results of the service test for each length of hose tested.

5-2.7* All hose failing the physical examination, bursting, leaking, or having couplings that fail because of slippage or leakage shall be tagged as required in 3-1.6, removed from service, and repaired or discarded. Hose that has been repaired shall be service-tested again before being placed back in service.

5-2.8 For leaking hose or for hose jackets failing the physical examination, a distinguishing mark noting the location of the defects shall be placed on the hose. For defective couplings, the couplings shall be cut from the hose.

5-2.9 After testing, all hose shall be thoroughly cleaned, drained, and dried as specified in Section 2-6 before being placed in service or storage.

5-3 Unlined Hose. Unlined fire hose shall be replaced with an approved lined fire hose when service testing is required.

5-4 Booster and Hard Suction Hose.

5-4.1* Booster hose shall be tested annually in accordance with Section 5-2 to 110 percent of its maximum working pressure. If a maximum working pressure cannot be determined for the hose, it shall be tested to 110 percent of the normal highest working pressure as used in the system.

5-4.2* Hard suction hose shall be dry-vacuum tested annually as follows:

(a) The hose shall be attached to a suction source.

(b) The free end shall be sealed with a transparent disk and connected to an accurate vacuum measuring instrument.

(c) A 22-in. (74.5-kPa) mercury vacuum shall be developed. While holding the vacuum for 10 minutes, the lining of the hose shall be inspected through the transparent disk. There shall be no collapsing of the lining into the waterway.

5-4.3* If hard suction hose is used under positive pressure, it shall also be service-tested to a water pressure of 165 psi (1138 kPa) using the procedures outlined in Section 5-2.

5-5 Service Test Using a Hose Testing Machine. The following procedure shall be used when hose is service-tested using a hose testing machine.

5-5.1 Hose Testing Machine Integrity. The condition of the hose testing machine shall be thoroughly checked before commencing the service tests. This check shall be performed daily before each testing session and before using the hose testing machine each time it is transported to a new testing site.

5-5.1.1 The hose testing machine shall be carefully examined for damaged components that might fail during the test. If any damage is discovered, the hose testing machine shall not be used until the damaged component(s) is repaired or replaced.

5-5.1.2 A pressure leak integrity test shall be performed on the machine to determine whether the pressurized outlet side of the machine and its related components are leak free. The fire hose outlet connection(s) of the machine shall be capped or otherwise closed. Pressure shall be applied through the machine using the integral pump to a level that is 10 percent higher than the highest service test pressure needed for the hose to be tested. The pressure shall be held for 3 minutes with the pump turned off. If leaks are detected, the testing machine shall not be used until the leaking component(s) is repaired or replaced.

5-5.1.3 The test gauge that is used to read the test pressure shall have been calibrated within the previous year.

5-5.2 Conducting the Test.

5-5.2.1 The test layout shall be connected to the outlet side of the water supply valve on the hose testing machine. A test cap with a bleeder valve shall be attached to the far end of each hose line in the test layout. If a test cap is not available, a nozzle with a nontwist shutoff shall be permitted to be used.

5-5.2.2* With the test cap valve or the nozzle open, the pressure shall be raised gradually to 45 psi ± 5 psi (310 kPa ± 35 kPa). After the hose test layout is full of water, all the air in each hose line shall be exhausted by raising the discharge end of each hose line above the highest point in the system. The nozzle or test cap valve shall be closed slowly, then the outlet water supply valve shall be closed.

Warning: Care shall be taken to remove all air from the hose before the valve in the test cap or the nozzle is closed and the pressure raised. The development of test pressures introduces a serious accident potential if air remains in the system.

5-5.2.3* The hose directly in back of the test cap or the nozzle shall be secured to avoid possible whipping or other uncontrolled reactions in the event of a hose burst.

5-5.2.4 With the hose at 45 psi ± 5 psi (310 kPa ± 35 kPa), it shall be checked for leakage at each coupling and the couplings tightened with a spanner wrench where necessary. Each hose shall then be marked at the end or back of each coupling to determine, after the hose has been drained, if the coupling has slipped during the test.

5-5.2.5 All personnel other than those persons required to perform the remainder of the procedure shall clear the area.

5-5.2.6 The pressure shall be raised slowly at a rate not greater than 15 psi (103 kPa) per second until the service test pressure is attained and then maintained, by pressure boosts if necessary, for the duration of the stabilization period. The stabilization period shall be not less than 1 minute per 100 ft (30 m) of hose in the test layout.

5-5.2.7 After the stabilization period, the hose layout shall hold the service test pressure for 3 minutes without further pressure boosts.

5-5.2.8 While the hose test layout is at the service test pressure, it shall be inspected for leaks. If the inspecting personnel walk the test layout to inspect for leaks, they shall be at least 15 ft (4.5 m) to the left side of the nearest hose line in the test layout. The left side of the hose line shall be defined as that side that is to the left when facing the free end from the pressure source. Personnel shall never stand in front of the free end of the hose; on the right side of the hose; closer than 15 ft (4.5 m) on the left side of the hose; or straddle a hose in the test layout during the test.

5-5.2.9 If the hose test layout does not hold the service test pressure for the 3-minute duration, the service test shall be terminated and the length(s) of hose that leaked shall have failed the test. The test layout shall be drained and the defective hose removed from the test layout. The service test shall be restarted beginning with 5-5.2.1.

5-5.2.10 After 3 minutes at the service test pressure, each test cap or nozzle shall be opened to drain the test layout.

5-5.2.11 The marks placed on the hose at the back of the couplings shall be observed for coupling slippage. If the coupling has slipped, the hose shall have failed the test.

5-6 Service Test Using a Stationary Pump or a Pump on a Fire Department Apparatus. The following procedure shall be used when hose is to be service-tested using a stationary pump or a pump on a fire department apparatus.

5-6.1 The test gauge that is used to read the test pressure shall have been calibrated within 30 days prior to the testing.

5-6.2* A hose test valve consisting of a fire department gate valve with a $^1/_4$-in. (6.4-mm) opening drilled through the gate and designed to withstand the service test pressures shall be used between the pump and the hose test layout.

5-6.3 The test layout shall be connected to the hose test valve. If a fire department pumper is used, the hose test valve shall not be attached to any discharge outlet at or adjacent to the pump operator's position. The hose test valve end of the hose line shall be secured with a belt tie-in or rope hose tool at a point 10–15 in. (250–400 mm) from the coupling. A test cap with a bleeder valve shall be attached to the far end of each hose line in the test layout. If a test cap is not available, a nozzle with a nontwist shutoff shall be permitted to be used.

5-6.4* With the hose test valve open and the test cap valve or nozzle open, the pressure shall be gradually raised to 45 psi ± 5 psi (310 kPa ± 35 kPa). After the hose test layout is full of water, all air in each hose line shall be exhausted by raising the discharge end of each hose line above the highest point in the system. The nozzle or test cap valve shall be closed slowly, then the hose test valve shall be closed.

Warning: Care shall be taken to remove all air from the hose before the valve in the test cap or the nozzle is closed and the pressure raised. The development of test pressures introduces a serious accident potential if air remains in the system.

5-6.5* The hose directly in back of the test cap or the nozzle shall be secured to avoid possible whipping or other uncontrolled reactions in the event of a hose burst.

5-6.6 With the hose at 45 psi ± 5 psi (310 kPa ± 35 kPa), it shall be checked for leakage at each coupling and the couplings tightened with a spanner wrench where necessary. Each hose shall then be marked at the end or back of each coupling to determine, after the hose has been drained, if the coupling has slipped during the test.

5-6.7 All personnel other than those persons required to perform the remainder of the procedure shall clear the area.

5-6.8 The pressure shall be raised slowly at a rate not greater than 15 psi (103 kPa) per second until the service test pressure is attained and then maintained for 5 minutes.

5-6.9 While the test layout is at the service test pressure, the hose shall be inspected for leaks. If the inspecting personnel walk the test layout to inspect for leaks, they shall be at least 15 ft (4.5 m) to the left side of the nearest hose line in the test layout. The left side of the hose line shall be defined as that side that is to the left when facing the free end from the pressure source. Personnel shall never stand in front of the free end of the hose, on the right side of the hose, or closer than 15 ft (4.5 m) on the left side of the hose, or straddle a hose in the test layout during the test.

5-6.10 If, during the test, a section of hose is leaking or a section bursts, the service test shall be terminated, and that length of hose shall have failed the test. The test layout shall be drained, and the defective hose removed from the test layout. The service test shall be restarted beginning with 5-6.3.

5-6.11 After 5 minutes at the service test pressure, the pump shall be shut down; the hose test valve opened; the pressure allowed to equalize with the source; the pump discharge gates closed; and each test cap valve or nozzle opened to drain the test layout.

5-6.12 The marks placed on the hose at the back of the couplings shall be observed for coupling slippage. If the coupling has slipped, the hose shall have failed the test.

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 Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 1995 edition.

NFPA 1961, *Standard on Fire Hose*, 1997 edition.

Appendix A Explanatory Material

Appendix A is not a part of the requirements of this NFPA document but is included for informational purposes only. This appendix contains explanatory material, numbered to correspond with the applicable text paragraphs.

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-1-3 Water Hammer. The formula for water hammer is as follows:

$$\Delta p = cd\Delta v$$

where:
Δp = change in pressure [lb/ft^2 (kg/m^2)]
c = velocity of pressure wave traveling
back toward the water sources [ft/sec (m/sec)]
d=mass density of water [1.9 slugs/ft^3 (979.2 kg/m^3)]
Δv = change in water velocity [ft/sec (m/sec)]

NOTE: For $2^1/_2$-in. (65-mm) double-jacket rubber-lined hose, c is approximately 800 to 1000 ft/sec (240 to 300 m/sec). *(See Fire Fighting Hydraulics by R.G. Purington.)*

A-1-4.1 See ASTM E 380, *Standard Practice for Use of the International System of Units (SI) (The Modernized Metric System),* for additional information.

A-2-1.1 Attack grade hose can be used in applications designed for occupant-use hose. It is not the intent of this standard to require the testing of attack grade hose used in an occupant-use hose application any more frequently than is required by Section 2-3. If attack grade hose is installed on racks or reels or in hose houses and is designed to be used by a fire department or fire brigade, it is the intent of this standard that the hose be tested in conformance with Section 2-1.

A-2-1.2 If at all possible, the apparatus should be loaded with previously tested and dried hose and returned to service.

The use of 100 percent polyester hose has increased very rapidly. However, this hose should be thoroughly drained and dried before reloading on the apparatus. Damp or wet polyester hose loaded on the apparatus hose bed will still form mildew. Although this will not affect the hose itself, it does cause undue rusting of the apparatus body and increases the potential of dry rot in the wood flooring under the hose.

The use of a protective hose bed cover is recommended to protect the hose load from weather damage and other physical damage. Where covers are provided, care needs to be taken to permit free circulation of air under the cover to reduce mildew growth. Covers should be made from flame-resistant materials and secured to the apparatus in a manner that prevents them from blowing off while the apparatus is in motion.

Where the humidity is 70 percent or greater or where hose is for municipal use, jackets with cotton yarns should be treated with water repellents and against mildew.

A-2-1.3 It has been discovered that when 100 percent polyester hose is loaded on the apparatus in the conventional manner (horseshoe U-load, accordion, or skid loads), excessive edge wear is noted on this type of hose. As a result of this edge wear, hose manufacturers recommend that if 100 percent polyester hose is used, it should be loaded on the apparatus in the flat load manner.

The best fire department and forestry practice is to remove the hose from the apparatus at least once a month. Water should be run through the hose once quarterly and the hose thoroughly dried before being replaced on the apparatus.

The user should contact the manufacturer of the hose for advice on how often the hose should be removed from the hose bed and repacked.

A-2-1.4 Failures in short lengths of large-diameter pumper supply hose, also called soft suction hose, generally are caused when this hose is folded while carried on the apparatus and either tied down or placed in a small compartment. Where hose is constantly folded at the same points, the folds place considerable stress on the warp threads. If space limitations prevent varying folding positions, the hose should be carried in a roll on a step or running board. Many fire departments keep one end of the hose preconnected to the suction side of the pump, which decreases the time for hydrant hookup.

A-2-1.6.2 Pressure and volume relief devices should be provided to allow sufficient flow to the atmosphere to effectively prevent the pressure in large-diameter hose from exceeding the desired setting. Relief valves normally installed on fire department pumpers to control discharge pressures are not adequate to perform this function.

A-2-1.7 When hoisting attack hose, damage can be avoided and the task made easier by use of hose rollers. Synthetic hose is more susceptible than cotton hose to damage from hot embers and radiant heat. Where it is necessary for vehicles to

cross attack hose lines, hose bridges should be used. More damage to the hose is likely to occur on uncharged hose than on charged hose. To control water hammer when opening a water supply controlled by a quick-acting valve, such as a ball valve, "crack" the valve and allow water to fill the system before opening the valve completely.

A-2-1.9 During freezing weather, it is common practice to place the nozzle out a window and, by "cracking" the valve, keep water moving through the hose while overhaul is in process. Avoid sharply bending hose in or on which ice has formed, as frozen hose can easily be damaged by a sharp bend. Use care in removing hose from ice after a fire. Steam is useful in removing ice from hose.

A-2-1.10 At structural fires, fire hose is exposed not only to heat from fires but to burning embers and broken glass, nails, and other sharp objects.

A-2-2 General recommendations for care and use of large-diameter relay-supply hose are as follows:

(a) Hose should be loaded flat in the hose bed and layered across the bed. All couplings should be loaded so as to pull off the load without flipping over.

(b) Hose should be cleaned of all grit and foreign materials before being reloaded into apparatus bed. For the type of hose described in 2-1.4, drying after washing is not a requirement; however, hose should be rinsed off and dried with a clean rag or towel and then reloaded. Wet and dirty hose should not be reloaded for in-service use until thoroughly cleaned and dried.

(c) Couplings should be lubricated occasionally with a liquid silicone or light silicone base lubricant or a dry graphite powder.

A-2-2.7 The automatic pressure governor or the discharge relief valve on the pumper does not provide protection to the suction side of the pump. The lower the setting of the relay relief valve, the greater the protection to the hose. A manual air bleeder valve (petcock) should be provided on the relay relief valve to control the buildup of air pressure. A typical relay operation with large-diameter relay-supply hose is shown in Figure A-2-2.7.

When shutting down the relay operation, always disengage the pump nearest the fire first and allow the water to run free, then shut down the relay from the water source. This will prevent the pumper nearest the fire from pumping dry.

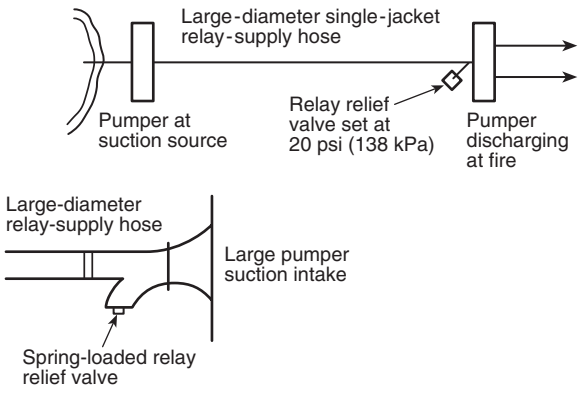

Figure A-2-2.7 Schematic showing relay relief valve.

A-2-2.9 Large-diameter relay-supply hose should not be run over by vehicles. If hose must be crossed, hose bridges should be used and vehicles should have sufficient clearance to cross without contacting the hose.

A-2-3 Class II Standpipe System. Note size of standpipe and $1^1/_2$-in. (38-mm) hose for building occupant use in Figure A-2-3.

A-2-3.4 When the humidity is 70 percent or greater, jackets with cotton yarns should be treated with water repellents and against mildew growth. Typical hose houses are shown in Figures A-2-3.4(a) and A-2-3.4(b).

A-2-4.2 To maximize life of hose, it should be stored in a ventilated area at temperatures between 32°F and 100°F (0°C and 38°C).

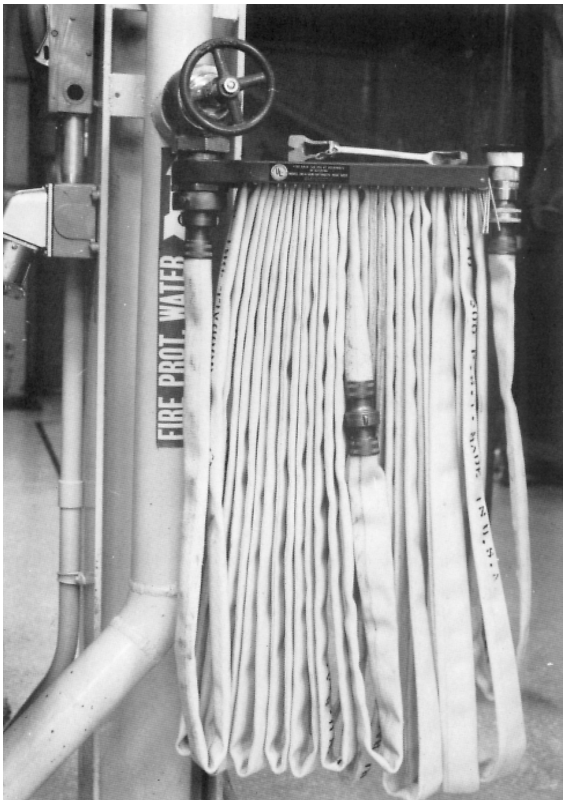

Figure A-2-3 Typical standpipe and fire hose rack arrangement. ***(Courtesy of National Aeronautics and Space Administration)***

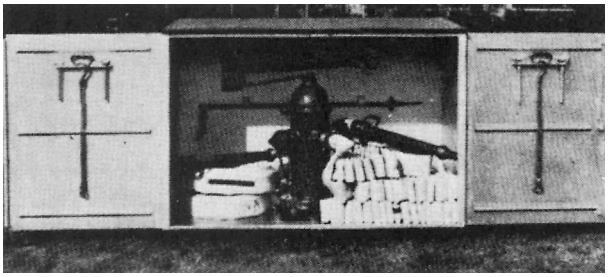

Figure A-2-3.4(a) Hose house of compact dimensions for installation over a yard hydrant. Construction can be steel or aluminum.

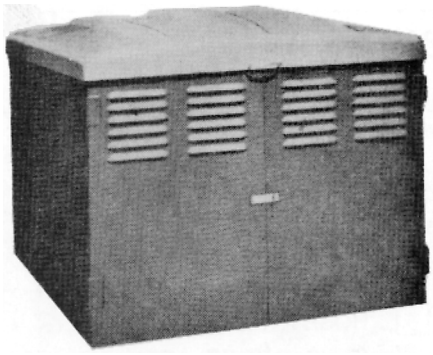

Figure A-2-3.4(b) Steel house of compact dimensions for installation over a yard hydrant. House is shown closed. Top lifts up, and doors on front side open for complete accessibility.

A-2-6.1 For washing, use a scrub brush, mild soap or detergent, and water. A mechanical washer can be used where hose is used frequently or a large number of hose lengths need to be washed. Avoid constant washing of cotton jacket hose treated for mildew resistance, as this will remove the treatment. There are several commercial hose washers available, although many fire departments have constructed their own.

A-2-6.3 There are a number of ways to dry hose. Tower drying has proved successful. However, care should be taken to properly ventilate and control the temperature of the tower so the hose will not be damaged by excessive heat. It is poor practice to suspend hose from couplings.

The design of hose towers should meet all applicable building, electrical, and safety codes and requirements. Fire fighters should be made aware of the hazards associated with hose-drying towers, the protective equipment they should wear while working in a hose tower, and the correct method for raising and hanging wet fire hose, as well as retrieving dry hose.

Commercial hose dryers that force warm air through a cabinet in which hose is loosely coiled on wire racks are also available. While this process dries the outside jacket, it might not allow for thorough draining of the inside of the hose.

Inclined hose racks are often used, as most existing stations can accommodate such racks. The racks should be located where the sun or excessive heat will not damage the hose. The rack has the advantage of allowing the hose to drain internally while providing a drying area from which fire fighters can easily load and unload hose.

A-2-7.1 Commercial storage racks are available, but many users have built their own to fit their particular needs.

A-3-1.1 Records are essential and necessary data to determine hose performance and ensure safe use in fire fighting. Cost-effectiveness can also be determined. This recorded information should be used for effective hose management.

A-3-1.2 Where hose repairs are frequent, however, couplings and hose lengths can become intermingled so that either stenciling the hose or changing the couplings should be employed. In stamping couplings, the proper procedure is to insert a special steel plug with round edges into the end of the expansion ring. One sharp blow from a steel numbering die will then clearly stamp the coupling. Coupling bowls can be damaged by improper stamping. Aluminum couplings should be stamped before they are hardcoated. Some fire departments color code couplings as well as various tools to identify the company to which the equipment is assigned. This enables each company to readily identify and pick up its hose and equipment at a fire. Where mutual aid operations are frequent, each length of hose should be appropriately stenciled or marked with the identification of the fire department owning same. A water-based latex paint is not harmful to hose. Paints with a petroleum solvent base can cause the bond between the liner and jacket to fail.

A-3-1.3 Because the safe use of hose requires continuous, accurate, up-to-date records, records should be maintained and stored at the company level in addition to being part of a central file. Conditions, repairs, changes, problems, and so on, should be recorded immediately for each length of hose. *(See Figure A-3-1.3.)*

Hose Record Card

ID No. _____ City _____ Engine Co. _____

Size (dia.) ____ Length _____ Type hose _____ Const. _____ Cost _____

Mfg. _____ Part no. _____ Date rcd. _____ Date in service _____

Vendor _____ Cplg. mfg. _____ Type cplgs. _____

Repairs

Date	Kind	Cost	New length	New ID no.

Remarks: _____

Test Record

Service test to _____ psi

Date	Service test pres. psi	Test OK	Reason failed	Date	Service test pres. psi	Test OK	Reason failed

Date	Exposed to possible damage		Date	Reason
		Removed from service		
		Condemned		
		Sold		
		Wrnty. failure		

Figure A-3-1.3 Example showing front and back of a hose record card. ***(Courtesy of Sacandia Industries, Inc.)***

A-3-1.5 Other information recorded might include coupling threads, manufacturer of coupling and part number, length of guarantee, label number, and cost.

A-3-1.6 This tag might also include information required for inclusion on the permanent hose record. *(See Figure A-3-1.6.)*

Hose Repair Tag

Hose to be repaired must be tagged

ID number:	Company number
Picked up by:	Date picked up
Delivered by:	Date delivered

Repairs Needed:

Repairs Made:

Repaired by:	Date repaired
Service tested psi	Date tested

☐ Hose is not repairable.
ID no. of replacement hose

Note: This tag must be filled out and returned with hose.
Enter repairs on hose record card.

****

Figure A-3-1.6 An example of a hose repair tag. (*Courtesy of Memphis Fire Department*)

A-3-2.1 Forestry hose is often moved from one location to another in large quantities. Many times forestry fire apparatus leaves the scene of a fire with a different complement of hose than that at arrival. Because of the relocation of hose following fire activity, maintaining individual records of each length of hose can be impractical. As a minimum, records on stored hose should be kept at stations and fire warehouses to ensure proper inventory rotation.

A-4-1.2 It should never be necessary to hammer a shutoff valve to make it operate.

A-4-1.7 Nozzles should be washed in a solution of soap and warm water. The nozzle should be submerged and the adjustable controls operated until there is free movement. The nozzle should then be rinsed in water. The nozzle should be lubricated in accordance with the manufacturer's instructions. Cracked rubber-covered handles on nozzles can be the source of accidents and should be replaced.

A-4-2.1 In most cases, a machine shop with the proper facilities can repair damaged threads. One way to detect any slippage of the coupling on the hose is to inspect the area where the expansion ring is located for any appreciable gap between the expansion ring and the coupling waterway. Ordinarily, the swivels can be freed satisfactorily by immersion in warm, soapy water.

A-4-2.2 On some couplings such abuse can cause the hose bowl and swivel to go "out-of-round," and, as a result, the swivel will not turn.

A-4-2.5 Usually an improper fit between the internal bowl diameter and the outside diameter of the hose of more than $\pm 1/32$ in. (±0.79 mm) will require special techniques and should be avoided.

The tail gasket is the gasket placed in the coupling at the end of the hose to prevent leakage and to keep the fabric of the hose jacket dry. When ordering couplings and tail gaskets for recoupling hose with expansion ring couplings, it is important that the appropriate tail gasket be provided. The coupling manufacturer needs to know the outside diameter of the hose and the wall thickness of the hose to provide the proper coupling and gasket. Also, the length of the expansion ring needs to be consistent with the length of the coupling bowl. *(See Figure A-4-2.5.)*

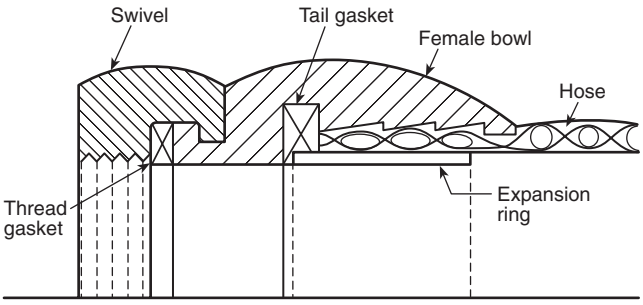

Figure A-4-2.5 Female coupling assembly.

The three-piece collars and compression-type hose couplings attached with a shank and external binding method might not be interchangeable from manufacturer to manufacturer and among different hose constructions. The user should verify that the binding is designed for the hose and shank with which it is being used. Check with the coupling or hose manufacturer for proper assembly instructions and bolt torque settings where necessary.

A-4-2.6 A degree of skill and experience is required to properly attach couplings to hose. It is necessary to have good equipment and a mechanic skilled and experienced in attaching couplings. If not, this work should be done by the hose manufacturer.

A-4-3.1 A high-quality synthetic gasket with antioxidants or neoprene should be used, as natural rubber gaskets can deteriorate with age and will harden and break away from the gasket seat.

A thread gasket with a smaller diameter than that of the recess can cause a leaky connection when pressure is applied. *(See NFPA 1963, Standard for Fire Hose Connections.)*

A-4-3.2 If the gasket protrudes at the nozzle connection, it can cause a ragged stream, reducing the effective reach of the nozzle, and, at a coupling, it can cause increased friction loss.

A-5-1.3 Hose meeting the requirements of NFPA 1961, *Standard on Fire Hose,* 1987 or subsequent editions, and hose meeting the requirements of NFPA 1961, *Standard for Fire Hose,* 1979 and prior editions, will probably have different service test pressures.

A-5-2.2 The surface on which the hose is laid out should be as smooth as possible. Rough surfaces will accelerate abrasion and hinder proper movement of the hose line.

Hose is tested in lengths not exceeding 300 ft (91 m) to allow the hose to untwist and be straightened out. As the pressure rises, the shorter length will allow the hose to assume a natural elongation, creating less warp in the hose.

It is also important that all the air in the hose be removed. If any point in the hose layout is elevated, air will be trapped at that point. Excessive lengths make it difficult to exhaust all the air. The ideal hose test area will have a slight upward incline from the pressure source to the capped end. This allows the air to flow to the capped end and be bled off. There should be no humps or valleys in the hose between the ends, as these will trap air.

A-5-2.5 Stationary pumps and pumps on fire apparatus are designed for pumping substantial flow volumes at moderate pressures. The use of such pumps when testing hose at moderate to high pressures with very little flow or possibly no flow may cause overheating of the water in these pumps as well as recirculation cavitation operating conditions. Both the overheating and recirculation cavitation operating conditions are known to cause permanent damage to the pumps. In addition, the hot water inside the pumps (which is possibly even superheated steam) creates a safety hazard to personnel operating the pump or testing the fire hose.

A-5-2.7 Damaged fire hose should not be patched unless such repair is recommended by the manufacturer of the hose and it is performed by properly trained and equipped personnel.

A-5-4.1 If booster hose is manufactured in accordance with ANSI/UL 92, *Fire Extinguisher and Booster Hose*, the maximum working pressure will be shown on the cover of the hose.

A-5-4.2 The suction hose vacuum test can be run in conjunction with the annual pumper suction test. *(See Figure A-5-4.2.)*

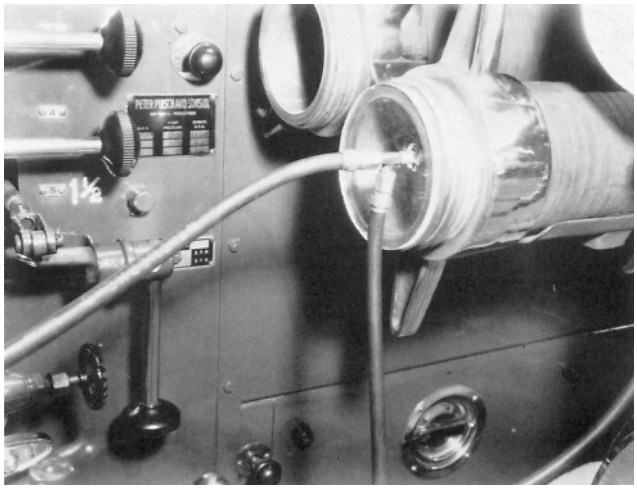

Figure A-5-4.2 Plastic test disk for pumper suction hose. One line runs to the pumper vacuum and the other to a test gauge. A clear plastic disk at the other end used with a light makes it possible to observe if the internal lining is drawn into the waterway. *(Courtesy of San Diego Fire Department)*

A-5-4.3 Suction hose manufactured in accordance with the 1992 edition of NFPA 1961, *Standard on Fire Hose*, will be marked FOR VACUUM USE ONLY if it is designed for use under vacuum only. If the suction hose is designed for use under positive pressure, it will be marked SERVICE TEST TO (the service test pressure) AND 22 IN. HG. VACUUM PER NFPA 1962.

PVC suction hose is not designed for use under positive pressure. If unmarked suction hose is to be used under positive pressure, the user should check with the manufacturer to be sure the hose is designed for such applications.

A-5-5.2.2 Air under pressure becomes greatly compressed, and the hose can whip violently if the pressure is suddenly released by a hose burst. A blown-off coupling propelled by the compressed air will act like a high-velocity missile.

A-5-5.2.3 Hose can be expected to stretch when the pressure is increased to the test pressure. Allowance should be made for this stretch when the hose is secured.

A-5-6.2 The use of the hose test valve prevents a volume surge from the pump in the event of a hose bursting during the test. The $^1/_4$-in. (6.4-mm) opening drilled through the gate permits the pressure to be raised to the test pressure after the hose has been filled, the air completely removed, and the hose test valve closed.

A-5-6.4 Air under pressure becomes greatly compressed, and the hose can whip violently if the pressure is suddenly released by a hose burst. A blown-off coupling propelled by the compressed air will act like a high-velocity missile.

A-5-6.5 Hose can be expected to stretch when the pressure is increased to the test pressure. Allowance should be made for this stretch when the hose is secured.

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

NFPA 1961, *Standard on Fire Hose*, 1997 edition.
NFPA 1963, *Standard for Fire Hose Connections*, 1993 edition.

B-1.2 ANSI/UL Publication. Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 92, *Fire Extinguisher and Booster Hose*, 1993.

B-1.3 ASTM Publication. American Society for Testing and Materials, 100 Barr Harbor Drive, West Conchohocken, PA 19428-2959.

ASTM E 380, *Standard Practice for Use of the International System of Units (SI) (The Modernized Metric System)*, 1993.

B-1.4 Other Publication. Purington, R. G., *Fire Fighting Hydraulics*, 1974, 1st ed., McGraw-Hill, New York, 371–373.

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