



UL 19

STANDARD FOR SAFETY

Lined Fire Hose and Hose Assemblies

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UL Standard for Safety for Lined Fire Hose and Hose Assemblies, UL 19

Fourteenth Edition, Dated August 13, 2018

SUMMARY OF TOPICS

This new edition of ANSI/UL 19 includes the following:

Addition of Radiant Heat Test Method

Addition of Conductive Heat Test Method

Addition of Appendix C – Radiant Heat and Conductive Heat Test Results (Informative)

The new/revised requirements are substantially in accordance with Proposal(s) on this subject dated June 8, 2018.

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AUGUST 13, 2018

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UL 19



ANSI/UL 19-2018

Standard for Lined Fire Hose and Hose Assemblies

The First through Sixth editions were titled "Cotton Rubber-Lined Hose."

First Edition – July, 1914
Second Edition – March, 1931
Third Edition – December, 1937
Fourth Edition – August, 1941
Fifth Edition – April, 1948
Sixth Edition – August, 1953
Seventh Edition – August, 1967
Eighth Edition – October, 1971
Ninth Edition – March, 1978
Tenth Edition – December, 1992
Eleventh Edition – December, 1995
Twelfth Edition – November, 2001
Thirteenth Edition – October, 2013

Fourteenth Edition

August 13, 2018

This ANSI/UL Standard for Safety consists of the Fourteenth Edition.

The most recent designation of ANSI/UL 19 as an American National Standard (ANSI) occurred on August 13, 2018. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

The Department of Defense (DoD) has adopted UL 19 on April 5, 1999. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

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INTRODUCTION

1 Scope

1.1 These requirements cover single- and multiple-jacketed lined fire hose with or without couplings attached, in the trade sizes of 1-1/2, 1-3/4, 2, 2-1/2, 3, 3-1/2, 4, 5, and 6 inch (38, 45, 51, 65, 76, 89, 102, 127, and 152 mm nominal ID). Single-jacketed hose is intended for service test pressures of 150, 200, or 250 psig (1035, 1380, or 1725 kPa). Multiple-jacketed hose or covered hose judged equivalent to multiple-jacketed hose is intended for service test pressures of 200, 300, or 400 psig (1380, 2070, or 2760 kPa).

1.2 These products are intended for municipal and industrial fire protection purposes. Single-jacketed hose is for use at fire hydrants, standpipes, and similar places. They are not intended for hard usage nor where the hose will be subjected to chafing on rough or sharp surfaces. Multiple-jacketed hose or covered hose judged equivalent to multiple-jacketed hose are for use on pumpers and in places where service conditions require the additional protection against wear afforded by the extra woven jacket or cover.

1.3 The products covered by these requirements are intended to be periodically inspected and maintained while in service, as outlined in the Standard for the Care, Use, Inspection, Service Testing and Replacement of Fire Hose, Couplings, Nozzles, and Fire Hose Appliances, NFPA 1962.

2 Units of Measurement

2.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

3 Undated References

3.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

4 Glossary

4.1 For the purpose of this standard, the following definitions apply.

4.2 EXPANSION RING – A ring that expands against the hose lining, forcing the hose tightly against the coupling.

4.3 FILLER THREADS – The threads or yarns of the jacket or reinforcement that are helically wound throughout the length of the hose at approximately right angles to the warp threads.

4.4 HOSE ASSEMBLY – Hose furnished with couplings attached to each end.

4.5 MULTIPLE-JACKETED HOSE – Hose having two or more woven jackets or a covered hose that complies with all of the performance tests in this standard for multiple-jacketed hose. See 6.3.

4.6 PROOF PRESSURE – A specified pressure applied to new hose to indicate its acceptability at intended maximum normal highest operating pressures.

4.7 SERVICE TEST PRESSURE – The pressure to which the hose is periodically tested to determine that it can remain in service. The service test pressure is at least 10 percent greater than the maximum normal highest operating pressure.

4.8 WARP THREADS – The threads or yarns of the jacket or reinforcement that run lengthwise to the hose.

CONSTRUCTION

5 Internal Diameter

5.1 Hose shall have an internal diameter of not less than the trade size of the hose.

5.2 A tapered plug gauge having a taper of 3/8 inch per foot (31.2 mm/m) marked to indicate variations of 1/64 inch (0.4 mm) in diameter, is to be used to measure the internal diameter. If the lining of the hose has a lap joint, the tapered plug gauge is to be provided with a slot to accommodate the lap joint.

5.3 To determine the internal diameter, the end of the hose is to be cut square and the tapered plug gauge inserted in the hose sample until a close fit is obtained without forcing. The diameter of the gauge at the end of the sample, to the nearest 1/64 inch (0.4 mm), is to be recorded as the internal diameter of the hose.

6 Jacket and Inner Reinforcements

6.1 A jacket shall be evenly and firmly woven, and free from visible defects, thread knots, lumps, and irregularities of twist provided that they would not impair its intended use. The threads shall be continuous, and any knots in the filler threads shall be tucked under the warp threads.

6.2 A jacket shall be seamless and shall have the fillers woven around the hose throughout its length and the warps interwoven with the fillers. A jacket may be made with a cover over the woven jacket.

6.3 Hose having a woven jacket or hose having an inner reinforcement and a protective cover may be considered equivalent to multiple-jacketed hose if it complies with the applicable performance requirements specified in this standard.

7 Lining

7.1 A lining shall be of uniform thickness and free from pitting or other irregularities or imperfections and shall comply with the applicable test requirements specified in Sections 24 – 27.

8 Cover

8.1 A cover shall be of uniform thickness and free from pitting, blisters, or other imperfections that would impair its intended use, and shall comply with the applicable test requirements in Sections 24 – 26.

8.2 A cover may have intentional pricking, ribs, corrugations, or a wrapped finish.

9 Coatings and Treatments

9.1 Hose may have jackets with treatments or coatings if the hose complies with the applicable performance requirements in this standard.

10 Couplings

10.1 The couplings of hose assemblies shall be made from metals having the strength and other characteristics necessary to comply with the applicable performance requirements in this standard.

10.2 A metal used in the construction of any part shall have corrosion-resistant properties equivalent to those of high-strength yellow brass, UNS No. C86500 in the Standard Specification for Copper Alloys in Ingot form, ASTM B30 and in the Standard Specification for Copper Alloy Sand Castings for General Applications, ASTM B584.

10.3 To determine if a metal has the properties mentioned in 10.2, it shall comply with the requirements of the Salt-Spray Corrosion Test, Section 32.

10.4 A copper-alloy part containing more than 15 percent zinc shall comply with the requirements of the Moist Ammonia Air-Stress Cracking Test, Section 31.

10.5 An expansion ring of a coupling shall be smooth and have rounded edges.

10.6 A swivel mechanism of a coupling shall turn freely by hand.

10.7 A surface shall have no sharp edges or projections that might abrade a hose. The inside surfaces shall be machine-finished.

Exception: Corrugations in a tail section need not be machine-finished.

10.8 A gasket of a coupling shall have uniform dimensions.

PERFORMANCE

11 Hydrostatic Proof-Pressure Tests

11.1 General

11.1.1 Hose shall comply with items a – k and hose assemblies shall comply with items a – l, when subjected for at least 15 seconds to a hydrostatic proof-pressure of two times the service pressure. The pressure may be maintained for up to 1 minute if necessary, to determine compliance with the requirements. See 11.4.5.

- a) The elongation of single-jacketed hose shall not exceed 10 percent of the length measured at 10 psig (69 kPa). See 11.4.6.
- b) The elongation of multiple-jacketed hose shall not exceed 8 percent of the length measured at 10 psig for sizes of 1-1/2 – 2-1/2 inches (38 – 65 mm nominal ID). See 11.4.6.
- c) The elongation of multiple-jacketed hose shall not exceed 10 percent of the length measured at 10 psig for sizes of 3 inches (76 mm nominal ID). See 11.4.6.
- d) The elongation of multiple-jacketed hose shall not exceed 13 percent of the length measured at 10 psig for sizes of 3-1/2 – 6 inches (89 – 152 mm nominal ID). See 11.4.6.
- e) The hose shall not leak or balloon, and there shall be no breaking of any thread in the jacket.
- f) The twist of the hose shall not exceed the values indicated in Table 11.1. Any final twist shall be in the direction to tighten couplings. A twist to the right, the direction that would tend to tighten couplings, is indicated by a clockwise rotation of the free end of the hose as viewed from the water supply end. The hose shall not twist to the left more than 2 degrees per foot (0.114 rad/m) while the pressure is being increased to the test value. See 11.4.7.
- g) The warp of the hose shall not exceed 20 inches (508 mm) per 50 foot (15.2 m) length. See 11.4.8 and 11.4.9.
- h) Single-jacketed hose shall not rise from the level of the test surface more than 7 inches (178 mm) for hose sizes of 1-1/2 – 2 inches (38 – 51 mm nominal ID). See 11.4.11.
- i) Single-jacketed hose shall not rise from the level of the test surface more than 4 inches (102 mm) for hose sizes of 2-1/2 and 3 inches (65 and 76 mm nominal ID). See 11.4.11.
- j) Single-jacketed hose shall not rise from the test surface for hose sizes of 3-1/2 inches (89 mm) and larger. See 11.4.11.
- k) Multiple-jacketed hose shall not rise from the test surface. See 11.4.11.
- l) A hose assembly shall show no slippage or leakage of the coupling or damage to the hose at the coupling.

11.2 Sample

11.2.1 The test is to be conducted on a nominal 50 foot (15.2 m) length or longer, unless otherwise specified, sample of the hose or hose assembly.

11.3 Equipment

11.3.1 A hand- or power-driven pump or an accumulator system capable of increasing the pressure in the sample at a rate of 300 – 1000 psig (2070 – 6900 kPa) per minute is to be used.

11.3.2 The test surface is to be inclined to facilitate removal of air from the sample and of such design and dimensions that the sample is free to move during the tests.

Table 11.1
Maximum twist of hose per 50 feet

Trade size of hose, inches, (mm ID)	No. of jackets	Service test pressure, psi (kPa)	Maximum twist, turns per 50 feet (15.2 m)
1-1/2, 1-3/4, 2 (38, 45, 51)	Single	150 (1035)	7-1/2
2-1/2, 3, 3-1/2, 4, 5, 6 (65, 76, 89, 102, 127, 152)	Single	150 (1035)	3-3/4
1-1/2, 1-3/4, 2 (38, 45, 51)	Single	200 or 250 (1380 or 1725)	10
2-1/2, 3, 3-1/2, 4, 5, 6 (65, 76, 89, 102, 127, 152)	Single	200 or 250 (1380 or 1725)	5
1-1/2, 1-3/4, 2 (38, 45, 51)	Multiple	200, 300, or 400 (1380, 2070, or 2760)	4-1/4
2-1/2, 3, 3-1/2, 4, 5, 6 (65, 76, 89, 102, 127, 152)	Multiple	200, 300, or 400 (1380, 2070, or 2760)	1-3/4

11.4 Test method

11.4.1 If a hose assembly is being tested, it is to be marked prior to the tests with a pencil or other suitable means at a point immediately adjacent to each coupling.

11.4.2 One end of the sample is to be connected to the source of water supply by means of couplings or temporary test fittings, and the other end is to be free to move and is to be closed by a fitting provided with a petcock for the escape of air while the sample is being filled with water. For hose having a nominal length of 50 feet (15.2 m), the connection between the end of the sample and the source of water supply is to be rigid. For hose having a nominal length greater than 50 feet, the connection between the end of the sample and the source of water supply may be flexible.

11.4.3 The sample is to be stretched out on the test surface so as to lie straight and without twist. To facilitate the complete removal of air from the sample, the surface on which the sample rests is to be inclined so that the supply end is lower than the other end. With the petcock open, water is to be admitted through the sample gradually until all air has been expelled and the sample is completely filled with water. The petcock is then to be closed and the pressure raised to 10 psig (69 kPa) and held at that pressure

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while the initial length measurement is taken. While at this pressure, the sample is to be straightened out in order to obtain an accurate measurement. The jacket construction and workmanship in weaving, particularly knots, loose ends, and skips in warp threads are to be noted and recorded.

11.4.4 The length of the sample between fittings is to be measured and recorded to the nearest inch (centimeter). The position of the sample with regard to twist is to be noted. From this point on, neither the sample nor the fittings are to be touched, moved, or interfered with in any way until all measurements and observations have been completed at the final test pressure.

11.4.5 Following measurement of the length at 10 psig (69 kPa), the pressure in the sample is to be increased at a rate of 300 – 1000 psig (2070 – 6900 kPa) per minute until the required proof pressure is reached. While the pressure is being increased, the sample is to be examined for leakage and other defects. The proof pressure is to be maintained for at least 15 seconds, but not more than 1 minute. During the time the test pressure is maintained, the observations and measurements for elongation, twist, warp, and rise are to be completed.

11.4.6 If the sample warps to any appreciable extent and particularly if the allowable limit of elongation is approached, the length at proof pressure is to be measured by following the contour of the sample. For samples that do not warp to any extent, the measurement is to be taken parallel to the edge of the test surface. For this purpose, an edge of the table is to be marked off in feet and inches (meters and centimeters). All measurements are to be taken to the nearest inch (centimeter) from the inside edges of the fittings. The elongation of the sample is to be calculated from the measurement taken at the proof pressure and the measurement taken at 10 psi (69 kPa).

11.4.7 The amount of twist at proof pressure is to 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 sample. The amount of twist is to be recorded to the nearest one-eighth turn or 45 degrees (0.79 rad), and the direction as either right or left.

11.4.8 For samples having a nominal length of 50 feet (15.2 m), or less if specified, the warp is the maximum deviation between the sample and a straight line that is drawn between reference points on the fittings at each end of the sample.

11.4.9 For samples having a length greater than 50 feet (15.2 m) but not exceeding 100 feet (30.5 m), the warp is the maximum deviation between the sample and each of two straight lines. One straight line is to be drawn between the reference point on one fitting to a reference point on the sample 50 feet from that fitting. The other straight line is to be drawn from the reference point on the other fitting to a reference point on the sample 50 feet from that fitting. All reference points are to be located on the centerline of the sample and the center of the fittings.

11.4.10 If a hose is not provided with a fitting at its free end, a lightweight fitting without lugs is to be attached to the free end. If a fitting with lugs is provided on the free end of the hose, an adaptor that does not weigh more than the fitting and that has a larger outside diameter than the lugs is to be attached to the fitting.

11.4.11 The maximum distance that the sample rises above the test surface while at the proof pressure is to be measured to the nearest inch (centimeter).

12 Kink Test

12.1 General

12.1.1 Hose, while kinked, shall withstand a hydrostatic test pressure of 1-1/2 times the marked service test pressure without leakage, rupturing, or breaking of any thread in the jacket or reinforcement.

12.2 Sample

12.2.1 The length of the sample is to be at least 3 feet (0.9 m).

12.3 Equipment

12.3.1 The hydrostatic equipment for this test is to be the same as that specified in 11.3.1.

12.4 Test method

12.4.1 The sample is to be filled with water with the petcock open to allow all air to escape. The petcock is then to be closed, the pressure raised to approximately (but not exceeding) 10 psig (69 kPa), and the sample kinked 18 inches (457 mm) from the free end by tying the hose back against itself as close to the fittings as practicable, so that there will be a sharp kink. The pressure is then to be increased at a rate of 300 – 1000 psig (2070 – 6900 kPa) per minute until 1-1/2 times the service test pressure is reached, and then immediately released.

13 Hydrostatic Strength Test

13.1 General

13.1.1 Hose, while lying straight, and curved around a surface having a radius of 27 inches (0.7 m), shall withstand a hydrostatic test pressure of three times the marked service test pressure without rupturing or breaking of any thread in the jacket or reinforcement.

13.1.2 Hose assemblies, while lying straight, and curved around a surface having a radius of 27 inches (0.7 m), shall withstand a hydrostatic test pressure of three times the service test pressure without leakage, rupturing, or breaking of any thread in the jacket or reinforcement, and without slippage, leakage, or damage of the couplings.

13.2 Sample

13.2.1 The length of the sample is to be 3 feet (0.9 m).

13.2.2 If a hose assembly is being tested, the sample is to be marked prior to the test with a pencil or other suitable means at a point immediately adjacent to each coupling.

13.3 Equipment

13.3.1 The hydrostatic equipment for this test is to be the same as that described in 11.3.1, except that a protective enclosure is also to be used.

13.3.2 A test frame or surface that is curved to a radius of 27 inches (0.7 m) is to be used for conducting the burst test while the hose is in the curved position. The test frame on the surface is to have provisions for firmly securing both ends of the sample while under test.

13.4 Test method

13.4.1 The sample is to be placed in a protective enclosure, connected to the source of water supply, the air expelled, and the pressure raised at a rate of 300 – 1000 psig (2070 – 6900 kPa) per minute until the hydrostatic test pressure specified in 13.1.1 or 13.1.2 is reached, and immediately released. The sample is to be tested in the straight and curved positions.

14 Repeated Bending Test

14.1 General

14.1.1 A coupled sample of hose in the sizes of 1-1/2, 1-3/4, 2, 2-1/2, 3, and 3-1/2 inches (38, 45, 51, 65, 76, and 89 mm nominal ID) shall withstand 100,000 cycles of repeated bending to the radius specified in Table 14.1, while filled with water, without breakdown. Upon completion of the repeated bending, the sample, while lying straight, shall comply with the requirements of the Hydrostatic Strength Test, Section 13.

14.2 Sample

14.2.1 The length of sample as specified in Table 14.2 is to be used.

Table 14.1
Radius of bend and distance between center of reels for repeated bending test

Trade size of hose, Inches (mm ID)	Radius of bending, Inches (mm)	Distance between centers of reels, Inches (mm)	
		Vertical	Horizontal
1-1/2 (38)	8 (203)	19 (483)	8 (203)
1-3/4 (45)			
2 (51)	14 (356)	34 (864)	14 (356)
2-1/2 (65)			
3 (76)	14 (356)	34 (864)	14 (356)
3-1/2 (76)			

Table 14.2
Length of test sample for repeated bending test

Trade size of hose, Inches (mm ID)	Length of test sample,	
	feet	(m)
1-1/2 (38)	14	(4.3)
1-3/4 (45)		
2 (51)	15	(4.6)
2-1/2 (65)		
3 (76)	16	(4.9)
3-1/2 (89)		

14.3 Equipment

14.3.1 The equipment for this test is to consist of a steel framework on which are mounted two wooden reels. A semicircular groove, wide enough to accommodate the sample without binding, is to be cut in the circumference of each reel to act as a guide for the sample. The radius of the reels, measured to the base of the circumferential grooves, is to be as specified in Table 14.1. The reels are to be mounted with their flat sides in the same vertical plane so that the distance between centers is as specified in Table 14.1. Each reel is to rotate freely about an axle at its center. A motor-driven mechanism is to be provided that pulls the sample up over the reels for a total distance of 4 ± 0.5 feet (1.2 ± 0.15 m) and then reverses to let the hose down, at a rate of 4 ± 1 complete cycles per minute.