UL 219

STANDARD FOR SAFETY

Lined Fire Hose for Interior Standpipes

UL Standard for Safety for Lined Fire Hose for Interior Standpipes, UL 219

Fourth Edition, Dated October 25, 2013

SUMMARY OF TOPICS

This revision of ANSI/UL 219 is being issued to update the title page to reflect the most recent designation as a Reaffirmed American National Standard (ANS). No technical changes have been made.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The requirements are substantially in accordance with Proposal(s) on this subject dated October 5, 2018.

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The most recent designation of ANSI/UL 219 as a Reaffirmed American National Standard (ANS) occurred on December 11, 2018. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

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 lined interior standpipe fire hose in the 1-1/2 and 2-1/2 inch sizes that is intended:

a) For fire-protection purposes only;

b) For use with inside standpipes installed in accordance with the Standard for the Installation of Standpipe and Hose Systems, NFPA 14;

c) For use on hose racks and reels and in cabinets where the specific combination of hose and rack, reel, or cabinet has been investigated and found acceptable;

d) To withstand infrequent service; and

e) 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.

1.2 The 1-1/2 inch size hose is intended for use primarily by the building occupants for the control of incipient fires until the arrival of the fire department.

1.3 The 2-1/2 inch size hose is intended for use by fire departments and those trained in handling large water streams required during the more advance stages of fire on the inside of buildings or for exposure fire protection.

1.4 These requirements do not cover couplings nor their method of attachment.

2 General

2.1 Units of measurement

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

2.2 Components

2.2.1 Except as indicated in 2.2.2, a component of a value covered by this standard shall comply with the requirements for that component.

2.2.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or

b) Is superseded by a requirement in this standard.

2.2.3 A component shall be used in accordance with its rating established for the intended conditions of use.

2.2.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

2.3 Undated References

2.3.1 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.

CONSTRUCTION

3 Length

3.1 Unless otherwise specified, the hose shall be in nominal 50-foot to 100-foot lengths. The length shall not be more than 2 feet shorter than the nominal length. The length of hose from which the burst test sample is taken shall not be more than 3 feet shorter than the nominal length (after sample cutting). The length of the hose is the measurement obtained as described in 8.3.8.

4 Internal Diameter

4.1 The internal diameter of the 1-1/2 inch size hose shall be not less than 1-1/2 inches (38.1 mm). The internal diameter of the 2-1/2 inch size hose shall be not less than 2-9/16 inches (65.1 mm).

4.2 A tapered plug gauge having a taper of 3/8 inch per foot (31 mm per m), marked to indicate variations of 1/64 inch (0.4 mm) in diameter, is to be used to measure the internal diameter.

4.3 To determine the inside 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.

5 Reinforcement

5.1 Hose having an outer jacket shall have a single jacket made from cotton threads, synthetic threads, or both. The jacket shall be evenly and firmly woven, and free from visible defects, dirt, thread knots, lumps, and irregularities of twist. The threads shall be continuous and any knots in the filler threads shall be tucked under the warp threads. See 5.3 and 8.3.2.

5.2 The jacket shall be seamless and shall have the fillers woven around the hose throughout its length and the warps interwoven with the fillers. See 5.3.

5.3 Hose having reinforcement different from the outer woven jacket specified in 5.1 and 5.2 is acceptable if the hose is found to comply with the performance tests in this standard.

6 Lining

6.1 The lining shall be made of rubber, plastic, or rubber/plastic compounds of uniform thickness and shall comply with the requirements in Sections 17 – 22, as applicable. It shall be made of either:

a) Calendered sheets, lap-jointed and vulcanized into one solid body, or

b) A single-ply extruded or dipped tube.

The lining may be reinforced with a fabric sheeting or other type of reinforcement. See 6.3.

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

6.3 Hose having a lining different from those specified in 6.1 is acceptable if the hose complies with the requirements in Sections 8 – 21.

7 Cover

7.1 A cover, if provided, shall be made of rubber, plastic, or rubber/plastic compounds of uniform thickness and shall comply with the tests specified in Sections 17 – 20, as applicable.

7.2 A cover with intentional pricking and a cover with ribs or corrugations are acceptable.

PERFORMANCE

8 Hydrostatic Proof-Pressure Tests

8.1 General

8.1.1 When subjected for at least 15 seconds to a hydrostatic proof pressure of 300 or 500 psig (2.07 or 3.45 MPa), as requested by the manufacturer, a hose shall comply with (a) – (e). For (a), (c), and (d), the pressure may be maintained for up to 1 minute if necessary, to determine compliance with the requirements. See 8.3.7.

a) The hose shall not elongate by more than 10 percent of the length measured at 10 psig (69 kPa). See 8.3.8.

b) The hose shall not leak or balloon, and there shall be no breaking of any thread in the jacket.

c) The twist of the hose shall not exceed:

1) 50 degrees per foot (2.86 rad/m) for 1-1/2 inch size, and

2) 25 degrees per foot (1.43 rad/m) for 2-1/2 inch size.

Any final twist shall be in the direction to tighten couplings. 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 8.3.6.

d) The warp of the hose shall not exceed 20 inches (0.5 m) per 50-foot (15.2-m) length. See 8.3.9, 8.3.10, and 8.3.11.

e) The hose shall not rise from the level of the test surface more than 7 inches (178 mm) for the 1-1/2 inch size or more than 4 inches (102 mm) for the 2-1/2 inch size.

8.2 Apparatus

8.2.1 The hydrostatic pressure is to be applied by means of a hand- or power-driven pump or an accumulator system capable of increasing the pressure in the hose at a rate of 300 – 1,000 psig (2.07 – 6.89 MPa) per minute.

8.2.2 The necessary equipment and facilities are to include a test surface, or the equivalent, that will provide a clear space at least 20 inches (0.5 m) wide on each side of a line drawn through the center of the supply connection and parallel to the edges of the test surface.

8.3 Test method

8.3.1 The test is to be conducted on the full length of the hose.

8.3.2 While the hose is being prepared for test, the jacket construction is to be examined for visible defects such as in weaving – particularly knots, loose ends, and skips in warp threads. See 5.1.

8.3.3 One end of the hose 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 closed with a fitting provided with a petcock for the escape of air while the hose is being filled with water. For hose having a nominal length of 50 feet, the connection between the end of the hose 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 hose and the source of water supply may be flexible.

8.3.4 The hose is to be stretched out on the test table so as to lie straight and without twist. To facilitate the complete removal of air from the hose, the surface on which the hose rests is to be slightly inclined so that the supply end is lower than the other end. With the petcock open, water is to be admitted through the hose gradually until all air has been expelled and the hose 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 while the initial length measurement is taken. While at this pressure, the hose is to be straightened out to obtain an accurate measurement.

8.3.5 The length of the hose between fittings is to be measured and recorded to the nearest inch. See 8.3.8. The position of the hose with regard to twist is to be noted. From this point on, neither the hose 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.

8.3.6 The amount of twist 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 hose. The amount of twist is to be recorded to the nearest one-eight turn or 45 degrees (0.79 rad).

8.3.7 Following measurement of length at 10 psig (69 kPa), the pressure in the hose is to be increased at a rate of 300– 1,000 psig (2.07 – 6.89 MPa) per minute until the required test pressure is reached. While the pressure is being increased, the hose is to be carefully examined for leakage and other defects. The test pressure is to be maintained for at least 15 seconds, but not more than 1 minute. The time during which the test pressure is maintained may exceed the minimum of 15 seconds only for as long as is necessary to complete the measurements and observations.

8.3.8 If the hose warps to any appreciable extent and particularly if the allowable limit of elongation is approached, the length at final pressure is to be measured by following the contour of the hose. For hose that does not warp to any extent, the measurement is to be taken parallel to the edge of the test table. For this purpose, an edge of the table is to be marked off in feet and inches. All measurements are to be taken from the inside edges of the fittings.

8.3.9 For hose having a nominal length of 50 feet, the warp is the maximum deviation between the hose and a straight line that is drawn between reference points on the fittings at each end of the hose.

8.3.10 For hose having a length greater than 50 feet (15 m) but not exceeding 100 feet (30 m), the warp is the maximum deviation between the hose 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 hose 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 hose 50 feet from that fitting. All reference points are to be located on the center line of the hose and the center of the fittings.

8.3.11 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.

9 Kink Test

9.1 General

9.1.1 A 3 foot (1 m) or longer length of hose, while kinked, shall withstand the hydrostatic pressure specified in Table 9.1 without rupturing or breaking any thread in the jacket or reinforcement.

Table 9.1
Hydrostatic pressure for kink test of hose

Proof pressure, psig (MPa)	Required kink pressure, psig (MPa)
300 (2.07)	300 (2.07)
500 (3.45)	400 (2.76)

9.2 Apparatus

9.2.1 The hydrostatic apparatus for this test is to be the same as specified in 8.2.1.

9.3 Test method

9.3.1 The hose 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 hose 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 (2.07 – 6.84 MPa) per minute until the required pressure is reached, and immediately released.

10 Hydrostatic Strength Test

10.1 General

10.1.1 A 3-foot (0.9-m) sample of hose, while lying straight, shall withstand the hydrostatic pressure specified in Table 10.1 without rupturing or breaking any thread in the jacket or reinforcement. The test is to be repeated with a 3-foot sample of hose curved around a surface having a radius of 27 inches (0.7 m).

Table 10.1
Hydrostatic pressure in hydrostatic strength test of hose

Proof pressure, psig (MPa)	Minimum burst pressure, psig (MPa)
300 (2.07)	500 (3.45)
500 (3.45)	750 (5.17)

10.2 Apparatus

10.2.1 The test apparatus is to be the same as describe in 8.2.1, except that a protective enclosure is to be used.

10.3 Test method

10.3.1 A 3-foot (0.9-m) sample is to be cut from a length selected at random before the length is subjected to the hydrostatic proof-pressure test. The remaining portion of the length is to be subjected to the hydrostatic proof-pressure test. See 8.1.1(b).

10.3.2 The 3-foot (0.9-m) sample is to be connected to the source of water supply, the air expelled, and the pressure raised at a rate of 300 – 1,000 psig (2.1 – 6.9 MPa) per minute until the test pressure specified in Table 10.1 is reached and immediately released. The sample is to be tested in the straight and curved positions.

11 Repeated-Bending Test

11.1 General

11.1.1 A hose filled with water shall withstand 10,000 cycles of repeated bending to the radius specified in Table 11.1 without breakdown. Upon completion of the repeated bending, the hose, while lying straight, shall comply with the Hydrostatic Strength Test, Section 10.

Table 11.1
Radius of bend and distance between centers of reels

Size of hose, inches	Radius of bending,		Distance between centers of reels			
			Vertical,		Horizontal,	
	inches	(mm)	inches	(mm)	inches	(mm)
1-1/2	8	(203)	19	(483)	8	(203)
2-1/2	14	(356)	34	(864)	14	(356)

11.2 Apparatus

11.2.1 The apparatus 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 hose without binding, is to be cut in the circumference of each reel to act as a guide for the hose. The radius of the reels, measured to the base of the circumferential grooves, is to be as specified in Table 11.1. 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 11.1. Each reel is to rotate freely about an axle at its center. A motor-driven mechanism is to be provided that pulls the hose up over the reels for a total distance of 48 ±6 inches (1.2 ±0.15 m) and then reverses to let the hose down, at a rate of 4 ±1 complete cycles per minute.

11.3 Test method

11.3.1 A 12-foot (3.7-m) length of hose of the 1-1/2 inch size or a 14-foot (4.3-m) length of hose in the 2-1/2 inch size is to be filled with water and capped at each end. It is then to be placed over the reels in an S-shaped curve with the top end hanging downward and fastened to a weight and the bottom end fastened to the motor-driven mechanism described in 11.2.1. The hose is to be subjected to 10,000 complete cycles.

11.3.2 After completion of the bending test, the hose is to be removed from the test apparatus, examined for any evidence of damage, and then subjected to the Hydrostatic Strength Test, Section 10.

12 Wet Hose Test

12.1 General

12.1.1 A hose shall withstand 48 hours of immersion in water at room temperature without visible deterioration and shall then withstand, while wet, the Hydrostatic Strength Test, Section 10.

12.2 Apparatus

12.2.1 Apparatus for this test is to consist of a container of water and the hydrostatic equipment specified in 10.2.1.

12.3 Test method

12.3.1 A coupled 3-foot (0.9-m) length of the hose is to be immersed in tap water at room temperature for 48 hours. The hose is then to be removed from the water, visually examined for deterioration, and immediately subjected, while wet and lying straight, to the Hydrostatic Strength Test, Section 10.

13 Fold-Resistance Test

13.1 General

13.1.1 A 3-foot (0.9-m) sample of hose shall withstand the Hydrostatic Strength Test, Section 10, after being subjected to folding as described in 13.3.1.

13.2 Apparatus

13.2.1 Apparatus for this test is to consist of an oven as specified in the Test for Rubber-Deterioration in an Air Oven, ASTM D573-88, and a clamp fitted with calibrated springs capable of exerting a total force of 120 pounds (534 N).

13.3 Test method

13.3.1 A 3-foot (0.9-m) sample of hose is to be folded at the center of the length and held tightly folded by means of a clamp fitted with calibrated springs so that a total force of 120 pounds (534 N) is exerted on the fold. The assembly is then to be placed in a thermostatically controlled oven at a temperature of 49°C (120°F) for 60 days. At the end of the test period, the assembly is to be removed from the oven and allowed to cool at room temperature. The clamp is then to be removed, and the sample is then to be subjected to the Hydrostatic Strength Test, Section 10.

14 Abrasion Test

14.1 General

14.1.1 After being subjected to the abrasion test described in 14.2.1 for the number of cycles specified in (a) or (b), a hose shall withstand the applicable pressure specified in Table 14.1 without rupturing or breaking any thread in the jacket or reinforcement.

a) For 1-1/2 inch size hose, 50 cycles of abrasion.

b) For 2-1/2 inch size hose, 150 cycles of abrasion.

Table 14.1
Hydrostatic pressure after abrasion

Trade size of hose, inches	Proof pressure, psig (MPa)		Required pressure after abrasion, psig (MPa)	
1-1/2	300	(2.07)	300	(2.07)
	500	(3.45)	500	(3.45)
2-1/2	300	(2.07)	300	(2.07)
	500	(3.45)	500	(3.45)

14.2 Apparatus

14.2.1 The following apparatus is to be used for the test:

a) A horizontally reciprocating machine with a 12-inch (305-mm) stroke capable of 20 cycles per minute;

b) A stationary mandrel having a diameter of 2-1/4 inches (56.2 mm) and covered with No. 1-1/2 (coarse) emery cloth;

c) An 8-pound (3.6-kg) weight for 1-1/2 inch (38.1 mm) size hose;

d) A 12-pound (5.4-kg) weight for 2-1/2 inch (63.5 mm) size hose; and

e) The hydrostatic apparatus specified in 10.2.1.

14.3 Test method

14.3.1 A 5-foot (1.5 m) length of the hose is to be clamped at one end to a horizontally reciprocating crossbar. The other end is to be allowed to hang down over the mandrel. The hose is to be held in contact with the emery cloth by means of the applicable weight attached to the free end of the hose. The hose is to be automatically drawn back and forth over the emery cloth at a rate of approximately 20 cycles per minute by the motion of the crossbar. After the applicable number of cycles specified in 14.1.1, the hose is to be removed from the test apparatus, coupled, connected to the source of water supply, the air expelled, and the pressure raised at a rate of 300 – 1,000 psig (2.07 – 6.89 MPa) per minute until the pressure specified in Table 14.1 is reached.

15 Heat-Resistance Test

15.1 General

15.1.1 A hose, while lying straight, shall withstand the Hydrostatic Strength Test, Section 10, after exposure to a heated steel block as described in 15.3.1.

15.2 Apparatus

15.2.1 An oven capable of maintaining 260.0 ±2.0°C (500.0 ±3.6°F), a steel block 2-1/2 by 1-1/2 by 8 inches (63.5 by 38.1 by 203 mm), and the hydrostatic equipment specified in 10.2.1 are to be used for this test.

15.3 Test method

15.3.1 An 18-inch (0.45 m) coupled length of hose is to be sealed at one end, filled with tap water, sealed at the other end, and conditioned for 24 hours in a room maintained at 23.0 ±2.0°C (73.0 ±3.6°F). The steel block is to be heated to 260.0 ±2.0°C (500.0 ±3.6°F) in an oven, removed from the oven, and within 5 seconds placed so that the longitudinal axis of the steel block is perpendicular to the longitudinal axis of the hose. The contact area is to be the mid-point of the 2-1/2 inch (63.5 mm) wide side of the steel block and the mid-point of the hose. A metal knife edge is to be used as a support near one end of the steel block to obtain maximum force on the hose. After 60 seconds, the steel block is to be removed. After cooling, the hose is to be subjected to the Hydrostatic Strength Test, Section 10.

16 Accelerated-Aging Test Of Threads

16.1 General

16.1.1 The breaking strength of the warp and filler threads that have been conditioned in an air oven as specified in 16.3.1 shall not be less than 40 percent of the strength of the threads that have not been oven conditioned.

16.2 Apparatus

16.2.1 Breaking strength tests are to be conducted using a power-operated machine, as described in the Tests for Rubber Properties in Tension, ASTM D412-87. The oven described in the Tests for Rubber – Deterioration in an Air Oven, ASTM D573-88, is to be used for the conditioning.

16.3 Test method

16.3.1 Three 8-inch (203 mm) lengths of the warp threads and three 8-inch lengths of the filler threads taken from the jacket of the hose are to be placed in an air-circulating oven at 165.0 ±2.0°C (329.0 ±3.6°F) for 168 ±1/2 hours. After the oven conditioning, the threads are to be allowed rest for at least 24 hours in a room maintained at 23.0 ±2.0°C (73.0 ±3.6°F) and 50 ±5 percent relative humidity. The threads are then to be subjected to a breaking strength test using a tensile-strength testing machine having a jaw separation of 2 inches (50.8 mm) per minute. The average of 3 specimens is to be considered the breaking strength. This value is to be compared with the breaking strength of thread specimens that have not been oven conditioned.

17 Adhesion Tests

17.1 Lining

17.1.1 The adhesion between the lining and the jacket or reinforcement shall be such that the rate of separation of a 1-1/2-inch (38 mm) strip of the lining from the jacket or reinforcement is not greater than 1 inch (25.4 mm) per minute using a 12-pound (5.4 kg) weight.

17.1.2 If a rubber backing is used between the lining and the jacket or reinforcement, the adhesion between the lining and the backing and between the backing and the jacket or reinforcement shall be such that the rate of separation of a 1-1/2-inch (38 mm) strip is not greater than 1 inch (25.4 mm) per minute using a 12-pound (5.4-kg) weight. See 17.4.4.

17.1.3 The requirements in 17.1.1 and 17.1.2 are not intended to exclude a construction that provides no adhesion between the jacket and lining along the fold, if the surface over which there is no adhesion is not greater than 35 percent of the total surface.

17.2 Cover

17.2.1 The adhesion between a cover and the woven jacket or reinforcement shall be such that the rate of separation of a 1-1/2-inch (38 mm) strip of the cover from the jacket is not greater than 1 inch (25.4 mm) per minute using a 10-pound (4.5 kg) weight.

17.3 Apparatus

17.3.1 The apparatus required for this test is to consist of a supporting frame, clamps, weights, weight holders, and a timer. The supporting frame is to be constructed so that specimens, with weights attached, may be suspended vertically and hang freely during the test.

17.4 Test method

17.4.1 The specimen for the adhesion test is to be cut transversely.

17.4.2 The specimen is to be 2 inches (50.8 mm) wide and is to be cut through to give a rectangular sample 2 inches wide and the full circumference of the hose in length. A strip of lining or cover 1-1/2 inches (38 mm) wide is to be cut out accurately; the cut is to extend through the rubber but not entirely through the woven jacket. This strip is to be separated from the jacket for about 1-1/2 inches. A reference mark is to 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 are to be secured in clamps.

17.4.3 With the separated jacket gripped in a stationary clamp, the separated rubber is to be gripped in a freely suspended clamp hanging vertically, to which the prescribed weight is to be attached. Provisions are to be made for supporting and releasing the weight slowly without jerking. The distance through which separation takes place is to be noted for 10 minutes, or until complete separation occurs. The adhesion to the jacket is to be taken as the rate obtained by dividing the total distance separated in inches (mm), to the nearest 0.1 inch (2.5 mm), by the elapsed time in minutes.

17.4.4 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 are to be determined using the methods described in 17.4.1 – 17.4.3. If the adhesion between:

a) The lining and the backing, or

b) 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 backing and the jacket for (a) or between the lining and the backing for (b) is to be considered the adhesion.

18 Tensile Strength And Elongation Test

18.1 General

18.1.1 The tensile strength and ultimate elongation of specimens taken from the lining and cover, if provided, shall not be less than specified in Table 18.1.