

Underwriters Laboratories Inc. (UL)
333 Pfingsten Road
Northbrook, IL 60062-2096

UL Standard for Safety
for
Fire Extinguisher and Booster Hose, UL 92

Tenth Edition, Dated July 27, 1993

Revisions: This Standard contains revisions through and including July 24, 1996.

A change is indicated by a note following the affected item. The note is preceded and followed by an asterisk.

The new and/or revised requirements are substantially in accordance with UL's Bulletin on this subject dated January 23, 1996. The bulletin is now obsolete and may be discarded.

The revisions dated July 24, 1996 include a reprinted title page (page 1) for this Standard.

As indicated on the title page (page 1), this UL Standard for Safety is an American National Standard. Attention is directed to the note on the title page of this Standard outlining the procedures to be followed to retain the approved text of this ANSI/UL Standard.

The master for this Standard at UL's Northbrook Office is the official document insofar as it relates to a UL service and the compliance of a product with respect to the requirements for that product and service, or if there are questions regarding the accuracy of this Standard.

UL's Standards for Safety are copyrighted by UL. Neither a printed copy of a Standard, nor the distribution diskette for a Standard-on-Diskette and the file for the Standard on the distribution diskette should be altered in any way. All of UL's Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of UL.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of UL.

Revisions of UL Standards for Safety are issued from time to time. A UL Standard for Safety is current only if it incorporates the most recently adopted revisions.

UL provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if UL or an authorized UL representative has been advised of the possibility of such damage. In no event shall UL's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

UL will attempt to answer support requests concerning WordPerfect, Envoy, and Standards-on-Diskette. However, this support service is offered on a reasonable efforts basis only, and UL may not be able to resolve every support request. UL supports a Standards-on-Diskette only if it is used under the conditions and operating systems for which it is intended. UL's support policies may change from time-to-time without notification.

UL reserves the right to change the format, presentation, file types and formats, delivery methods and formats, and the like of both its printed and electronic Standards without prior notice.

Standards-on-Diskette purchasers agree to defend, indemnify, and hold UL harmless from and against any loss, expense, liability, damage, claim, or judgement (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing a Standard-on-Diskette on the purchaser's computer system.

If a single-user version Standards-on-Diskette was purchased, one copy of this Standard may be stored on the hard disk of a single personal computer, or on a single LAN file-server or the permanent storage device of a multiple-user computer in such a manner that this Standard may only be accessed by one user at a time and for which there is no possibility of multiple concurrent access. The original distribution diskette should be stored in a safe place.

If a multiple-user version Standards-on-Diskette was purchased, one copy of the Standard may be stored on a single LAN file-server, or on the permanent storage device of a multiple-user computer. The number of concurrent users shall not exceed the number of users authorized for the Standards-on-Diskette version. The original distribution diskette should be stored in a safe place.

Standards-on-Diskette are intended for on-line use, such as for viewing the requirements of a Standard, conducting a word search, and the like. Only one copy of the Standard may be printed from each single-user version of a Standards-on-Diskette. Only one copy of the Standard may be printed for each authorized user of a multiple-user version of a Standards-on-Diskette. An employee of an organization purchasing a Standard-on-Diskette can make a copy of the page or pages being viewed for their own fair and/or practical internal use. Because of differences in the computer/software/printer setup used by UL and those of Standards-on-Diskette purchasers, the printed copy obtained by a purchaser may not look exactly like the on-line screen view or the printed Standard.

The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Listing, Recognition, and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

Copyright 1996 Underwriters Laboratories Inc.

This Standard consists of pages dated as shown in the following checklist:

Page	Date
tr1 – tr2	July 24, 1996
1	July 27, 1993 (Reprinted: July 24, 1996)
2, 3	July 24, 1996
4, 5	July 27, 1993
6 – 14, 14A, 14B, 15	July 24, 1996
16	July 27, 1993

July 27, 1993
(Title Page Reprinted: July 24, 1996)



1

UL 92

Standard for

Fire Extinguisher and Booster Hose

The First through Fifth editions were titled "Chemical Engine Hose."

First Edition – June, 1948
Second Edition – March, 1949
Third Edition – May, 1954
Fourth Edition – January, 1969
Fifth Edition – August, 1972
Sixth Edition – June, 1975
Seventh Edition – November, 1977
Eighth Edition – April, 1980
Ninth Edition – April, 1988

Tenth Edition

July 27, 1993

Approval as an American National Standard (ANSI) covers the numbered paragraphs on pages dated July 27, 1993. These pages should not be discarded when revised or additional pages are issued if it is desired to retain the ANSI approved text.

An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc.

Approved as ANSI/UL 92-1982, October 19, 1982
Approved as ANSI/UL 92-1988, June 10, 1988
Approved as ANSI/UL 92-1994, November 28, 1994

Revisions of this standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

ISBN 1-55989-349-4

COPYRIGHT © 1973, 1996 UNDERWRITERS LABORATORIES INC.

No Text on This Page

CONTENTS**FOREWORD****INTRODUCTION**

1 Scope	5
2 General	5

CONSTRUCTION

3 Types	5
4 Tube and Cover	5
5 Reinforcement	6
6 Internal Diameter	6
7 Couplings	7

PERFORMANCE

8 Elongation and Contraction Test	7
9 Twist Test	7
10 Kink Test	8
11 Proof Pressure Test	9
12 Hydrostatic Strength Test	9
13 Adhesion Test	10
14 Tensile Strength and Elongation Test of Tube and Cover	10
15 Accelerated Air-Oven Aging Test	11
16 Water Immersion Test	11
17 Ozone Exposure Test	12
18 Low Temperature Test	12
19 Coupling Retention Test	13
20 Pull Test	13
21 Mercurous Nitrate Immersion Test	14
21A Moist Ammonia-Air Stress Cracking Test	14
22 Salt-Spray Corrosion Test	14A

MANUFACTURING AND PRODUCTION TESTS

23 General	15
------------------	----

MARKING

24 General	15
------------------	----

FOREWORD

- A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.
- B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.
- C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.
- D. A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with the Standard.
- E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of or reliance upon this Standard.
- F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

INTRODUCTION

1 Scope

1.1 These requirements cover fire extinguisher and booster hose with or without couplings attached, in sizes of 3/8 inch (9.5 mm) up to and including a nominal internal diameter of 1-1/2 inches (38.1 mm) for use on portable, wheeled, and stationary fire extinguishers, and also as booster hose on fire apparatus. This hose is intended for use at maximum working pressure of 200, 250, 400, 600, 800, 1000, or 1250 psig (1.38, 1.72, 2.76, 4.14, 5.52, 6.90, or 8.62 MPa).

1.1 revised July 27, 1993

1.2 These requirements also cover hose for use on fire extinguishers requiring characteristics for low-temperature flexibility at minus 54°C (minus 65°F).

1.3 A product that contains features, characteristics, components, materials, or systems new or different from those in use when the standard was developed, and that involves a risk of fire, electric shock, or injury to persons shall be evaluated using the appropriate additional component and end-product requirements as determined necessary to maintain the level of safety for the user of the product as originally anticipated by the intent of this standard.

2 General

2.1 Units of Measurement

2.1.1 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

2.2 References

2.2.1 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 Types

3.1 Fire extinguisher and booster hose shall be the wrapped, braided, or spiraled type.

3.2 All hose shall consist of a rubber tube, a reinforcement of cotton or synthetic fibers or corrosion resistant material such as stainless steel, and a rubber cover.

4 Tube and Cover

4.1 General

4.1.1 The tube or lining and cover of a hose shall be made from natural rubber, synthetic rubber, or both, which is referred to hereafter as rubber.

4.1.2 A tube and a cover shall be of uniform thickness, and free from pitting, blisters, or other imperfections that would impair its intended use. This requirement is not intended to exclude the use of a corrugated cover or wrapped cover finish.

4.1.3 Intentional pricking of the cover is acceptable.

4.2 Thicknesses

4.2.1 The thickness of a tube shall not be less than 0.060 inch (1.52 mm), and that of a cover not less than 0.047 inch (1.19 mm), when determined in accordance with 4.2.2 – 4.2.5.

4.2.2 For buffing off irregularities in the sample, the buffing machine specified in the Recommended Practice for Rubber-Preparation of Pieces for Test Purposes from Products, ASTM D3183–84 (1992), is to be used. The dial micrometer specified in the Test Methods for Rubber Properties in Tension, ASTM D412–92, is to be used for measuring thickness.

4.2.2 revised July 24, 1996

4.2.3 One piece, approximately 6 – 8 inches (152 – 203 mm) long, taken from the sample selected for physical and detail tests, is to be used in determining the thickness of the lining and cover in accordance with 4.2.4 and 4.2.5.

4.2.4 A strip, approximately 6 – 8 inches (152 – 203 mm) long and 1 inch (25 mm) wide, or as close to 1 inch wide as possible from small diameter hose, is to be cut from the hose, and the rubber part separated from the plies. If the thickness of the part is not uniform around the circumference of the hose, the strip is to be cut from the thinnest portion of the sample.

4.2.5 The strip sample is to be buffed just sufficiently to remove the impressions left by the fabric or braid or other surface irregularities, using the buffing machine described in 4.2.2. A series of five thickness measurements is to be taken within the area from which the impressions have been removed, and the maximum reading obtained is to be taken as the thickness of the rubber part.

5 Reinforcement

5.1 Wrapped Type

5.1.1 Wrapped-type hose sized 5/8 inch (15.9 mm) or smaller shall have at least three plies of fabric. Hose sized larger than 5/8 inch shall have at least four plies of fabric.

5.2 Braided and Spiraled Type

5.2.1 Plies of reinforcement shall be of cotton or synthetic fibers, or corrosion resistant material such as stainless steel and shall be evenly and firmly applied over the tube. Braids and spirals shall be thoroughly impregnated with a rubber compound that shall cause the plies to adhere firmly to each other and to the rubber tube and cover.

5.2.2 Hose in 3/8 and 7/16 inch (9.5 and 11.1 mm) sizes shall have at least one braid or two plies of spirals. Hose in sizes larger than 7/16 inch and up to 5/8 inch (15.9 mm) shall have at least two braids or four plies of spirals. Hose larger than 5/8 inch shall have at least three braids or six plies of spirals.

5.2.3 Adjacent plies of spirals shall be wound in opposite directions. Hose having a lesser number of braids or spirals than specified in 5.2.2 may be considered acceptable if found by investigation to (1) comply with the other requirements in this standard, and (2) be equivalent with respect to kink resistance and deformation resistance to hose having the specified number of braids or spirals.

6 Internal Diameter

6.1 The internal diameter of a hose shall be equal to the nominal diameter $\pm 1/32$ inch (0.8 mm) for sizes up to and including 5/8 inch (15.9 mm), and $\pm 1/16$ inch (1.6 mm) for larger sizes, when determined in accordance with 6.2 and 6.3.

6.2 The internal diameter is to be measured using (1) a tapered plug gauge having a taper of 3/8 inch per foot (31 mm/m), marked to indicate variations of 1/64 inch (0.4 mm) in diameter, or (2) a set of plug gauges, step, straight, or ball type, in increments of 0.005 inches (0.13 mm).

6.3 The end of the hose is to be cut square. If a tapered plug gauge is used, the plug gauge is to be inserted into 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. If a set of step, straight, or ball-type plug gauges is used, the diameter of the gauge, that when inserted into the hose sample gives a close fit without forcing, is to be recorded as the internal diameter of the hose.

7 Couplings

7.1 A hose coupling shall be made of corrosion resistant material. See Salt Spray Corrosion Test, Section 22.

7.1 added July 27, 1993

PERFORMANCE

8 Elongation and Contraction Test

8.1 General

8.1.1 The change in length of the hose or hose assembly, when pressurized from 10 psig (69 kPa) to the maximum working pressure, shall be plus 4 to minus 6 percent for sizes less than 3/4 inch (19.1 mm) and plus 6 to minus 0 percent for sizes 3/4 inch and larger.

8.1.1 revised July 27, 1993

8.2 Apparatus

8.2.1 The hydrostatic equipment specified in Methods of Testing Rubber Hose, ASTM D380–94, is to be used for this test.

8.2.1 revised July 24, 1996

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 (508 mm) 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 Method

8.3.1 Samples are to consist of at least one full length, nominally 50 feet (15.24 m), of each size of hose. To expedite the test procedure, a "nominal length" may be assumed unless the actual length measured at 10 psig (69 kPa) is less than 48 feet (14.63 m) or more than 53 feet (16.15 m). For hose assemblies, the length of the hose between fittings is to be measured.

8.3.1 revised July 27, 1993

8.3.2 This test is to be conducted at the maximum working pressure in accordance with the test methods specified in Methods of Testing Rubber Hose, ASTM D380–94.

8.3.2 revised July 24, 1996

9 Twist Test

9.1 General

9.1.1 For a 3/4 inch (19.1 mm) and larger hose, the twist in a direction to loosen couplings shall not be greater than 7 degrees per foot (0.4 rad/m).

9.2 Apparatus

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

9.3 Method

9.3.1 This test is to be a continuation of the Elongation and Contraction Test, Section 8, and measurements for twist are to be taken at the maximum working pressure.

9.3.2 To expedite the test procedure, a "nominal length" may be assumed unless the actual length measured at 10 psig (69 kPa) is less than 48 feet (14.63 m) or more than 53 feet (16.15 m). Hence, if for 3/4 inch (19.1 mm) and larger hose of such a "nominal length", the twist does not exceed one turn in a left-hand direction, the length is to be considered acceptable.

9.3.3 This test is to be conducted at the maximum working pressure in accordance with the test methods specified in Methods of Testing Rubber Hose, ASTM D380–94.

9.3.3 revised July 24, 1996

9.3.4 If the twist is first in one direction and then in the other, the extreme position from which the hose starts to turn to the left is to be considered as the starting point from which readings are taken. If the length at any time during the progress of the test shows a twist to the left over 7 degrees per foot (0.4 rad/m), the length is to be considered as not having met the requirements of this test.

10 Kink Test

10.1 General

10.1.1 A hose or hose assembly, when kinked, shall withstand the hydrostatic pressure indicated in Table 10.1 for 5 seconds without leakage, ballooning, or rupture. Hose and hose assemblies intended for working pressures greater than 600 psig (4.14 MPa) are not to be subjected to the Kink Test.

10.1.1 revised July 27, 1993

Table 10.1
Hydrostatic pressure in kink test of hose

Maximum working pressure of hose, psig (MPa)	Required pressure in kink tests, psig (MPa)
200 (1.38)	250 (1.72)
250 (1.72)	300 (2.07)
400 (2.76)	500 (3.45)
600 (4.14)	700 (4.83)

10.2 Apparatus

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

10.3 Method

10.3.1 This test is to be conducted at the pressures specified in Table 10.1, in accordance with the test methods specified in Methods of Testing Rubber Hose, ASTM D380–94.

10.3.1 revised July 24, 1996

11 Proof Pressure Test

11.1 General

11.1.1 The hose, when lying straight, shall withstand a hydrostatic pressure of twice the maximum working pressure for 1 minute without leakage, ballooning or rupture.

11.1.2 A hose assembly, while lying straight, shall withstand a hydrostatic pressure of twice the maximum working pressure for 1 minute without leakage, ballooning or rupture of the hose and without slippage, leakage, or damage to the coupling.

11.1.2 added July 27, 1993

11.2 Apparatus

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

11.3 Method

11.3.1 Samples are to consist of a full length, nominally 50 feet (15.2 m), of each size of hose or hose assembly. To expedite the test procedure, a "nominal length" may be assumed unless the actual length measured at 10 psig (69 kPa) is less than 48 feet (14.6 m) or more than 53 feet (16.2 m). This test can be conducted on the same sample used for the Elongation and Contraction Test, Section 8, and Twist Test, Section 9. 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.

11.3.1 revised July 27, 1993

12 Hydrostatic Strength Test

12.1 General

12.1.1 A 3-foot (0.9-m) sample of each size of hose, while lying straight, shall withstand a hydrostatic pressure of four times the maximum recommended working pressure without leakage, ballooning or rupture.

12.1.2 A 3-foot (0.9-m) sample of each size of hose assembly, while lying straight, shall withstand a hydrostatic pressure of four times the maximum working pressure without leakage, ballooning or rupture of the hose and without slippage, leakage, or damage to the coupling.

12.1.2 added July 27, 1993

12.2 Apparatus

12.2.1 The hydrostatic apparatus for this test is to be the same as that specified in 8.2.1. The sample is to be placed in an enclosure of sufficient strength to protect the operator.

12.3 Method

12.3.1 A 3-foot (0.9-m) sample of each size of hose or hose assembly, while lying straight, is to be subjected to the Straight Bursting Test specified in Methods of Testing Rubber Hose, ASTM D380–1994. 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.

12.3.1 revised July 24, 1996

13 Adhesion Test

13.1 General

13.1.1 The adhesion between the cover and the wrapped, braided, or spiraled reinforcement shall be such that the rate of separation of a ring-shaped sample, 1 inch (25.4 mm) in width, is not greater than 1 inch per minute (0.42 mm/sec) with a weight of 10 pounds (4.5 kg).

13.1.2 The adhesion between the tube and the wrapped, braided, or spiraled reinforcement shall be such that the rate of separation of a ring-shaped sample, 1 inch (25.4 mm) in width, is not greater than 1 inch per minute (0.42 mm/sec) with a weight of 10 pounds (4.5 kg).

13.1.3 The adhesion between the plies of reinforcement fabric or braids shall be such that the rate of separation of a ring-shaped sample, 1 inch (25.4 mm) in width, is not greater than 1 inch per minute (0.42 mm/sec) with a weight of 12 pounds (5.4 kg).

13.2 Apparatus

13.2.1 This test is to be conducted with the type of apparatus described for the Dead-Weight Method specified in Test Methods for Rubber Property-Adhesion to Flexible Substrate, ASTM D413–82(1993).

13.3 Method

13.3.1 The test is to be conducted in accordance with the Static-Mass Method specified in Test Methods for Rubber Property-Adhesion to Flexible Substrate, ASTM D413–82(1993). The adhesion is to be taken as the rate obtained by dividing the total distance separated in inches (mm), to the nearest 1/32 inch (0.8 mm), by the elapsed time in minutes.

13.3.1 revised July 24, 1996

14 Tensile Strength and Elongation Test of Tube and Cover

14.1 General

14.1.1 The tensile strength of a tube shall not be less than 1000 psi (6.89 MPa), and the ultimate elongation of a tube shall not be less than 250 percent [from 1 to 3-1/2 inches (25.4 – 88.9 mm)].

14.1.2 The tensile strength of a cover shall not be less than 1200 psi (8.27 MPa), and the ultimate elongation of a cover shall not be less than 300 percent [from 1 to 4 inches (25.4 – 102 mm)].

14.2 Apparatus

14.2.1 This test is to be conducted on a power-operated machine, as specified in Test Methods for Rubber Properties in Tension, ASTM D412–92.

14.2.1 revised July 24, 1996

14.2.2 The elongation is to be measured by means of a scale or other device that is to be used in such a way as not to touch the sample and is to be capable of indicating the elongation with an accuracy of 0.1 inch (2.5 mm).

14.2.3 The sample is to be buffed and measured with the equipment specified in 4.2.2.

14.2.4 Die C, as specified in Test Methods for Rubber Products in Tension, ASTM D412–92, is to be used for cutting the sample.

14.2.4 revised July 24, 1996