1931 ANSI/NFPA 1931 An American National Standard August 5, 1994

NFPA 1931 Standard on Design of and Design Verification Tests for Fire Department Ground Ladders 1994 Edition

National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101

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There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

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NFPA 1931

Standard on

Design of and Design Verification Tests for Fire Department Ground Ladders

1994 Edition

This edition of NFPA 1931, *Standard on Design of and Design Verification Tests for Fire Department Ground Ladders*, was prepared by the Technical Committee on Fire Department Ground Ladders and acted on by the National Fire Protection Association, Inc., at its Annual Meeting held May 16–18, 1994, in San Francisco, CA. It was issued by the Standards Council on July 14, 1994, with an effective date of August 5, 1994, and supersedes all previous editions.

The 1994 edition of this document has been approved by the American National Standards Institute.

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.

Origin and Development of NFPA 1931

NFPA 193, *Standard on Fire Department Ladders, Ground and Aerial*, was first presented to the Association in 1954 and was tentatively adopted as a standard on aerial ladder testing. It was adopted as a standard in 1955.

In 1958, new material covering recommendations for portable ladders, ground ladders, and aerial ladders — their use, maintenance, and testing, was added. In addition, revision was made to the section pertaining to testing aerial ladders.

In 1959, requirements for aluminum ground ladders for fire department use were adopted by the Association.

In May 1972, a complete revision of the 1959 edition was adopted.

In 1975, the document was separated into two standards, NFPA 1931, dealing with ground ladders, and NFPA 1904, *Standard for Aerial Ladder and Elevating Platform Fire Apparatus*, dealing with the testing of aerial devices.

The 1979 edition incorporated extensive revisions, including editorial and style changes to bring the document into line with the *NFPA Manual of Style*.

In 1984, the text was divided into two documents, with NFPA 1931 containing the requirements for manufacturers on design and design verification testing for new ground ladders. A companion document, NFPA 1932, *Standard on Use, Maintenance, and Service Testing of Fire Department Ground Ladders*, covers requirements for the ground ladder user.

The 1989 edition included additional requirements for labels, modified rung spacing, added requirements for securing halyards, and required staypoles to be stowable against the base section if they could not be properly deployed.

This 1994 edition contains minor amendments to keep the standard up to date. Some of the material was editorially reorganized. A table providing ground ladder duty ratings was added. Additional requirements were added for wood ground ladders, and some of the labeling was modified.

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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 the membership may have occurred.

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 design, inspection, testing, and use of ground ladders for the fire service.

Contents

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Standard on

Design of and Design Verification Tests for Fire Department Ground Ladders

1994 Edition

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates explanatory material on that paragraph in Appendix A.

Information on referenced publications can be found in Chapter 5 and Appendix B.

Chapter 1 Administration

1-1 Scope.

1-1.1* This standard specifies requirements for the design of and the design verification tests for fire department ground ladders. The tests specified herein are the responsibility of ladder manufacturers only and SHALL NOT be performed by fire departments.

1-1.2* This standard shall apply to all new ground ladders intended for use by fire department personnel for rescue, fire-fighting operations, and training. These ladders are not intended for and shall not be used for any other purpose.

1-2* Purpose.

1-2.1 This standard shall provide the manufacturer of fire department ground ladders with a set of performance requirements against which ladders shall be certified. It is not the purpose of this standard to specify the details of construction. Limitations imposed are for the purpose of providing reasonable safety requirements and establishing test methods.

1-2.2 Fire department ground ladders constructed to and certified as meeting the requirements of this standard will provide reasonable safety for fire fighters and victims during use, provided that fire departments who purchase or use ground ladders meeting the requirements of NFPA 1932, *Standard on Use, Maintenance, and Service Testing of Fire Department Ground Ladders*.

1-3 Definitions.

Angle of Inclination. The pitch for portable, non-self-supporting ground ladders. The preferred angle of inclination is 75½ degrees.

Approved.* Acceptable to the authority having jurisdiction.

Attic Extension Ladder. An extension ladder that is specifically designed to be used to gain entry through a scuttle, hatch, or other similarly restricted opening.

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

Bark Pocket. See Wood Irregularities.

Base (Bed) Section. The lowest or widest section of an extension ladder.

Beam (Side Rail). The main structural side of the ground ladder.

Bedded Position. The position in which the fly section(s) of an extension ladder is fully retracted with the pawls engaged.

Butt. The end of the beam placed on the ground, or other lower support surface, when ground ladders are in the raised position. A butt can be the lower end of beams or added devices.

Butt Spurs (Foot). That component of ground ladder support that is in contact with the lower support surface to reduce slippage. It can be the lower end of beams or added devices.

Check. See Wood Irregularities.

Collapsible Ladder. See Folding Ladder.

Combination Ladder. A ground ladder capable of being used both as a step ladder and a single or extension ladder.

Designated Design Strength. The necessary strength to pass all test requirements in this standard.

Designated Length. The length marked on the ladder.

Design Verification Tests. Tests of a ladder structure and components thereof to prove conformance to the requirements of this standard. Design verification tests are the responsibility of the manufacturer and shall be performed only on new, unused ladders, which shall be destroyed after completion of the tests. These tests shall not be performed by fire departments.

Dogs. See Pawls.

Duty Rating. The recommended in-service working load.

Extension Ladder. A non-self-supporting ground ladder adjustable in length. It consists of two or more sections traveling in guides, brackets, or the equivalent so arranged as to allow length adjustment.

Fire Department Ground Ladder. Any portable ladder specifically designed for fire department use in rescue, fire-fighting operations, or training and not permanently attached to fire apparatus.

Fly Section(s). The upper section(s) of an extension ladder.

Folding Ladder. A single-section ladder with rungs that can be folded or moved to allow the beams to be brought into a position touching or nearly touching each other.

Halyard. Rope used on extension ladders for the purpose of raising a fly section(s). A wire cable might be referred to as a halyard where used on the uppermost fly section(s) of three- or four-section extension ladders.

Heat Sensor Label. A label that changes color at a preset temperature to indicate a specific heat exposure.

Inside Ladder Width. The distance measured from the inside edge of one beam to the inside edge of the opposite beam.

Knot. See Wood Irregularities.

Ladder. A device on which a person climbs for ascending or descending. This device consists of two beams (side rails) joined at regular intervals by cross pieces called rungs on which a person is supported during this climb.

Exception: See Pompier Ladder.

Ladder Nesting. The procedure whereby ladders of different sizes are stacked partially within one another to reduce the amount of space required for their storage on the apparatus.

Maximum Extended Length. The total length of the extension ladder when all fly sections are fully extended and pawls engaged.

Pawls. Devices attached to a fly section(s) for the purpose of anchoring the fly section(s) where extension ladders are used in the extended position. Pawls engage ladder rungs near the beams for anchoring purposes.

Permanent Deformation (Set). That deformation remaining in any part of a ladder or its components after all test loads have been removed from the ladder.

Pitch Pocket. See Wood Irregularities.

Pompier Ladder (Scaling Ladder). A ladder having a single center beam only and with a large hook on top used for scaling.

Roof Ladder. A single ladder equipped with hooks at the top end of the ladder.

Rungs. The ladder cross pieces on which a person steps while ascending or descending.

Scaling Ladder. See Pompier Ladder.

Set. See Permanent Deformation.

Shall. Indicates a mandatory requirement.

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

Side Rail. See Beam.

Single Ladder. A non-self-supporting ground ladder, nonadjustable in length, consisting of only one section.

Slope of Grain. See Wood Irregularities.

Split. See Wood Irregularities.

Staypoles (Tormentors). Poles attached to each beam of the base section of extension ladders and used to assist in the raising of the ladder and to help provide stability of the raised ladder.

Tested. Verification of compliance with test requirements as specified in this standard.

Test Failure. Noncompliance with the test requirements as specified in this standard.

Tip. The end of the ladder opposite the butt end.

Tormentors or Tormentor Poles. See Staypoles.

Ultimate Failure. Collapse of a ground ladder structure or component thereof.

Visible Damage. A permanent change in condition that is clearly evident by visual inspection without recourse to optical measuring or observation devices.

Visual Inspection. Observation by eye unaided by optical devices, except prescription eyeglasses or lenses.

Wood Irregularities. Natural characteristics in or on the wood that can lower its durability, strength, or utility. These include:

Bark Pocket. An opening between annual growth rings that contains bark. Bark pockets appear as dark streaks on radial surfaces and as rounded areas on tangential surfaces.

Check. A separation of the wood along the fiber direction that usually extends across the rings of annual growth and commonly results from stresses set up in the wood during seasoning.

Knot. A portion of a branch or limb embedded in the tree and cut during the process of lumber manufacture. It is classified according to size, quality, and location in the cross section of a piece of lumber. The size of the knot is determined by its average diameter on the surface of the piece.

Pitch Pocket. An opening extending parallel to the annual growth rings that contains, or that has contained, either solid or liquid pitch.

Slope of Grain. A deviation of the fiber direction from a line parallel to the sides of the piece. Cross grain can be diagonal, spiral, or both.

Split. A separation of the wood parallel to the fiber direction due to tearing of the wood fibers, which is normally caused by external forces.

Working Length. The length of a non-self-supporting portable ladder measured along the beams from the base support point of the ladder to the point of bearing at the top.

Chapter 2 Ladder Design

2-1 Requirements for All Ground Ladders.

2-1.1 Ground ladders shall have a duty rating as specified in Table 2-1.1 when raised at the preferred angle of inclination.

Table 2-1.1 Ground Ladder Duty Rating

Type	Maximum Load (lb)	(kg)
Folding ladders	300	136
Pompier ladders	300	136
Combination ladders	750	340
Single and roof ladders	750	340
Extension ladders	750	340

2-1.2 Ground ladders shall be constructed in a manner to ensure that structural and workmanship defects do not exist. Sharp edges, burrs in excess of $1/64$ in. (0.4 mm), or other defects that might cut or tear clothing or skin, or that result in inadequate structural strength, shall be considered workmanship defects.

2-1.3 Materials of Construction.

2-1.3.1 Materials used in ground ladder construction shall be of sufficient strength to meet the performance requirements of this standard.

2-1.3.2 All structural components of ground ladders shall be constructed of materials that maintain at least 75 percent of their designated design strength at 300°F (149°C).

2-1.3.3 Where varying types of metal are used in construction of ground ladders, they shall be chosen or finished to avoid or minimize electrolytic action.

2-1.3.4 Fiberglass materials shall meet the performance requirements of Chapter 7 of ANSI 14.5, *Ladders—Portable Reinforced Plastic—Safety Requirements.*

2-1.3.5 Wood components shall meet the requirements of Chapter 5 of ANSI A14.1, *Ladders—Portable Wood—Safety Requirements*, except that wood irregularities shall not exceed the following:

(a) The general slope of the grain shall not be steeper than 1 in 15.

(b) Knots shall not appear, except that pin knots in rungs shall be permitted.

(c) Pitch and bark pockets shall be permitted, provided that there is not more than one that is 1/32 in. (1 mm) in width, 2 in. (51 mm) in length, and 1/8 in. (3 mm) in depth.

(d) Checks shall not be more than 2 in. (51 mm) in length or 1/8 in. (3 mm) in depth.

(e) Splits shall not be more than 2 in. (51 mm) in length or 1/8 in. (3 mm) in depth.

(f) Cracks shall not be permitted.

(g) Compression wood shall not be permitted.

(h) Cross grain shall not be permitted.

(i) Chambers associated with black streaks shall not be permitted.

2-1.4 The beams at the tip of each section of ground ladders shall be rounded to allow the ladder to slide on irregular surfaces without catching or snagging during placement or operations.

Exception: Combination ladders, folding ladders, wall ladders, and pompier ladders shall be excluded from this requirement.

2-1.5 Rungs shall not be less than 1 1/4 in. (32 mm) in diameter.

Exception No. 1: Folding and pompier ladder rungs shall be excluded from this requirement.

Exception No. 2: Swell center rungs on wood ladders shall be permitted to taper to 1 1/8 in. (28.6 mm).

2-1.6* Rungs shall be spaced on 12-in. to 14-in. (305-mm to 356-mm) centers. Rungs shall be uniformly spaced ± 1/8 in. (± 3 mm).

2-1.7 Butt spurs shall be provided on the butt end of each beam of single ladders and on the butt end of each beam of the base section of extension ladders.

2-1.8 Ladder Marking.

2-1.8.1 The designated length of the ground ladder shall be marked within 12 in. (305 mm) of the butt of each beam of single ladders and on each beam of the base section of extension ladders.

2-1.8.2 Ground ladders meeting all requirements of this standard shall be so certified by the ladder manufacturer, and a label stating that the ground ladder meets these requirements shall be affixed to the ladder.

2-1.8.3 All ground ladders shall bear a unique individual identification number or alphanumeric code and the month and year of manufacture. This identification shall be branded or metal-stamped on the ground ladder, or stamped on a metal plate permanently attached to the ground ladder.

2-1.8.4 All metal ground ladders shall bear the electrical hazard warning label shown in Figure 2-1.8.4 on the outside of each beam 4 1/2 ft to 6 ft (1.37 m to 1.83 m) from the butt.

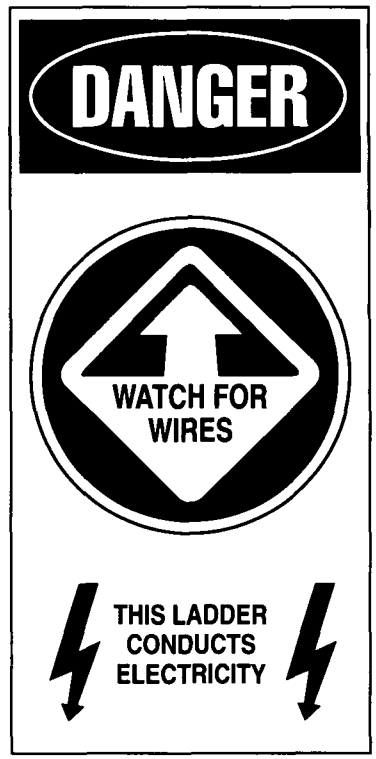


Figure 2-1.8.4 Electrical hazard warning label for metal ground ladders.

2-1.8.5 All fiberglass and wood ground ladders shall bear the electrical hazard warning label shown in Figure 2-1.8.5 on the outside of each beam 4 1/2 ft to 6 ft (1.37 m to 1.83 m) from the butt.

2-1.8.6 All ground ladders shall bear the label shown in Figure 2-1.8.6 approximately 4 1/2 ft. to 6 ft (1.37 m to 1.83 m) from the butt on the outside of both beams.

2-1.9* The surfaces of rungs designed for use in ascending, descending, working, or standing shall be corrugated, serrated, knurled, dimpled, or coated with a skid-resistant material across their entire width.

2-1.10 Heat Sensor Labels.

2-1.10.1 All metal and fiberglass ground ladders shall bear heat sensor labels preset for 300°F (149°C) ± 5 percent. Each heat sensor shall have printed on the label an expiration year and wording indicating that the expiration date is at the end of that year.

2-1.10.2 Heat sensor labels shall be located on the inside of each beam of each section immediately below the second rung from the tip of each section and immediately below the center rung of that section.

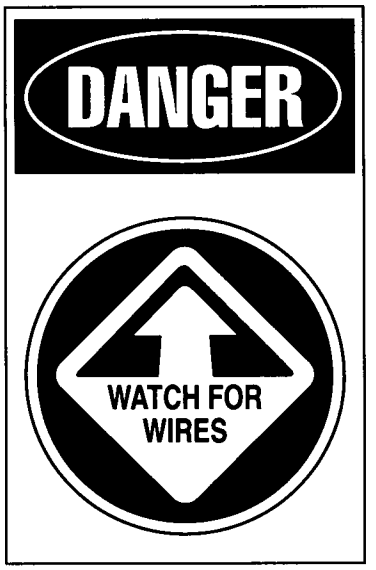


Figure 2-1.8.5 Electrical hazard warning label for fiberglass and wood ground ladders.

2-2 Additional Requirements for Single Ladders Only.

2-2.1 These design requirements shall be in addition to the design requirements specified in Section 2-1.

2-2.2* Length. The designated length of a single ladder shall be the length of one beam excluding any butt spur. The actual length of the beam shall not be less than the designated length.

2-2.3 Width. The minimum inside width between beams for single and roof ladders shall not be less than 16 in. (406 mm).

2-3 Additional Requirements for Roof Ladders Only.

2-3.1 These design requirements shall be in addition to the design requirements specified in Sections 2-1 and 2-2.

2-3.2 Ladders with double-tapered beams shall not be provided with rigid or folding roof hook assemblies for use in roof operation.

2-3.3 Folding Roof Hook Assemblies.

2-3.3.1* Folding roof hooks shall be provided on all roof ladders. The roof hooks shall be directionally spring-locked and have tapered points to reduce slippage. These roof hooks shall be of sufficient size to meet the design verification tests of Section 3-3 and have a minimum opening of not less than 6 in. (150 mm), measured perpendicular from the outside of the beam to the point.

2-3.3.2 Folding roof hook assemblies shall be attached to the beams in a manner that does not appreciably weaken the beams.

2-4 Additional Requirements for Extension Ladders Only.

2-4.1 These design requirements shall be in addition to the design requirements specified in Section 2-1.

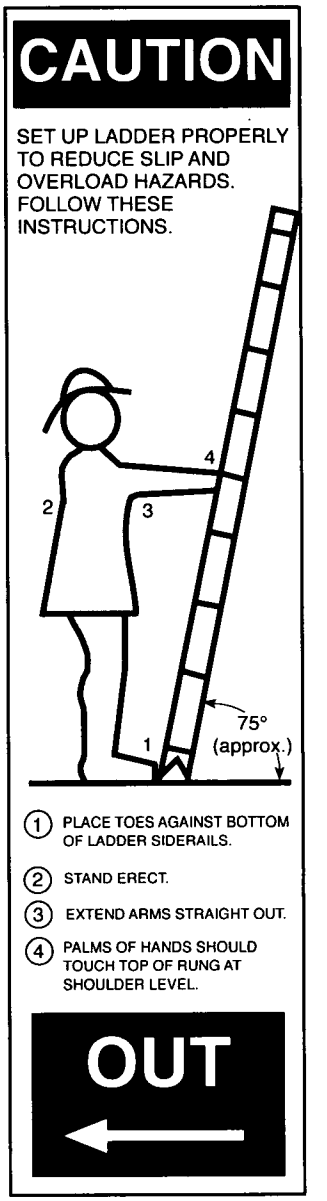


Figure 2-1.8.6 Ladder positioning label.

2-4.2 Construction.

2-4.2.1 Extension ladders shall be constructed with a permanently affixed stop installed by the manufacturer to prevent their overextension. The manufacturer shall determine the location of this permanently affixed stop to ensure that the test requirements of this standard are met when the ladder is extended to maximum extended length.

2-4.2.2 Extension ladders shall not be constructed in a manner or method that necessitates the elimination of a rung on any section.

Exception: One of the lower two rungs of the fly section shall be permitted to be replaced by the steel cross bar of a halyard-actuated rung lock system.

2-4.2.3 Extension ladders shall be constructed in a manner so that the rungs of each section shall align with the

rungs of other sections when the ladder is extended and pawls are engaged.

2-4.3* Length.

2-4.3.1 The designated length of an extension ladder shall be the maximum extended length along the beams on one side excluding any butt spur. The minus tolerance of the designated length shall not exceed 6 in. (152 mm).

2-4.3.2 Attic extension ladders shall not exceed 16 ft (4.9 m) in length.

2-4.4 Width.

2-4.4.1 Extension ladders shall have a minimum inside width between beams on any section of not less than 16 in. (406 mm).

2-4.4.2 Attic extension ladders shall have a minimum inside width between beams on any section of not less than 7½ in. (190 mm).

2-4.5 Hardware. Hardware shall meet the minimum strength requirements of the ground ladder's component parts and shall be corrosion-resistant or protected against corrosion.

2-4.6 Halyard and Pulley.

2-4.6.1 Extension ladders over 16 ft (4.9 m) in designated length shall be equipped with a halyard and pulley system.

2-4.6.2 The pulley shall be attached to the ladder in a manner so as not to appreciably weaken either the rungs or the beams.

2-4.6.3 The pulley shall not be less than 1¼ in. (32 mm) in diameter, measured at the base of the sleeve.

2-4.6.4 The halyard shall not be less than ⅜ in. (9.5 mm) in diameter having a minimum breaking strength of 825 lb (374 kg) and shall be of sufficient length for the purpose intended. Splices shall not be permitted.

2-4.6.5 On three- and four-section extension ladders, all fly sections beyond the first fly section shall be permitted to be extended by wire rope. Such wire cable shall have a 5 to 1 safety factor while supporting 2 times the dead load weight of the fly section(s) the cable is intended to raise. Where wire rope is used, a means for adjusting the length of wire rope shall be provided. Splices shall not be permitted.

2-4.6.6* Where a continuous halyard is used, a secondary means to secure the halyard from the ground prior to climbing shall be provided.

2-4.7 Pawls.

2-4.7.1 Pawls shall be of a positive mechanical action type and shall engage a rung of the supporting section.

2-4.7.2 Pawls shall be fastened or secured to beams in a manner so that vibration and use will not cause bolts and nuts to loosen.

2-4.7.3 Pawls shall be constructed so that the hook portion of the pawl that engages or rests on the rung shall have sufficient bearing surface or area to prevent the hook from cutting into the rung(s) when engaged.

2-4.7.4 The hooks on pawls shall be finished in a manner to avoid sharp edges and points.

2-4.7.5 Pawls shall be designed and attached so that they will rest on the rungs as near the beams as possible.

2-4.8 Staypoles.

2-4.8.1 Staypoles shall be furnished on all extension ladders of over 40 ft (12.2 m) designated length.

2-4.8.2 All staypoles shall be permanently attached to the ground ladder and shall not be removed for ladder nesting.

2-4.8.3 Staypole spikes shall not project beyond the butt of the base section when the extension ladder is in the bedded position.

2-4.8.4 A means shall be provided to hold the staypoles in a secure position against the base section when the staypoles are not in use.

2-4.8.5 A label shall be provided on each staypole between 4½ ft and 6 ft (1.37 m and 1.83 m) from the butt of the pole. The label shall read: "CAUTION: Only place staypoles when both poles can be placed properly."

2-5 Additional Requirements for Combination Ladders Only.

2-5.1 These design requirements shall be in addition to the design requirements specified in Section 2-1.

2-5.2 Length.

2-5.2.1 The designated length of combination ladders shall be determined in the single or extension configuration.

2-5.2.2 The designated length of combination ladders shall not exceed 16 ft (4.9 m).

2-5.3 Width. The minimum inside width between beams for combination ladders shall not be less than 12 in. (305 mm).

2-6 Additional Requirements for Folding Ladders Only.

2-6.1 These design requirements shall be in addition to the design requirements specified in Section 2-1.

2-6.2 Construction.

2-6.2.1 All folding ladders shall be equipped with foot pads to prevent slippage. The pads shall have a nonskid or skid-reducing material on the bottom side of the foot pad.

2-6.2.2 Folding ladders shall have a positive-locking device to hold the ladder in the open position.

2-6.3 Length. The designated length of folding ladders shall not exceed 14 ft (4.3 m).

2-6.4 Width. The minimum inside width between beams for folding ladders in the open position shall not be less than 7½ in. (190 mm).

2-7 Additional Requirements for Pompier Ladders.

2-7.1 These design requirements shall be in addition to the design requirements specified in Section 2-1.

2-7.2 Construction.

2-7.2.1 Pompier ladders shall be equipped with a serrated steel hook permanently fastened to the center beam of the ladder.

2-7.2.2 Pompier ladders shall be equipped with a minimum of two stand-off brackets. Each stand-off bracket shall maintain a minimum distance of 7 in. (178 mm) between the centerline of the rung and the portion of the bracket that contacts the wall.

2-7.3 Length. The designated length of pompier ladders shall not exceed 16 ft (4.9 m).

2-7.4 Width. The minimum overall width of the rungs shall be 12 in. (305 mm).

Chapter 3 Design Verification Tests

3-1 Requirements for All Design Verification Tests.

3-1.1 Design verification tests shall be conducted during the initial evaluation of a specific product design and thereafter whenever there is a change in the design, method of manufacturing, or material. Ladders subjected to design verification tests shall be destroyed after testing is completed.

3-1.2 Design verification tests shall not be conducted on ladders that have been in use or subjected to prior damage, misuse, or abuse.

3-1.3 Diligent effort and close attention to all details shall be exercised in setting up and conducting the tests, as subtle variations in test techniques can introduce significant testing errors that can bias the testing results. Personnel inexperienced in ladder testing, although otherwise professionally qualified, shall be especially careful to follow the test methods specified in this chapter.

3-1.4 Test loads shall be applied slowly, using extreme care to avoid impact-loading during the test. Test loads shall remain in place for a minimum of 1 min.

3-1.5 Conformance to the design verification test requirements shall be determined 1 min after removal of the test load.

3-2 Single, Extension, and Combination Ladder Design Verification Tests.

3-2.1 Horizontal Bending Tests.

3-2.1.1 The ladder shall be positioned for testing and tested as shown in Figure 3-2.1. The ladder shall be placed in a flat, horizontal position supported under the first rung from each end of the ladder. When extension and combination ladders are tested, the ladder shall be extended to the maximum extended length with pawls engaged.

3-2.1.2 Auxiliary means shall be permitted to be used to ensure that the ladder pawls remain engaged during the test to prevent movement of the fly section relative to the base section during the test.

3-2.1.3 A test load of 750 lb (340 kg) shall be distributed equally over a three-rung span at the center of the ladder. The load shall be applied to the center 3½ in. (89 mm) of each of the three rungs.

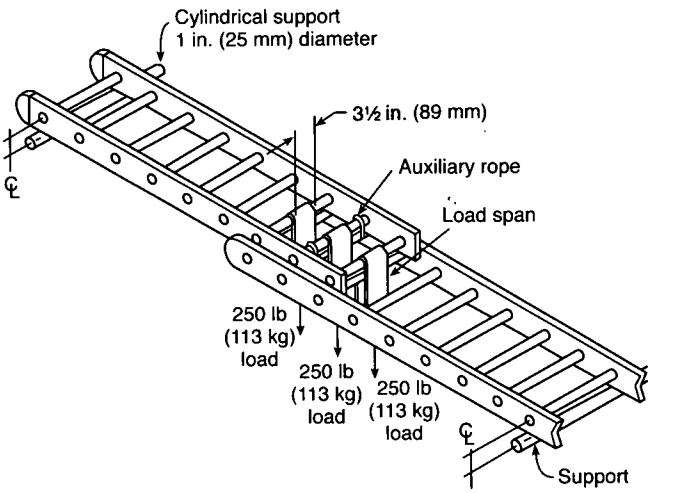


Figure 3-2.1 Design verification horizontal bending test.

3-2.1.4 The ladder shall sustain the test load without ultimate failure.

3-2.2 Deflection Test.

3-2.2.1 The ladder shall be positioned for testing and tested as shown in Figure 3-2.2. The ladder shall be extended to the maximum extended length and set to the proper angle of inclination of 75½ degrees by positioning the base section at a horizontal distance from the vertical wall equal to ¼ the effective working length of the ladder.

3-2.2.2 A test load of 500 lb (227 kg) shall be applied to the rung at the vertical center of the ladder adjacent to the beam over a span of 3½ in. (89 mm).

3-2.2.3 The butt spur on the beam opposite the test load shall remain in contact with ground or other supporting surface.

3-2.2.4 The test load then shall be reapplied to an area of the rung adjacent to the opposite beam, and the test shall be repeated.

3-2.3 Rung Bending Strength Test.

3-2.3.1 The test shall be conducted on a test unit consisting of either a single section of the ladder, or on a three-rung test sample taken from the maximum width portion of a like ladder section with a like rung. The test unit shall be positioned for testing and tested as shown in Figure 3-2.3. The test unit shall be supported and the test load shall be applied using a standard loading block located in the center of the rung. The rung being tested shall not be braced.

3-2.3.2 A downward test load of 1,000 lb (454 kg) shall be applied on the standard loading block.

3-2.3.3 Upon removal of the test load, the permanent deformation shall be measured with a straight edge and a rule, as shown in Figure 3-2.3. The permitted permanent deformation shall not exceed $\frac{L}{50}$ for rung length (L), measured between the beams.

3-2.3.4 There shall not be any permanent deformation greater than the permitted deformation as specified in 3-2.3.3, and there shall not be any other visible damage.

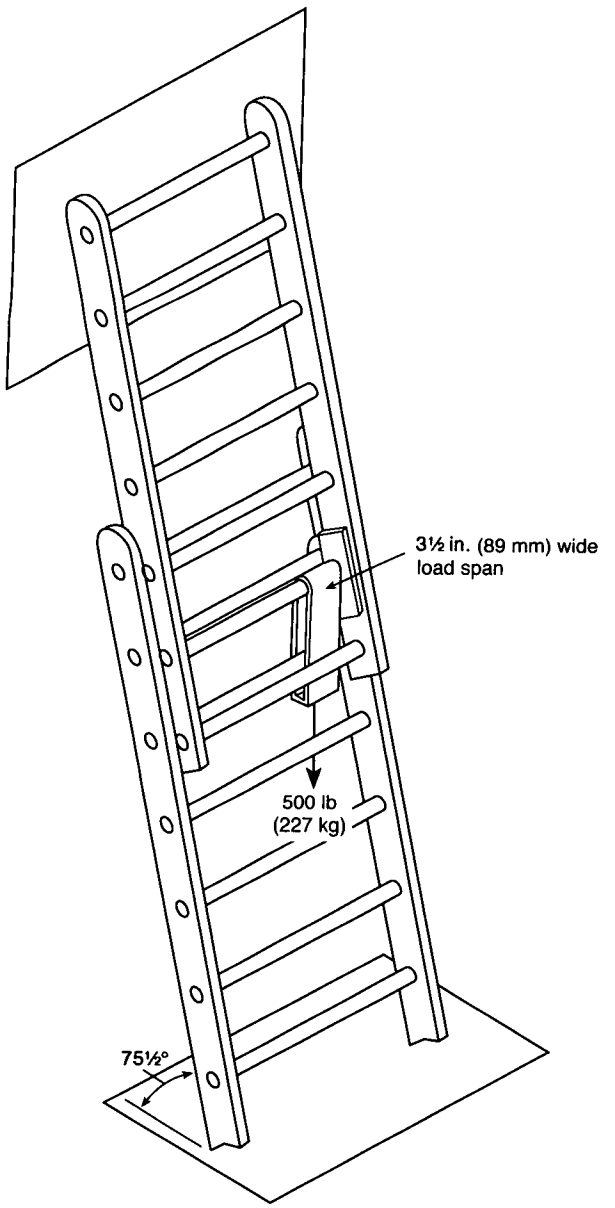


Figure 3-2.2 Design verification deflection test.

3-2.4 Rung-to-Beam Shear Strength Test.

3-2.4.1 The test shall be conducted on a test unit consisting of a single section of the ladder, or a three-rung test section taken from a like ladder having the same rung cross section and rung joint. The test unit shall be positioned for testing and tested as shown in Figure 3-2.4. The test unit shall be set at the proper angle of inclination of 75½ degrees.

3-2.4.2 A downward test load of 1,000 lb (454 kg) shall be applied on the widest like cross section, on both braced and unbraced test rungs, as near the beam as possible. Where a 3-ft (0.9-m) test section is used, the test shall be applied to the center rung. Where single sections of a ladder are tested, the test load shall be applied to the third or fourth rung from the butt.

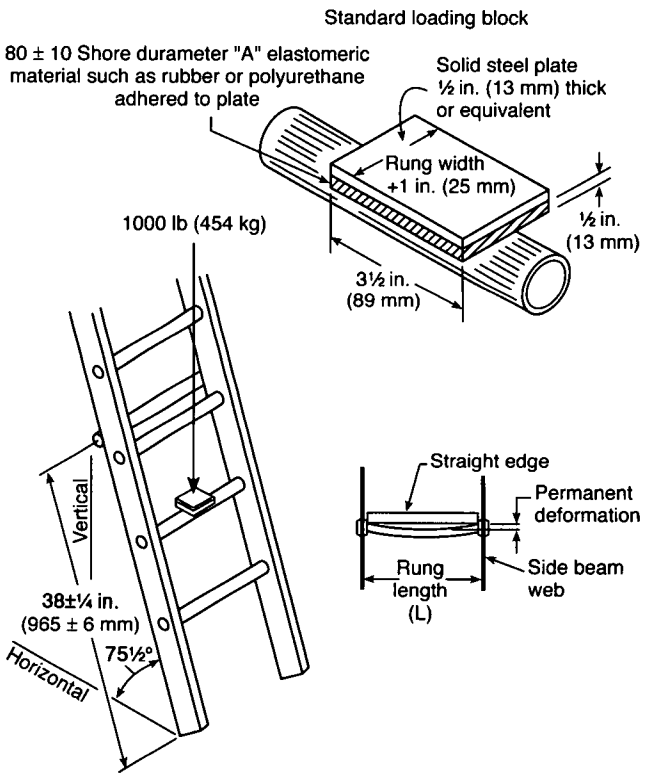


Figure 3-2.3 Design verification rung bending test.

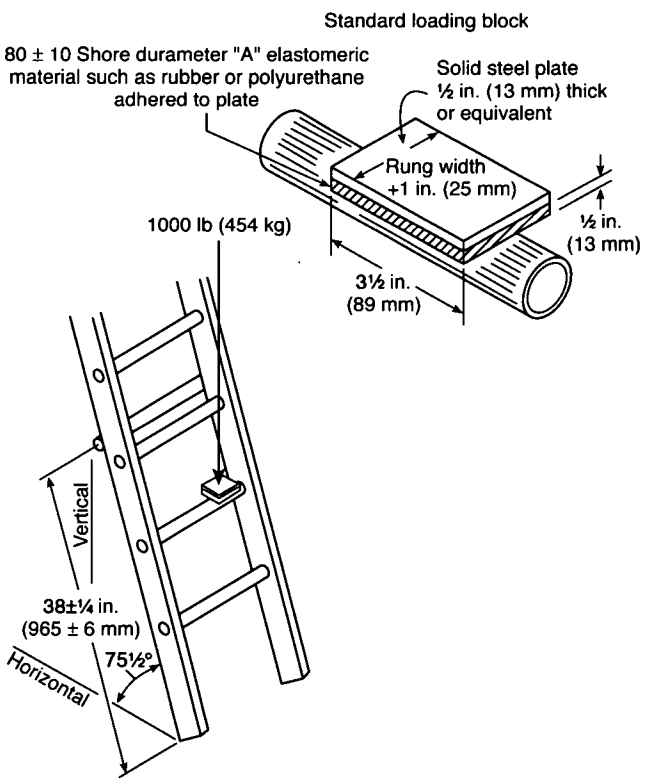


Figure 3-2.4 Design verification rung-to-beam shear strength test.

3-2.4.3 Upon removing the test load, the test unit shall show no permanent deformation or ultimate failure either in the fastening means attaching the rung or in the beam.

3-2.5 Rung Torque Test.

3-2.5.1 The test shall be conducted on a test unit consisting of either a single section of the ladder or a short test section comprising at least one rung and two beams. The test unit shall be positioned for testing and tested as shown in Figure 3-2.5.

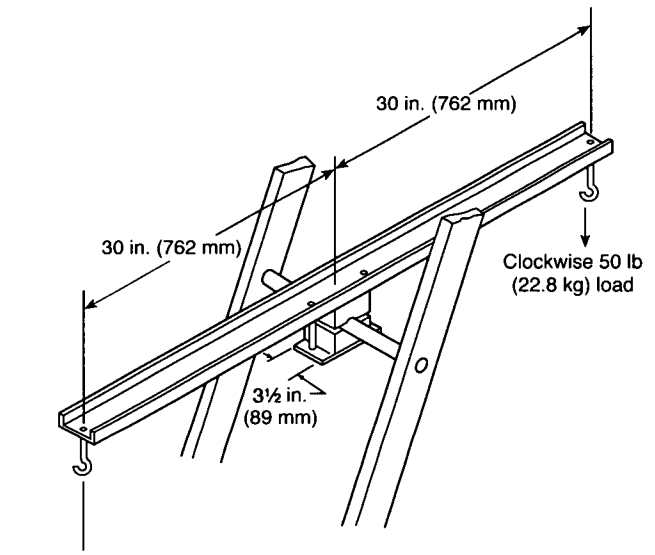


Figure 3-2.5 Design verification rung torque test.

3-2.5.2 A torque test load of 1,500 in.-lb (169.5 Nm) shall be applied in a clockwise and then a counterclockwise direction, alternately, for 10 cycles.

3-2.5.3 The rung joint shall be secured to the beams so that the alternating torque load shall not cause relative motion between the rung and the beams in excess of 9 degrees, based on a 1/16-in. (1.6-mm) maximum movement for a 1¼-in. (32-mm) diameter round rung.

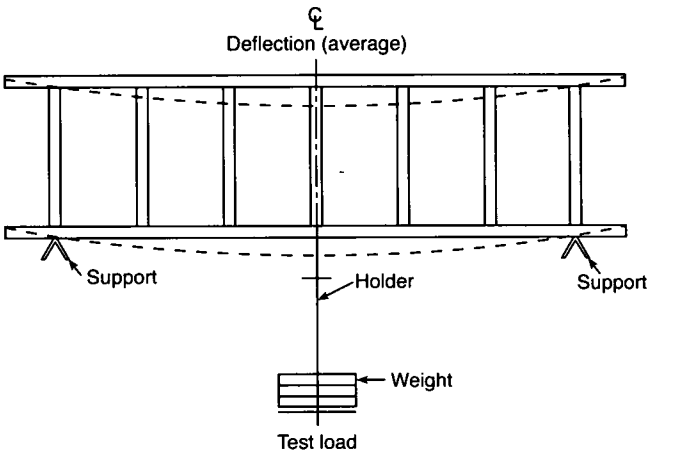
3-2.6 Side Sway Test.

3-2.6.1 The test shall be conducted on a test unit consisting of a single ladder, individual sections from an extension ladder, or individual sections from a combination ladder.

3-2.6.1.1 All sections of an extension ladder shall be individually tested.

3-2.6.1.2 Both sections of a combination ladder shall be individually tested.

3-2.6.2 The test unit shall be positioned for testing and tested as shown in Figure 3-2.6. The test unit shall be placed on edge, resting on level supports located directly under the top and bottom rungs. The beams shall be in an approximately horizontal plane, and the rungs shall be in the vertical plane and perpendicular to the ground.



The deflection is the difference between the height of the lower edge of the ladder side when unloaded (solid line) and when loaded (dotted line).

Figure 3-2.6 Design verification side sway test.

3-2.6.3 A preload of 60 lb (27.2 kg) shall be applied at the center of the span over a 3½-in. (89-mm) length of the bottom beam, held for a period of 1 min and unloaded.

3-2.6.4 A test load of 140 lb (63.5 kg) shall then be applied to the center of the span over a 3½-in. (89-mm) length of the bottom beam. The test load shall be applied by hanging weights from the bottom of the lower beam. Care shall be taken to ensure that the test load is centered with respect to the width of the beam.

3-2.6.5 Each test unit shall withstand this test without any permanent deformation in excess of 1/1000 of the effective span of the beams.

3-2.7 Beam Cantilever Bending Tests.

3-2.7.1 The test shall be conducted on a test unit consisting of either a single ladder section or the base section of an extension ladder; any butt spurs affixed to the section shall be removed before the test is conducted. The test unit shall be placed on edge with the rungs in a vertical plane. The lower beam shall be unsupported from the butt end to the midpoint of the lowest rung.

3-2.7.2 The test unit shall be positioned for testing and tested as shown in Figure 3-2.7(a). The test load shall be applied by means of a weight of 850 lb (385.5 kg) to the extreme bottom end of the upper beam. The test load shall be applied to a 2-in. (51-mm) wide, 1-in. (25-mm) thick block resting on the full width of the beam and held in place by a clamp. The block shall be 1-in. (25-mm) thick, 2-in. (51-mm) long measured along the beam, and of width equal to the clear distance between flanges. The test load shall be suspended so that it is acting through the vertical neutral axis of the beam.

3-2.7.3 The allowable permanent deformation of the upper beam shall not exceed ½ in. (12.7 mm).

3-2.7.4 The test unit shall be positioned for testing and tested as shown in Figure 3-2.7(b). The test load then shall be applied to the extreme bottom end of the lower beam as specified in 3-2.7.2.

3-2.7.5 The allowable permanent deformation of the lower beam shall not exceed ½ in. (12.7 mm).

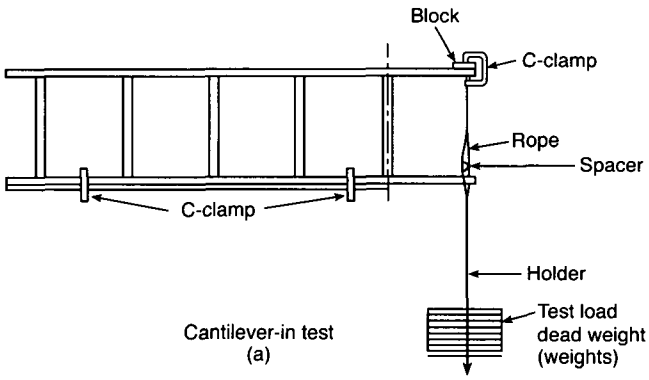


Figure 3-2.7(a) Design verification beam cantilever-in bending test.

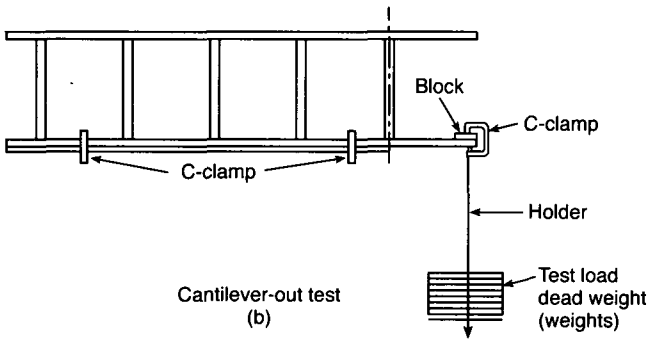


Figure 3-2.7(b) Design verification beam cantilever-out bending test.

3-2.8 Ladder Section Twist Test.

3-2.8.1 The ladder shall be positioned for testing and tested as shown in Figure 3-2.8. The test shall be conducted on a ladder base section of at least 7 ft (2.1 m) in length, supported over a 7-ft (2.1-m) test span. The ladder shall be placed in a flat horizontal position and support for the ladder on one end shall be fixed. It is important to ensure that the ladder is tightly clamped onto the test fixtures during this test.

3-2.8.2 A preload of 600 in.-lb (68 Nm) shall be used to establish a reference for angular deflection and shall be applied to the ladder in a clockwise direction for a minimum period of 1 min, after which the ladder shall be unloaded.

3-2.8.3 A test torque of 1,200 in.-lb (135 Nm) then shall be applied in a clockwise direction. The test torque shall be permitted to be applied by either a torque wrench or test loads applied on the end of the arm.

3-2.8.4 The angle of twist measured from the horizontal position in the clockwise direction shall not be greater than 14 degrees.

3-2.8.5 A preload of 600 in.-lb (68 Nm) then shall be used again to establish a reference for angular deflection and shall be applied to the ladder in a counterclockwise direction for a minimum period of 1 min, after which the ladder shall be unloaded.

3-2.8.6 A test torque of 1,200 in.-lb (135 Nm) then shall be applied in a counterclockwise direction. The test torque shall be permitted to be applied by either a torque wrench or test loads applied on the end of the arm.

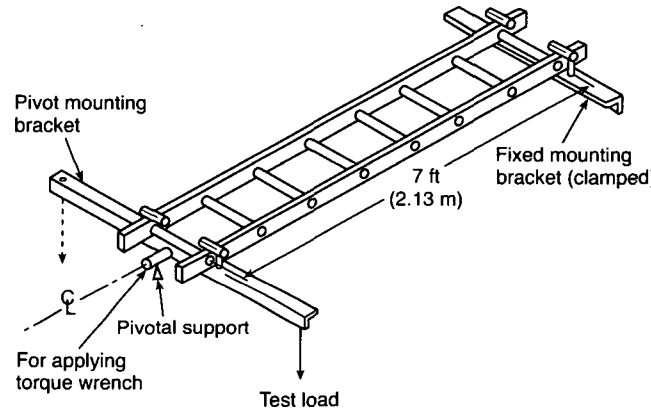


Figure 3-2.8 Design verification ladder section twist test.

3-2.8.7 The angle of twist measured from the horizontal position in the counterclockwise direction shall not be greater than 14 degrees.

3-2.9 Butt Spur Slip Test.

3-2.9.1 All butt spurs for single and extension ladders shall be tested for skid resistance. The ladder shall be positioned for testing and tested as shown in Figure 3-2.9. The test unit shall consist of a 16-ft (4.9-m) extension ladder extended to the maximum extended length and set at the proper angle of inclination of 75½ degrees.

3-2.9.2 The test surfaces shall be A-C plywood, the "A" surface of which shall be presanded using No. 320 fine wet/dry sandpaper. The "A" surface of the plywood shall be placed in contact with the butt of the test unit. The surface that the tip of the fly section rests against also shall be the "A" surface and shall be similarly treated.

3-2.9.3 The grain on the vertical sheet under the upper end of the fly section shall run in a vertical direction, and the grain on the horizontal sheet under the base shall be parallel to the test load.

3-2.9.4 A test load of 500 lb (227 kg) shall be attached to the third rung from the tip of the fly section.

3-2.9.5 A horizontal pulling force of 50 lb (22.7 kg) applied to the bottom of the test unit at 1 in. (25 mm) above the test surface shall not cause movement in excess of ¼ in. (6 mm) across the test surface.

3-3 Additional Design Verification Tests for Roof Ladders Only.

3-3.1 These design verification tests shall be performed in addition to the design verification tests specified in Section 3-2 and the testing requirements specified in Section 3-1.

3-3.2 The ladder shall be positioned for testing and tested as shown in Figure 3-3.2. The ladder shall be hung solely by the roof hooks, with the hooks supported only by the points of the hooks, in a vertical position from a fixture capable of supporting the entire test load and weight of the ladder. The ladder shall be secured in such a manner to retain the ladder in the test position to prevent injury to test personnel if the hooks fail during the test.

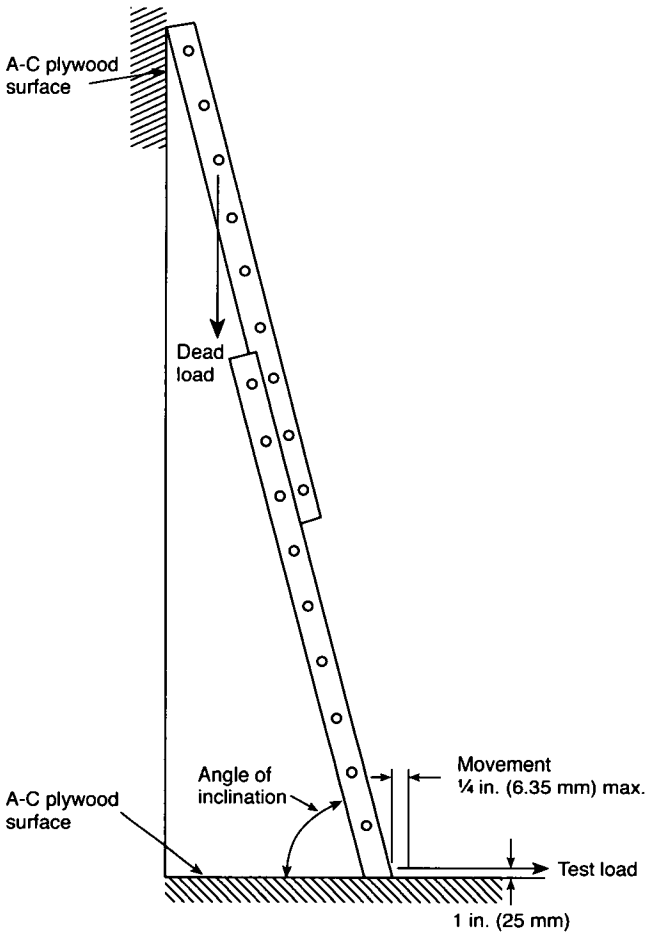


Figure 3-2.9 Design verification butt spur slip test.

3-3.3 A test load of 2,000 lb (907 kg) shall be placed over as many rungs as needed. The test load shall consist of weight increments consistent with safety and ease of handling.

3-3.4 The test load shall be applied for a minimum of 1 min.

3-3.5 Ladder and roof hook assemblies shall sustain this test load with no damage to the structure, and any deformation to the hooks shall not exceed 5 degrees.

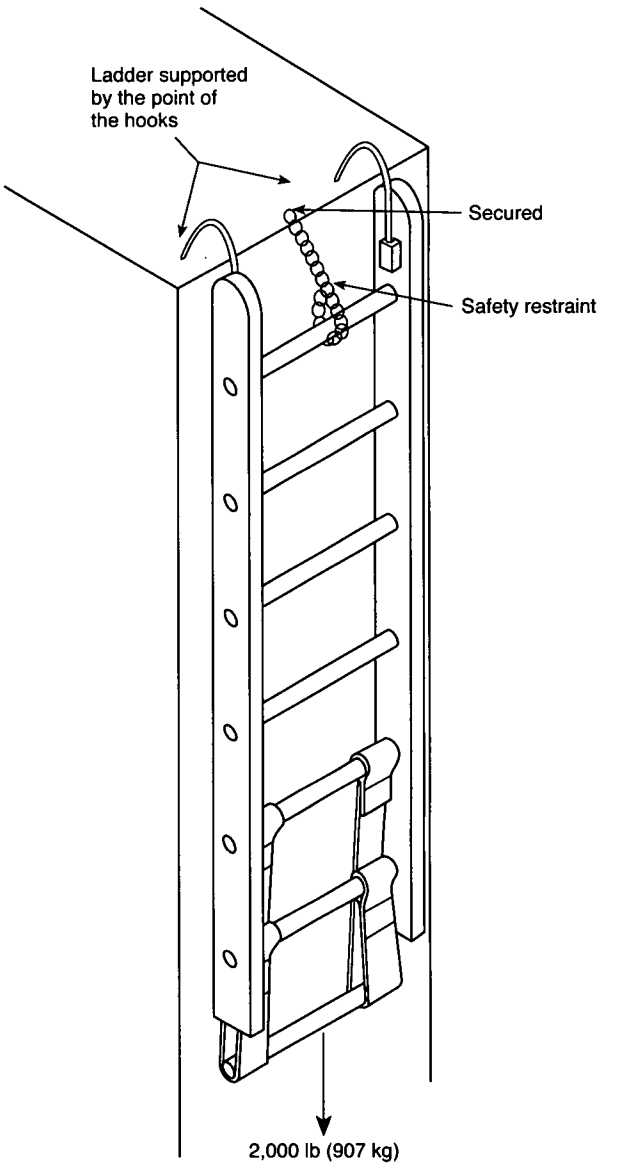


Figure 3-3.2 Design verification roof hook test.

3-4 Additional Design Verification Tests for Extension and Combination Ladders Only.

3-4.1 These design verification tests shall be performed in addition to the design verification tests specified in Section 3-2 and the testing requirements specified in Section 3-1.

3-4.2 Beam And Hardware Test.

3-4.2.1 The test shall be conducted on a test unit consisting of either the shortest full-size ladder manufactured, or a test section of sufficient length for test purposes. If a full-size ladder is used, the fly section shall be extended a minimum of one rung beyond the bedded position. Short test sections of extension ladders shall consist of portions of the base and fly sections with all the hardware or fittings attached.

3-4.2.2 The test unit shall be positioned for testing and tested as shown in Figure 3-4.2. The test unit shall be placed at the proper angle of inclination of 75½ degrees with both pawls engaged.

3-4.2.3 A downward distributed test load of 2,000 lb (907kg) shall be applied to the top rung of the fly section.

3-4.2.4 The test unit shall sustain this test load with no permanent deformation or other visible weakening of the beams and hardware.

3-4.3 Single Pawl Load Test.

3-4.3.1 The ladder shall be positioned for testing and tested as shown in Figure 3-4.3. The test shall be conducted on a test unit consisting of a single pawl attached in its normal configuration to a sufficient length of beam for test purposes with the test unit set at the proper angle of inclination of 75½ degrees. The pawl shall be engaged over a fixed steel rod of the same diameter as a rung.

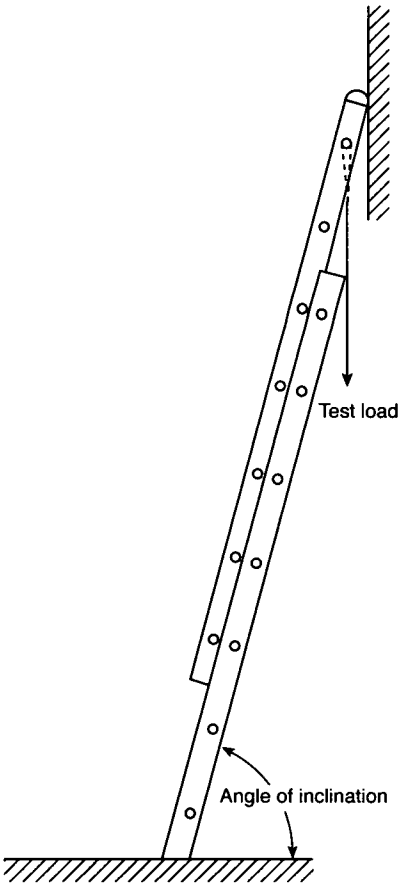


Figure 3-4.2 Design verification beam and hardware load test.

3-4.3.2 A downward test load of 2,000 lb (907 kg) shall be exerted on the end of the beam. The beam shall be permitted to be guided to prevent it from turning.

3-4.3.3 The test unit shall sustain this test load without disengagement of the pawl or disengagement of the pawl attachment to the beam.

3-4.4 Pawl Tip Load Test.

3-4.4.1 The test shall be conducted on a test unit consisting of either the shortest full-size ladder manufactured or a test section of sufficient length for test purposes. If a full-size ladder is used, the fly section shall be extended a minimum of one rung beyond the bedded position. Short test sections shall consist of portions of the base and fly sections of the extension ladder with the pawls attached.

3-4.4.2 The test unit shall be positioned for testing and tested as shown in Figure 3-4.4. The test unit shall be set at the proper angle of inclination of 75½ degrees with both pawls partially engaged. The butt end of the test unit shall be prevented from slipping by a block or equivalent means. The tip of each pawl shall bear on the center of a steel test fixture placed over the top of a rung. During the test, each pawl shall be prevented from pivoting by a means located adjacent to the pivot point of the pawl, but that shall not in any way affect that portion of the pawl under test.

3-4.4.3 A downward distributed test load of 2,000 lb (907 kg) shall be applied.

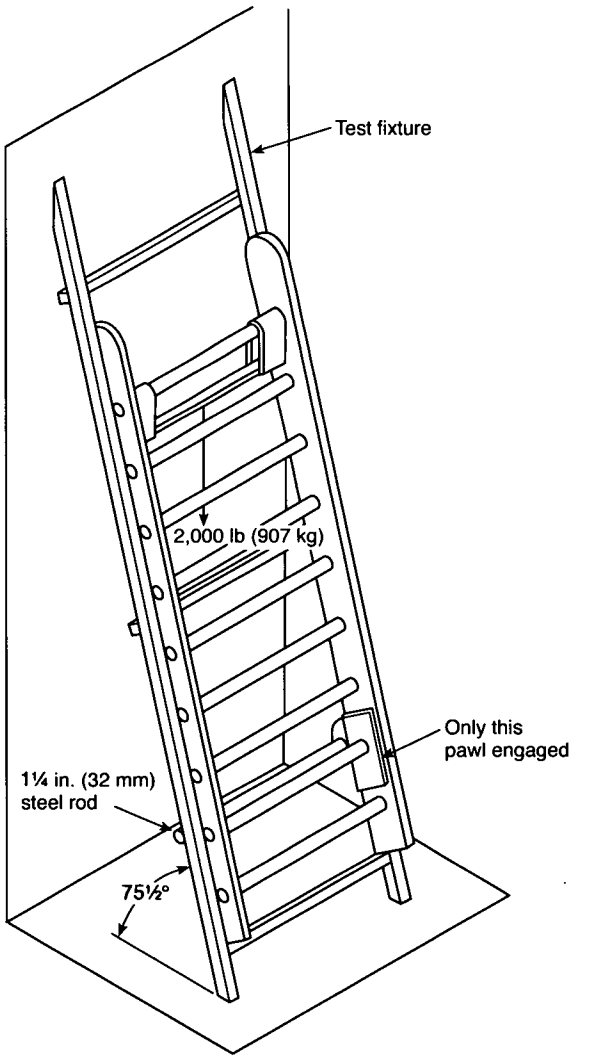


Figure 3-4.3 Design verification single pawl load test.

3-4.4.4 The test unit and components shall sustain the test load without ultimate failure.

3-5 Additional Design Verification Tests for Extension Ladders Only.

3-5.1 These design verification tests shall be performed in addition to the design verification tests specified in Sections 3-2 and 3-4 and the testing requirements specified in Section 3-1.

3-5.2 Cyclic Rung-Pawl Test.

3-5.2.1 This test shall not apply to fixed-type or manually operated pawls used on extension ladders or combination ladders.

3-5.2.2 A machine equivalent to that shown in Figure 3-5.2(a) shall be used to operate the pawl through the following cycle, as shown in Figure 3-5.2(b):

(a) One 6-in. (152-mm) upstroke to allow the pawl to engage the rung;

(b) A full 6-in. (152-mm) downstroke to allow the pawl onto the rung;

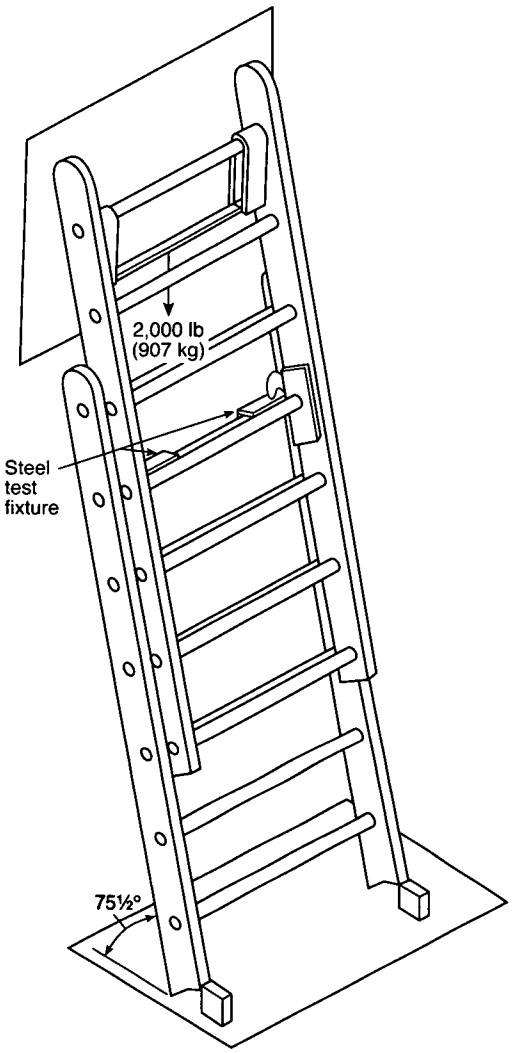


Figure 3-4.4 Design verification pawl tip test.

(c) A full 12-in. (305-mm) upstroke to disengage the pawl;

(d) A full 12-in. (305-mm) downstroke to return the pawl to the starting position.

3-5.2.3 Pawls shall be tested with the ladder set at the proper angle of inclination of 75½ degrees. The pawl shall be permitted to be manually lubricated prior to or during the test.

3-5.2.4 The stroke speed shall be 7 in. to 14 in. (78 mm to 356 mm) per second. A minimum of 6,000 cycles shall be imposed.

3-5.2.5 Any malfunction of the pawl or fracture of its components, including springs, shall be considered as a failure of this test. The presence of wear that does not affect the proper functioning of the pawl shall not constitute failure.

3-5.3 Multisection Extending Force Test.

3-5.3.1 The test shall be conducted on a complete extension ladder. The ladder shall be set, at a 90-degree vertical position, in the bedded position. The base section shall be permitted to be braced or otherwise held to maintain vertical alignment.

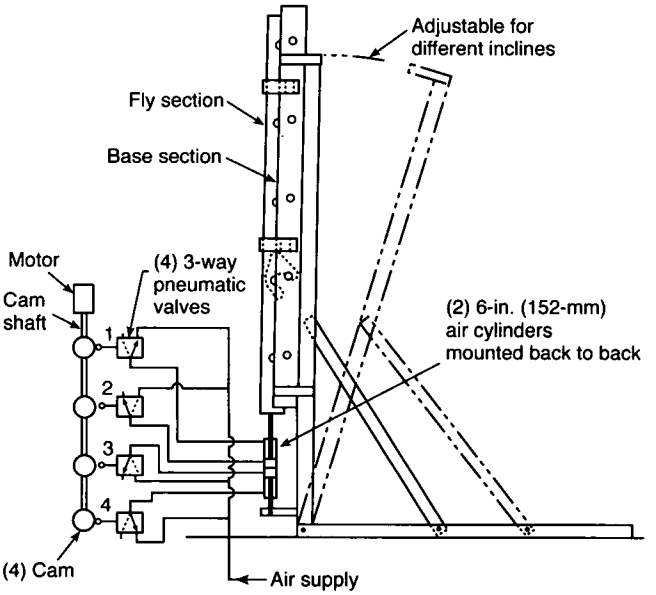


Figure 3-5.2(a) Design verification cyclic rung-pawl test.

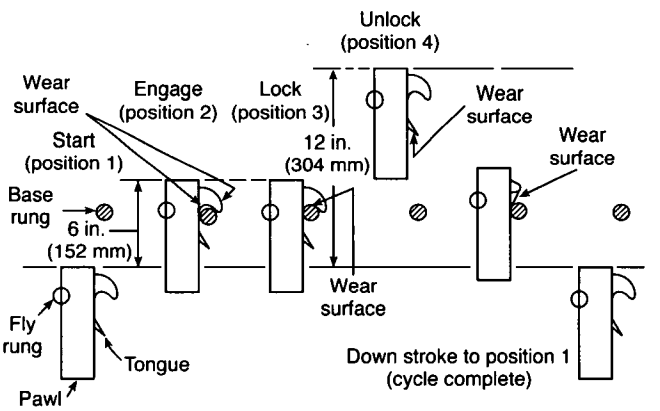


Figure 3-5.2(b) Design verification rung-pawl testing cycle.

3-5.3.2 A measured downward test force shall be applied to the rope if the ladder has a halyard and pulley system installed. The test force shall be smoothly applied to cause vertical extension of the fly section of 2 ft (610 mm) or more, at a rate of 6 in. to 12 in. (152 mm to 305 mm) per second. For those ladders not equipped with a halyard and pulley, the measured test force shall be applied vertically to the bottom rung of the fly section.

3-5.3.3 The maximum measured test force that occurs during each pull shall be recorded in pounds of pull. Three test pulls shall be done for each ladder, and the maximum forces shall be averaged for the three pulls.

3-5.3.4 The average maximum pull pounds shall not exceed two times the weight of one ladder fly section.

3-6 Additional Design Verification Tests for Combination Ladders Only.

3-6.1 These design verification tests shall be performed in addition to the design verification tests specified in Sections 3-2 and 3-4 and the testing requirements specified in Section 3-1.

3-6.2 Compression Test.

3-6.2.1 The combination ladder shall be positioned for testing and tested as shown in Figure 3-6.2. The ladder shall be tested in its A-frame position, with the test load of 2,000 lb (907 kg) applied uniformly to the top rungs.

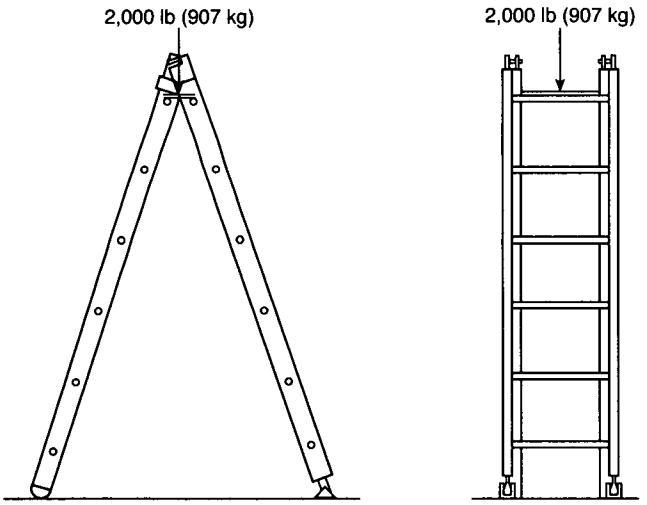


Figure 3-6.2 Design verification combination ladder compression test.

3-6.2.2 The ladder shall sustain the test load without ultimate failure.

3-7 Design Verification Tests for Folding Ladders Only.

3-7.1 These design verification tests shall be performed in accordance with the design verification testing criteria specified in Section 3-1.

3-7.2 Horizontal Bending Test.

3-7.2.1 The ladder shall be positioned for testing and tested as shown in Figure 3-7.2. The folding ladder shall be placed in a flat, horizontal position supported 6 in. (152 mm) from each end.

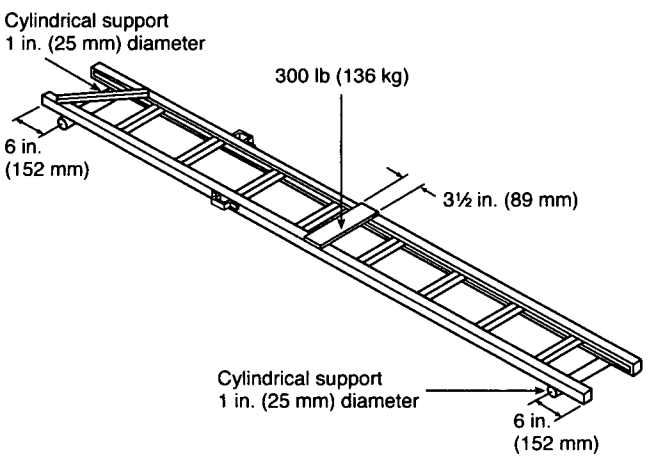


Figure 3-7.2 Design verification folding ladder horizontal bending test.

3-7.2.2 A test load of 300 lb (136 kg) shall be applied at the center of the ladder span and equally distributed across both beams over an area of $3\frac{1}{2}$ in. (89 mm).

3-7.2.3 The ladder shall withstand this test without ultimate failure.

3-8 Design Verification Tests for Pompier Ladders Only.

3-8.1 These design verification tests shall be performed in accordance with the design verification testing criteria specified in Section 3-1.

3-8.2 The ladder shall be positioned for testing and tested as shown in Figure 3-8.2. The ladder shall be tested in the vertical hanging position supported only by the hook.

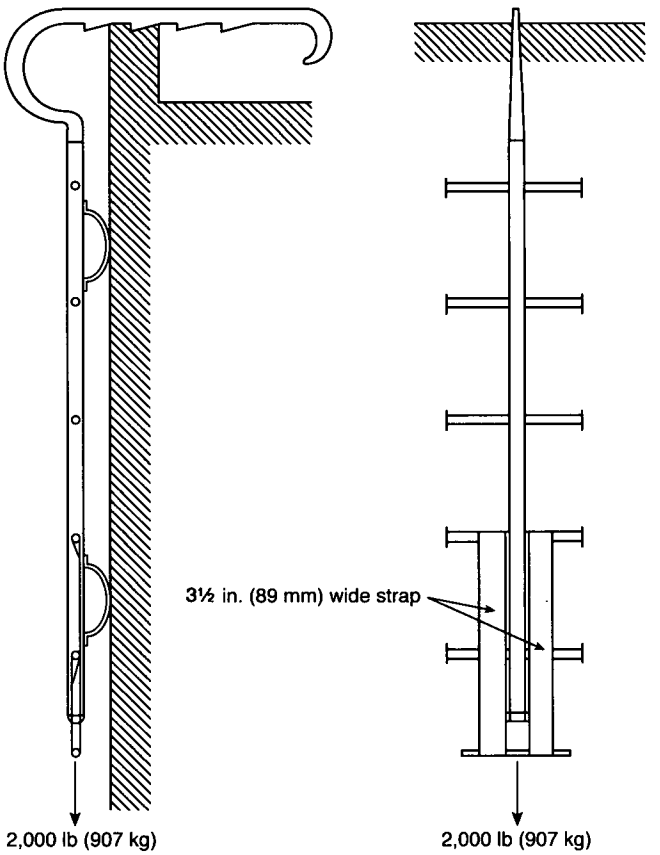


Figure 3-8.2 Design verification pompier ladder test.

3-8.3 A test load of 2,000 lb (907 kg) shall be applied.

3-8.4 The ladder shall sustain this test load without ultimate failure.

Chapter 4 Label Tests

4-1 Labels To Be Tested. All labels required for ground ladders in 2-1.8.2, 2-1.8.4, 2-1.8.5, 2-1.8.6, 2-1.10, and 2-4.8.5 shall meet the requirements of this chapter.

4-2 Performance Requirements.

4-2.1 Legibility. When tested as specified in 4-3.2, the label shall retain its original color, readability, and clarity without any darkening, fogging, or blistering.

4-2.2 Adhesion. When tested as specified in 4-3.3.1, the label shall have an average adhesion of not less than

2 pounds-force per linear in. (0.35 N per linear mm) of label width, and not less than 50 percent of the average adhesion measured for 4-3.3.1 when tested as specified in 4-3.3.2.

4-3 Testing.

4-3.1 Preconditioning.

4-3.1.1 The sample labels shall be applied to a surface material of the same type to which the label will be affixed, and this shall constitute the test sample. The test sample shall be exposed for 72 hr at 73°F ± 2°F (23°C ± 1°C) and 50 ± 2 percent relative humidity.

4-3.1.2 The sample labels shall be applied to a surface material of the same type to which the label will be affixed, and this shall constitute the test sample. First, the test sample shall be exposed for 72 hr at 73°F ± 2°F (23°C ± 1°C) and 50 ± 2 percent relative humidity. Then, the test sample shall be exposed for 24 hr at -40°F (-40°C).

4-3.1.3 The sample labels shall be applied to a surface material of the same type to which the label will be affixed, and this shall constitute the test sample. First, the test sample shall be exposed for 72 hr at 73°F ± 2°F (23°C ± 1°C) and 50 ± 2 percent relative humidity. Then, the test sample shall be exposed for 6 weeks at 140°F ± 4°F (60°C ± 2°C) and 97 ± 3 percent relative humidity.

4-3.1.4 The sample labels shall be applied to a surface material of the same type to which the label will be affixed, and this shall constitute the test sample. First, the test sample shall be exposed for 72 hr at 73°F ± 2°F (23°C ± 1°C) and 50 ± 2 percent relative humidity. Then, the test sample shall be exposed for 90 days mechanical convection air-oven aging at 190°F ± 2°F (87°C ± 1°C).

4-3.1.5 The sample labels shall be applied to a surface material of the same type to which the label will be affixed, and this shall constitute the test sample. First, the test sample shall be exposed for 72 hr at 73°F ± 2°F (23°C ± 1°C) and 50 ± 2 percent relative humidity. Then, the test sample shall be exposed for 720 hr of ultraviolet light and water. The ultraviolet light shall be obtained from two stationary, enclosed carbon-arc lamps. The arc of each lamp shall be formed between two vertical carbon electrodes, 1/2 in. (12.7 mm) in diameter, located at the center of a revolvable, vertical metal cylinder, 31 in. (787 mm) in diameter and 17 3/4 in. (450.9 mm) in height. Each arc shall be enclosed with a No. 9200-PX clear Pyrex glass globe. The samples shall be mounted vertically on the inside of the revolvable cylinder, facing the lamps, and the cylinder shall continuously revolve around the stationary lamps at one rpm. A system of nozzles shall be provided so that each sample, in turn, is to be sprayed with water as the cylinder revolves. During each 20-min operating cycle, each sample shall be exposed to the light and water spray for 3 min, and to the light only for 17 min. The air temperature within the revolving cylinder of the apparatus during operation shall be 145°F ± 9°F (63°C ± 5°C).

4-3.1.6 The sample labels shall be applied to a surface material of the same type to which the label will be affixed, and this shall constitute the test sample. First, the test sample shall be exposed for 72 hr at 73°F ± 2°F (23°C ± 1°C) and 50 ± 2 percent relative humidity. Then, the test sample shall be exposed for 240 hr in a salt spray test as specified by ASTM B117, *Standard Method of Salt Spray (Fog) Testing*.

4-3.1.7 The sample labels shall be applied to a surface material of the same type to which the label will be affixed, and this shall constitute the test sample. First, the test sample shall be exposed for 72 hr at 73°F ± 2°F (23°C ± 1°C) and 50 ± 2 percent relative humidity. Then, the test sample shall be exposed for 48 hr immersion in distilled water.

4-3.1.8 The sample labels shall be applied to a surface material of the same type to which the label will be affixed, and this shall constitute the test sample. First, the test sample shall be exposed for 72 hr at 73°F ± 2°F (23°C ± 1°C) and 50 ± 2 percent relative humidity. Then, the test sample shall be exposed for 10 days mechanical convection air-oven aging at 356°F (180°C).

4-3.2 Legibility Test.

4-3.2.1 The test sample shall be preconditioned as specified in 4-3.1.1, after which the label shall be examined to determine color, readability, and clarity.

4-3.2.2 Test samples then shall be exposed to each precondition as specified in 4-3.1.2 through 4-3.1.8.

4-3.2.3 After each preconditioning, the label shall be compared to the label preconditioned to 4-3.1.1 to determine compliance with 4-2.1.

4-3.3 Adhesion Test.

4-3.3.1 At least two test samples shall be preconditioned as specified in 4-3.1.1 and then tested as specified in 4-3.3.3 to determine the average adhesion.

4-3.3.2 Test samples then shall be exposed to each precondition as specified in 4-3.1.3 through 4-3.1.8 and tested as specified in 4-3.3.3.

4-3.3.3 Labels shall be pulled from the surface material at an angle of 90 degrees to the surface, at a constant speed of 1.0 in. (50.8 mm) per min by means of an Instron testing machine. The force to remove the label shall be recorded automatically on a chart, and the average force calculated in lb/1 in. (N/mm × 0.175) width of label.

4-3.3.3.1 Test results shall be obtained from not less than two test samples to comprise an average for each precondition.

4-3.3.3.2 Test results obtained from samples specified in 4-3.3.2 shall be compared to the test results obtained from samples specified in 4-3.3.1 to determine compliance with 4-2.2.

Chapter 5 Referenced Publications

5-1 The following documents or portions thereof are referenced within this standard and shall be considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

5-1.1 NFPA Publication. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 1932, *Standard on Use, Maintenance, and Service Testing of Fire Department Ground Ladders*, 1994 edition.

5-1.2 Other Publications.

5-1.2.1 ANSI Publications. American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

ANSI A14.1-1990, *Ladders — Portable Wood — Safety Requirements.*

ANSI A14.5-1990, *Ladders — Portable Reinforced Plastic — Safety Requirements.*

5-1.2.2 ASTM Publication. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM B117-1990, *Standard Method of Salt Spray (Fog) Testing.*

Appendix A Explanatory Material

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

A-1-1.1 Ground ladders used in the fire service must be constructed to rigid standards of the highest quality. These ladders often are the only means of fire fighter entry into a building or portions of a building and could be the only means of egress for victims trapped by a fire within a building. Fire department ground ladders serve as a means of transporting people, equipment, and extinguishing agents from one level to a higher or lower level. Since the lives of the fire fighters and fire victims often rely on the performance without failure of these valuable pieces of fire department equipment, these standards of performance must be such that ladders can be used with the maximum of ease and assurance at all times.

A-1-1.2 Ladders used by fire department personnel for purposes other than rescue, fire fighting, and training, and not transported, should be covered by the applicable ANSI and OSHA standards.

A-1-2 It is recognized that specific details on ladder construction materials have been established by other organizations such as the American National Standards Institute, U.S. Department of Agriculture Forest Products Laboratory, and the Aluminum Association. This standard should never be interpreted as establishing lower materials strength criteria than those set forth in such recognized standards.

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 concerned with product evaluations that is in a position to determine compliance with appropriate standards for the current production of listed items.

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-2-1.6 Rung spacing of 14 in. (356 mm) can facilitate easier leg locks when wearing protective clothing in accordance with NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program.* Rung spacing of 12 in. (305 mm) can result in more climbing power.

A-2-1.9 Rubber rung covers are available.

A-2-2.2 Single ladders become unwieldy and difficult to handle when they exceed 30 ft (9.1 m) in length; however, it is recognized that certain local conditions can make longer single ladders desirable, and this recommendation should not exclude such special conditions.

A-2-3.3.1 Materials used in the construction of folding roof hook assemblies for roof ladders should be selected on the basis of their ability to withstand water, heat, chemicals, and loads imposed upon hooks during fireground operations.

Fire departments that use roof ladders in areas where snow and ice accumulate on roofs might want to use an even larger hook to ensure the ladder holds over a ridge that is covered with snow and ice.

A-2-4.3 Fire department ground ladders should not exceed 50 ft (15.2 m) designated length, as greater lengths are unwieldy and require increased personnel and specialized training.

A-2-4.6.6 Since a continuous halyard cannot be tied off, a secondary means to prevent retraction of the fly section must be provided in case there is inadvertent disengagement of the pawls.

Appendix B Referenced Publications

B-1 The following document or portions thereof is referenced within this standard for informational purposes only and thus is not considered part of the requirements of this document. The edition indicated for the reference is the current edition as of the date of the NFPA issuance of this document.

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

NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*, 1992 edition.

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The NFPA Codes and Standards Development Process

Since 1896, one of the primary purposes of the NFPA has been to develop and update the standards covering all areas of fire safety.

Calls for Proposals
The code adoption process takes place twice each year and begins with a call for proposals from the public to amend existing codes and standards or to develop the content of new fire safety documents.

Report on Proposals
Upon receipt of public proposals, the technical committee members meet to review, consider, and act on the proposals. The public proposals – together with the committee action on each proposal and committee-generated proposals – are published in the NFPA's Report on Proposals (ROP). The ROP is then subject to public review and comment.

Report on Comments
These public comments are considered and acted upon by the appropriate technical committees. All public comments – together with the committee action on each comment – are published as the Committee's supplementary report in the NFPA's Report on Comments (ROC).

The committee's report and supplementary report are then presented for adoption and open debate at either of NFPA's semi-annual meetings held throughout the United States and Canada.

Association Action
The Association meeting may, subject to review and issuance by the NFPA Standards Council, (a) adopt a report as published, (b) adopt a report as amended, contingent upon subsequent approval by the committee, (c) return a report to committee for further study, and (d) return a portion of a report to committee.

Standards Council Action
The Standards Council will make a judgement on whether or not to issue an NFPA document based upon the entire record before the Council, including the vote taken at the Association meeting on the technical committee's report.

Voting Procedures
Voting at an NFPA Annual or Fall Meeting is restricted to members of record for 180 days prior to the opening of the first general session of the meeting, except that individuals who join the Association at an Annual or Fall Meeting are entitled to vote at the next Fall or Annual Meeting.

"Members" are defined by Article 3.2 of the Bylaws as individuals, firms, corporations, trade or professional associations, institutes, fire departments, fire brigades, and other public or private agencies desiring to advance the purposes of the Association. Each member shall have one vote in the affairs of the Association. Under Article 4.5 of the Bylaws, the vote of such a member shall be cast by that member individually or by an employee designated in writing by the member of record who has registered for the meeting. Such a designated person shall not be eligible to represent more than one voting privilege on each issue, nor cast more than one vote on each issue.

Any member who wishes to designate an employee to cast that member's vote at an Association meeting in place of that member must provide that employee with written authorization to represent the member at the meeting. The authorization must be on company letterhead signed by the member of record, with the membership number indicated, and the authorization must be recorded with the President of NFPA or his designee before the start of the opening general session of the Meeting. That employee, irrespective of his or her own personal membership status, shall be privileged to cast only one vote on each issue before the Association.

Sequence of Events Leading to Publication of an NFPA Committee Document

Call for proposals to amend existing document or for recommendations on new document.

▼

Committee meets to act on proposals, to develop its own proposals, and to prepare its report.

▼

Committee votes on proposals by letter ballot. If two-thirds approve, report goes forward. Lacking two-thirds approval, report returns to committee.

▼

Report is published for public review and comment. (Report on Proposals - ROP)

▼

Committee meets to act on each public comment received.

▼

Committee votes on comments by letter ballot. If two-thirds approve, supplementary report goes forward. Lacking two-thirds approval, supplementary report returns to committee.

▼

Supplementary report is published for public review. (Report on Comments - ROC).

▼

NFPA membership meets (Annual or Fall Meeting) and acts on committee report (ROP and ROC).

▼

Committee votes on any amendments to report approved at NFPA Annual or Fall Meeting.

▼

Complaints to Standards Council on Association action must be filed within 20 days of the NFPA Annual or Fall Meeting.

▼

Standards Council decides, based on all evidence, whether or not to issue standard or to take other action, including hearing any complaints.

▼

Appeals to Board of Directors on Standards Council action must be filed within 20 days of Council action.