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NFPA 1931 Design of and Design Verification Tests for Fire Department Ground Ladders 1989 Edition

NFPA

National Fire Protection Association Batterymarch Park, Quincy, MA 02269

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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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NATIONAL FIRE PROTECTION ASSOCIATION

NFPA 1931

Standard on

Design of and Design Verification Tests for Fire Department Ground Ladders

1989 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 Equipment and acted on by the National Fire Protection Association, Inc. at its Annual Meeting held May 15-18, 1989 in Washington DC. It was issued by the Standards Council on June 14, 1989, with an effective date of August 7, 1989, and supersedes all previous editions.

The 1989 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. In 1955 it received final adoption.

In 1957, a subcommittee of the NFPA Committee on Fire Department Equipment prepared new material covering recommendations for portable ladders, ground ladders, and aerial ladders — their use, maintenance, and testing. In addition, revision was made in the section pertaining to testing aerial ladders. These changes were approved at the 1958 Annual Meeting.

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

In May 1972, a complete revision of the 1959 edition of NFPA 193 was approved. During 1974 and 1975, NFPA 193 was studied in detail by a subcommittee of the NFPA Technical Committee on Fire Department Equipment and it was felt that NFPA 193 should be separated into two documents since the conditions of use of ground ladders and aerial ladders were so widely divergent.

The ground ladder portion was adopted in 1975 as NFPA 1931, *Standard on Fire Department Ground Ladders*.

The 1979 edition incorporated extensive revisions including editorial and style changes to bring the document in 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 the requirements of the ground ladder user.

The 1989 edition includes minor amendments to keep the standard up to date. Additional requirements for labels were included, rung spacing was modified, requirements for securing halyards were added, and staypoles were required to be stowable against the base section if they could not be properly deployed.

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Standard on

Design of and Design Verification Tests for Fire Department Ground Ladders

1989 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.

Chapter 1 Administration

1-1 Scope.

1-1.1* This standard specifies requirements for the design, 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 and dimensional requirements against which the product shall be checked. 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 the requirements of NFPA 1932, *Standard on Use, Maintenance, and Service Testing of Fire Department Ground Ladders*, are complied with by the fire departments who purchase or use ground ladders meeting the requirements of this standard.

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 similar restricted opening.

Authority Having Jurisdiction.* The "authority having jurisdiction" is the organization, office or individual responsible for "approving" equipment, an installation or a procedure.

Base (Bed) Section. The lowest, or widest, section of non-self-supporting ground ladders.

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

Bedded Position. The position in which fly section(s) of extension ladders are stored in the nonextended position with the pawls resting on a rung of the supporting section.

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

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

Collapsible Ladder. See Folding Ladder.

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

Design Verification Tests. Tests of the design ladder structure and components thereof. These design verification tests are the responsibility of the ladder manufacturer and are only to be performed on new, unused ladders.

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

Designated Length. The length marked on the ladder.

Dogs. See Pawls.

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

Fire Department Ground Ladder. All ground ladders specifically designed for fire service use that are in the possession of a fire department or other fire service organization, and that are used for, or intended to be used for rescue, fire fighting operations, or training.

Fly Section. Upper section(s) of an extension ladder. The first section above the base section is the first fly section, the second section above the base section is the second fly section, etc.

Folding Ladder. A single ladder designed so that the rungs can be folded or moved in a manner to allow the beams to be brought into a position of touching each other, or nearly touching each other, for storage or carrying purposes.

Ground Ladder. Ladders not mechanically or physically attached permanently to fire apparatus, and not requiring mechanical power from the apparatus for ladder use and operation.

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

Heat Sensor Label. A label that turns 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. (*See also Outside Ladder Width.*)

Ladder. A device on which a person climbs for ascending or descending. This device shall consist of two beams (side rails) joined at regular intervals by cross pieces called rungs on which a person is supported during this climb. (*See also Pompier Ladder, an exception to this definition.*)

Ladder Nesting. The procedure whereby ladders of different sizes are positioned 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.

May. This term is used to state a permissive use, or an alternative method to a specified requirement.

Outside Ladder Width. The distance measured from the outside edge of one beam to the outside edge of the opposite beam, or the widest point of the ladder including staypoles when provided, whichever is greater. (*See also Inside Ladder Width.*)

Pawls. Devices attached to fly section(s) for the purpose of anchoring fly section(s) when 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. The included (acute) angle between the horizontal and the ladder, which is measured on the side of the ladder opposite the climbing side.

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 decending.

Scaling Ladder. See Pompier Ladder.

Set. See Permanent Deformation.

Shall. Indicates a mandatory requirement.

Should. This term, as used in Appendix A, 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.

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. Failure of the ground ladder structure, or components thereof, to pass the required tests.

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

Tormentors or Tormentor Poles. See Staypoles.

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

Visible Damage. Damage that is clearly evident by visual inspection without recourse to optical measuring devices.

Visual Inspection. Inspection by the eye without recourse to any optical devices, except prescription eyeglasses.

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 be constructed in a manner so as 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 may cut or tear clothing or skin, or resulting in inadequate structural strength, shall be considered workmanship defects.

2-1.2 Materials used in ground ladder construction shall be of sufficient strength to meet the performance requirements of this standard.

2-1.3 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, and pompier ladders shall be excluded from this requirement.

2-1.4 Rungs shall not be less than 1¼ in. (32 mm) in diameter.

Exception: Folding and pompier ladder rungs shall be excluded from this requirement.

2-1.5* Rungs shall be spaced on between 12- and 14-in. (305- and 356-mm) centers. Rungs shall be uniformly spaced ± ⅛ in. (3 mm).

2-1.6 Butt spurs shall be provided on the butt end of each beam of single ladders, and the butt end of each beam of the base section of extension ladders.

2-1.7 Ladder Marking.

2-1.7.1 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 each beam of the base section of extension ladders.

2-1.7.2 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.

2-1.7.3 All ground ladders shall bear a unique individual identification number or alphanumeric code, and 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.

2-1.7.4 All ground ladders shall bear the electrical hazard warning label shown in Figure 2-1.7.4 on the outside of each beam 4½ ft (1.37 m) to 6 ft (1.83 m) from the butt.

2-1.7.5 All ground ladders shall bear the framing square marking shown in Figure 2-1.7.5 approximately 4½ ft (1.37 m) to 6 ft (1.83 m) from the butt on the outside of both beams.

Figure 2-1.7.4 Electrical Hazard Warning Label.

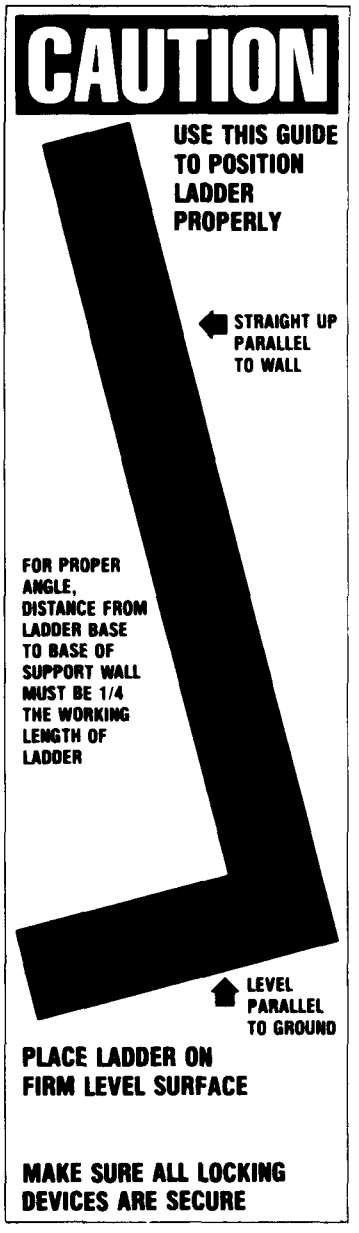


Figure 2-1.7.5 Ladder Positioning Label.

2-1.8 Additional Requirements for Metal Ground Ladders Only.

2-1.8.1 When varying types of metal are used in construction of metal ground ladders, they shall be chosen or finished so as to avoid or minimize electrolytic action.

2-1.8.2 All structural components of metal ground ladders shall be constructed of materials that maintain at least 75 percent of their designated design strength at 300 °F (149 °C).

2-1.8.3* Rungs on metal ground ladders shall be constructed of a heavy-duty corrugated, serrated, knurled, or dimpled material, or coated with a skid-resistant material.

2-1.8.4 Heat Sensor Labels.

2-1.8.4.1 All metal ground ladders shall bear heat sensor labels preset for 300 °F (149 °C).

2-1.8.4.2 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 third rung above the ladder butt.

2-1.9 Additional Requirements for Fiberglass Ground Ladders Only.

2-1.9.1 All structural components of fiberglass ground ladders shall be constructed of materials that maintain at least 75 percent of their designated design strength at 300 °F (149 °C).

2-1.9.2* Rungs on fiberglass ground ladders shall be constructed of a heavy-duty corrugated, serrated, knurled, or dimpled material, or coated with a skid-resistant material.

2-1.9.3 Fiberglass beams shall meet the performance requirements in Chapter 7 of ANSI A14.5, *Safety Requirements for Portable Reinforced Plastic Ladders.*

2-1.9.4 Heat Sensor Labels.

2-1.9.4.1 All fiberglass ground ladders shall bear heat sensor labels preset for 300 °F (149 °C).

2-1.9.4.2 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 third rung above the ladder butt.

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 of this chapter.

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 of this chapter.

2-3.2 Only single ladders may be provided with folding roof hook assemblies for use in roof operations.

2-3.3 Folding Roof Hook Assemblies.

2-3.3.1* Folding roof hooks shall be solid steel and directionally spring locked. The point of the roof hook that engages the roof shall be tapered to reduce slippage.

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 of this chapter.

Exception: Swell center rungs on wood ladders may taper to 1⅛ in. (28.6 mm).

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 assure 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 which necessitates the elimination of a rung on any section.

2-4.2.3 Extension ladders shall be constructed in a manner so that 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. 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).

2-4.4 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 allowed.

2-4.6.5 On three and four section extension ladders, all fly sections beyond the first fly section may be extended by wire rope. Such wire rope shall not be less than 3/16 in. (4.8 mm) in diameter. When wire rope is used, a means for adjusting the length of wire rope shall be provided. Splices shall not be allowed.

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 contructed so that the hook portion of the pawl that engages or rests on the rung shall have sufficient bearing surface or area so as 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 40 ft (12.2 m) or greater designated length.

2-4.8.2 All staypoles shall be permanently attached to the ground ladder with universal swivel mounts 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 (1.37 m) and 6 ft (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 of this chapter.

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 16 in. (406 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 of this chapter.

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 of this chapter.

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 center line 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 may introduce significant testing errors that can bias the testing results. Personnel inexperienced in ladder testing, even though 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 one minute.

3-1.5 Conformance to the design verification test requirements shall be determined one minute after removal of 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.

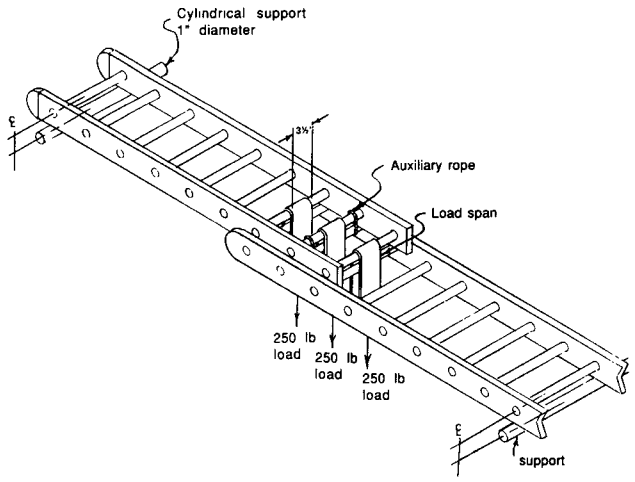


Figure 3-2.1 Design Verification Horizontal Bending Test.

3-2.1.2 Auxiliary means may 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.

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

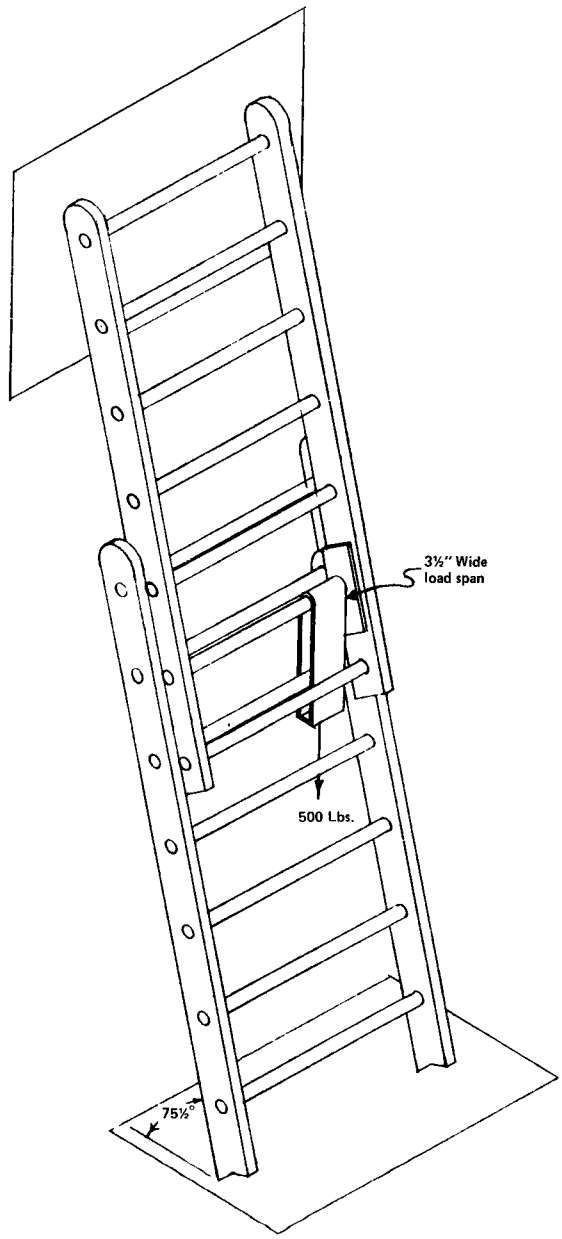


Figure 3-2.2 Design Verification Deflection Test.

the base section 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 shall be reapplied to area of rung adjacent to opposite beam, and the test 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.

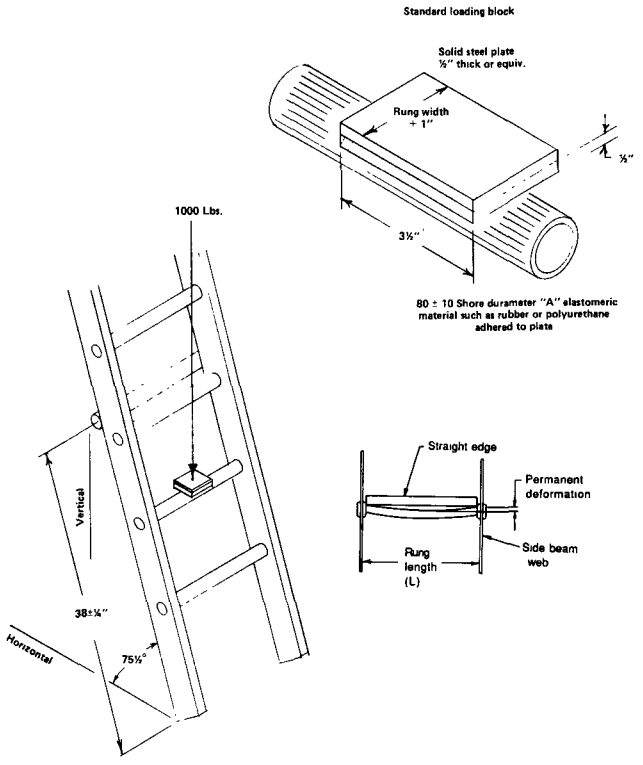


Figure 3-2.3 Design Verification Rung Bending Test.

3-2.3.2 A downward test load of 1000 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 allowable 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 allowed deformation as specified in 3-2.3.3, and there shall not be any other visible damage.

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.

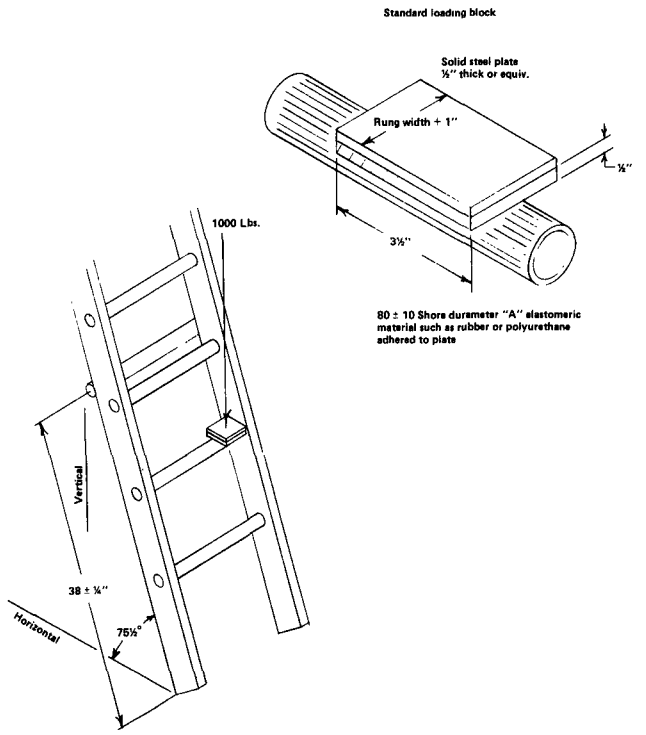


Figure 3-2.4 Design Verification Rung-to-Beam Shear Strength Test.

3-2.4.2 A downward test load of 1000 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. When a 3-ft (0.9-m) test section is used, the test shall be applied to the center rung. When single sections of a ladder are tested, the test load shall be applied to the third or fourth rung from the butt.

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.

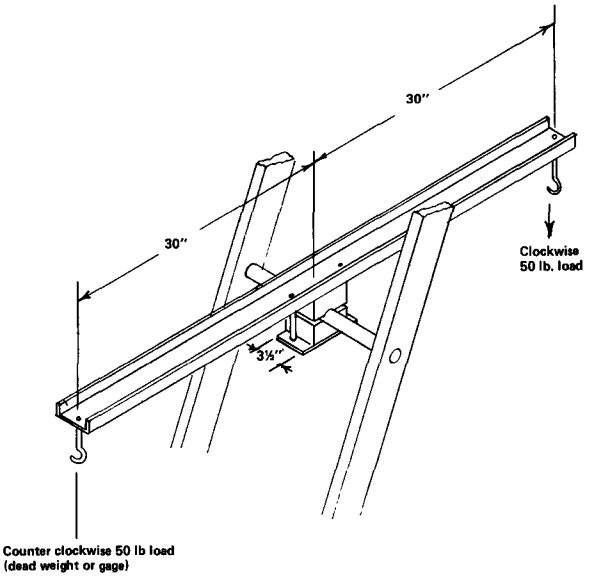


Figure 3-2.5 Design Verification Rung Torque Test.

3-2.5.2 A torque test load of 1500 inch-pounds (169.5 Nm) shall be applied in a clockwise and then 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.

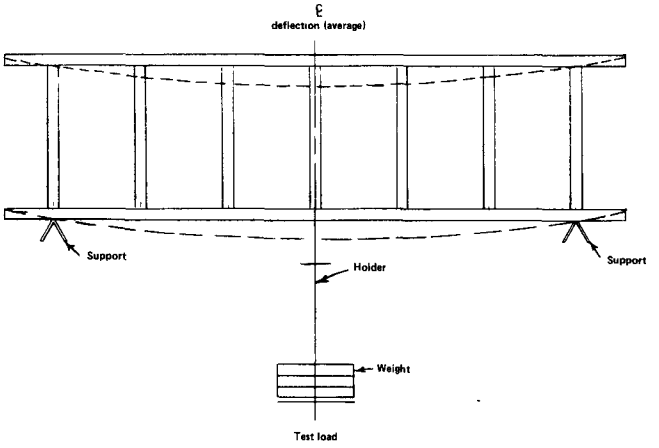
3-2.6.1.1 All sections of an extension ladder shall be individually tested.

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.

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 minute, 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.



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.

3-2.6.5 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 shall then 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).

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

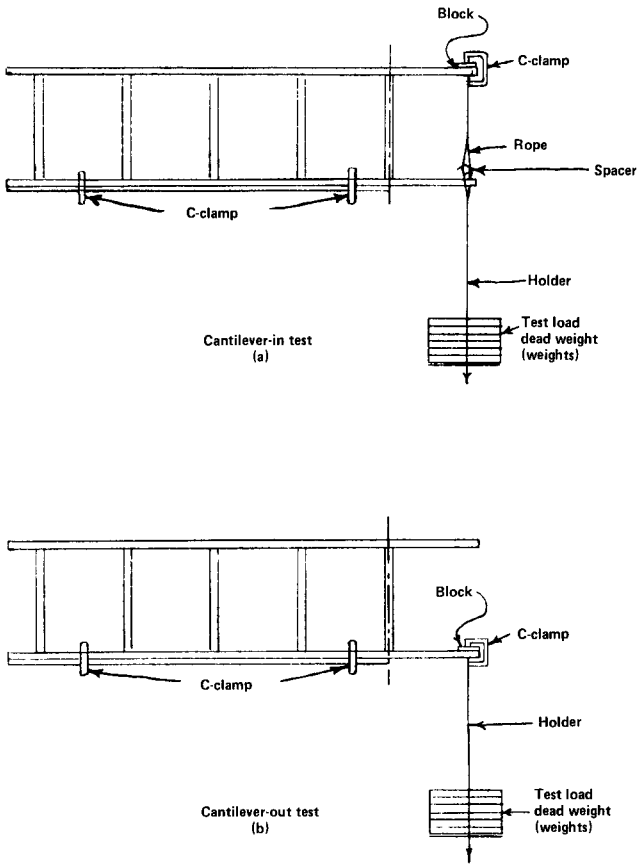


Figure 3-2.7(a) and (b) Design Verification Beam Cantilever Bending Test.

ladder on one end shall be fixed. Attention shall be given to ensure that the ladder is tightly clamped onto the test fixtures during this test.

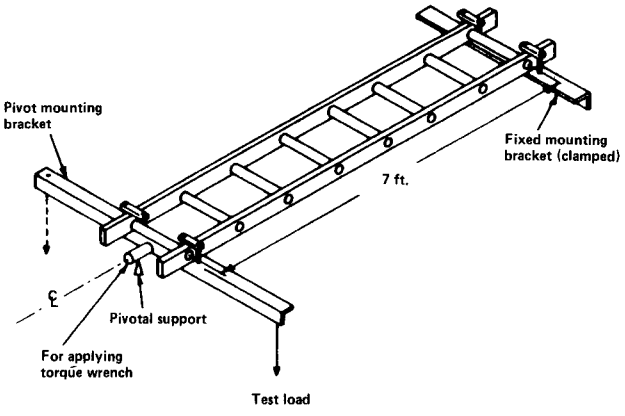


Figure 3-2.8 Design Verification Ladder Section Twist Test.

3-2.8.2 A preload of 600 inch-pounds (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 one minute after which the ladder shall be unloaded.

3-2.8.3 A test torque of 1200 inch-pounds (135 Nm) shall then be applied in a clockwise direction. The test torque may be applied by either a torque wrench, or test loads applied alternately on each 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 Next, a preload of 600 inch-pounds (68 Nm) 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 one minute after which the ladder shall be unloaded.

3-2.8.6 A test torque of 1200 inch-pounds (135 Nm) shall then be applied in a counterclockwise direction. The test torque may be applied by either a torque wrench, or test loads applied alternately on each end of the arm.

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 posi-

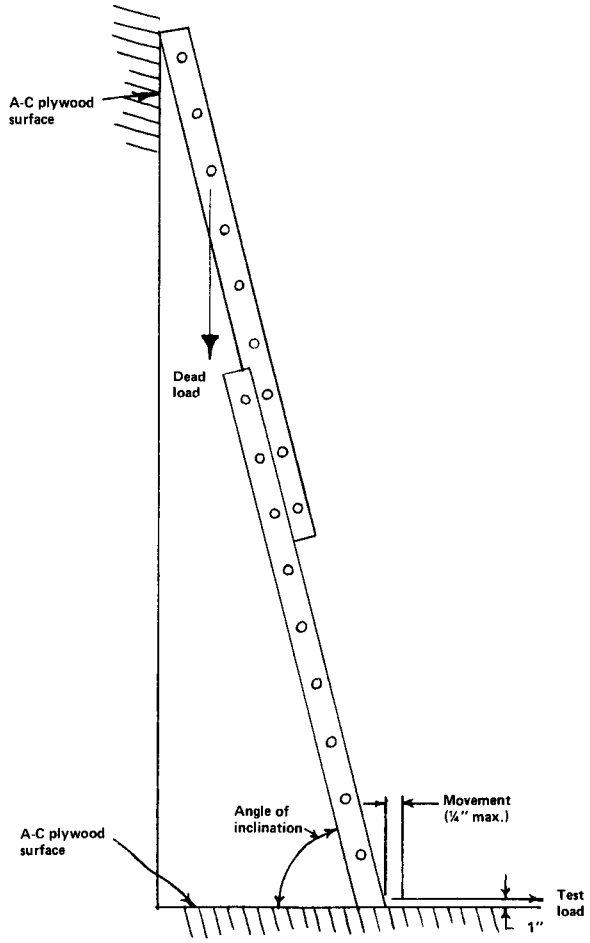


Figure 3-2.9 Design Verification Butt Spur Slip Test.

tioned 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 shall also be the "A" surface 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.

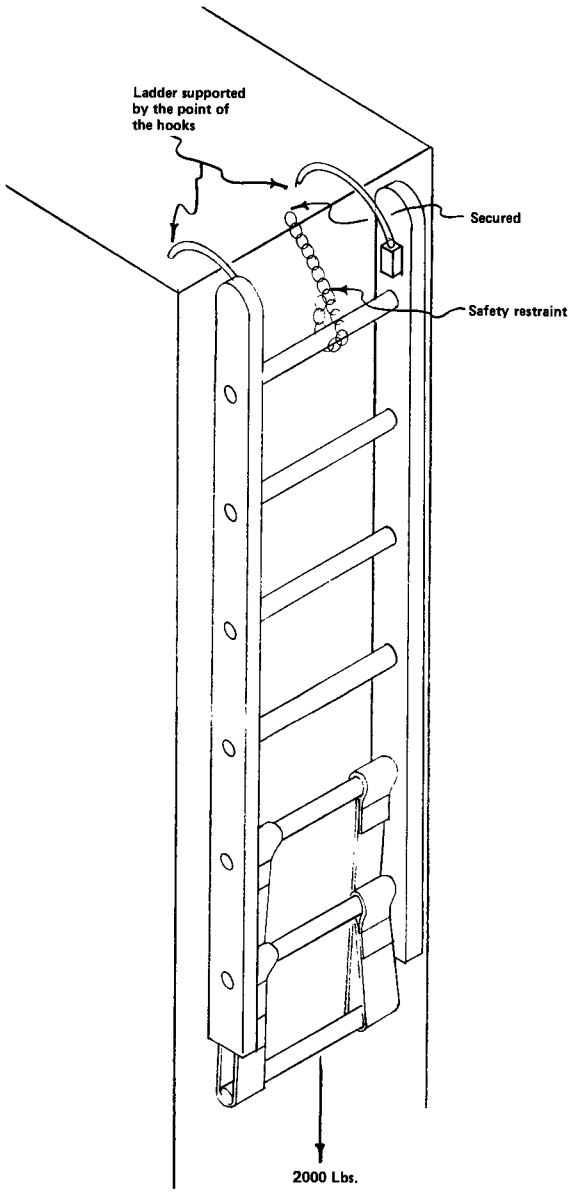


Figure 3-3.2 Design Verification Roof Hook Test.

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 of this chapter.

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.

3-3.3 A test load of 2000 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 one minute.

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.

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 of this chapter.

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 2000 lb (907 kg) 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.

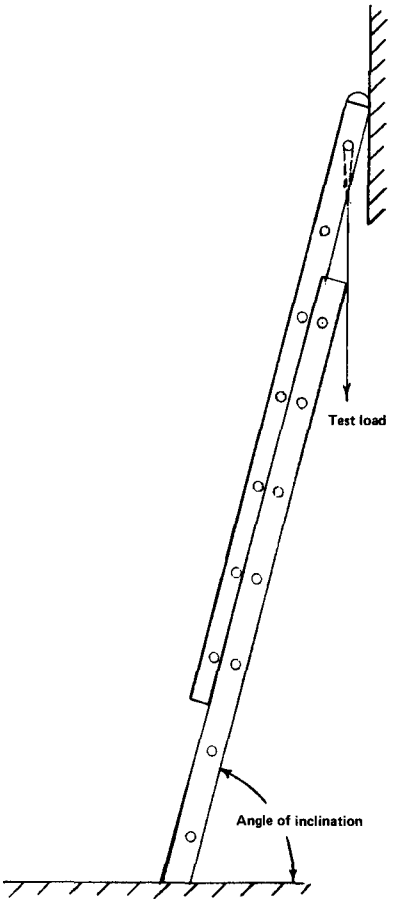


Figure 3-4.2 Design Verification Beam and Hardware Load Test.

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.

3-4.3.2 A downward test load of 2000 lb (907 kg) shall be exerted on the end of the beam. The beam may 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

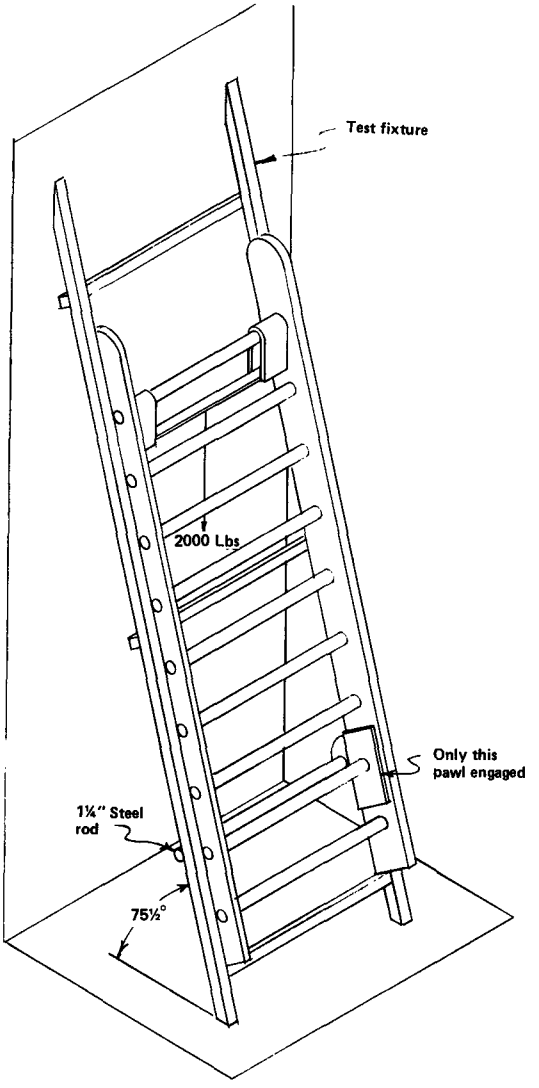


Figure 3-4.3 Design Verification Single Pawl Load Test.

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 which shall not in any way affect that portion of the pawl under test.

3-4.4.3 A downward distributed test load of 2000 lb (907 kg) shall be applied.

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 of this chapter.

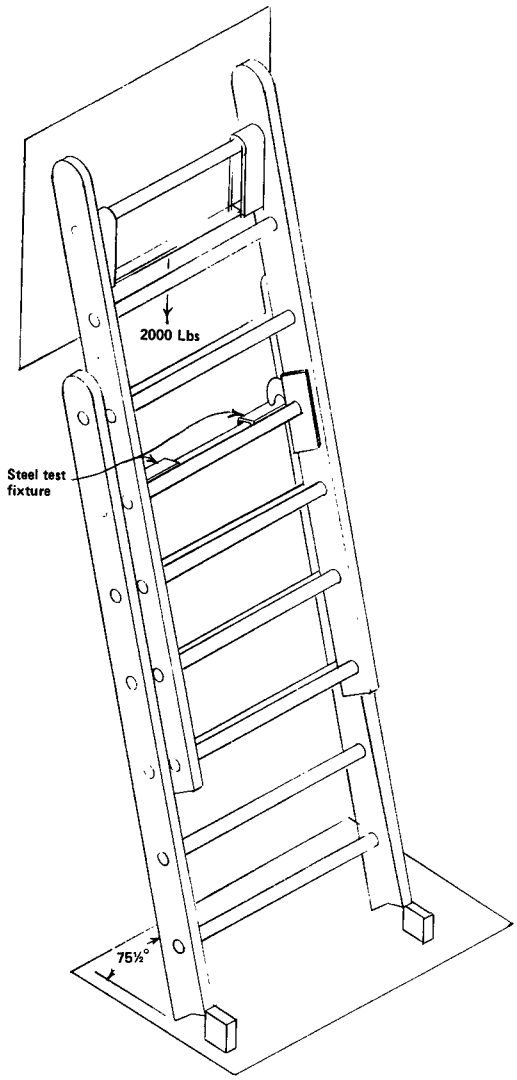


Figure 3-4.4 Design Verification Pawl Tip Test.

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,

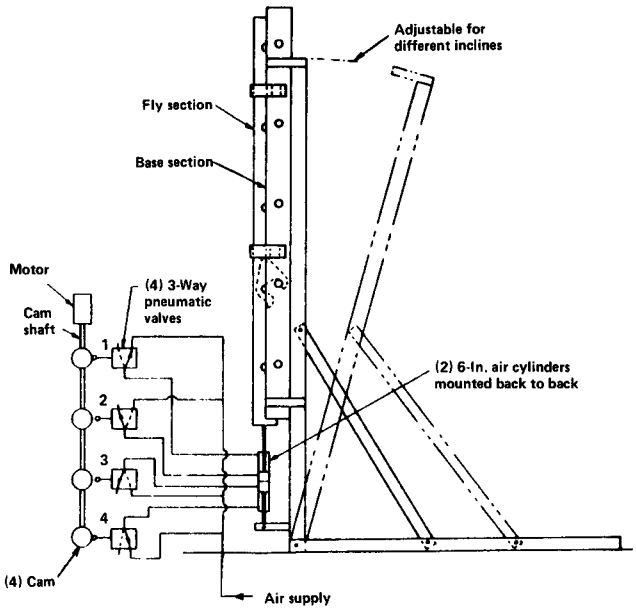
(b) Full 6-in. (152-mm) downstroke to allow the pawl onto the rung,

(c) Full 12-in. (305-mm) upstroke to disengage the pawl,

(d) 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 may be manually lubricated prior to or during the test.

3-5.2.4 The stroke speed shall be 7 to 14 in. (78 to 356 mm) per second. A minimum of 6000 cycles shall be imposed.



Operating Cycle	Air-Valve Position No. 1	No. 2	No. 3	No. 4
Full upstroke	O	C	C	O
Full downstroke	C	O	O	C
One-half downstroke to latch	O	C	O	C
Downstroke to lock	C	O	O	C

Figure 3-5.2(a) Design Verification Cyclic Rung-Pawl Test.

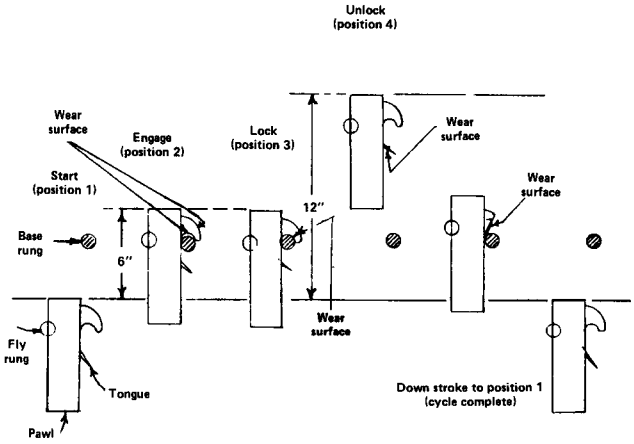


Figure 3-5.2(b) Design Verification Rung-Pawl Testing Cycle.

3-5.2.5 Any malfunction of the pawl or fracture of its components, including springs, shall be considered as a failure to meet this requirement. 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 in a 90-degree ver-

tical position, in the bedded position. The base section may be braced or otherwise held to maintain vertical alignment.

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 to 12 in. (152 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 of this chapter.

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 2000 lb (907 kg) applied uniformly to the top rungs.

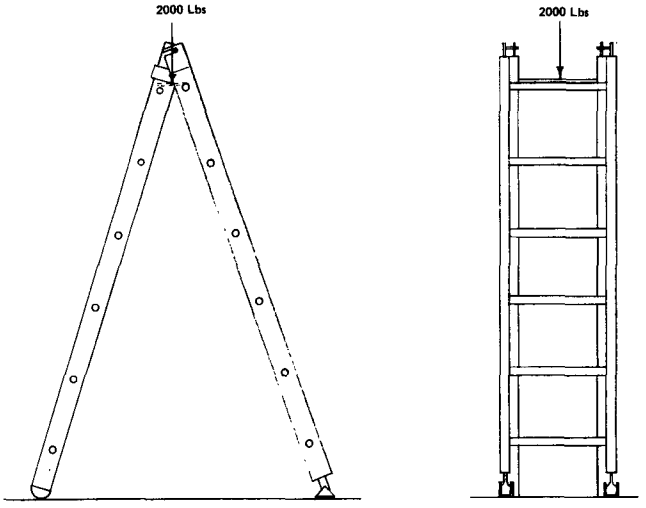


Figure 3-6.2 Design Verification Combination Ladder Compression Test.

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 in this chapter.

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.

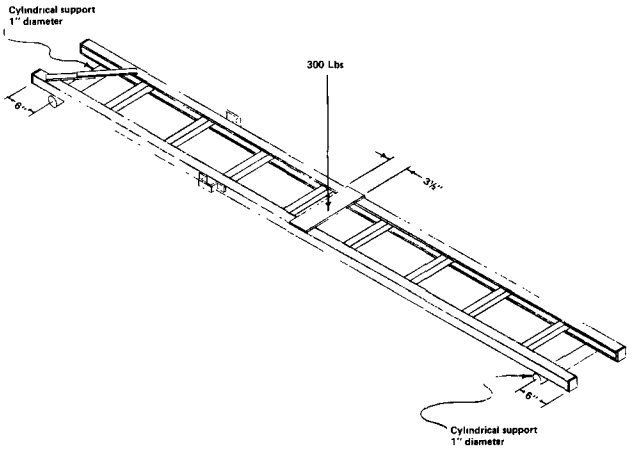


Figure 3-7.2 Design Verification Folding Ladder Horizontal Bending Test.

3-7.2.2 A test load of 300 lb (136 kg) shall be applied at the center of the ladder span equally distributed across both beams over an area of 3½ in. (89 mm).

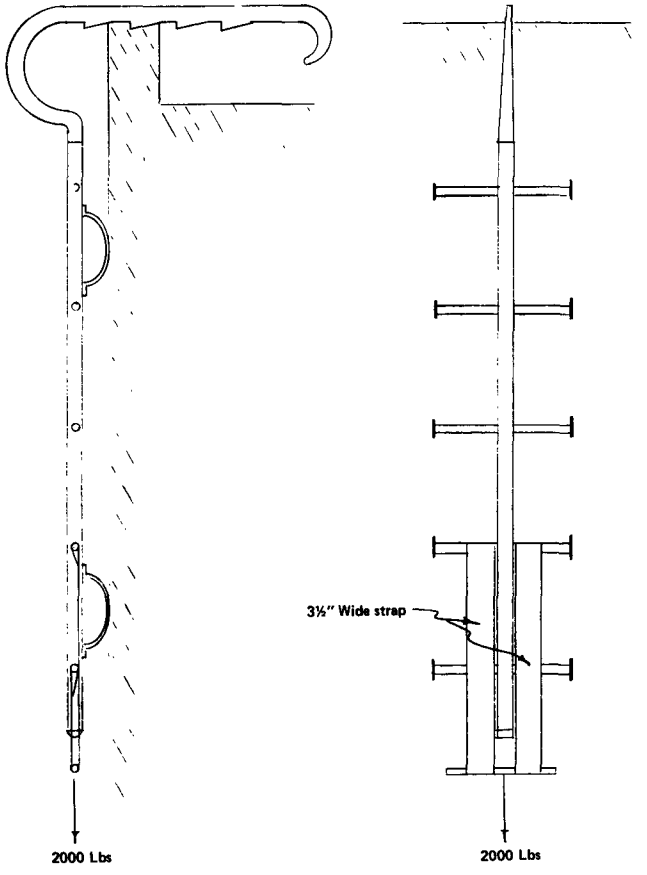


Figure 3-8.2 Design Verification Pompier Ladder Test.

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 of this chapter.

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.

3-8.3 A test load of 2000 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 2-1.7.2, 2-1.7.4, 2-1.7.5, 2-1.8.4, 2-1.9.3, and 2-4.8.5 of this standard shall meet the requirements of this chapter.

4-2 Performance Requirements.

4-2.1 Legibility. When tested as specified in 4-3.2 of this chapter, 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 of this chapter, the label shall have an average adhesion of not less than 2 lb 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.

4-2.3 Nontransferability. When tested as specified in 4-3.4 of this chapter, if the label can be removed it shall self-destruct so as to render the label nontransferable in any way.

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 that the label will be affixed to, and this shall constitute the test sample. The test sample shall be exposed for 72 hours at 73 ± 2 °F (23 ± 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 that the label will be affixed to, and this shall constitute the test sample. First, the test sample shall be exposed for 72 hours at 73 ± 2 °F (23 ± 1 °C) and 50 ± 2 percent relative humidity. Then the test sample shall be exposed for 24 hours at minus 40 °F (-40 °C).

4-3.1.3 The sample labels shall be applied to a surface material of the same type that the label will be affixed to, and this shall constitute the test sample. First, the test sample shall be exposed for 72 hours at 73 ± 2 °F (23 ± 1 °C) and 50 ± 2 percent relative humidity. Then the test sample shall be exposed for 6 weeks at 140 ± 4 °F (60 ± 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 that the label will be affixed to, and this shall constitute the test sample. First, the test sample shall be exposed for 72 hours at 73 ± 2 °F (23 ± 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 ± 2 °F (87 ± 1 °C).

4-3.1.5 The sample labels shall be applied to a surface material of the same type that the label will be affixed to, and this shall constitute the test sample. First, the test sample shall be exposed for 72 hours at 73 ± 2 °F (23 ± 1 °C) and 50 ± 2 percent relative humidity. Then the test sample shall be exposed for 720 hours 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, ½ in. (12.7 mm) in diameter, located at the center of a revolvable, vertical metal cylinder, 31 in. (787 mm) in diameter and 17¾ 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-minute operating cycle, each sample shall be exposed to the light and water spray for 3 minutes, and to the light only for 17 minutes. The air temperature within the revolving cylinder of the apparatus during operation shall be 145 ± 9 °F (63 ± 5 °C).

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

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

4-3.1.8 The sample labels shall be applied to a surface material of the same type that the label will be affixed to, and this shall constitute the test sample. First, the test sample shall be exposed for 72 hours at 73 ± 2 °F (23 ± 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 shall then 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 shall then 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 minute 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 pounds per 1 in. (N/mm x 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.

4-3.4 Nontransferability Test.

4-3.4.1 At least two test samples shall be exposed to each precondition as specified in 4-3.1.1 through 4-3.1.8.

4-3.4.2 Immediately following each preconditioning, an attempt shall be made to remove the label from the surface material within 10 minutes using a razor blade.

4-3.4.3 If any label can be removed, compliance with 4-2.3 shall be determined.

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, Batterymarch Park, Quincy, MA 02269.

NFPA 1932-1989, *Standard for the Use, Maintenance, and Service Testing of Fire Department Ground Ladders.*

5-1.2 ANSI Publication. American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

ANSI A14.5-1985, *Safety Requirements for Portable Reinforced Plastic Ladders.*

5-1.3 ASTM Publication. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM B117-1985, *Standard Method of Salt Spray (Fog) Testing.*

Appendix A

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 are often the only means of fire fighter entry into a building or portions of a building and may 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 for the same.

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, US Department of Agriculture Forest Products Laboratory, and the Aluminum Association. This standard should never be interpreted as establishing lower materials strength criteria than what may be set forth in other recognized standards such as these.

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 or 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 which 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, 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 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-2-1.5 Fourteen-inch rung spacing may facilitate easier leg locks when wearing protective clothing in accordance with NFPA 1500, *Standard on Fire Department Occupational Safety and Health Program*. Twelve-inch rung spacing may result in more climbing power.

A-2-1.8.3 Rubber rung covers are available.

A-2-1.9.2 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 may make longer single ladders desirable and this recommendation section should not exclude those 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 fire ground operations.

A-2-4.3 It is recommended that fire department ground ladders should not exceed 50 ft (15.2 m) designated length as lengths greater than this 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.

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Tentative Interim Amendment

NFPA 1931

Standard on

Design of and Design Verification Tests for Fire Department Ground Ladders

1989 Edition

Pursuant to Section 15 of the NFPA Regulations Governing Committee Projects, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 1931, *Standard on Design of and Design Verification Tests for Fire Department Ground Ladders,* 1989 edition. The TIA was processed by the Committee on Fire Department Equipment and was issued by the Standards Council on July 14, 1989.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a Proposal of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards making process.

1. *Delete 4-2.3, 4-3.4, 4-3.4.1 through 4-3.4.3.*

SUBMITTING PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Contact NFPA Standards Administration for final date for receipt of proposals on a specific document.

INSTRUCTIONS

Please use the forms which follow for submitting proposed amendments. Use a separate form for each proposal.

1. For each document on which you are proposing amendment indicate:
   (a) The number and title of the document
   (b) The specific section or paragraph.

2. Check the box indicating whether or not this proposal recommends new text, revised text, or to delete text.

3. In the space identified as "Proposal" include the wording you propose as new or revised text, or indicate if you wish to delete text.

4. In the space titled "Statement of Problem and Substantiation for Proposal" state the problem which will be resolved by your recommendation and give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If a statement is more than 200 words in length, the technical committee is authorized to abstract it for the Technical Committee Report.

5. Check the box indicating whether or not this proposal is original material, and if it is not, indicate source.

6. If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee.

NOTE: The NFPA Regulations Governing Committee Projects in Paragraph 10-10 state: Each proposal shall be submitted to the Council Secretary and shall include:

(a) identification of the submitter and his affiliation (Committee, organization, company) where appropriate, and

(b) identification of the document, paragraph of the document to which the proposal is directed, and

(c) a statement of the problem and substantiation for the proposal, and

(d) proposed text of proposal, including the wording to be added, revised (and how revised), or deleted.