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Portable Wood Ladders

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

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FOREWORD

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product employing materials or having forms of construction which conflict with specific requirements of the Standard cannot be judged to comply with the Standard. A product employing materials or having forms of construction not addressed by this Standard may be examined and tested according to the intent of the requirements and, if found to meet the intent of this Standard, may be judged to comply with the Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

INTRODUCTION

1 Scope

1.1 These requirements cover portable wood ladders of the following types: step, single, extension, sectional, trestle, extension trestle, and several forms of special purpose ladders.

1.2 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this standard, and that involves a risk of fire or of electric shock or injury to persons shall be evaluated using appropriate additional component and end-product requirements to maintain the level of safety as originally anticipated by the intent of this standard. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this standard does not comply with this standard. Revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this standard.

2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, a component of a product covered by this standard shall comply with the requirements for that component.

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

- a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or
- b) Is superseded by a requirement in this standard.

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

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

2.2 Units of measurements

2.2.1 When a value for measurement is followed by a value in other units in parentheses, the first stated value is the requirement.

2.3 Undated references

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

3 Instructions

3.1 Instructions covering the intended use of the specific ladder shall be provided with each ladder and shall contain information that applies only to the specific type of ladder. See 35.5.

4 Glossary

4.1 **EXTENSION LADDER** – A nonself-supporting portable ladder, adjustable in length, and consisting of two or more sections traveling in integral or separate guides or brackets arranged to permit length adjustment. Its size is designated by the sum of the lengths of the individual sections measured along the side rails.

4.2 **EXTENSION TRESTLE LADDER** – A self-supporting portable ladder, adjustable in length, consisting of a trestle ladder base and a vertically adjustable single ladder, with means for locking the ladders together. The size is designated by the length of one of the side rails in the trestle ladder base measured along the front edge, including the shoe, plus the allowable extended length of the extension section measured along one of the side rails.

4.3 **INSIDE CLEAR WIDTH** – The distance between the inside flanges of the side rails of a ladder.

4.4 **LADDER** – An appliance usually consisting of two side rails joined at regular intervals by crosspieces called steps, rungs, or cleats, on which a person steps while ascending or descending.

4.5 **LOW-DENSITY WOOD** – Wood that is exceptionally light in weight and usually deficient in strength for the species. In softwood species, low density is frequently indicated by exceptionally wide, or sometimes by extremely narrow rings, and generally is characterized by a low proportion of latewood. In ring-porous hardwood species, low density is most commonly associated with excessively narrow annual rings in which the earlywood portion predominates.

4.6 **PLATFORM LADDER** – A self-supporting portable ladder of fixed size with a platform provided at the highest standing level. The size is designated by the distance along the front rail from the platform to the base of the ladder, including any foot or shoe.

4.7 **SECTIONAL LADDER** – A nonself-supporting portable ladder, nonadjustable in length, consisting of two or more sections constructed so that the sections may be combined to function as a single ladder. Its size is designated by the overall length of the assembled sections, measured along the rails, including any material necessary for attaching.

4.8 **SINGLE LADDER** – A nonself-supporting portable ladder, nonadjustable in length, consisting of only one section. Its size is designated by the overall length of the side rail, excluding any foot or end cap.

4.9 SPECIAL-PURPOSE LADDER – A portable ladder that is either a modification or a combination of design or construction features of one of the general-purpose ladders defined in this standard to adapt the ladder to special or specific uses.

4.10 STEPLADDER – A self-supporting portable ladder, nonadjustable in length, having flat steps and a hinged back. Its size is designated by the overall length of the ladder, measured along the front edge of the side rails, including any foot or top cap.

4.11 STEP STOOL (LADDER TYPE) – A self-supporting, foldable portable ladder, non-adjustable in length, 32 inches (813 mm) or less in overall size with flat steps, without a pail shelf, designed to be climbed on the ladder top cap as well as on all steps. The side rails may continue above the top cap.

4.12 TOP CAP – The uppermost horizontal member of a portable stepladder.

4.13 TOP STEP – The first step immediately below the top surface or top cap of a portable stepladder. When a ladder is constructed without a top cap, the top step is the first step below the top of the rails.

4.14 TRESTLE LADDER – A self-supporting portable ladder, nonadjustable in length, consisting of two sections, hinged at the top to form equal angles with the base. The size is designated by the length of the side rails measured along the front edge, including any foot or shoe.

4.15 ULTIMATE FAILURE – Collapse of the ladder structure or, where applicable, a component thereof.

4.16 VISIBLE DAMAGE – Damage clearly evident to the eye without recourse to optical measuring devices.

4.17 WOOD IRREGULARITIES – Any characteristics in or on wood that may lower its durability, strength, or utility.

CONSTRUCTION

5 Materials

5.1 Wood parts

5.1.1 All wood parts shall be of the species as specified in 5.4.1 and:

- a) Well-seasoned, smoothly machined, and dressed on all sides;
- b) Free from sharp edges and splinters; and
- c) Sound and visibly free from irregularities except as specified in 5.2.1 – 5.3.7.

Low-density wood shall not be used.

5.2 Acceptable irregularities in side rails and back legs

5.2.1 CROSS GRAIN – The general slope of grain in side rails of minimum dimension shall not be steeper than 1 in 12, except that for a ladder under 10 feet (3.05 m) long and having flat steps for treads, the general slope of grain shall not be steeper than 1 in 10.

5.2.2 The slope of grain is to be measured over a distance that allows the determination of the general slope of the grain not to be influenced by short local deviations.

5.2.3 KNOTS – Knots shall not appear in narrow faces of side rails. Knots, when tight and sound and less than 1/2 inch (12.7 mm) in diameter, are not prohibited from being used on the wide face when they are at least 1/2 inch back from either edge and not more frequent than 1 knot in any 3 feet (0.91 m) of ladder length.

5.2.4 PITCH AND BARK POCKETS – (Openings extending parallel to the annual growth rings that contain or contained pitch or bark). Pitch and bark pockets are not prohibited from being used when they are not more than:

- a) 1/8 inch (3.2 mm) wide,
- b) 2 inches (50.8 mm) long, and
- c) 1/2 inch (12.7 mm) deep,

and then only when they are not more frequent than one to any 3 feet (0.91 m) of ladder length.

5.2.5 CHECKS – Checks are not prohibited from being used in side rails and back legs when they are not more than 6 inches (152 mm) long or 1/2 inch (12.7 mm) deep.

5.2.6 SPLITS – Splits are not prohibited from being used in side rails and back legs when they are not more than 2 inches (50.8 mm) long.

5.2.7 COMPRESSION WOOD – Occurrences of compression wood in relatively small amounts are not prohibited from being used when no single streak exceeds 1/2 inch (12.7 mm) in width, and the aggregate of streaks does not exceed one-fourth of the wide face of the side rail. There shall be no streaks of compression wood on the narrow face of the rail. Those parts containing bow or crook that interfere with the operation of the ladder shall not be used. Streaks of compression wood shall not be closer than 1/2 inch to the edge of the rail.

5.3 Acceptable irregularities in flat steps, rungs, and other ladder parts

5.3.1 CROSS GRAIN IN PARTS OTHER THAN RUNGS – The general slope of grain in flat steps of minimum dimension shall not be steeper than 1 in 12, except that for a ladder under 10 feet (3.05 m) long, the slope of grain shall not be steeper than 1 in 10.

5.3.2 CROSS GRAIN IN RUNGS – The general slope of grain in rungs shall not be steeper than 1 in 15.

5.3.3 KNOTS – Knots over 1/8 inch (3.2 mm) in diameter shall not appear in rungs. Knots appearing in the wide faces of flat steps shall not exceed a diameter of 1/4 inch (6.4 mm).

5.3.4 PITCH AND BARK POCKETS – Pitch and bark pockets are not prohibited, but they shall not be more than 1/8 inch (3.2 mm) wide, 2 inches (50.8 mm) long, or 1/2 inch (12.7 mm) deep, and then only when they are not more frequent than one to any 3 feet (0.91 m) of ladder length.

5.3.5 CHECKS – Seasoning checks are not prohibited, but they shall not be more than 6 inches (152.4 mm) long or 1/2 inch (12.7 mm) deep.

5.3.6 SPLITS – Splits are not prohibited, but they shall not be more than 2 inches (50.8 mm) long.

5.3.7 COMPRESSION WOOD – Occurrences of compression wood are not prohibited, but no single streak shall exceed 1/2 inch (12.7 mm) in width, and the aggregate of streaks shall not exceed one-fourth of the wide face. No streak of compression wood shall be within 1/2 inch of the edge. There shall be no streaks of compression wood on the narrow face. Parts containing bow or crook that interfere with the operation of the ladder shall not be used.

5.4 Classification of various species of wood acceptable for use in ladders

5.4.1 The requirements in (a) – (e) provide a list of native woods, divided into five groups on the basis of mechanical properties considered from the standpoint of use for ladder construction. The position of any species within a group bears no relation to its strength or acceptability.

a) GROUP A – White Ash; Beech; Birch; Rock Elm; Hickory; Locust; Hard Maple; Red Maple; Red Oak; White Oak; Pecan.

b) GROUP B – Douglas Fir (Coast region); Western Larch; Southern Yellow Pine.

c) GROUP C – Port Orford Cedar; Cucumber; Gum; Hemlock; Tamarack.

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d) GROUP D – Alaska Cedar; Cypress; American Elm; Noble Fir; White Fir; Hackberry; Magnolia; Oregon Maple; Norway Pine; Redwood; Eastern Spruce; Sitka Spruce.

e) GROUP E – Red Alder; Aspen; Incense Cedar; Eastern Hemlock; Lodgepole Pine; Ponderosa Pine; Englemann Spruce; Sycamore; Tupelo.

5.4.2 Group E woods are not prohibited from being substituted for Group D woods on the following basis:

- a) The dimensions shall be at least 5 percent greater for each cross-section dimension or
- b) The thickness may remain unchanged, in which case the width shall be at least 7-1/2 percent greater when used edgewise (as in a rail), or 15 percent greater when used flatwise (as in a tread).

5.4.3 Group A woods are not prohibited from being substituted for Group B woods.

5.5 Alternate materials

5.5.1 When a wood ladder is manufactured with a part or parts made of other materials (for example, aluminum or steel steps, top cap, or rungs), these parts shall comply with the applicable requirements in the Standard for Portable Metal Ladders, UL 184, in addition to the requirements in this standard. A component made of other wood-base material is not prohibited from being used when it has the strength, stiffness, durability, and weathering characteristics at least equal to those specified for the component in this standard.

5.5.2 A nail shall be steel or material determined to be of equivalent strength and holding power.

6 General

6.1 Duty rating

6.1.1 A wood ladder shall be marked and identified by duty rating based on work load, in compliance with the requirements in 35.2.

6.2 Lengths

6.2.1 A step, platform, and trestle ladder, and an extension trestle section shall have lengths as specified in Table 6.1.

6.2.2 A single, sectional, and extension ladder shall have lengths as specified in Table 6.2.

6.3 Exposed metal surfaces

6.3.1 An exposed metal surface shall be free from sharp edges, burrs, and structural defects.

6.4 Rung or step spacings

6.4.1 The spacing of rungs or steps shall be on $12 \pm 1/8$ inch (305 ± 3 mm) centers, except for minimum 8 inch (203 mm) centers for step stools. On a stepladder, the top step shall be located at least 18 inches (457 mm) below the top cap when means are provided to restrict inadvertent stepping into the opening, or when the tread of the top step is extended so that it contacts a vertical line from the lower front edge of the top cap.

Table 6.1
Ladder lengths step, platform, trestle, and extension trestle ladders

Duty rating,		Length					
		Stepladder,		Platform ladder,		Trestle and extension trestle ^a ,	
		feet	(m)	feet	(m)	feet	(m)
pounds	(kg)						
200	90.7	3 – 6	0.9 – 1.8	—	—	—	—
225	102.1	3 – 12	0.9 – 3.7	3 – 12	0.9 – 3.7	—	—
250	113.4	3 – 20	0.9 – 6.1	3 – 20	0.9 – 6.1	6 – 20	1.8 – 6.1
300	136.1	3 – 20	0.9 – 6.1	3 – 20	0.9 – 6.1	6 – 20	1.8 – 6.1

^a Applies to base section and extension section individually.

Table 6.2
Ladder lengths extension, sectional and single ladders

Duty rating,		Length					
		Extension,		Sectional,		Single,	
		feet	(m)	feet	(m)	feet	(m)
pounds	(kg)						
200	90.7	8 – 16	2.4 – 4.9	—	—	8 – 14	2.4 – 4.3
225	102.1	8 – 24	2.4 – 7.3	8 – 31	2.4 – 9.4	8 – 20	2.4 – 6.1
250	113.4	8 – 30	2.4 – 9.1	8 – 31	2.4 – 9.4	8 – 30	2.4 – 9.1
300	136.1	8 – 30	2.4 – 9.1	8 – 31	2.4 – 9.4	8 – 30	2.4 – 9.1

6.5 Hardware and fasteners

6.5.1 Hardware shall be of a material that is protected against corrosion or is inherently corrosion-resistant.

6.5.2 A fastener shall be applied in a tight and secure manner and remain so with intended use and care, or shall be such that it can be field tightened. A rivet shall be peened or set over the hardware or a washer. A washer shall be a standard riveting burr; [for example, a 3/16-inch (4.8-mm) diameter rivet shall use a minimum 1/2-inch (12.7-mm) diameter burr, and a 1/4-inch (6.4-mm) diameter rivet shall use a minimum 5/8-inch (15.9-mm) diameter burr]. The head of the rivet, when used against wood, shall be a wagon box, truss, or similar type head. A hole drilled in wood parts for a fastener shall not exceed the diameter of the fastener by more than 1/32 inch (0.8 mm).

6.6 Dimensions

6.6.1 Dimensions specified herein are the minimum dressed cross-sectional dimensions for the types of ladders designated, based on the species of wood as specified in 5.4.1, at a moisture content of 15 percent. The dimensions for side rails are based on a mortise or gain as specified for the various types of ladders for step or rung attachments.

STEPLADDERS

7 General

7.1 Slope

7.1.1 A stepladder shall have a minimum slope of 3-1/2 inches per foot (292 mm/m) of length of the front section, and a minimum slope of 2 inches per foot (167 mm/m) of length of the back section.

7.2 Width and spread

7.2.1 The minimum width between side rails at the top step, inside to inside, shall be not less than 11-1/2 inches (292 mm). From top to bottom, the side rails shall spread at least 1-1/4 inches per foot (104 mm/m) of length of stepladder.

7.3 Step attachment

7.3.1 Steps shall be closely fitted into grooves in the side rail, 1/8 inch (3.2 mm) in depth with a tolerance of $\pm 1/32$ inch (0.8 mm), and shall be firmly secured; or they shall be closely fitted into metal brackets which, in turn, shall be firmly secured to the side rails.

7.4 Top cap

7.4.1 A stepladder shall have a one-piece or a multiple-piece top cap with wood or metal brackets or fittings tightly secured to the top, and to the side rails or back legs, or both, to allow free swinging of the back section without excessive play or wear at the joints. Rivets shall be spaced no closer together than 1-1/4 inches (31.8 mm). On a 250-pound (113.4-kg) and 300-pound (136.1-kg) duty-rated stepladder, there shall be a minimum of three 3/16-inch (4.8-mm) diameter or two 1/4-inch (6.4-mm) diameter rivets, or fasteners determined to be the equivalent, to attach each metal bracket to each front rail when the metal bracket is used to provide the top hinging of the back section.

7.5 Spreader

7.5.1 A ladder shall include an integral metal spreader or locking device to hold the front and back sections securely in the open position. The spreader shall have all sharp points covered or removed. For a 200-pound (90.7-kg) duty-rated ladder, the bucket shelf and spreader is not prohibited from being combined in one unit. The spreader, or the lower set of a double set of spreaders when used, shall not be more than 6-1/2 feet (1.98 m) above the lower support surface.

7.6 Length tolerance

7.6.1 When measured along the front edge of the side rails, a stepladder shall measure within 2 inches (50.8 mm) of the marked length.

7.7 Bucket shelf

7.7.1 A bucket shelf which is an integral part of a stepladder shall be fastened so that it can be folded up when the ladder is closed. On ladders 8 feet (2.44 m) or less in length, the shelf shall be designed so that it must be folded before the ladder can be closed; or during the closing of the ladder the shelf shall fold and the bucket shelf arms shall not project beyond the front rail frame surfaces facing the user.

7.8 Shoes

7.8.1 When shoes are provided, they shall be securely bolted, nailed, or riveted, or attached by methods determined to be equivalent. Properly fitted, elastic boot-type shoes are not required to be provided with additional means of attachment.

8 250- and 300-Pound Duty-Rated Stepladders

8.1 Dimensions

8.1.1 The minimum dimensions of the parts of a 250-pound (113.4-kg) and a 300-pound (136.1-kg) duty-rated stepladder shall be as specified in Table 8.1 or Table 8.2, as applicable, when a stepladder is constructed from Group A, B, C, or D woods (see 5.4.1).

Table 8.1
Minimum dimensions of parts for 250-pound (113.4-kg) duty-rated stepladders

Part	Ladder length, feet (m)											
	Less than 12 (3.6)				14 and 16 (4.3 and 4.8)				18 and 20 (5.5 and 6.1)			
	Thickness,		Depth,		Thickness,		Depth,		Thickness,		Depth,	
	inch	(mm)	inches	(mm)	inch	(mm)	inches	(mm)	inches	(mm)	inches	(mm)
Side rails	3/4	19.1	3-1/4	82.5	3/4	19.1	3-1/2	89	1-1/16	27.3	3-1/2	89
Back legs	3/4	19.1	2-1/4	57.1	3/4	19.1	2-5/8	66.7	1-1/16	27.3	2-1/4	57.1
Steps	3/4	19.1	3-5/8	92.1	3/4	19.1	4	101.6	3/4	19.1	4	101.6
Top	3/4	19.1	5-1/2	140	3/4	19.1	5-1/2	140	3/4	19.1	5-1/2	140

Table 8.2
Minimum dimensions of parts for 300-pound (136.1-kg) duty-rated stepladders

Part	Ladder length, feet (m)											
	Less than 12 (3.6)				14 and 16 (4.3 and 4.8)				18 and 20 (5.5 and 6.1)			
	Thickness,		Depth,		Thickness,		Depth,		Thickness,		Depth,	
	inches	(mm)	inches	(mm)	inches	(mm)	inches	(mm)	inches	(mm)	inches	(mm)
Side rails	1	25.4	3-1/4	82.5	1	25.4	3-1/2	89	1-1/16	27.3	3-1/2	89
Back legs	1-1/16	27.3	2-1/4	57.1	1-1/16	27.3	2-3/8	60.3	1-3/8	35	2-3/8	60.3
Steps	3/4	19.1	3-3/4	95.6	3/4	19.1	4-1/4	108	3/4	19.1	4-1/4	108
Top	3/4	19.1	5-1/2	140	3/4	19.1	5-1/2	140	3/4	19.1	5-1/2	140

8.1.2 The minimum thickness of the side rails shall provide for the cutting of a groove 1/8 inch (3.2 mm) in depth with the tolerance indicated in 7.3.1 and shall be increased when grooves of greater depth are used.

8.2 Flat steps

8.2.1 Steps shall be secured against front to back lateral movement with at least two 6-d nails [minimum dimensions: 0.0858 inch (2.179 mm) in diameter and 1-7/8-inches (47.6-mm) long], or the equivalent, at each end. When nails are used, they shall be located at least 3/8 inch (9.3 mm) from the rail edge. Each step less than 30 inches (762 mm) long shall be reinforced by a steel rod of not less than 0.160 inch (4.1 mm) in diameter. Steps 30 inches and longer shall be reinforced by a steel rod of not less than 0.180 inch (4.6 mm) in diameter. These rods shall be provided with a washer at each end to prevent pressing into the side rails. The washers shall be at least 1 inch (25.4 mm) in diameter and either:

- a) Flat metal 0.042 inch (1.07 mm) thick or
- b) Formed steel at least 0.020 inch (0.51 mm) thick.

A truss block shall be fitted between the rod and the center of each step; or a metal angle brace on each end shall be firmly secured to the step and the side rails; or the steps shall be reinforced by a construction of strength determined to be the equivalent. With rod reinforcement, the end shall be peened and the bottom step shall also be provided with a metal angle brace on each side that shall be securely riveted, or determined to be the equivalent, to the bottom step and side rails.

8.2.2 In addition to the requirements specified in 8.2.1, all steps 3-5/8 – 4-1/4 inches (92.1 – 108 mm) wide and 27 inches (686 mm) or more in overall length, and all steps 4-1/4 inches (108 mm) or wider and 32 inches (813 mm) or more in overall length shall be provided with a metal angle brace at each end. The brace shall be securely riveted to the step and side rail, or shall be secured by a construction of strength determined to be the equivalent. The maximum projection of the leading edge of a step shall not exceed 3/4 inch (19.1 mm) at the top of the step.

8.3 Anti-split devices

8.3.1 When a separate hinge is not used, the back legs of a 250-pound (113.4-kg) and a 300-pound (136.1-kg) duty-rated stepladder shall be reinforced by a rivet through the depth of the leg above the hinge point, by metal plates or collars at the hinge point, or by other means intended to prevent splitting of the back leg from the hinge pin to the top.

8.4 Bracing of back section

8.4.1 The back section shall be braced according to the requirements in:

- a) 8.4.2 – 8.4.4 or
- b) 8.4.5 – 8.4.7.

8.4.2 The back legs shall be braced with 1-1/8-inch (28.6-mm) diameter dowels of Group A woods (see 5.4.1) having 7/8-inch (22.2-mm) diameter tenons, spaced not more than 12 inches (304.8 mm) apart. The back legs shall be bored with holes either extending through the legs or to within 1/8 inch (3.2 mm) of the outside face of the legs, having a diameter that provides a tight fit for the cross piece. The shoulder of the rung shall be forced firmly against the leg, and the tenon secured in place with a 0.080-inch (2.0-mm) diameter nail, or determined to be the equivalent thereof, to prevent turning.

8.4.3 The back legs shall also be braced by a metal angle brace securely fastened on each side and to the rung. One rung is to be so braced for each 4 feet (1.2 m) of length or fraction thereof on ladders 4 feet or more in length. Braces are required only on the bottom rung for ladders 4 feet or shorter.

8.4.4 When rungs are more than 28 inches (711 mm) in length, they shall be provided with a center bearing consisting of a wood bar not less than 3/4 by 2 inches (19.1 by 50.8 mm) in cross-section, securely nailed to each rung passing through it, and long enough to include each rung longer than 28 inches.

8.4.5 The back legs shall be braced with horizontal wood bars not less than 3/4 by 2-1/2 inches (19.1 by 57.2 mm) in cross-section, and spaced not more than 12 inches (305 mm) apart. The ends of the bars shall either fit into metal sockets in the back legs of not less than 0.032 inch (0.81 mm) steel, or determined to be the equivalent, or into mortises of not less than 1/8 inch (3.2 mm) in depth in the back legs. A steel rod not less than 0.160 inch (4.1 mm) in diameter shall pass through the back legs, the bar, and, at each end, through metal washers:

- a) One inch (25.4 mm) in diameter, minimum 20 gage or
- b) Formed steel washers of 24 gage, to prevent pressing into the back legs.

8.4.6 The back legs shall also be braced by a metal angle brace on each side securely fastened to the bar and to the back legs. One bar is to be so braced for each 4 feet (1.2 m) of length or fraction thereof on ladders 4 feet or more in length. Braces are required only on the bottom bar for ladders 4 feet or shorter.

8.4.7 Metal sockets, when used, shall be attached to the back legs by wood screws, rivets, or by means of the rod running through the socket or determined to be the equivalent thereof.

8.5 Oval rungs

8.5.1 Oval wood rungs or rectangular wood rungs are not prohibited from being used in the back legs when they:

- a) Are secured with a nail or a screw at each end, or determined to be the equivalent thereof and
- b) Have at least the same strength and bearing as round rungs of the same length.

9 225-Pound Duty-Rated Stepladders

9.1 Dimensions

9.1.1 The minimum dimensions of the parts of a 225-pound (102.1-kg) duty-rated stepladder shall be as specified in Table 9.1 when made of Group B, C or D woods (see 5.4.1).

9.1.2 The minimum thickness of the side rails shall provide for the cutting of a groove 1/8 inch (3.2 mm) deep with the tolerance of $\pm 1/32$ inch (0.8 mm), and shall be increased when grooves of greater depth are used. The minimum thickness of the steps shall provide for the cutting of tread grooves in the top surface not exceeding 1/8 inch (3.2 mm) in width and 1/16 inch (1.6 mm) in depth. A rod lock groove in the underside of the step shall not be more than 9/32 inch (7.1 mm) wide and 9/32 inch deep.