



Portable ladders

Part 1: Performance and geometric requirements



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- Australian Aluminium Council
 - Australian Industry Group
 - Consumers Federation of Australia
 - Engineers Australia
 - Ladder Manufacturers Association of Australia
 - Master Builders Australia
 - National Retail Association
 - Safety Institute of Australia
 - Victorian Department of Health and Human Services
 - Working at Height Association
-

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Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

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Australian Standard®

Portable ladders

Part 1: Performance and geometric requirements

Originated as part of AS 1892—1977.
Previous editions AS/NZS 1892.1:1996 and AS/NZS 1892.3:1996.
Revised, amalgamated and redesignated as AS 1892.1:2018.

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee SF-034, Portable Ladders, to supersede AS/NZS 1892.1:1996, *Portable ladders*, Part 1: *Metal* and AS/NZS 1892.3:1996, *Portable ladders*, Part 3: *Reinforced plastic*.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

This Standard is Part 1 in a series of Standards covering the safe design, manufacture and use of portable ladders and attachments. Other Standards in the series are as follows:

AS 1892.2, *Portable ladders*, Part 2: *Timber*

AS/NZS 1892.5, *Portable ladders*, Part 5: *Selection, safe use and care*

In this edition Parts 1 and 3 have been consolidated into a single document. Design and performance requirements for metal and fibreglass ladders remain the same, except for the following:

- (a) Addition of test reporting requirements (Clause 1.7).
- (b) Additional labelling requirements (Clause 2.8).
- (c) Addition a new classification for ladders with 'higher stability' (Clause 1.5.33).
- (d) Addition of test and performance criteria for 'higher stability' ladders (Appendices GG, HH and II).
- (e) Clarification of which test methods apply to each type of ladder (Section 8).
- (f) Addition of particular requirements for work platforms (Section 9).
- (g) Addition of particular requirements for step stools (Section 10).

In this edition, the test methods have been included as a set of appendices. The test methods have not changed greatly; however, in the light of experience gained from the previous editions, they have been clarified.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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STANDARDS AUSTRALIA

Australian Standard Portable ladders

Part 1: Performance and geometric requirements

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out requirements for the design and manufacture of portable ladders from various materials and combinations of materials, such as metal, plastic, reinforced plastic, other composites, ceramics, timber and engineered wood.

The Standard provides two duty ratings for industrial ladders and domestic ladders, which are assigned minimum load ratings.

The Standard provides two stability ratings; for stability and higher stability, which may relate to industrial ladders and domestic ladders. Any such stabilizing device or devices shall be an integral part of the ladder and shall not be removable.

The Standard covers single and multiple-section ladders, multipurpose ladders, combination ladders and those special-purpose ladders defined in Clause 1.5 and to other ladders that can be set up in configuration equivalent to the foregoing ladders.

The Standard does not fully cover ladder accessories. Examples of accessories not covered may include, but are not limited to, ladder levellers, ladder stabilizers, stand-off devices, ladder jacks, ladder straps, hooks, castors, shelves, safety gates that may be installed on, or used in conjunction with ladders.

NOTE: Accessories should not lessen the performance and test requirements of ladders to which they are attached.

1.2 OBJECTIVE

The objective of this Standard is to provide designers, manufacturers and regulatory authorities with the minimum performance and dimensional requirements for portable ladders, in order to minimize the risk to the safety of portable ladder users. Performance requirements include strength, stability and durability criteria for the evaluation of portable ladders.

1.3 APPLICATION

Portable ladders shall conform to the relevant requirements of Section 2, General requirements, and with the specific requirements of the Section(s) appropriate to the type of ladder, as follows:

- (a) Single ladders: Section 3.
- (b) Extension ladders: Section 4.
- (c) Stepladders: Section 5.
- (d) Trestle ladders: Section 6.
- (e) Multipurpose ladders: Section 7.

- (f) Other ladders: Section 8.
- (g) Work platforms: Section 9.
- (h) Step stools: Section 10.

1.4 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS	
2089	Sheave blocks for lifting purposes
4142	Fibre ropes
4142.2	Part 2: Three-strand hawser-laid and eight-strand plaited
AS/NZS	
1554	Structural steel welding
1554.1	Part 1: Welding of steel structures
1665	Welding of aluminium structures
2312	Guide to the protection of iron and steel against exterior atmospheric corrosion by the use of protective coatings (series)
ASTM	
D149	Test methods for dielectric breakdown voltage and dielectric strength of solid electrical insulating materials at commercial power frequencies
D229	Standard test methods for rigid sheet and plate materials used for electrical insulation
D709	Specification for laminated thermosetting materials
D790	Test methods for flexural properties of unreinforced and reinforced plastics and electrical insulating materials
D792	Test methods for density and specific gravity (relative density) of plastics by displacement
D1499	Practice for filtered open-flame carbon-arc type exposures of plastics
D2565	Practice for xenon-arc exposure of plastics intended for outdoor applications
D2583	Test method for indentation hardness of rigid plastics by means of a Barcol impressor
G23	Practice for operating light-exposure apparatus (carbon-arc type) with and without water for exposure of nonmetallic materials
G26	Practice for operating light-exposure apparatus (xenon-arc type) for exposure of nonmetallic materials
G154	Practice for operating fluorescent ultraviolet (UV) lamp apparatus for exposure of non-metallic materials

1.5 DEFINITIONS

For the purpose of this Standard, the definitions below apply (see also Figure 1.1).

1.5.1 Articulation

A hinge that is capable of being locked in one or more positions.

1.5.2 Brace

A rigid member (typically diagonal) used to enhance stiffness and strength, for example, at a tread to stile connection.

1.5.3 Composite

A homogeneous or layered material created by the synthetic assembly of two or more materials (a selected filler or reinforcing elements and a compatible matrix binder), to obtain specific characteristics and properties.

1.5.4 Domestic ladder

A ladder designed to be used by a householder for construction, maintenance and repairs carried out at a private dwelling for non-commercial purposes.

1.5.5 Double-sided stepladder

A self-supporting portable ladder of fixed length with two pairs of stiles which are—

- (a) hinged or fixed; and
- (b) each fitted with treads for ascent and descent.

1.5.6 Dual-purpose stepladder

A self-supporting portable ladder of which the back section is fitted with rungs or treads, and which can be further adjusted to provide an extension of the front section as a non-self-supporting portable ladder (in the extended position).

1.5.7 Duty rating

The rating assigned to the ladder, i.e. industrial or domestic, that indicates the service capability of the ladder.

1.5.8 Effective length

The length of a ladder less end caps and feet, where fitted.

1.5.9 E-glass

A borosilicate glass, the type most frequently used for glass fibre for reinforced plastics, suitable for electrical laminates because of its high resistivity.

1.5.10 End cap

A terminating piece fixed to the end of a stile to cover and/or protect the end of the stile.

1.5.11 Extension ladder

A non-self-supporting portable ladder, consisting of two or more sections travelling in guides, including interlocking stiles or brackets arranged in order to permit adjustment of length.

1.5.12 Fibreglass

A glass-reinforced plastic, where the most common plastic encountered would be polyester. The composite possesses directional properties, as well as specific mechanical, electrical, anti-corrosion and weathering characteristics.

1.5.13 Handrail

A component that provides additional assistance for ascending or descending a ladder or provides an alternate hand hold opportunity. It also is used to describe the uppermost horizontal members of an enclosure at the top of a platform stepladder.

1.5.14 Industrial ladder

Any ladder other than a domestic ladder.

1.5.15 Load rating

The maximum load, including the weight of the user, materials and tools, that the ladder is intended to carry, in kilograms.

1.5.16 Multipurpose ladder (multifold ladders)

A portable ladder having one or more pairs of articulation joints that allow the ladder to be rearranged to function as a single ladder, with or without a stand-off, as a single or double-sided stepladder, or work platform.

1.5.17 Overlap

The distance by which each section of an extension ladder coincides with its matching section.

1.5.18 Permanent set

An irreversible deformation that remains in a structure or material after it has been subjected to stress.

1.5.19 Platform

A horizontal structure of substantial size on which the user will stand.

1.5.20 Platform stepladder

A self-supporting portable ladder with a specially designed platform near the top, to provide a maximum height working area.

1.5.21 Polyesters

Thermosetting resins produced by dissolving unsaturated, generally linear, alkyd resins in a vinyl-type active monomer including styrene, methyl styrene, or diallylphthalate. Cure is effected through vinyl polymerization using either peroxide catalyst and promoters or heat to accelerate the reaction.

1.5.22 Portable ladder

A readily movable piece of equipment consisting of stiles (see Clause 1.5.35) joined at regular intervals by cross-pieces called rungs or treads (see Clause 1.5.27), on which the user may stand or step when ascending or descending.

1.5.23 Pultrusion

A continuous moulding process whereby reinforcing fibres are saturated with a liquid polymer resin and then carefully formed and pulled through a heated die to form a part. Pultrusion results in straight constant cross-section parts of virtually any shippable length.

1.5.24 Rail

A rigid member (typically horizontal) linking the stiles.

1.5.25 Reinforced plastic

A plastic with strength properties greatly superior to those of the base resin as a result of high-strength fillers embedded in the composition. The reinforcing fillers include fibres, fabrics, or mats made of fibres.

1.5.26 Reinforcement

A strong inert material bonded into a plastic to increase its strength, stiffness and impact resistance. Reinforcements are usually fibres of glass, sisal, cotton, and the like, in woven or non-woven form. To be effective, the reinforcement material must form a strong adhesive bond with the resin.

1.5.27 Rungs and treads

A horizontal member joining the stiles and used by the user ascending or descending a ladder.

NOTES:

- 1 The terms 'rung', 'step', and 'tread' are used in industry. For the purpose of this Standard, the term 'rung' is used for single and extension ladders, and the term 'tread' for stepladders. The term 'tread' is also used as a general term where applicable.
- 2 The terms 'rung', 'tread', and 'step' do not include the top cap.

1.5.28 Section**1.5.28.1 Bottom or base section**

The lowermost section of a non-self-supporting portable ladder.

1.5.28.2 Middle or intermediate section

The section between the top (fly) and bottom (base) sections of a non-self-supporting portable ladder.

NOTE: There may be more than one middle or intermediate section in a ladder.

1.5.28.3 Top or fly section

The uppermost section of a non-self-supporting portable ladder.

1.5.29 Single ladder

A non-self-supporting portable ladder, of fixed length, consisting of one section.

1.5.30 Single-sided stepladder

A self-supporting portable ladder, of fixed length, with flat treads for ascent and descent and a hinged back not intended for ascent or descent. Variations in designs of single-sided stepladders include platform stepladder and dual-purpose stepladder.

1.5.31 Special-purpose ladder

A ladder that represents either a modification or a combination of design or construction features of one or more of the general-purpose ladders herein defined, in order to adapt to special or specific uses.

1.5.32 Spreader

A member, typically including one or more hinged connections, that—

- (a) improves the rigidity of the ladder;
- (b) prevents the ladder from opening beyond its designed spread;
- (c) prevents the ladder from being used at less than the designed spread; and
- (d) prevents the ladder from accidentally closing when fully open.

1.5.33 Stability rating

The rating of stability assigned to the ladder, identifiable as 'stability' or 'higher stability', when achieving the applicable stability performance criteria. Levellers and/or stabilizers may be used to achieve the stability requirements.

1.5.34 Step stool

A self-supporting portable ladder with a specially designed platform near the top, to provide a maximum height working area.

1.5.35 Stile

A side member that supports the treads or rungs.

NOTE: The terms 'stile', 'side rail', 'string' and 'stringer' are used synonymously in industry. For the purpose of this Standard, the term 'stile' is used throughout.

1.5.36 Structural damage

Collapse of a ladder, such as in failure to support a test load.

NOTE: Visible damage does not constitute structural damage unless accompanied by failure to support a test load.

1.5.37 Test span

The distance between the supports of a ladder under test.

1.5.38 Top cap

The uppermost horizontal member of a portable stepladder which the stiles are secured to.

1.5.39 Trestle ladder

A self-supporting portable ladder of fixed length, consisting of two sections hinged at the top to form equal angles with the base, each section being provided with cross-bearers, on which a plank or planks may be supported.

1.5.40 Visible damage

Damage to the ladder that is visible to the unaided eye, or damage that impairs normal functioning of the ladder, except, where relevant, permissible permanent set.

NOTE: Wearing prescription spectacles during examination for visible damage is permitted.

1.5.41 Work platform

A self-supporting portable ladder with a substantial size platform of a design other than a Platform stepladder or Step stool.

1.5.42 Working length

1.5.42.1 *For ladders of adjustable length*

The length measured along the stiles, including feet and end caps where fitted, when the ladder is in the fully extended position.

1.5.42.2 *For ladders of fixed length*

The overall length measured along the stile, including feet, top and end caps where fitted.

1.5.43 Working surfaces

The clear portion of steps, rungs, treads or platform on which the user may place a foot while standing on or ascending or descending a ladder.

1.6 TESTING ORDER AND NUMBER OF TEST SPECIMENS

The tests in this Standard are performance type-tests and a number of these tests may damage the test specimen. Accordingly, it is permitted to replace the test specimen if required.

The order of testing is the subject of agreement between the parties and should be recorded. The number of test specimens required to complete the testing should also be recorded.

NOTES:

- 1 Typically, the number of test specimens required should not exceed three.
- 2 The ladder manufacturer should be included among the parties agreeing to the sequence of testing.

1.7 TEST REPORTS

Test reports should include the following details:

- (a) Name of the testing laboratory.
- (b) Date of test.
- (c) Type of test and reference to the relevant appendix of this Standard.
- (d) Type of product tested.
- (e) Manufacturer or importer of the product.
- (f) Manufacturer's or importer's model number or product identification.
- (g) Any notable features to describe the product.
- (h) The result of the test, e.g. pass or fail.

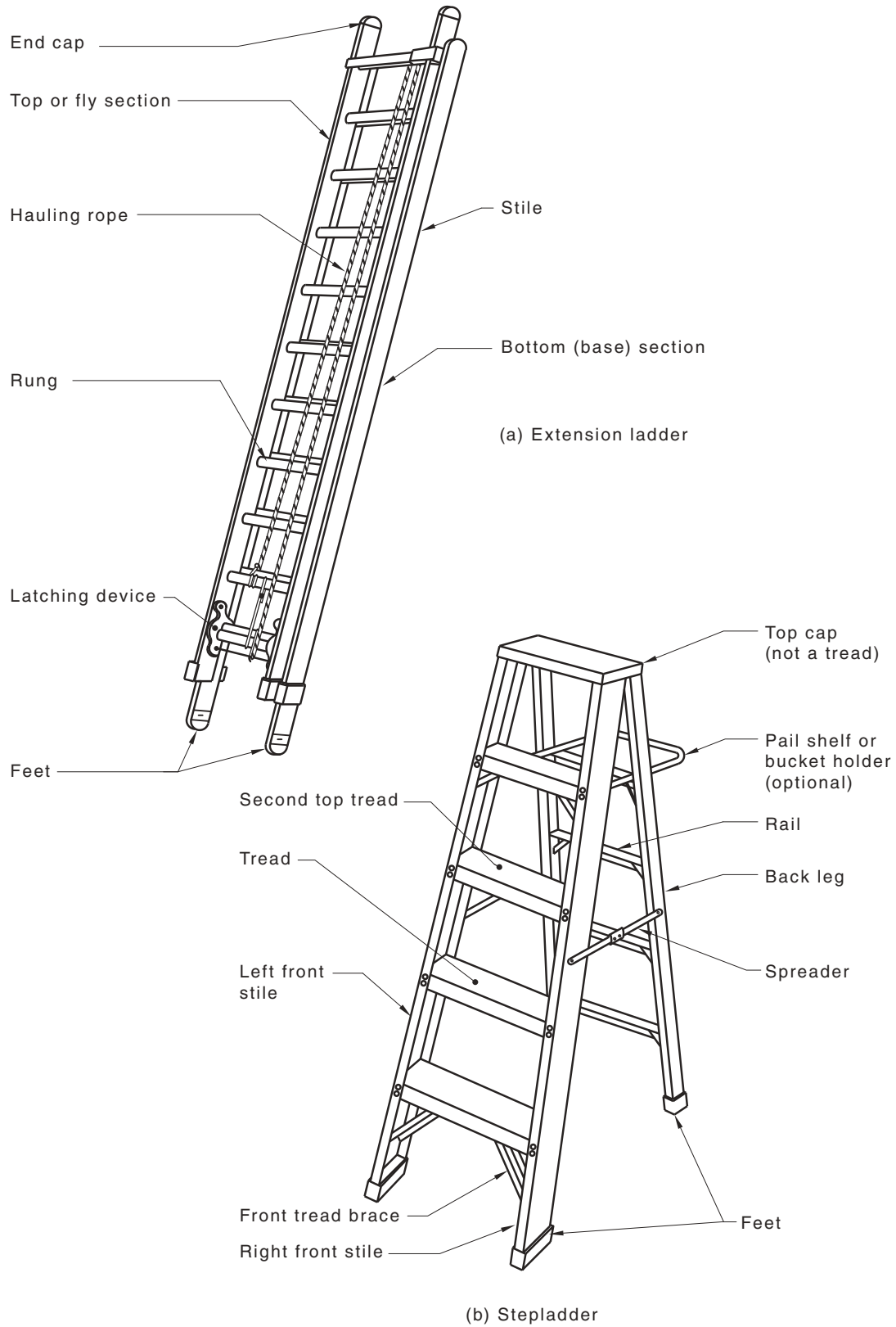
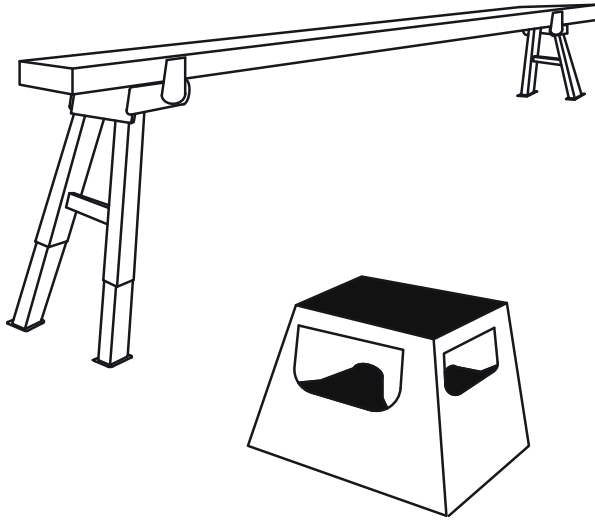
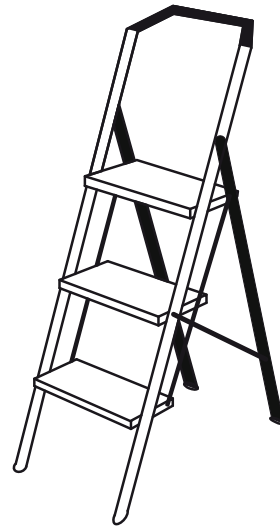


FIGURE 1.1 (in part) COMPONENTS AND TERMS RELATIVE TO LADDERS



(c) Work platform—examples



(d) Step stool—example

FIGURE 1.1 (in part) COMPONENTS AND TERMS RELATIVE TO LADDERS

SECTION 2 GENERAL REQUIREMENTS

2.1 DESIGN AND CONSTRUCTION

The design and construction shall be such that the ladder is of sufficient strength, stiffness and stability to meet the performance requirements of this Standard.

NOTE: Specific design and construction requirements are not a part of this Standard, because of the wide variety of materials and design possibilities.

2.2 RATINGS

2.2.1 Duty rating

Portable ladders shall be rated as either 'industrial' or 'domestic' in accordance with their designed service capability.

2.2.2 Load rating

Portable ladders shall have a load rating of—

- (a) not less than 120 kg for industrial ladders; or
- (b) not less than 100 kg for domestic ladders.

2.2.3 Stability rating

Portable ladders may be rated as 'higher stability' in accordance with specific performance requirements. Refer to Appendices GG, HH and II.

2.3 MATERIALS

2.3.1 General

Materials should be durable and resistant to corrosion. Additionally, materials should be able to withstand handling under normal usage.

Ferrous fittings or components may be made corrosion resistant by coating or plating. Materials used shall be compatible with respect to galvanic action.

NOTE: Guidance in the protection of iron and steel against exterior atmospheric corrosion is given in AS/NZS 2312 series.

2.3.2 Fibreglass

2.3.2.1 General

Fibreglass should be a fully cured composite consisting of a commercial grade thermosetting isophthalic polyester resin reinforced with glass fibres. The selection of polyester resin shall consider the following end use requirements:

- (a) Electrical.
- (b) Corrosion resistance.
- (c) Outdoor weathering.
- (d) Thermal conditions.
- (e) Structural integrity.

Resins and reinforcements, or combinations thereof, other than those specified in this Standard, may be used provided the ladder conforms to the relevant performance requirements.

NOTE: This option is allowed even when laboratory coupon test results do not conform to the values given in Appendix A, Tables A1 and A2, with the provision that the minimum percent retention of condition-A coupon values be 75% after either wet or weather-cycle tests and 60% after 66°C temperature tests.

2.3.2.2 Reinforcements

Glass fibre reinforcements may consist of any combination of mat, roving, cloth, or fabric of 'E' glass with a silane or equivalent coupling agent. The quantity, selection, distribution and orientation of the glass reinforcements shall ensure conformance to the requirements of this Standard.

A complete enveloping surface layer of continuous strand mat, continuous filament reinforcing mat, surface veil, non-woven fibrous fabric, or equivalent material, may be provided for added weathering resistance. This may consist of glass of Type A, B or E, or be a polyester staple fibre. Alternative materials or other techniques that provide at least an equivalent weathering resistance may be employed. In any event, the outermost layer shall consist of polyester.

The reinforcement design shall provide bidirectional strength in the composite.

2.3.2.3 Resin, filler and additives

The resin shall be chosen after consideration of its structural, electrical, thermal, and outdoor weather-resistant characteristics. Except where the specific resin system provides equivalent ultraviolet resistance, an ultraviolet screen or absorber shall be employed.

Fillers, lubricants, catalysts, and other additives shall be selected after consideration of their effect on the electrical, thermal, outdoor weather resistance, water absorption and structural properties of the composite.

2.3.2.4 Pigment

The particular ingredients in the pigmentation employed shall be light stable and have no detrimental effect on the weathering, thermal, electrical, or structural properties of the composite. The interaction of pigments, fillers and catalysts and their overall effect on the resin system shall be considered during the selection process.

2.3.2.5 Special requirements

Composites may be modified for specific situations. Adverse environments involving conditions such as corrosion, high humidity, sunlight, cold, heat, or erosion may require a special resin, a unique enveloping material, an exterior finish, or a combination thereof. The resulting product shall conform to the applicable performance requirements and tests of this Standard.

NOTE: The specification of criteria for non-flammability may result in impairment of other properties.

2.3.2.6 Product cure

The composite shall be cured sufficiently to attain a minimum Barcol hardness of 50, in accordance with ASTM D2583.

2.3.2.7 Fabrication properties

When glass reinforced plastic is bored, punched, or drilled and riveted, it shall not split or delaminate.

NOTE: A drift pin test, with the pin tapered to 1.04 times the hole diameter, has been found to provide a suitable means of testing this requirement.

2.3.2.8 Physical and mechanical properties

Physical and mechanical properties of reinforced plastic stiles are given in Appendix A

2.3.2.9 Accelerated weathering test procedures

As a means of determining the weathering characteristics of newly manufactured non-metallic members; both outdoor and artificial weathering tests may be employed. The different types of accelerated exposure devices used may include, but are not limited to, the following:

- (a) Fluorescent ultraviolet (UV) and condensation apparatus, as outlined in ASTM G154, to simulate the deterioration caused by sunlight and water as rain or dew. This test is preferred, particularly if a cycle of 6 h of ultraviolet exposure at 54°C followed by 6 h of condensation at 38°C is used.
- (b) Carbon-arc devices as outlined in ASTM G23, using distilled or deionized water in the water spray cycle. The requirements of ASTM D1499 also apply.
- (c) Xenon-arc type devices as outlined in ASTM D2565, and ASTM G26, using distilled or deionized water in the water spray cycle.

In either of the methods given in Items (b) and (c), the following cycle applies:

- (i) 102 minimum light only, black-panel temperature $63 \pm 5^\circ\text{C}$ during light-only cycle.
 - (ii) 18 minimum light and spray, relative humidity $50 \pm 5\%$, black-panel temperature $38 \pm 5^\circ\text{C}$ during light and spray.
 - (iii) Ozone, 5 parts per hundred million (optional).
- (d) An accelerated weathering device, utilizing an equatorial mount with mirrors for acceleration and water spray, may be used after correlation with one of the artificial weathering devices.

2.3.2.10 Evaluation of surface appearance

The degradation of surface appearance after exposure to the weathering cycle is subjective. The characteristics given in Clauses 2.3.2.11 to 2.3.2.13 apply.

2.3.2.11 Change in surface fibre appearance

An increase in the prominence of fibres on the surface of the material. This is known as 'fibre blooming', and can be a result of resin erosion. The change should be given as 8 times the rating for the degree of change given in Table 2.1.

2.3.2.12 Change in colour

Colour changes that are noticeable to the eye should be given as 5 times the rating for the degree of change given in Table 2.1.

2.3.2.13 Loss of gloss

The loss of glossiness in the material, i.e. reduction of light reflected from the surface, should be given a rating equal to the degree of change given in Table 2.1.

TABLE 2.1
RATING VALUES FOR SURFACE
APPEARANCE CHANGES

Degrees of change	Rating
None	0
Trace	1
Slight	2
Medium	3
Heavy	4
Severe	5

2.3.2.14 *Classification of weather resistance*

The weather resistance of a reinforced plastic material should be classified by comparing the sum of the ratings given in Clauses 2.3.2.11 to 2.3.2.13, with those given in Table 2.2.

TABLE 2.2
CLASSIFICATIONS
OF WEATHER RESISTANCE

Rating ranges	Classification
≤ 35	Weather resistant
$> 35 \leq 50$	General purpose
$> 50 \leq 70$	Interior application

2.4 ELECTRICAL PROPERTIES

2.4.1 General

The electrical properties of the materials used in stiles for reinforced plastic ladders, shall be determined at the time of manufacture as per Clauses 2.4.2 and 2.4.3.

2.4.2 A.C. dielectrical strength

When tested in accordance with the short-time test method given in ASTM D149 and ASTM D229, using the parallel plane to plane method in oil, as modified below, the a.c. dielectric strength of a 25 mm long full section specimen shall be not less than 25 000 V.

The full section specimen having parallel ends is placed edgewise between circular disc flat electrodes having a nominal outside diameter of 125 mm and a nominal thickness of approximately 25 mm. The edges are rounded to a 6 mm radius.

The electrodes shall extend a minimum of 12 mm beyond the specimen. The dielectric strength shall be determined for ten specimens and the arithmetic mean value shall be reported.

2.4.3 D.C. current leakage

When tested using the method given below, the d.c. current leakage between two electrodes spaced 25 mm apart shall not exceed 90 mA when a voltage of 90 kV is applied to the electrodes.

The sample of ladder stile shall be conditioned at $23 \pm 3^\circ\text{C}$ and 60% relative humidity for 72 h before testing.

Two continuous lengths of metallic conductive tape are affixed completely around the periphery of the sample at a separation of 250 mm. After connecting the tape to a suitable power supply, the voltage applied to the tapes is progressively raised to 90 kV, and the leakage current is measured. Where flashover occurs at less than 90 kV, the voltage and flashover current shall be reported.

2.5 QUALITY OF MANUFACTURE AND FINISH

2.5.1 General

All exposed surfaces shall be free from sharp edges and burrs, and shall be either protected against corrosion or manufactured from material that is inherently resistant to corrosion.

2.5.2 Sharp edges

Ladders shall have no unfinished sheared metal edges or other sharp parts that are exposed to hands and legs. Sheared metal edges that are not rolled shall be finished so that any sharp feathering or edges, or any sharp burrs or spurs caused by the shearing process, are removed.

2.5.3 Fixings

Bolts and rivet holes shall be located and spaced in accordance with manufacturer's/supplier's specifications. Rivets should be appropriately set and free from structural defects.

NOTE: Attention is drawn to the importance of the selection, hardness and fitting of rivets.

2.5.4 Welds

Welds shall be in accordance with the accepted codes of practice appropriate to the structural material used (e.g. AS/NZS 1665 for aluminium, AS/NZS 1554.1 for steel). All weld spatter and slag shall be removed prior to the application of any corrosion-protective coatings.

2.5.5 Hollow sections

Where hollow sections are used, means shall be provided to prevent the retention of water within the section.

2.5.6 Fibreglass

Composites made by a continuous open-end moulding process, such as the pultrusion method of manufacture, or by other processes may be used provided they meet the performance requirements of this Standard.

The material shall be smooth, clean, uniform in colour, and reasonably free from conducting particles, foreign materials, pits, cracks, voids, chips, sink marks, delamination, blisters, and scratches. The distribution of fillers, additives, or glass fibre shall be in accordance with the manufacturer's instructions. The material shall be free of resin-rich and resin-starved areas, and there shall be no evidence of significant reinforcement shifting, wrinkles, bunching up, or density variation within a length.

2.6 STILES

2.6.1 Design

Because of the wide variety of types of ladders and the varied conditions of use, ladders may be designed with parallel stiles, with stiles varying uniformly in separation along the length (i.e. tapered), or with stiles flaring at the base.

2.6.2 Manufacture

The stiles shall be manufactured from a suitable cross-sectional shape and shall be of sufficient width to provide secure support for the treads, rungs, or cross-bearers.

2.7 TREADS AND RUNGS

2.7.1 Size and shape

Treads and rungs shall conform to the following requirements for size and shape:

- (a) Treads and rungs shall present a working surface that will minimize the possibility of slipping.

Working surfaces of rungs, steps, and platforms for use in ascending, descending, working or standing, shall be corrugated, serrated, knurled, dimpled, or coated with a skid-resistant material.

- (b) They shall be of size and cross-sectional shape adequate in accordance with Clauses 5.6, 10.4 and Appendices G, H, I, S, T, U and Z.

NOTE: The size and shape of the working surface will also affect the comfort and therefore the safety of persons working from ladders for extended periods. Accordingly, the maximum practicable working surface is desirable.

2.7.2 Spacing

The spacing of treads and rungs shall comply with the following requirements:

- (a) Treads and rungs shall be parallel with each other within $\pm 2^\circ$.
- (b) Treads and rungs shall be uniformly spaced at a distance between centres within the range 248 ± 2 mm to 306 ± 2 mm (all measurements between the centres of the tops of treads and rungs).
- (c) The distance from the bottom ends of the stile, including feet where fitted, to the top of the first tread or rung shall be not less than 246 mm and not greater than the nominal tread or rung spacing.
- (d) For stepladders other than platform stepladders, treads shall be spaced so that the distances from the upper surface of the top cap, to the top of the highest tread or rung shall be equal (± 8 mm) to the spacing of the treads or rungs.

2.8 MARKINGS AND SAFETY LABELS

2.8.1 Identification

All ladders shall have the following information permanently marked in a prominent position:

- (a) The name of the Australian manufacturer or importer (whether the ladder has been made for sale or otherwise).
- (b) The working length (in metres) of the ladder (the closed and maximum working lengths for extension type ladders).
- (c) Reference to this Standard and the duty rating (i.e. 'AS/NZS 1892.1 INDUSTRIAL' or 'AS/NZS 1892.1 DOMESTIC' as appropriate), and the words 'This ladder is intended to carry a maximum load of' and the load rating (in kilograms).

2.8.2 Safety labels

Ladders shall have the following information permanently marked in a prominent position:

- (a) All ladders shall have a yellow exclamation symbol on an orange header with word the 'WARNING' in black (see Figure 2.1), and text 'MISUSE OF A LADDER MAY RESULT IN A FALL, SERIOUS INJURY, PARALYSIS OR DEATH'.



FIGURE 2.1 WARNING LABEL

- (b) On metal ladders or ladders with electrically conductive stiles, add the words 'DO NOT USE WHERE ELECTRICAL HAZARD EXISTS'.
- (c) On double-sided stepladders, add the words 'TO BE USED IN THE FULLY OPEN POSITION ONLY'.
- (d) On those treads or rungs that would represent an unsafe working position, a yellow exclamation symbol on a red header with word the 'DANGER' in white, and text 'DO NOT STEP' (see Figure 2.2) shall be added.

Such markings shall warn against standing any higher than the third top rung on a single or extension ladder, or the second top tread on stepladders (not including platform stepladders).



FIGURE 2.2 DANGER LABEL

NOTE: Other instruction or warning labels may be appropriate to illustrate correct setup, use and hazards associated with a particular type of ladder. Some example of additional safety labels are given in Appendix C.

2.8.3 Label requirements

All markings and safety labels shall comply with the requirements of Appendix B. Safety labels applied to ladder components shall be as follows:

- (a) Permanent, taking into consideration the life of the product and the environment in which it is likely to be used.
- (b) Located to guard against wear, abrasion and disfiguring.
- (c) Attached by a method which does not affect the strength of the members to which they are attached.
- (d) Legible and in letters not less than—
 - (i) 8 mm high in uppercase for the words 'DANGER', 'WARNING', 'DOMESTIC' or 'INDUSTRIAL'; and
 - (ii) 4 mm high in uppercase or lowercase for the other words and numbers.

NOTE: Suppliers are encouraged to use larger letter heights where practicable.

- (e) Able to be read by a person standing next to the ladder.
- (f) In a contrasting colour to the ladder colour.

2.9 FEET

Feet shall be fitted to the bottom of each stile in the bottom section of the ladder, which may be fixed or hung. The following requirements apply to feet:

- (a) The material and construction of the feet shall be resistant to deformation and slipping in accordance with Paragraphs L5, P5, Q6, V5, W5, GG4 and HH4.
- (b) The feet or surfacing material shall be securely fixed to the stiles but may be removable for renewal.
- (c) The projected area of ladder feet shall be not less than the area enclosed by the external dimensions of the stile or back leg, as appropriate.

NOTE: For examples, see Figure 2.3.

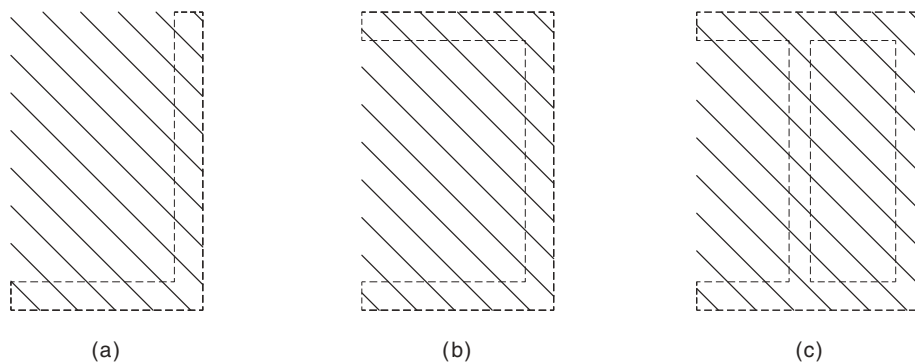


FIGURE 2.3 EXAMPLES OF MINIMUM AREA OF FEET (HATCHED)
FOR DIFFERENT SECTION OF STILE OR BACK LEG

SECTION 3 PARTICULAR REQUIREMENTS FOR LADDERS CONFIGURED AS SINGLE LADDERS

3.1 LENGTH

The maximum length of a single ladder, shall not exceed—

- (a) 9 m for industrial ladders; or
- (b) 5 m for domestic ladders.

3.2 DISTANCE BETWEEN STILES

The clear distance between the inside faces of the stiles or the width of the working surface of the rungs shall be not less than 265 mm (see Figure 3.1).

If the stiles are flared (see Clause 2.6), this dimension shall apply to the portion of the ladder above the flare.

NOTE: The 265 mm distance is the minimum clear distance between the stiles, not the length of the rung.

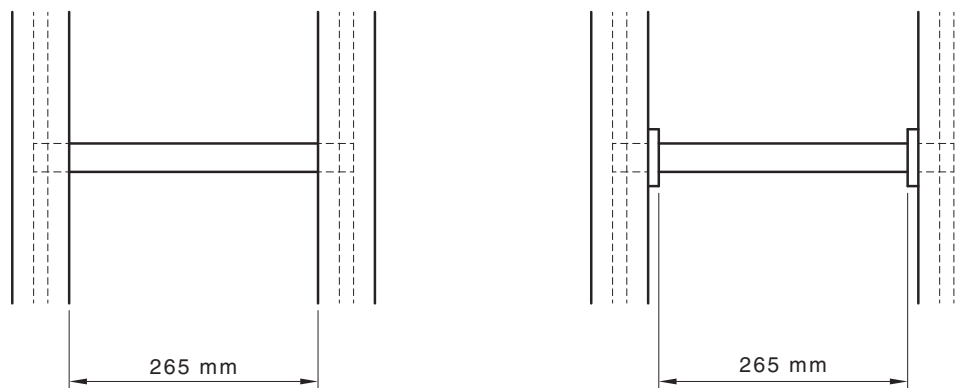


FIGURE 3.1 DISTANCE BETWEEN STILES

3.3 PERFORMANCE

Single ladders and other ladders when configured as single ladders shall be subjected to the performance tests in, and shall comply with the performance criteria in, the Appendices listed in Table 3.1.

TABLE 3.1
PERFORMANCE TEST APPENDICES APPLICABLE
TO SINGLE LADDERS AND LADDERS EQUIVALENTLY CONFIGURED

—	B	—	D	E	F	G	H	I	J	K	L	M	N	—	P	—	—
—	—	—	—	—	—	—	—	AA	BB	CC	DD	EE	—	—	HH	II	—

NOTES:

- 1 Appendices AA, BB and CC are applicable to ladders containing lockable hinges only.
- 2 Appendices DD and EE are applicable to ladders containing reinforced plastic stiles only.
- 3 Appendices HH and II are applicable to ladders providing a higher stability rating.
- 4 Examples of labels used for additional safety warnings are given in Appendix C.

SECTION 4 PARTICULAR REQUIREMENTS FOR LADDERS CONFIGURED AS EXTENSION LADDERS

4.1 LENGTH

The maximum length of an extension ladder, including feet, shall not exceed—

- (a) 15 m for industrial ladders; or
- (b) 7 m for domestic ladders.

4.2 EXTENSION OF STILE ABOVE TOP RUNG

Except for those ladders fitted with a pole chain, hoop, or similar device, the distance between the top rung and the top of the ladder, when measured axially along the centre-line of the ladder, shall not exceed 308 mm.

4.3 DISTANCE BETWEEN STILES

The clear distance between the inside faces of the stiles or the width of the working surface of the rungs in the narrowest section of the ladder, shall be not less than 265 mm (see Figure 3.1).

4.4 OVERLAP

Care shall be taken to ensure that the rungs on overlapping sections coincide.

4.5 STOPS

The ladder shall be designed so that it cannot be over extended.

4.6 FITTINGS

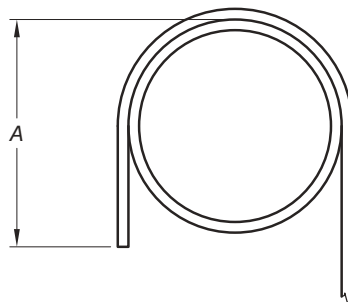
4.6.1 Finish

Fittings shall have no sharp edges liable to cause indentation to stiles or rungs.

4.6.2 Fixed hooks

Fixed hooks shall—

- (a) have an effective length (*A*) over the rungs of not less than the depth of the rung (see Figure 4.1); and
- (b) bear evenly on the rung and with a total bearing width of not less than 12 mm.



A – effective length of
hook over the rung

FIGURE 4.1 FIXED HOOK

4.6.3 Latching devices

Ladders in which the upper section(s) are raised or lowered by rope shall be fitted with latching devices that—

- (a) operate to engage automatically if the rope breaks or is released;
- (b) are not dependent for their operation on a spring;
- (c) bear evenly on the rung and with a total bearing width of not less than 12 mm;
- (d) operate dynamically with the ladder at an angle of not less than 70° and statically at an angle of 90° above the horizontal; and
- (e) are designed so as to maintain the top and bottom sections of the ladder in a relative position such that the working surface of rungs at the overlap form double working surfaces at every intended stage of extension.

4.6.4 Guide brackets

Guide brackets, where used, shall be attached securely and positioned so as to prevent the upper section from tipping or falling out while being raised or lowered, or while the ladder is being used.

4.7 LIFTING DEVICES

4.7.1 General

Where the maximum length of an extension ladder is greater than 5 m, the ladder shall be equipped with a hauling rope and pulley or suitable device to enable an operator at ground level to raise the top section or intermediate sections.

4.7.2 Load

The fittings and rope should be capable of withstanding an ultimate load that would support at least 10 times the mass of the movable section(s) of the ladder.

4.7.3 Rope

4.7.3.1 Rope for two-section ladders

The hauling rope used with the pulley shall be of natural or synthetic fibre in accordance with the strength requirements of AS 4142.2, and the following:

- (a) The rope shall have a circumference of not less than 25 mm (approximately 8 mm diameter).
- (b) Natural fibre rope shall be treated to resist rotting.
- (c) Synthetic fibre rope shall be a fibrillated filament polypropylene with ultraviolet light protection, or other fibre having equivalent performance.

4.7.3.2 Rope for ladders having three or more sections

On ladders having three or more sections, hauling ropes shall be in accordance with the requirements of Clauses 4.7.2 and 4.7.3.1.

Where steel wire rope is used to link to and operate the top section, in conjunction with the centre sections, it shall be flexible steel wire rope with a diameter not less than 3 mm.

4.7.4 Hauling systems

Pulleys should—

- (a) be designed to minimize wear of either the pulley or the hauling rope;
- (b) be of a size and design in accordance with the relevant requirements of AS 2089; and
- (c) be attached in a manner that does not weaken the stiles or rungs, to the extent that such components fail to conform to the requirements of this Standard.

4.8 PERFORMANCE

Extension ladders and other ladders when configured as extension ladders shall be subjected to the performance tests in, and shall conform to the performance criteria in, the Appendices listed in Table 4.1.

TABLE 4.1

**PERFORMANCE TEST APPENDICES APPLICABLE
TO EXTENSION LADDERS AND LADDERS EQUIVALENTLY CONFIGURED**

—	B	—	D	E	F	G	H	I	J	K	L	M	N	O	P	—	—
—	—	—	—	—	—	—	—	AA	BB	CC	DD	EE	—	—	HH	II	—

NOTES:

- 1 Appendices AA, BB and CC are applicable to ladders containing lockable hinges only.
- 2 Appendices DD and EE are applicable to ladders containing reinforced plastic stiles only.
- 3 Appendices HH and II are applicable to ladders providing a higher stability rating.
- 4 Examples of labels used for additional safety warnings are given in Appendix C.

SECTION 5 PARTICULAR REQUIREMENTS FOR LADDERS CONFIGURED AS STEPLADDERS

5.1 LENGTH

The length of a stepladder measured along the front edge of the stiles, including feet, shall not exceed—

- (a) 6.1 m for industrial ladders; or
- (b) 2.4 m for domestic ladders.

5.2 DISTANCE BETWEEN STILES

The front section of single-sided stepladders and both sections of double-sided stepladders shall be designed so that the clear distance between the inside faces of the stiles at the tread immediately below the top cap is not less than 290 mm, and either—

- (a) the distance between the stiles varies uniformly along the length (i.e. tapered stepladder); or
- (b) the stiles flared out at the bottom to increase stability.

For tapered ladders described in Item (a) above, the distance between stiles shall increase by not less than 125 mm per metre length of stile.

For flared ladders described in Item (b) above, the distance between the bottom of the stiles shall be equivalent to that for a tapered ladder of the same length.

5.3 BACK LEGS

The following requirements apply to back legs:

- (a) Shall be constructed and braced so that the stepladder is stable when in the fully open locked position.
- (b) For single-sided stepladders, shall be braced in a manner that does not encourage the bracing to be used for ascending or descending.
- (c) Shall be hinged by a means that is at least equivalent in strength (single shear), wear, and cross-section to low carbon steel pivot pins of 8mm diameter. Neither the back legs nor the stiles shall bear on any threaded portions of pivot pins. Nuts, if used, shall be effectively locked. Tubular or hollow-section rivets shall not be used as pivot pins.
- (d) For ladders designed to be used in the closed position, shall be of such length that when the ladder is laid against a wall in the fully closed position with the working surfaces horizontal, it is supported fully on the front stiles or feet.
- (e) When folded, they shall not cause damage to the stiles, treads, or spreader bars.

5.4 SPREAD BETWEEN STILES AND BACK LEGS

With the ladder in the fully open position, the clear distance between the rear edge of the stiles and the front edge of the back legs shall be not less than 500 mm and not greater than 660 mm per metre length of stile.

5.5 BEARING AREA OF FEET

The bearing area of feet fitted to stiles or back legs shall be not less than that specified in Clause 2.9.

The four feet of the stepladder shall fully bear on a flat horizontal surface when the ladder is in the open locked position and shall remain so when subject to the compression test.

5.6 TREADS

Treads shall have a working surface width of not less than 75 mm. They shall be fitted to the stiles so that when the stepladder is fully open on a horizontal surface, the working surfaces of the treads are horizontal to within $\pm 2^\circ$ measured from front to back of the working surface.

5.7 SPREADER

The spreader shall be designed so that when correctly engaged it will—

- (a) improve the rigidity of the ladder;
- (b) prevent the ladder from opening beyond its design spread;
- (c) prevent the ladder from being used at less than the design spread; and
- (d) prevent the legs from accidentally closing when the legs are fully open.

When the ladder is in the closed position, the spreader shall not cause structural damage to the ladder, or to itself.

5.8 TOP CAP

The top cap fitted to the stepladder shall be not less than 75 mm wide from front to back. The top cap may overhang at the front, back or sides, but any overhang to the front shall not exceed 12 mm.

5.9 PERFORMANCE

Stepladders and other ladders when configured as stepladders shall be subjected to the performance tests in, and shall conform to the performance criteria in, the Appendices listed in Table 5.1.

TABLE 5.1
PERFORMANCE TEST APPENDICES APPLICABLE
TO STEPLADDERS AND LADDERS EQUIVALENTLY CONFIGURED

—	B	—	—	—	—	—	—	—	—	—	L	—	—	—	—	Q	R
S	T	U	V	W	X	Y	—	AA	BB	CC	—	—	FF	GG	—	II	—

NOTES:

- 1 Appendices AA, BB and CC are applicable to ladders containing lockable hinges only.
- 2 Appendix FF is applicable to ladders containing reinforced plastic stiles only.
- 3 Appendices GG and II are applicable to ladders providing a higher stability rating.
- 4 Examples of labels used for additional safety warnings are given in Appendix C.

SECTION 6 PARTICULAR REQUIREMENTS FOR TRESTLE LADDERS

6.1 LENGTH

A trestle ladder shall not exceed 5 m in length.

6.2 SPACING OF CROSS-BEARERS

The spacing of the cross-bearer plank supporting surfaces on a trestle shall be in nominal increments of 300 mm or 600 mm measured along the stile. The allowable variation in the nominal cross-bearer spacing for any one trestle design shall be ± 5 mm.

The top of the stiles shall extend not less than 150 mm above the top cross-bearer plank supporting surface.

Additional cross-bearer or cross-bearers are permitted within the first 300 mm increment from the foot of the trestle.

The trestle shall be capable of being set up such that at least one cross-bearer plank supporting surface is available at each 290 mm nominal increment in working height above the ground.

The three alternative means of spacing the cross-bearers are shown in Figure 6.1.

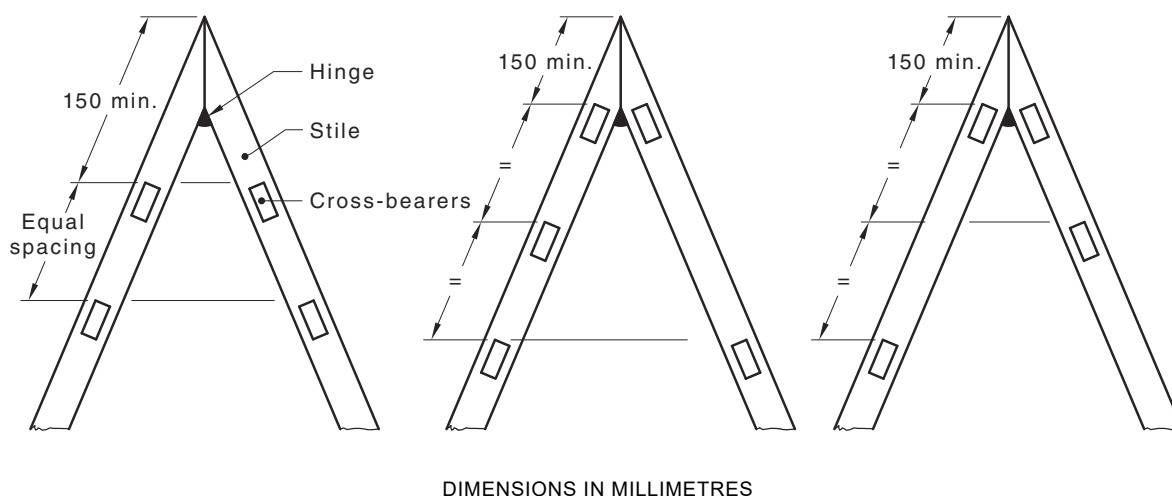


FIGURE 6.1 POSITION OF CROSS-BEARERS ON TRESTLE STILES

6.3 DISTANCE BETWEEN STILES

When measured at the top cross-bearer, the distance between the inside face of the stiles shall be as follows:

- (a) For trestles up to and including 2.5 m in length, not less than 380 mm and not greater than 530 mm.
- (b) For trestles over 2.5 m in length, not less than 500 mm and not greater than 530 mm.

The distance between the stiles shall increase toward the bottom, at a uniform rate of not less than 125 mm per metre length of stile.

6.4 SPREAD BETWEEN PAIRS OF STILES

With the ladder in the fully open position, the clear distance between the rear edge of the stiles and the front edge of the back legs, shall be not less than 500 mm and not greater than 660 mm per metre length of stile.

6.5 SPREADER

The spreader shall be designed such that, when correctly engaged, it will—

- (a) improve the rigidity of the ladder;
- (b) prevent the ladder from opening beyond its design spread;
- (c) prevent the ladder from being used at less than the design spread; and
- (d) prevent the legs from accidentally closing when the legs are fully open.

When the ladder is in the closed position, the spreader shall not cause structural damage to the ladder, or to itself.

6.6 HINGES

Stiles shall be hinged by means at least equivalent in strength (single shear), wear and cross-section to low carbon steel pivot pins of 8 mm diameter. Neither the back legs nor the stiles shall bear on any threaded portions of pivot pins. Nuts if used, shall be effectively locked. Tubular or hollow- section rivets shall not be used as pivot pins.

6.7 CHEEK PLATES

Cheek plates shall be fitted to the stiles, to relieve the hinges of side strain when the trestles are being moved in the closed position. They shall be attached between the first and second cross-bearers from the bottom of one pair of stiles.

6.8 PERFORMANCE

Trestles and other ladders when configured as trestles shall be subjected to the performance tests in, and shall conform to the performance criteria in, the Appendices listed in Table 6.1.

NOTE: Where trestle ladders are to be incorporated into a scaffolding system, refer to AS/NZS 1576.5.

TABLE 6.1
PERFORMANCE TEST APPENDICES APPLICABLE
TO TRESTLES AND LADDERS EQUIVALENTLY CONFIGURED

—	B	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Q	R
S	T	U	V	W	X	Y	—	AA	BB	CC	—	—	FF	GG	—	II	—

NOTES:

- 1 Appendices AA, BB and CC are applicable to ladders containing lockable hinges only.
- 2 Appendix FF is applicable to ladders containing reinforced plastic stiles only.
- 3 Appendices GG and II are applicable to ladders providing a higher stability rating.
- 4 Examples of labels used for additional safety warnings are given in Appendix C.

SECTION 7 PARTICULAR REQUIREMENTS FOR MULTIPURPOSE LADDERS

7.1 LENGTH

7.1.1 Where used as a single ladder

The length measured along the front edge of the stile, including feet, shall not exceed—

- (a) 9 m for industrial ladders; or
- (b) 5 m for domestic ladders.

7.1.2 Where used as a stepladder

The length measured along the front edge of the stile including feet to the centre of the hinge pivot-pin shall not exceed—

- (a) 6.1 m for industrial ladders; or
- (b) 2.4 m for domestic ladders.

7.2 DISTANCE BETWEEN STILES

The clear distance between the stiles shall not be less than 280 mm with either—

- (a) the distance between the stiles increasing uniformly from the centre articulation towards both ends; or
- (b) the stiles parallel from the centre articulation towards both ends, and flaring at the ends for added stability.

For tapered stiles described in Item (a) above, the distance between the stiles shall increase by not less than 75 mm per metre length of stile.

For flared ladders described in Item (b) above, the distance between the bottom of the stiles shall be equivalent to that for a tapered ladder of the same length, but not less than 340 mm and the flare shall be incorporated in a manner that does not weaken the stiles.

7.3 ANGLE BETWEEN STILES

7.3.1 Where used as a stepladder

With the ladder in the fully open position, the clear distance between the rear edge of the stiles and the front edge of the back legs, shall be not less than 500 mm and not greater than 660 mm per metre length of stile.

7.3.2 Where used as a work platform

Where used as a work platform, the slope of the front and rear stiles shall be not less than 65° and not greater than 80° above the horizontal.

7.4 ARTICULATION

Joints shall be attached to the stiles such that, under the foreseeable conditions of use in each of the ways in which the ladder may be configured, the joints will not unintentionally separate from the stile.

Joints shall have locking positions to permit configuration of the ladder in all positions specified by the ladder manufacturer. All sharp edges or pinch points shall be avoided or eliminated. Each joint shall clearly indicate whether it is locked or unlocked and shall incorporate a means of preventing accidental release.

7.5 PERFORMANCE

Multipurpose ladders shall be subjected to the performance tests in, and shall conform to the performance criteria in, the Appendices listed in Table 7.1.

TABLE 7.1
PERFORMANCE TEST APPENDICES
APPLICABLE TO MULTIPURPOSE LADDERS

—	B	—	D	E	F	—	—	—	J	—	L	M	N	—	—	Q	R
S	T	U	V	W	X	—	Z	AA	BB	CC	DD	—	FF	GG	HH	II	—

NOTES:

- 1 Appendices AA, BB and CC are applicable to ladders containing lockable hinges only.
- 2 Appendix DD, EE and FF is applicable to ladders containing reinforced plastic stiles only.
- 3 Appendices GG, HH and II are applicable to ladders providing a higher stability rating.
- 4 Examples of labels used for additional safety warnings are given in Appendix C.

SECTION 8 PARTICULAR REQUIREMENTS FOR OTHER LADDERS

8.1 SCOPE OF SECTION

The requirements of this Section apply to ladders that are not specifically described in other Sections.

It is not possible to list all ladders that are designed for use. Other ladders designed for special use shall conform to those relevant requirements that are applicable to the ladder they most closely resemble. Requirements of the relevant regulatory authorities may also apply. Ladders designed for special use may require additional working and operating instructions.

8.2 REQUIREMENTS

Ladders that are manufactured for special use by adapting or modifying standard-type ladders shall, as far as technically possible, be in accordance with the requirements of the relevant Section(s) as follows:

- (a) *Combination stepladder (or dual-purpose stepladder)*
When used as a single ladder, Section 3. When used as a stepladder, Section 5.
- (b) *Extension stepladder*
When used as an extension ladder, Section 4. When used as a stepladder, Section 5.
- (c) *Fruit-picker's stepladder*
Section 5, except that a single back leg may be fitted. Spikes may be fitted to the feet as an aid to stability.
- (d) *Platform stepladder*
Section 5 and in addition, the platform shall conform to the tread bending strength criteria when tested in accordance with Appendix S.
- (e) *Bucket/tray stepladder*
Section 5 and in addition, the tray shall support a distributed mass of 45 kg without signs of failure. The tray shall be clearly marked with the words 'NOT A STEP'.
- (f) *Access hole ladders*
Section 3, except that the requirements for minimum distance between the stiles does not apply.
- (g) *Order-picking stepladders*
When order-picking stepladders are designed especially for order picking in aiseways between shelved racking, the following shall apply:
 - (i) Except as varied hereunder, the relevant requirements of Section 5 shall apply.
 - (ii) Stiles may be parallel, provided that the distance between stiles is the widest practicable for the intended aiseway.
 - (iii) Handrails and kickplates shall be provided, but any foldable handrail system shall not form a nip-point to trap hands and shall have stanchions that lock into the vertical position.

- (iv) Spring castoring wheels may be fitted to one or both sets of stiles. Where fitted, they shall be adjusted to prevent ladder movement when one foot is placed upon a ladder tread. The force applied to a tread to prevent movement of the ladder shall not exceed 150 N (15 kgf).
- (v) The ladders shall be designed to ensure stability and rigidity for use in stock picking (e.g. be of diagonal bracing or be constructed of rigid frames).

SECTION 9 PARTICULAR REQUIREMENTS FOR WORK PLATFORMS

9.1 HEIGHT

Domestic and industrial work platforms shall not exceed 1 m in height to the top working surface. Legs may be adjustable in length to effect different working surface heights but not to exceed 1 m in height. Where adjustable legs are used, the legs shall clearly indicate whether it is locked or unlocked and shall incorporate a means of preventing accidental release.

9.2 LENGTH

The length of the top working surface of domestic and industrial work platforms shall be not less than 350 mm and not greater than 4 m. Where an adjustable length top working surface is used, the sections shall have the provision to be securely locked to prevent movement and shall be designed so that it cannot be over extended.

9.3 WIDTH

The width of the top working surface of domestic and industrial work platforms shall be not less than 220 mm.

9.4 SUPPORTING LEGS

The supporting legs of a work platform may be fixed, hinged or removable.

At all adjusted heights, the feet of supporting legs shall contact the ground at a position outside the extent of the platform or not more than 30 mm inside the extent to the platform.

9.5 SPACING OF CROSS-BEARERS

Cross-bearers shall be provided to access the top working surface on work platforms exceeding 600 mm in height. The spacing of the cross-bearers to access the top working surface shall not exceed 500 mm.

Where cross bearers are able to be used as rungs or treads, they shall be tested as such in accordance with the performance requirements of this Section.

The clear distance between features limiting the step width, perpendicular to the direction of approach for stepping up, shall be not less than 200 mm at the entry edge.

The clear space above and behind, measured from front of a rung or tread, parallel to the direction of approach for stepping up, shall be not less than 130 mm.

9.6 HINGES AND LOCKS

Where hinged supporting legs are used, the hinge shall be at least equivalent in strength (single shear), wear, and cross-section to low carbon steel pivot pins of 8 mm diameter. The pivoting members shall not bear on any threaded portions of pivot pins. Nuts, if used, shall be effectively locked. Tubular or hollow-section rivets shall not be used as pivot pins.

Locking devices shall be designed so that, when correctly engaged, they will—

- (a) improve the rigidity of the work platform;
- (b) prevent the work platform from opening beyond its design spread;
- (c) prevent the work platform from being used at less than the design spread; and
- (d) prevent the legs from accidentally closing when the legs are fully open.

When the work platform is in the closed position, the supporting legs shall not cause structural damage to the work platform, or to itself.

9.7 PERFORMANCE

Work platforms shall be subjected to the performance tests in, and shall conform to the performance criteria in, the Appendices listed in Table 9.1.

Where it may influence the test result, any adjustment in height or length shall be at the maximum intended for use for the testing.

For testing according to Appendix V, the weight shall be applied centrally to the top working surface.

TABLE 9.1

PERFORMANCE TEST APPENDICES APPLICABLE TO WORK PLATFORMS

—	B	—	—	—	—	—	—	—	—	—	L	—	—	—	—	—
S	—	—	V	—	—	Z	—	—	—	—	—	—	—	—	—	—

NOTE: Examples of labels used for additional safety warnings are given in Appendix C.

SECTION 10 PARTICULAR REQUIREMENTS FOR STEP STOOLS

10.1 LENGTH

The length of domestic and industrial step stools measured along the front edge of the stiles, including feet, shall not exceed 1.8 m in length.

10.2 HEIGHT

Domestic and industrial step stools shall not exceed 1.2 m in height to the top standing surface.

10.3 STILES

Domestic and industrial step stools may be designed with parallel stiles.

10.4 TREADS

The treads shall be in accordance with the following:

- (a) Have a working surface width of not less than 75 mm.
- (b) Be parallel with each other within $\pm 2^\circ$.
- (c) Be uniformly spaced at a distance between centres within the range 248 ± 2 mm to 306 ± 2 mm (all measurements between the centres of the tops of treads).

10.5 BACK LEGS

The back legs shall be in accordance with the following:

- (a) Be constructed and braced so that the stepladder is stable when in the fully open locked position.
- (b) For single-sided stepladders, be braced in a manner that does not encourage the bracing to be used for ascending or descending.
- (c) When folded, they do not cause damage to the stiles, treads, or spreader bars.

10.6 DISTANCE BETWEEN STILES

The step stool shall be designed so that the clear distance between the inside faces of the stiles at the top tread is not less than 290 mm.

10.7 SPREADER

The spreader shall be designed so that, when correctly engaged, it will—

- (a) improve the rigidity of the ladder;
- (b) prevent the ladder from opening beyond its design spread;
- (c) prevent the ladder from being used at less than the design spread; and
- (d) prevent the legs from accidentally closing when the legs are fully open.

When the ladder is in the closed position, the spreader shall not cause structural damage to the ladder, or to itself.

10.8 PERFORMANCE

Step stools shall be subjected to the performance tests in, and shall conform to the performance criteria in, the Appendices listed in Table 10.1.

TABLE 10.1
PERFORMANCE TEST APPENDICES APPLICABLE TO STEP STOOLS

—	B	—	—	—	—	—	—	—	—	—	L	—	—	—	—	Q	—
S	T	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

NOTE: Examples of labels used for additional safety warnings are given in Appendix C.

APPENDIX A
TYPICAL PHYSICAL AND MECHANICAL PROPERTIES FOR COMPOSITES
(Informative)

A1 PHYSICAL AND MECHANICAL PROPERTIES

The laboratory tests given in Paragraphs A2 and A3 are designed to measure the properties of isophthalic polyester ladder composites. This Standard addresses ladder stiles in particular, because experience with step or rung material is more limited.

Materials and designs not specifically covered by this Standard, and in particular, innovation, such as technological developments in field of reinforced plastic composites, is not intended to be excluded from this Standard. Conformance may be tested by applying the performance test requirements.

A2 TYPICAL PHYSICAL PROPERTIES

When tested in accordance with ASTM D792, specific gravity should be 1.8 with a tolerance of $\pm 10\%$.

Density may vary with composite design. These are average values based upon the composite's cross-section.

When tested in accordance with ASTM D229, the water absorption should not be greater than 0.75%.

A3 TYPICAL MECHANICAL PROPERTIES

A3.1 Dry

When dry, the composite should meet the mechanical properties specified in Tables A1 and A2. The test specimens should be preconditioned in accordance with condition A of ASTM D709.

A3.2 Wet

Web specimens are immersed and maintained in boiling distilled water for a minimum of 2 h, removed and immersed in distilled water maintained at room temperature, permitted to temperature stabilize, and tested wet. The mechanical properties of the wet composite should meet the values established in Tables A1 and A2.

A3.3 Elevated temperature

Web or flange specimens, as required, are maintained for a minimum of 30 min at a temperature of 66°C and then tested at that temperature. The mechanical properties at 66°C should meet the values established in Tables A1 and A2.

A3.4 Weathering

The mechanical properties of web coupon specimens prepared from the weathered samples should meet the values established in Table A2 after 1000 h of exposure to the weathering cycle. Further information concerning weathering is given in Clause 2.3.2.9.