BRITISH STANDARD

BS 2037 : 1994

Incorporating Amendment No. 1 and implementing Amendment No. 2, not published separately

Specification for

Portable aluminium ladders, steps, trestles and lightweight stagings

ICS 97.145

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS

Not for Resale

标准分享网 www.bzfxw.com 提供免费下载

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Technical Sector Board for Building and Civil Engineering (B/-) to Technical Committee B/512, upon which the following bodies were represented:

Aluminium Federation
British Hardware and Housewares Manufacturers' Association
British Ladder Manufacturers' Association
Consumer Policy Committee of BSI
Consumers' Association
Department of Trade and Industry (Consumer Safety Unit, CA Division)
Electricity Association
Health and Safety Executive
Institute of Trading Standards Administration
National Federation of Master Steeplejacks and Lighting Conductor Engineers
Refractory Contractors' Association

This British Standard, having been prepared under the direction of the Technical Sector Board for Building and Civil Engineering, was published under the authority of the Standards Board and comes into effect on 15 May 1994

© BSI 1998

First published October 1953
Second edition August 1964
Third edition November 1984
Fourth edition August 1990
Fifth edition May 1994

The following BSI references relate to the work on this standard:
Committee reference B/512
Draft for comment 93/104619 DC

ISBN 0 580 22610 7

Amendments issued since publication

Amd. No.	Date	Text affected
8870	October 1995	Indicated by a sideline in the margin
10011	June 1998	Indicated by a sideline in the margin

--`,,`-`-`,,`,,`,`,,`---
Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

Contents

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

标准分享网 www.bzfxw.com 提供免费下载

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS

Not for Resale

© BSI 1998

Foreword

This British Standard has been prepared under the direction of the Technical Sector Board for Building and Civil Engineering. This edition introduces technical changes but it does not reflect a full review or revision of the standard. It supersedes BS 2037 : 1990 together with its amendments Nos. 1 and 2 which are withdrawn. The principal changes from the previous edition are:

a) deletion of requirements for chemical and mechanical properties of certain aluminium alloys permitted for longitudinally welded tube;

b) explanation of the effect on this standard of the publication and implementation by the UK of the European Standard for ladders, EN 131;

c) addition of requirements for combination ladders.

While earlier editions of this standard were concerned with products for use in building and civil engineering, the present standard includes three classes according to the duty rating: class 1, suitable for industrial purposes; class 2 for less demanding applications such as the light trades; and class 3, which is intended for domestic users.

NOTE. Any reference to class 2 in this British Standard is solely related to folding trestles. Class 2 folding trestles under this British Standard are not included in BS EN 131 : Parts 1 and 2.

The possibility of adopting performance requirements for the finished product as a means of allowing a wider choice of aluminium alloys, their condition and form has been considered. However, it has been decided that this would be impractical in the light of existing experience and hence the permitted materials have been listed with some changes to those given in the earlier edition.

As many of the accidents associated with ladders have occurred from misuse, especially overloading, the standard requires the class and duty to be marked on the products. Annex M gives information on the care, use and maintenance of the products covered by the standard that may be provided by the manufacturer or supplier.

Annex A gives general information relating to the tests described in subsequent annexes.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Copyright British Standards Institution
Provided by IHS under license with BSI 1998
No reproduction or networking permitted without license from IHS
Not for Resale

标准分享网 www.bzfxw.com 提供免费下载

Section 1. General

1.1 Scope

This British Standard specifies requirements for materials, details of construction and performance for portable aluminium ladders, steps, trestles and stagings of the following types:

a) single-section ladders, including shelf ladders;

b) extending ladders;

c) standing step ladders, including swing back steps, folding platform steps and ladder backed steps;

d) folding trestles;

e) lightweight stagings;

f) combination ladders.

This standard does not apply to ladders for special professional use such as fire brigade ladders, or to mobile ladders which require mechanical aids for erection.

1.2 References

1.2.1 Normative references

This British Standard incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this standard only when incorporated in it by updating or revision.

1.2.2 Informative references

This British Standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

1.3 Definitions

For the purposes of this British Standard the following definitions apply.

1.3.1 leaning ladder

A ladder supported in use by a separate structure, e.g. a wall.

1.3.2 single-section ladder

A leaning ladder constructed and used as a single unit.

1.3.3 shelf ladder

A single-section ladder fitted with treads that are intended to be horizontal in use.

1.3.4 extending ladder

A leaning ladder consisting of two or three sections constructed so that the height can be varied, in increments of one rung spacing, by sliding the sections relative to each other.

1.3.5 standing step ladder

A self-supporting ladder consisting of a front and back hinged together, the ascendable front being in the form of a shelf ladder.

1.3.6 swing back steps

A standing step ladder in which the top is in the form of a tread and the back is merely a supporting frame.

1.3.7 folding platform steps

A standing step ladder in which the top is constructed in the form of a working platform.

1.3.8 ladder backed steps

A standing step ladder in which the back is fitted with cross-bearers suitable for supporting a working platform.

1.3.9 folding trestles

An arrangement of two frames hinged together, each fitted with cross-bearers suitable for supporting a working platform.

1.3.10 lightweight stagings

A working platform constructed of stiles, cross-bearers and decking, to provide a flat working surface.

1.3.11 stiles

The side members to which the rungs, treads or cross-bearers are fitted.

1.3.12 spacing (of rungs, treads or cross-bearers)

The distance, measured along the longitudinal axis of the stiles between the same relative positions of the members.

1.3.13 combination ladder

A ladder consisting of two sections which can be used in two or more of the following combinations as:

a) a leaning or extending ladder;

b) a standing ladder; or

c) a stairwell ladder, i.e. a standing ladder which can be adjusted for differences in fore and aft ground level.

1.3.14 standing ladder

A self-supporting ladder consisting of a front and back hinged together, the ascendable front being an assembly constructed from stiles with either treads or rungs.

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

1.4 Classification of duty rating

The articles covered by this standard shall be classified by the general conditions and probable frequency of use as given in a) to c).

a) *Class 1: industrial*. For heavy duty where relatively high frequency and onerous conditions of use, carriage and storage occur. Suitable for industrial purposes. Duty rating 130 kg.

b) *Class 2: light trades* (*folding trestles only*). For medium duty where relatively low frequency and reasonably good conditions of use, storage and carriage occur. Suitable for light trade purposes. Duty rating 110 kg.

c) *Class 3: domestic*. For light duty where frequency of use is low and good storage and carriage conditions pertain. Suitable for domestic and household purposes. Duty rating 95 kg.

1.5 Materials

1.5.1 General

The materials from which the component parts are made shall be in accordance with **1.5.2** to **1.5.6.**

1.5.2 Guide brackets and fixed and latching hooks

Guide brackets and fixed and latching hooks shall be made from the materials given in either a), b), c) or d), as follows:

a) aluminium alloys, as specified in **1.5.6**;

b) mild steel;

c) whiteheart malleable cast iron conforming to BS 6681 : 1986;

d) plastics.

1.5.3 Hinges

Hinges shall be made from the materials given in either a), b), c) or d) as follows:

a) aluminium alloys, as specified in **1.5.6**;

b) forged steel or steel strip;

c) whiteheart malleable cast iron conforming to BS 6681 : 1986.

d) plastics.

1.5.4 Feet of stiles and capping for upper ends of stiles or ends of treads

Feet of stiles and capping for upper ends of stiles or ends of treads shall be made from the materials given in either a), b) or c) as follows:

a) plastics;

b) rubber;

c) timber.

1.5.5 Decking of lightweight stagings

Decking of lightweight stagings shall be made from the materials given in either a), b) or c) as follows:

a) aluminium alloys, as specified in **1.5.6**;

b) plastics;

c) timber (see **2.7.3**).

1.5.6 Other components

Other components shall be made from aluminium alloys as follows:

a) drawn tube, extruded sections, longitudinally welded tube, components formed from sheet and strip, forging:

1) selected from within the 1000, 3000, 5000 and 6000 series, provided that the material possesses an elongation at rupture A of minimum 5 % when tested in accordance with BS EN 10002;

2) further alloys within the 2000 and 7000 series may be used provided that surface protection is given in accordance with the recommendations given in BS 8118 : Part 2.

b) castings LM 6 and LM 25 of BS 1490 : 1988.

NOTE 1. When used for class 1 articles, ferrous components should be protected against corrosion preferably to the standards required for external exposure by any of the materials and methods given in BS 729, BS 1706 or BS 4921. In the case of class 2 and class 3 articles, protection against internal environments should suffice, precoated steel is acceptable and enamelling or plastics coating have been found to be adequate.

NOTE 2. Plastics materials and rubber should be selected having regard to the stresses to which they may be subjected and their resistance to environmental deterioration, especially that due to ultraviolet light.

NOTE 3. The four digit identification designation of aluminium alloys in this standard is as given in other British Standards and in the International Registration Record for Aluminium Alloys. Care should be taken not to confuse proprietary or manufacturer's four digit designations with the aligned BS, IRR, or ISO designations. Further information on this identification system may be found in the BS 1470 series.

1.6 Tolerances on sizes

1.6.1 The dimensional tolerances on the aluminium alloys used to fabricate ladders, steps, trestles and stagings shall conform to those given in the appropriate British Standard.

1.6.2 The spacing of rungs and treads on an individual ladder shall not vary by more than 2.0 mm from the nominal spacing selected by the manufacturer from the range specified in section **2**.

1.6.3 A tolerance of $\pm$ 25 mm shall be permitted on the nominal length of all ladders covered by this standard.

Copyright British Standards Institution, 1998
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

标准分享网 www.bzfxw.com 提供免费下载

1.7 Marking

1.7.1 Equipment shall be clearly and durably marked with the information specified in **1.7.2**, **1.7.3**, **1.7.4** and **1.7.5** as appropriate. Conformity shall be checked by inspection and by rubbing the marking lightly, first for 15 s with a cloth soaked in water and then for 15 s with a cloth soaked in petroleum spirit. There shall be no reduction in legibility at the conclusion of the test. Adhesive labels, where used, shall not have worked loose or become curled at the edges.

Tie on labels shall not be used to provide the information specified in **1.7.2** and **1.7.3.**

1.7.2 Ladders, steps, trestles and lightweight stagings shall be marked with the following particulars:

a) the name, trademark or other means of identification of the manufacturer or supplier;

b) the number and date of this British Standard, i.e. BS 2037 : 1994[1)];

c) the class and duty rating, e.g. 'Class 1 — Industrial duty rating 130 kg'.

1.7.3 Ladders, steps and trestles shall be provided with a separate label displaying the following advice on a background coloured blue for class 1, yellow for class 2 or red for class 3.

'Never use damaged equipment.

Lean ladder at approximately 75° from horizontal (1 m out for each 4 m height).[2)]

Ensure firm and level base.

Check for hazards at top.

Avoid electrical hazards.

Avoid over-reaching.

Keep a secure grip.

Never stand on top rail of step ladder, or on top of swing back steps.[3)]

Extend by at least 1.10 m above any landing place.[2)]

Secure at top and bottom wherever possible.'[2)]

1.7.4 Lightweight stagings shall bear a label fitted to the outside of one stile incorporating, in letters not less than 4 mm high, the following:

'Maximum load three men spaced apart and hand tools or 270 kg uniformly distributed.'

1.7.5 Combination ladders shall, in addition to meeting the provisions of **1.7.3**, be marked with the following:

'Never ascend above the hinge/pivot position when used as a stairwell ladder.'

[1)] Marking BS 2037 : 1994 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

[2)] Required only for single section ladders, extending ladders and combination ladders incorporating a leaning/extending ladder mode of operation.

[3)] Not required for single section and extending ladders.

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

© BSI 1998

Section 2. Specific types of ladders, steps, trestles and stagings

2.1 Single-section ladders and extending ladders

2.1.1 Construction

2.1.1.1 *Lengths*

The lengths of single-section ladders and extending ladders when fully extended shall not exceed the lengths given in a) and b), as appropriate to the class.

a) Class 1: 17 m;

b) Class 3: 9.1 m.

2.1.1.2 *Distance between stiles*

The clear distance between the stiles at any point (in mm) shall be not less than that determined by the following equation:

$$\text{Minimum width at any point} = \frac{L}{200} + 230$$

where

L is the distance from any point to the top of the ladder (in mm).

NOTE. This requirement applies whether the ladders have parallel or converging stiles and for extending ladders is based on the length when fully extended. For example, the minimum width of a 4.5 m parallel ladder would be $\frac{4500}{200} + 230 = 252$ mm (to the nearest millimetre).

A tapered ladder of the same length would be at least 230 mm wide at the top $\frac{2250}{200} + 230 = 241$ mm (to the nearest millimetre) at the middle and $\frac{4500}{200} + 230 = 252$ mm to the nearest millimetre) at the bottom.

An extended ladder with two sections of different widths each 3.5 m long and with an extended length of 6.2 m would have a top section at least $\frac{3500}{200} + 230 = 248$ mm wide (to the nearest millimetre) and a bottom section at least $\frac{6200}{200} + 230 = 261$ mm.

The width of the sections of extending ladders shall be such as to provide a minimum clearance consistent with the operation of the ladder.

2.1.1.3 *Feet*

The lower end of each stile shall be closed by blocks of hardwood, plastics or rubber or fitted with an articulated foot soled with slip resistant material. The feet shall project to form a wearing surface and shall be securely fixed but easily removable for renewal. The length of projection of the blocks or fittings shall be taken into account when determining the overall length of the ladder.

2.1.1.4 *Rungs*

Each rung shall have a textured surface on the working face to reduce slipping. All rungs shall be securely fixed so as not to rotate in their supports and if the ends of the rungs protrude through the stiles they shall be smoothly finished so as not to injure a user's hands.

2.1.1.5 *Spacing of rungs*

Rungs shall be uniformly spaced at 250 mm to 300 mm centres. The distance from the ends of the stiles to the nearest rung centre shall be 125 mm to 300 mm.

2.1.1.6 *Fittings for extending ladders*

Fittings for extending ladders shall be such that the width of parts bearing on the rungs is not less than that given in table 1. The shape of hooks shall be such as to require upward movement of the upper section to disengage them from the rungs. The fittings shall have no sharp edges liable to cause indentation. Latching devices, if fitted, shall not be dependent for their operation on springs and, if of the rope-operated type, they shall be such that in the event of the rope breaking or being released they engage automatically and prevent uncontrolled closure of the ladder. Where the latches are acting as a pair, they shall be connected to ensure movement in unison. The latches or fixed hooks shall bear equally on the rungs. Guide brackets shall be formed with no tool marks that would affect their strength or performance. Any sharp corners shall be removed.

Table 1. Fittings for extending ladders

Major horizontal rung dimension or diameter mm	**Minimum width of fitting bearing on surfaces of rungs** mm
Up to and including 31	12.0
Over 31 and under 39	9.5
39 and greater	6.0

2.1.1.7 *Ropes*

The strength of rope attachments shall be such as to provide a factor of safety of not less than 8 times the mass of the extending section or sections.

Ropes shall be hemp sash cord, made from yarn, in accordance with table 1 of BS 6125 : 1981 or other material of equivalent strength. The nominal diameter of the ropes and breaking load shall be not less than the appropriate values given in table 2.

Copyright British Standards Institution, 1998
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

标准分享网 www.bzfxw.com 提供免费下载

Table 2. Ropes for extending ladders		
Ladder duty rating	**Minimum nominal diameter of ropes** mm	**Minimum breaking load** kg
Class 1	10	410
Class 3	7	215

2.1.1.8 ***Overlap of sections of extending ladders***

Text deleted.

2.1.2 Performance of single-section ladders and extending ladders

2.1.2.1 ***Deflection under load***

When tested in accordance with annex B, the deflection of the loaded stiles shall not exceed the limit determined by the following equations (see figure 2):

Maximum allowable deflection (in mm) for ladders with test span less than 12 m

$$= \frac{L}{37.2}$$

Maximum allowable deflection (in mm) for ladders with test span over 12 m

$$= 322.5 + \frac{(L - 12000)}{18.75}$$

where

L is the test span (in mm).

In addition, after removal of the test load there shall be no permanent damage and the residual deflection shall not exceed 1 mm per metre of test span.

2.1.2.2 ***Torsional rigidity***

When tested in accordance with annex B the difference between the deflection of the two stiles shall not exceed the limit determined by the following equations (see figure 3):

Maximum allowable difference between deflections (in mm) for ladders with a test span of less than 3.5 m

$$= 8.345L$$

Maximum allowable difference between deflections (in mm) for ladders with a test span of 3.5 m or greater but less than 9 m

$$= 0.02559L^3 - 1.238L^2 + 16.07L - 12.97$$

Maximum allowable difference between deflections (in mm) for ladders with a test span of 9 m or greater

$$= 50$$

where

L is the effective span (in m).

2.1.2.3 ***Strength***

When tested in accordance with annex C, after removal of the test load the residual deflection shall not exceed 1 mm per metre of length between the supports plus 1 mm.

2.1.2.4 ***Twist***

When tested in accordance with annex D, the angle of twist shall not exceed the value determined by the following equation:

Maximum allowable angle of twist (in degrees)

$$= C \times \frac{L}{2000}$$

where

C is the allowable twist (see table 3);

L is the test span (in mm).

Table 3. Maximum allowable angle of twist		
Duty rating	**Type**	**Maximum allowable angle of twist** Degrees (°)
Class 1	Industrial	18
Class 3	Domestic	22

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale
© BSI 1998

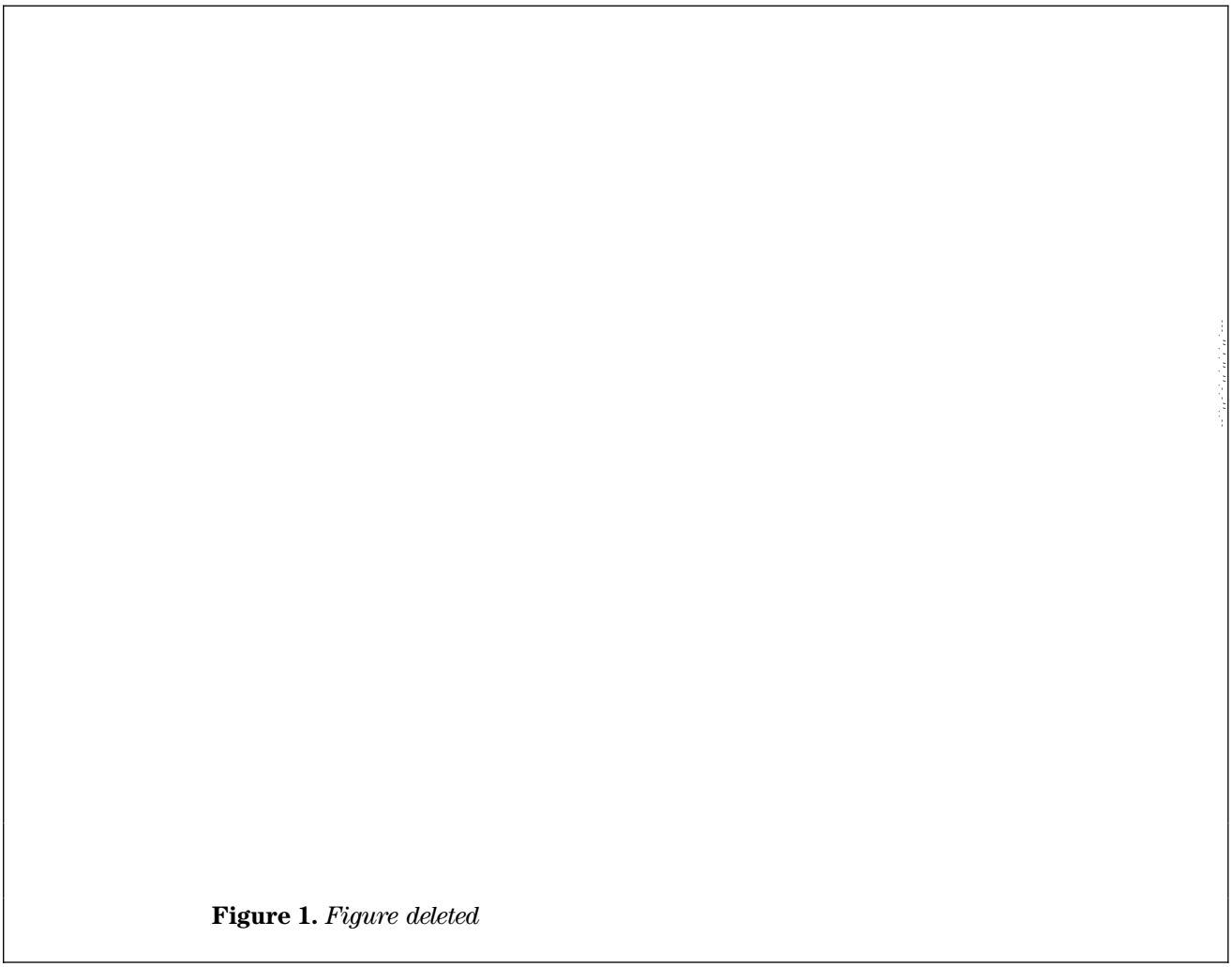


Figure 1. *Figure deleted*

2.1.2.5 *Sideways bending*

When tested in accordance with annex E, the deflection measured midway between supports shall not exceed (0.0033 L + 18 mm), where L is the test span (in mm) and the residual deflection shall not exceed 1 mm per metre.

2.1.2.6 *Cantilever bending*

When tested in accordance with annex F, the residual deflection of either stile shall not exceed 6 mm.

2.1.2.7 *Rungs*

When tested in accordance with annex G, the rungs shall support the load. In addition, after removal of the test load there shall be no damage or permanent deflection in excess of 1 mm.

2.1.2.8 *Round rung rotation*

When tested in accordance with annex N, the rotation of round rungs shall not exceed 5°.

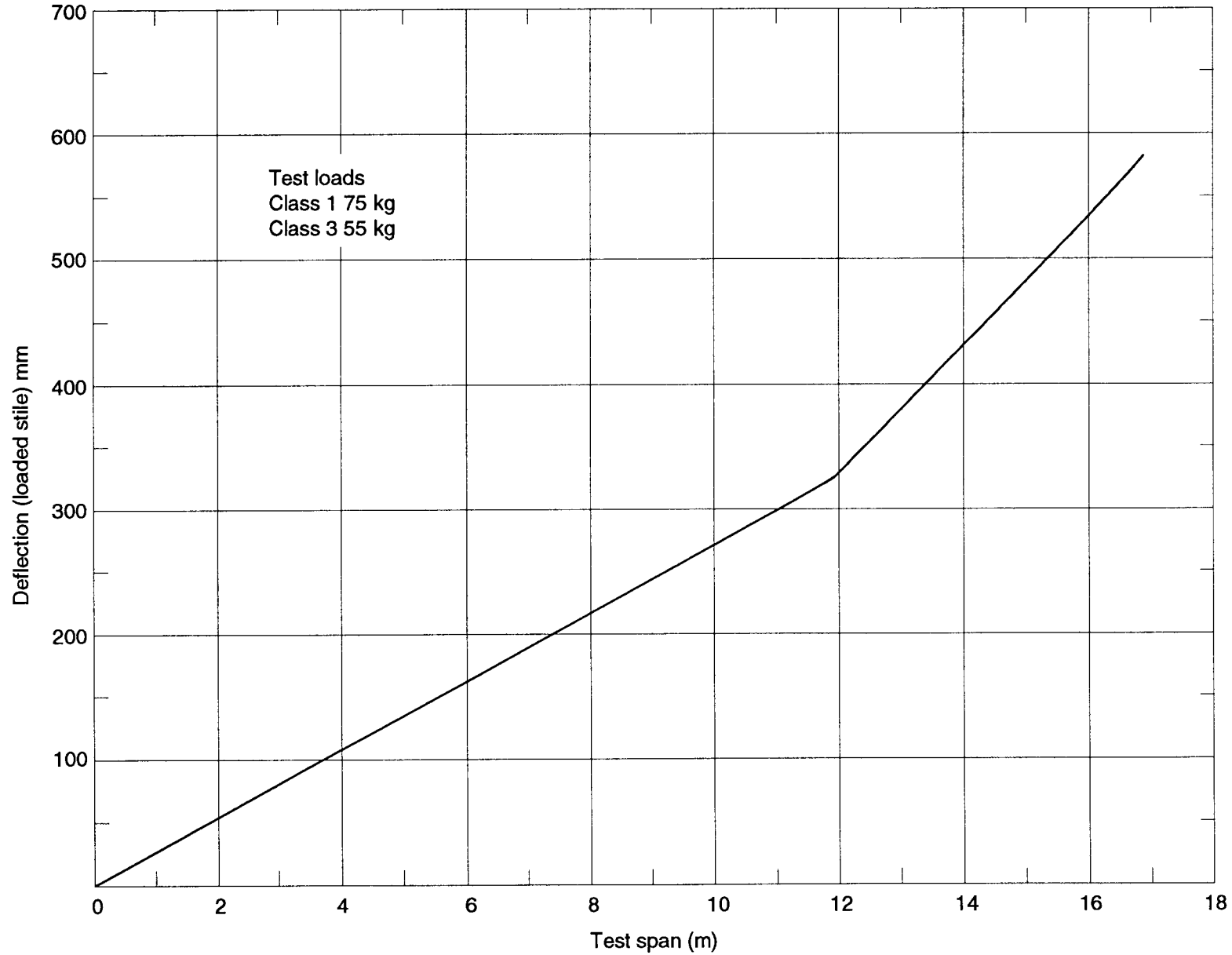
2.1.2.9 *Latching devices*

When tested in accordance with annex P the latching devices and other components shall support the test load. In addition, after removal of the load there shall be no damage or permanent deflection exceeding 1 mm.

Copyright British Standards Institution, 1998
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

标准分享网 www.bzfxw.com 提供免费下载

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS

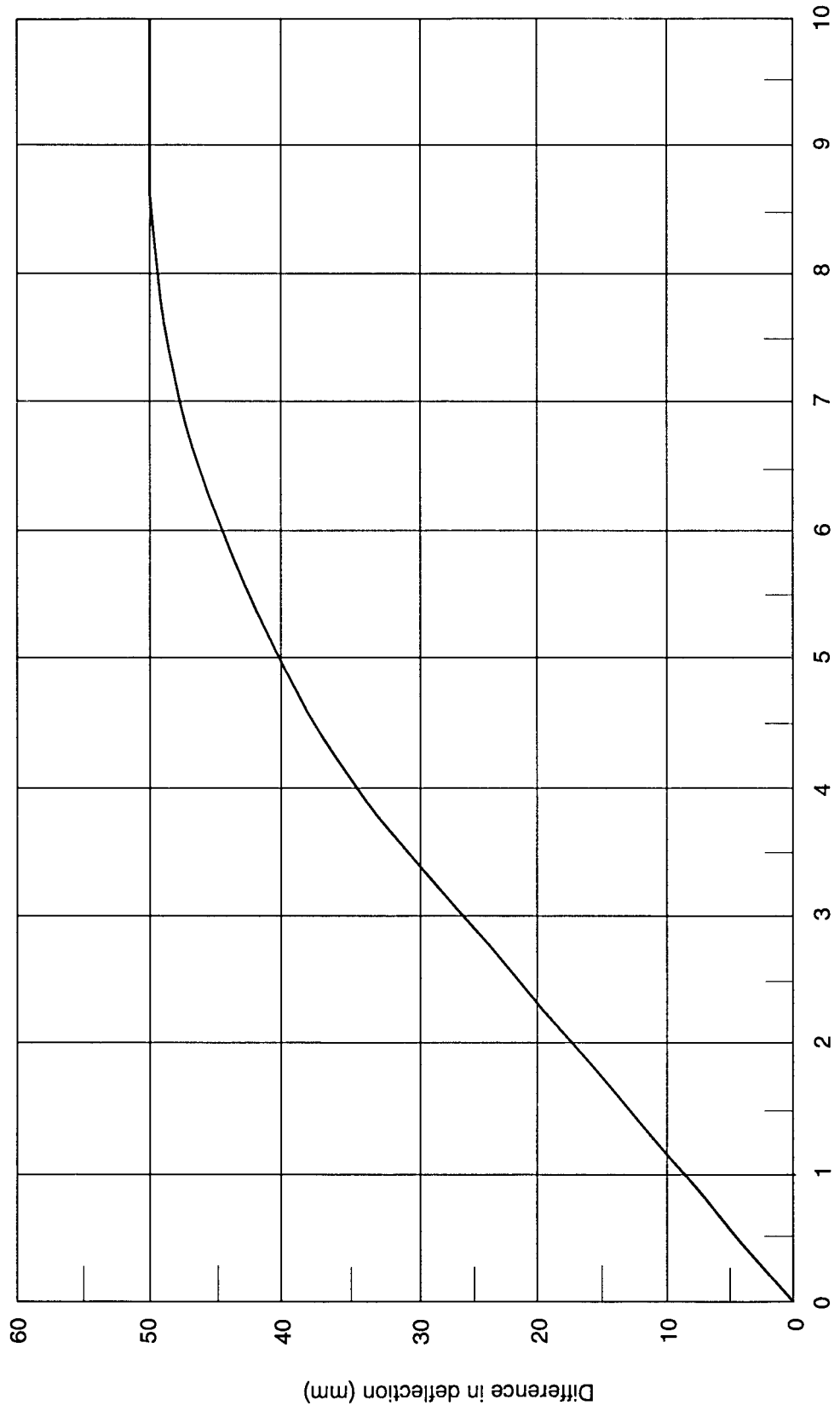


NOTE. The graph is for guidance only. The equations given in **2.1.2.1** are to be used for limit determination.

Figure 2. Maximum stile deflection under load

Not for Resale

© BSI 1998



NOTE. The graph is for guidance only. The equations given in **2.1.2.2** are to be used for limit determination.

Figure 3. Torsional rigidity: maximum difference in deflection between stiles

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

标准分享网 www.bzfxw.com 提供免费下载

2.2 Shelf ladders

2.2.1 Construction

2.2.1.1 *Lengths*

The lengths of shelf ladders shall be as specified in **2.1.1.1**.

2.2.1.2 *Distance between stiles*

The distance between stiles for parallel-sided ladders and tapered ladders shall be as given in a) and b).

a) *Parallel-sided ladders*. The working width between the inner edges of the stiles shall be not less than 355 mm.

b) *Tapered ladders*. The working width between the inner edges of the stiles at the level of the uppermost tread shall be not less than 250 mm. This dimension shall be increased by 12 mm to 25 mm per tread for each successive tread below the uppermost tread.

2.2.1.3 *Feet*

The lower ends of the stiles shall be fitted with feet of hardwood, plastics or rubber. The feet shall project to form a wearing surface, and shall be securely fixed but easily removable for renewal.

2.2.1.4 *Treads*

Treads shall be not less than 75 mm wide from back to front and shall have textured upper surfaces. When the ladder is inclined at any one angle within 65° to 77° to the horizontal the treads shall be horizontal.

2.2.1.5 *Spacing of treads*

Treads shall be uniformly spaced at 225 mm to 300 mm. The distance from the bottom of the stiles to the upper surface of the lowest tread shall be 125 mm to 300 mm.

2.2.2 Performance of shelf ladders

2.2.2.1 *Deflection under load*

When tested in accordance with annex B, the deflection of the loaded stiles shall not exceed the limit determined by the equations given in **2.1.2.1** (see also figure 2). In addition, after removal of the test load there shall be no permanent damage and the residual deflection shall not exceed 1 mm per metre of the test span.

2.2.2.2 *Torsional rigidity*

When tested in accordance with annex B the difference between the deflections of the two stiles shall not exceed the limit determined by the following equations (see figure 3):

Maximum allowable difference between deflections (in mm) for ladders with a test span of less than 3.5 m

$= 8.345L$

Maximum allowable difference between deflections (in mm) for ladders with a test span of 3.5 m or greater but less than 9 m

$= 0.02559L^3 - 1.238L^2 + 16.07L - 12.97$

Maximum allowable difference between deflections (in mm) for ladders with a test span of 9 m or greater

$= 50$

where

L is the effective span (in m).

2.2.2.3 *Strength*

The strength of shelf ladders shall be as specified in **2.1.2.3.**

2.2.2.4 *Twist*

When tested in accordance with annex D, the angle of twist shall not exceed the value given in table 3.

2.2.2.5 *Sideways bending*

When tested in accordance with annex E, the deflection measured midway between supports shall be as specified in **2.1.2.5.**

2.2.2.6 *Cantilever bending*

When tested in accordance with annex F, the residual deflection of either stile shall not exceed 6 mm.

2.2.2.7 *Test for treads*

When tested in accordance with annex H the tread shall support the load. In addition, after removal of the test load the residual deflection of the tread shall not exceed 1 mm.

2.3 Swing back steps

2.3.1 Construction

2.3.1.1 *Distance between stiles*

The minimum working width between the inner edges of the stiles at the level of the uppermost tread shall be not less than 250 mm. This dimension shall be increased by at least 12 mm for class 1 and by at least 22 mm for class 3 per tread for each successive tread below the uppermost tread.

2.3.1.2 *Stiles*

Stiles shall be of sufficient width to provide secure bearing for the treads. The steps shall be designed so that when fully open the inclination of the front stiles to the horizontal is within the following limits:

a) steps of heights up to 1675 mm: not less than 65° and not more than 70°;

b) steps of heights over 1675 mm: not less than 65° and not more than 75°.

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale
© BSI 1998

2.3.1.3 ***Back***

A back shall be hinged to the top by means of:

a) a single hinge extending across the full width of the steps; or

b) a pair of hinges of wrought or forged aluminium alloy, steel or malleable cast iron; or

c) pin hinges.

The back shall be constructed of either:

1) stiles and rails; or

2) stiles and rungs in accordance with **2.1.1.4**, **2.1.1.5** and **2.3.1.2**. Rungs shall be spaced such that the top of the rungs and treads are at the same level when the steps are opened.

2.3.1.4 ***Feet***

The four feet of the steps shall all be effectively on the same plane when the steps are standing in the open position such that when three feet are in contact with a horizontal surface and the tread surface is horizontal the gap below the fourth foot shall not be greater than 5 mm. The feet shall be soled with hardwood, plastics or rubber. The soling material shall be securely fixed but easily removable for renewal.

2.3.1.5 ***Treads***

Treads shall be not less than 75 mm wide from back to front and shall have textured upper surfaces. The steps shall be so designed that when they are in use on a level surface the treads are horizontal $\pm 2°$.

2.3.1.6 ***Length of stiles***

Stiles have maximum lengths as follows:

a) class 1: 4800 mm;

b) class 3: 2700 mm.

2.3.1.7 ***Spacing of treads***

Treads shall be uniformly spaced at 225 mm to 300 mm centres, measured along the stiles. The distance from the bottom of the feet to the upper surface of the lowest tread shall be 125 mm to 300 mm.

2.3.1.8 ***Top***

The top shall be not less than 100 mm wide from back to front and may overhang at the back, front or sides, except that any projection at the front shall not exceed 30 mm. The upper face shall have a textured surface.

2.3.1.9 ***Restriction of opening***

The degree of opening of the steps shall be limited by means of a locking bar on each side between the front stile and the back so that when fully extended the inclination of the front stiles is that specified in **2.3.1.2**, for steps of the appropriate height, and that of the back not less than 72° and not more than 80°.

The locking bar or device shall engage positively in the open position to form a rigid connection between the front and back sections. Folding stay bars shall positively engage in the open position by locking over centre.

NOTE. One piece type locking bars (or tie bars) may be used providing that they are designed and fixed higher on the front stiles and lower on the back stiles to ensure that forces are transmitted to the lower part of the back leg assembly.

2.3.2 Performance of swing back steps

2.3.2.1 ***Rigidity***

When tested in accordance with **J.1**, the steps shall show no damage or permanent deflection on removal of the load except that a residual spread of up to 8 mm, measured between the ends of the front and rear stiles, is acceptable.

2.3.2.2 ***Test for treads***

When tested in accordance with **J.2**, the tread shall support the load. In addition, upon removal of the test load the residual deflection of the tread shall not exceed 1.0 mm.

2.3.2.3 ***Deflection under load***

When the front is tested in accordance with annex B, the deflection of the loaded stiles shall not exceed the limit determined by the equations given in **2.1.2.1** (see also figure 2). In addition, in the case of the front assembly, upon removal of the test load there shall be no permanent damage and the residual deflection shall not exceed 1 mm per metre of test span.

2.3.2.4 ***Strength***

The strength of swing back steps shall be as specified in **2.1.2.3.**

2.3.2.5 ***Sideways bending***

When tested in accordance with annex E, the deflection measured midway between supports shall be as specified in **2.1.2.5.**

2.3.2.6 ***Cantilever bending***

When tested in accordance with annex F, the residual deflection of either stile shall not exceed 6 mm.

2.4 Folding platform steps

2.4.1 Construction

2.4.1.1 ***General***

The construction of folding platform steps shall be as specified in **2.3.1.2** to **2.3.1.5** and **2.3.1.7** together with **2.4.1.2** to **2.4.1.6.**

2.4.1.2 ***Distance between stiles***

The minimum working width between stiles at the level of the uppermost tread which is the platform shall be sufficient to allow the platform to be situated, and be capable of folding, between the stiles. The actual value of this dimension shall be increased by at least 12 mm for class 1 and by at least 22 mm for class 3 per tread for each successive tread below the uppermost tread.

Copyright British Standards Institution, 1998
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

标准分享网 www.bzfxw.com 提供免费下载

2.4.1.3 *Length of stile*

The maximum length of stile shall be specified in **2.3.1.6** with the measurement taken along the stile to the top of the platform.

2.4.1.4 *Horizontal rail*

The uppermost part of the top horizontal rail of the platform steps, which may be a hinge pin or simply a horizontal connecting rail, shall not project horizontally beyond the rear edge of the platform.

2.4.1.5 *Platform*

The platform shall be not less than 250 mm × 250 mm. The upper face shall have a textured surface.

2.4.1.6 *Restriction of opening*

The method used to restrict the opening of folding platform steps shall conform to **2.3.1.9** except that:

a) for platform steps with no more than five treads (including the platform) it shall not be necessary to use tie bars provided the platform or its supports engage when open to prevent further opening or closure of the steps;

b) for platform steps with more than five treads it shall be acceptable for the tie bars to restrict only the opening of the steps provided the platform engages to prevent closure.

2.4.2 Performance of folding platform steps

2.4.2.1 *General*

The performance of folding platform steps shall be as specified in **2.3.2** together with **2.4.2.2.**

2.4.2.2 *Test for platform*

When tested in accordance with **J.3**, the platform shall support the load. In addition, upon removal of the test load there shall be no damage and the residual deflection at the centre shall not exceed 1.0 mm.

2.5 Ladder backed steps

2.5.1 Construction

2.5.1.1 *General*

The construction of ladder backed steps shall be as specified in **2.3.1.1**, **2.3.1.2** and **2.3.1.4** to **2.3.1.9** together with **2.5.1.2** and **2.5.1.3**.

2.5.1.2 *Back*

The back shall be constructed of stiles and rungs and shall conform to **2.1.1**. In addition, the rungs shall be spaced so that the top of the rungs and treads are at the same level when the steps are open.

The hinge device joining the back to the front shall be of a type that will limit the extent of opening.

2.5.1.3 *Working height*

The maximum working height provided for a scaffold board shall be 1785 mm above floor level.

2.5.2 Performance of ladder backed steps

2.5.2.1 *Rigidity*

When tested in accordance with **J.1**, the rigidity of ladder backed steps shall be as specified in **2.3.2.1**.

2.5.2.2 *Front*

The performance of the fronts of ladder backed steps shall be as specified in **2.3.2.2** and **2.3.2.6.**

2.5.2.3 *Back*

The performance of the backs of ladder backed steps shall be as specified in **2.1.2.1** to **2.1.2.3**, **2.1.2.5** and **2.1.2.6.**

2.6 Folding trestles

2.6.1 Construction

NOTE. Preferred heights of folding trestles, measured on the closed stiles, are 1.9 m, 2.5 m and 3.1 m.

2.6.1.1 *Stiles*

The stiles of both halves shall be of equal length and shall be adequate to provide secure anchorage and enable the cross-bearers to support the test load specified in annex K. The inside width at the top of the trestle shall be not less than 500 mm and shall be increased by not less than 30 mm in each 300 mm of length of the stiles.

2.6.1.2 *Feet*

The four feet of the trestles shall all be on the same plane when the trestles are in the open position and shall be soled with hardwood, plastics or rubber. The soling material shall be securely fixed but easily removable for renewal.

2.6.1.3 *Side plates*

Side plates shall be fitted to keep the stiles in register when the trestle is closed.

2.6.1.4 *Hinges*

The hinges shall be of:

a) cast or forged aluminium; or

b) forged steel or steel strip conforming to type CR4 of BS 1449 : Part 1; or

c) whiteheart malleable cast iron.

They shall be trestle hinges of the locking type and shall limit opening to a contained angle of not less than 30° and not more than 40°.

NOTE. Ropes or locking bars or similar devices as used for swing back steps or platform steps may be fitted to reduce concentration of load on hinges.

2.6.1.5 *Cross-bearers*

Cross-bearers shall be spaced not more than 610 mm apart and shall be staggered alternately on each half of the trestle at half this distance except that there shall be a top cross-bearer at the same level on each half, at least 50 mm below the top of the trestle.

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

© BSI 1998

2.6.2 Performance of folding trestles

2.6.2.1 *General*

The performance of folding trestles shall be as specified in **2.1.2.1** to **2.1.2.3**, **2.1.2.5** and **2.1.2.6**, together with **2.6.2.2**

2.6.2.2 *Strength of cross-bearers*

When tested in accordance with annex K there shall be no permanent distortion.

2.7 Lightweight stagings

2.7.1 General

When tested in accordance with annex L the residual deflection shall not exceed 1/500 of the span or 3 mm, whichever is the greater.

The width of stagings shall be 450 mm +5 mm, − 10 mm.

NOTE. This standard does not specify the length of lightweight staging, but the preferred lengths are 1.8 m, 2.4 m, 3.0 m, 3.6 m, 4.2 m, 4.8 m, 5.4 m, 6.0 m, 6.6 m and 7.3 m, each length with a tolerance of +0 mm, −50 mm.

2.7.2 Cross-bearers

Cross-bearers shall be of aluminium or timber; where timber is used the cross-section and spacing of the bearers shall conform to **19.4** of BS 1129 : 1990.

The ends of the cross-bearers shall have either:

a) pins as specified in **19.4** of BS 1129 : 1990 where the ends of the cross-bearers are inserted into the stiles for support; or

b) square ends where the cross-bearers are screwed and/or bolted to a supporting flange which is an integral part of the stile.

2.7.3 Tie rods

Where timber cross-bearers of the type described in item a) of **2.7.2** are used, tie rods as specified in **5.4.1** of BS 1129 : 1990 shall be fitted immediately below or into a groove beneath each cross-bearer.

2.7.4 Rungs

Where timber cross-bearers of the type described in item b) of **2.7.2** are used, aluminium rungs as in **2.1.1.4** shall be used. The distance from the ends of the stiles to the nearest rung centre shall be between 250 mm and 300 mm.

NOTE. Rungs without a textured surface may be used.

The minimum number of rungs shall be as given in table 4.

Table 4. Minimum number of rungs

Stile length	Minimum no. of rungs
Less than 4.2 m	2
4.2 m to less than 6.6 m	4
6.6 m and over	6

2.7.5 Decking

When subjected to a mass of 90 kg applied to an area 50 mm × 50 mm mid-way between two adjacent bearers, the decking shall not fracture and there shall be no permanent distortion.

The decking shall consist of either:

a) aluminium or timber slats not less than 60 mm wide with a maximum gap between the slats of 10 mm. The gap between the slats and stiles shall be not more than 15 mm. Timber slats shall be made from European redwood, Douglas fir, imported Sittea spruce, eastern Canadian spruce, European whitewood, western hemlock, hembal, Parana pine, ramin or keruing;

b) wood laminates of minimum thickness 9 mm bonded with an adhesive conforming to BS 1203 : 1979. The face veneer of plywood shall run longitudinally with the staging. Joints required to form a continuous length of decking shall be:

1) butted and screwed with at least two countersunk no. 8 screws through each side of the joint into timber bearers; or

2) 30 mm half lap located centrally over a bearer fixed with at least four countersunk no. 8 screws 32 mm long through the laps into the bearer; or

3) butted and screwed with at least two countersunk no. 8 self-tapping screws or 4.8 mm (min.) diameter breakstem rivets through each side of the joint into aluminium bearers.

The top of the decking if metal or plastics shall be textured to provide a slip resistant surface.

2.8 Double sided steps

2.8.1 Construction

2.8.1.1 *General*

The construction of double sided steps shall be as specified in **2.3.1.1**, **2.3.1.2** and **2.3.1.4** to **2.3.1.9** together with **2.8.1.2.**

2.8.1.2 *Front and back*

The front and back shall be constructed in the same way with stiles and treads and to the same dimensions. The hinge device joining them shall be of a type that will limit the extent of opening.

2.8.2 Performance of double sided steps

2.8.2.1 *Rigidity*

When tested in accordance with **J.1** the rigidity shall be as specified in **2.3.2.1.**

2.8.2.2 *Front and back*

The performance of the front and back shall be as specified in **2.3.2.2** and **2.3.2.6.**

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

标准分享网 www.bzfxw.com 提供免费下载

2.9 Combination ladders

2.9.1 Construction

2.9.1.1 *Lengths*

The length of each section shall not exceed 2.5 m.

2.9.1.2 *Distance between stiles*

In the leaning/extending ladder mode, the distance between stiles shall be as specified in **2.1.1.2.**

In the standing ladder mode, the minimum working width between the inner edges of the stiles at the level of the uppermost tread/rung shall be not less than 250 mm. The distance between the outer edges of the stiles (or permanently fixed ladder stabilizer) measured at the lower end of all ascendable sections shall be not less than that determined by the following equation:

Minimum width at base of each ascendable section

$= 250 + 0.1L$

where

L is the length of ladder section (in mm).

2.9.1.3 *Stiles in standing ladder mode*

The stile construction shall be as specified in **2.3.1.2.**

2.9.1.4 *Restriction of opening in standing ladder mode*

The degree of opening of the steps shall be limited by means of a locking bar on each side between the front stile and the back so that when fully extended the inclination of the front stiles is that specified in **2.3.1.2** and that of the back not less than 65° and not more than 80°. The locking bar or device shall engage positively in the open position to form a rigid connection between the front and back sections.

Folding stay bars shall positively engage in the open position by locking over centre.

2.9.1.5 *Feet*

In the leaning/extending ladder mode the feet shall be as specified in **2.1.1.3**.

In the standing ladder mode the feet shall be as specified in **2.3.1.4.**

2.9.1.6 *Treads and rungs*

Treads or rungs shall have a textured surface to reduce slipping.

NOTE. The surface may be integral or formed by applied material.

In the design climbing position the surface of treads or flat top rungs shall be horizontal to within $\pm 3°$.

2.9.1.7 *Spacing of treads and rungs*

Treads shall be uniformly spaced at 225 mm to 300 mm centres, measured along the stiles. The distance from the floor to the upper surface of the lowest tread or rung shall be 125 mm to 300 mm.

2.9.2 Performance

2.9.2.1 *General*

For all standing mode tests stairwell ladders shall be tested in the level-ground configuration.

2.9.2.2 *Deflection under load*

In the leaning/extending ladder mode deflection under load shall be tested as specified in **2.1.2.1.**

In the standing ladder mode deflection under load shall be tested as specified in **2.3.2.3** for each ascendable section.

2.9.2.3 *Torsional rigidity (leaning ladder mode only)*

With the ladder fully extended, test for torsional rigidity as specified in **2.1.2.2.**

2.9.2.4 *Strength (leaning ladder mode only)*

With the ladder fully extended test for strength as specified in **2.1.2.3.**

2.9.2.5 *Twist*

Twist of ladder base section shall be tested as specified in **2.1.2.4.**

2.9.2.6 *Sideways bending*

When each ascendable section is tested in accordance with annex E, the deflection measured midway between supports shall be as specified in **2.1.2.5.**

2.9.2.7 *Cantilever bending*

When tested in accordance with annex F, the residual deflection of either stile shall not exceed 6 mm.

2.9.2.8 *Rigidity*

With the ladder in its standing ladder mode rigidity shall be tested as specified in **2.3.2.1.**

2.9.2.9 *Test for treads and rungs*

In the leaning/extending ladder mode test rung or tread of the upper section shall be tested as specified in **2.1.2.7**.

In the standing ladder mode test rung or tread of front section shall be tested as specified in **2.3.2.2.**

2.9.2.10 *Round rung rotation*

Round rung rotation shall be tested as specified in **2.1.2.8.**

2.9.2.11 *Latching devices (extending ladder mode only)*

Latching devices shall be tested as specified in **2.1.2.9**.

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

© BSI 1998

Annexes

Annex A (informative)

General test information

The tests described in annexes C, D and E of this standard are intended to be design verification tests to be used, for instance, during product development, or where there is a change in the design or material specification that affects the performance of a ladder etc., or if a query on performance requires a definitive means of checking conformity.

Tests need only be applied to one of a range of products where the feature being tested is common or identical to the rest of the range. Similarly, if the longest stile of a common section passes the tests then it will be unnecessary to test shorter products.

Throughout this standard visible marking of the metal caused by the application of the test loads or by the supports is not regarded as damage provided the shape of the section is not distorted.

Annex B (normative)

Test for deflection of ladders and step fronts

If this test is being applied to an extending ladder, extend it fully before the test is commenced.

If this test is being applied to a combination ladder, extend it fully to its maximum useable length before the test is commenced.

With the climbing face uppermost, support the ladder or steps horizontally under the stiles at each end rung or tread, or in the case of steps, where the hand or knee rail is an integral part of the step front, under the bottom tread and at a point 200 mm in from the hinge point. Measure the clear span between the supports. This is regarded as the test span for the purpose of this test. Apply a preload as given in table B.1, according to the class, vertically, at the middle of the ladder, distributed over 50 mm for a duration of 30 s, so that the stiles are loaded equally. Remove this load and establish datum. Then apply a test load as given in table B.1, according to the class, to the centre point of one stile distributed over 50 mm. By any convenient means measure the vertical deflection at the centre of the effective span of both stiles between the unloaded condition and after a period of not less than 30 s from the application of the full test load.

Table B.1 Loads for deflection test

Duty rating	Preload kg	Test load kg
Class 1: industrial	55	75
Class 2: light trades	50	65
Class 3: domestic	40	55

Annex C (normative)

Strength test for ladders, step fronts and trestle frames

If this test is being applied to an extending ladder, extend it fully before the test is commenced.

If this test is being applied to a combination ladder, extend it fully to its maximum useable length before the test is commenced.

With the climbing face uppermost, support the ladder or steps horizontally under the stiles at each end rung or tread, or in the case of steps, where the hand or knee rail is an integral part of the step front, under the bottom tread and at a point 200 mm in from the hinge point. Apply a preload, as given in table B.2, according to the class, vertically at the middle of the ladder, distributed over a length of 50 mm for a duration of 1 min, so that the stiles are loaded equally. Remove this load and establish a datum point. Then apply a test load, as given in table B.2, according to the class, in the same way as the preload for a duration of 1 min. Remove the load. By any convenient means measure the residual deflection at the datum point.

Table B.2 Loads for strength test

Duty rating	Preload kg	Test load kg
Class 1: industrial	95	130
Class 2: light trades	80	110
Class 3: domestic	70	95

Annex D (normative)

Ladder twist test

The test unit shall consist of a ladder base section of any length, supported over a 2 m test span except that if the ladder base section is less than 2 m then the maximum possible test span shall be used. Place the ladder in a flat horizontal position and support it at each end, as shown in figure D.1.

Copyright British Standards Institution, 1998
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

标准分享网 www.bzfxw.com 提供免费下载

The distance between the pivot point centre and the plane of the centreline of the rungs shall be not more than 50 mm. Apply a preload torque of 6.5 kg·m gently and then remove. The residual angle of pivotal support shall be noted as datum position to establish a reference for angular deflection. Apply a test torque of 13 kg·m in the same direction as the preload by either using a torque wrench or by applying a test load at the end of the arm. Measure the angle of twist from the datum position. Apply a second load of the same torque as the preload in the opposite direction and then remove. The residual angle of pivotal support shall be noted as datum position. Apply a second test load in the opposite direction to the first test load. Measure the angle of twist from the second datum position.

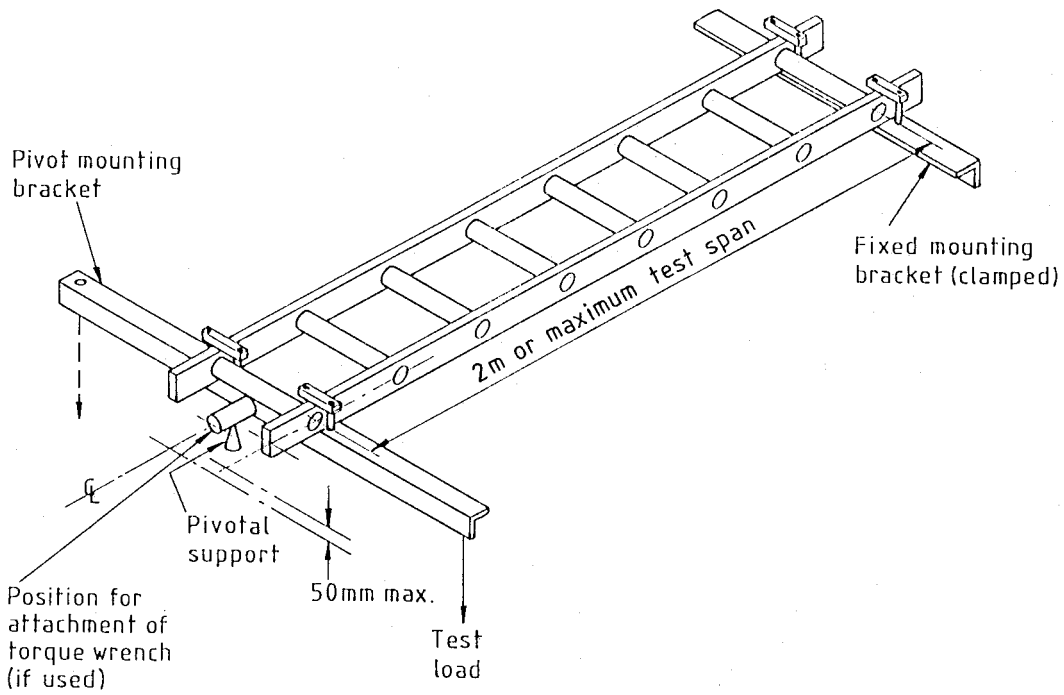
Annex E (normative)

Sideways bending (sway) test for ladders, step fronts and trestle frames

Place the ladder, step or trestle on its side with the rungs or treads vertical. Measure each section of the ladder individually, the bottom stile being supported as for the strength test of annex C under the end rungs (see figure E.1), or in the case of steps, where the hand or knee rail is an integral part of the step front, under the bottom tread and at a point 200 mm in from the hinge point. Apply a preload of 15 kg for 1 min and then remove it to determine the datum for measurement on the lower edge of the lower stile. Apply a test load as given in table E.1, according to the class, at the centre points of the span of the stiles distributed over 50 mm. By any convenient means measure the vertical deflection at the datum point on the lower edge of the ladder and then remove the test load. After 1 min measure the residual deflection at the same point.

Table E.1. Test loads for sideways bending (sway) test

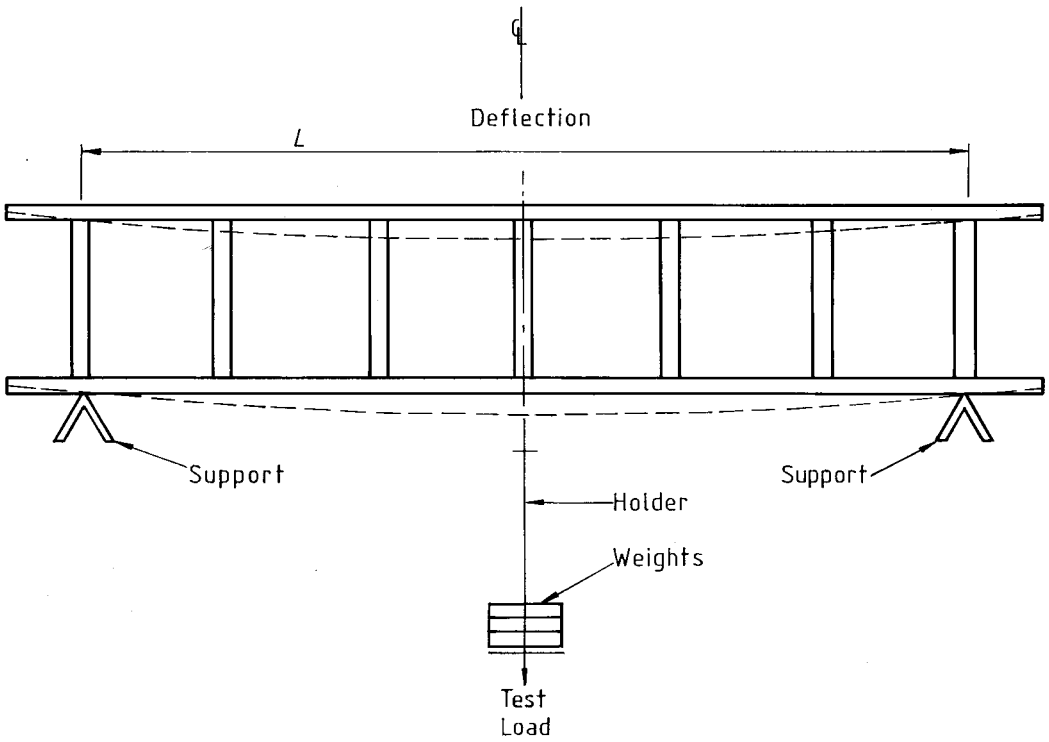
Duty rating	Preload kg	Test load kg
Class 1: industrial	15	27
Class 2: light trades	15	25
Class 3: domestic	15	23



NOTE. The test span is normally 2 m but a ladder section longer than 2 m can be used in the test without shortening.

Figure D.1 Arrangement for twist test on single or extension ladder

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale



NOTE. The deflection is the difference between the height of the lower edge of the ladder side when unloaded (solid line) and when loaded (dotted line). *L* is the test span (in mm).

Figure E.1 Arrangement for sideways bending (sway) test

Annex F (normative)

Cantilever bending (horn end strength) test for ladders, step fronts and trestle frames

The test unit shall consist of either a step front, trestle frame, single ladder section or the base section of an extension ladder. Any safety shoes or spikes affixed to the section shall be removed before the test is conducted. The test unit shall be placed on edge with the rungs or treads vertical. The lower stile shall be clamped to a support and shall be unsupported from the bottom end to the midpoint of the lowest rung or tread. If the rung has a flat surface, that surface shall be parallel to the end of the support (see figure F.1). Establish a datum point on the end of the stile to which the test load is to be applied. Apply a test load, as given in table F.1, according to the class, for a minimum period of 1 min to the upper stile. Apply the load to a block resting on the stile and held in place by a clamp or a similar device.

The block shall be 50 mm long, 25 mm thick and of a width such that the load is transferred to the full width of the stile or stile web. If the stile shape is such that additional packing is required it shall be of the same plan dimensions as the block and of the minimum thickness. Arrange the end of the block to be in line with the end of the stile on which it rests.

Apply the load symmetrically to the centre of the upper surface of the block so that it acts through the vertical axis of the stile for a minimum period of 1 min.

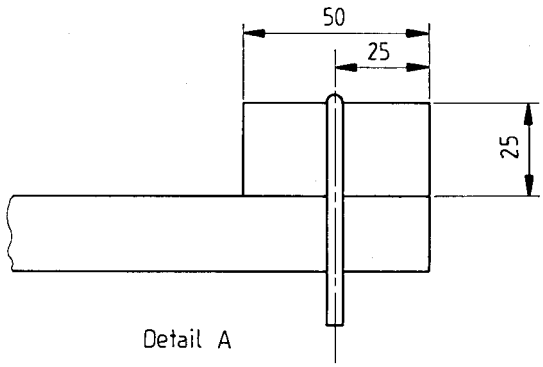
Remove the load and measure the residual vertical deflection within 1 min of removal. Repeat the loading and measurement procedure on the lower stile.

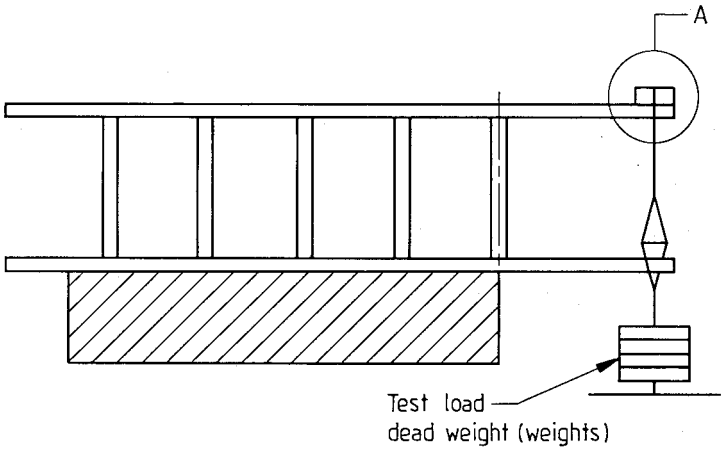
Table F.1 Test loads for cantilever bending (horn end strength) test

Duty rating	Test load kg
Class 1: industrial	125
Class 2: light trades	120
Class 3: domestic	90

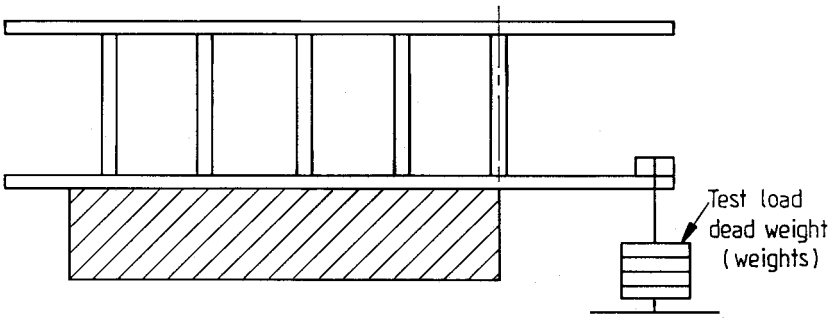
Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

标准分享网 www.bzfxw.com 提供免费下载





a) Cantilever in test



b) Cantilever out test

All dimensions are in millimetres.

Figure F.1 Arrangement for horn deflection test

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

Annex G (normative)

Test for rungs

Support the ladder at an angle of 75° from the horizontal and with continuous support for both stiles over a length equal to three rung spacings. To the centre rung of the three, apply a vertical load as given in table G.1, appropriate to the class of the ladder, distributed over a length of 50 mm for 1 min as follows:

a) at the centre of the rung; and then

b) close to one end.

Remove the load and examine the rungs for permanent deflection or visible damage.

Table G.1 Test loads for rungs, treads and platforms

Duty rating	Test load kg
Class 1: industrial	225
Class 3: domestic	180

Annex H (normative)

Test for treads of shelf ladders

Place the shelf ladder in the normal working position, supported so as to prevent movement of the feet or deflection of the stiles. To a typical tread apply a vertical load, as given in table G.1 over a length of 50 mm for 1 min as follows:

a) at the centre of the tread; and then

b) close to one end.

Remove the load and examine the ladder for permanent deflection or visible damage.

Annex J (normative)

Tests for steps

J.1 Test for rigidity

Attach securely, by any convenient means, a wheel (or roller) to the outer side of one of the back stiles. The wheel shall be of metal and have a diameter of 50 mm; it shall be mounted so that it can rotate freely, with its axis parallel to the treads, and raises the foot of the stile by 10 mm (see figure J.1).

Place the steps in the fully open position on a smooth level surface and apply the appropriate preload given in table J.1 to the top tread but one, adjacent to the stile on the same side as the wheel. In the case of platform steps, apply the preload to the tread immediately below the platform.

Maintain the load on the tread for 1 min, then remove the preload and then apply the appropriate test load given in table J.1 using the same procedure. After the 1 min has elapsed remove the test load and the wheel before inspecting the steps for damage and deformation.

Examine the steps for visible deformation or damage.

Table J.1 Test loads for steps and trestles

Duty rating	Preload kg	Test load kg
Class 1: industrial	95	130
Class 2: light trades	90	120
Class 3: domestic	85	110

J.2 Test for treads

After completing the test given in J.1, apply to a typical tread a vertical load as given in table G.1 over a length of 50 mm for 1 min as follows:

a) at the centre of the tread; and then

b) close to one end.

Remove the load and examine the ladder for visible damage. Place a 6 mm thick straight edge on the centreline of the tread climbing surface so that it is symmetrically positioned and covers 95 % of the length of the tread and the mid span point of the tread. Measure any space between the latter point and the straight edge.

J.3 Test for platform

After completing the tests given in J.2 apply to the centre of the platform a load as given in table G.1 over an area of 50 mm × 50 mm for 1 min.

Remove the load and examine the platform and the ladder for permanent deflection or visible damage.

Annex K (normative)

Test for trestles

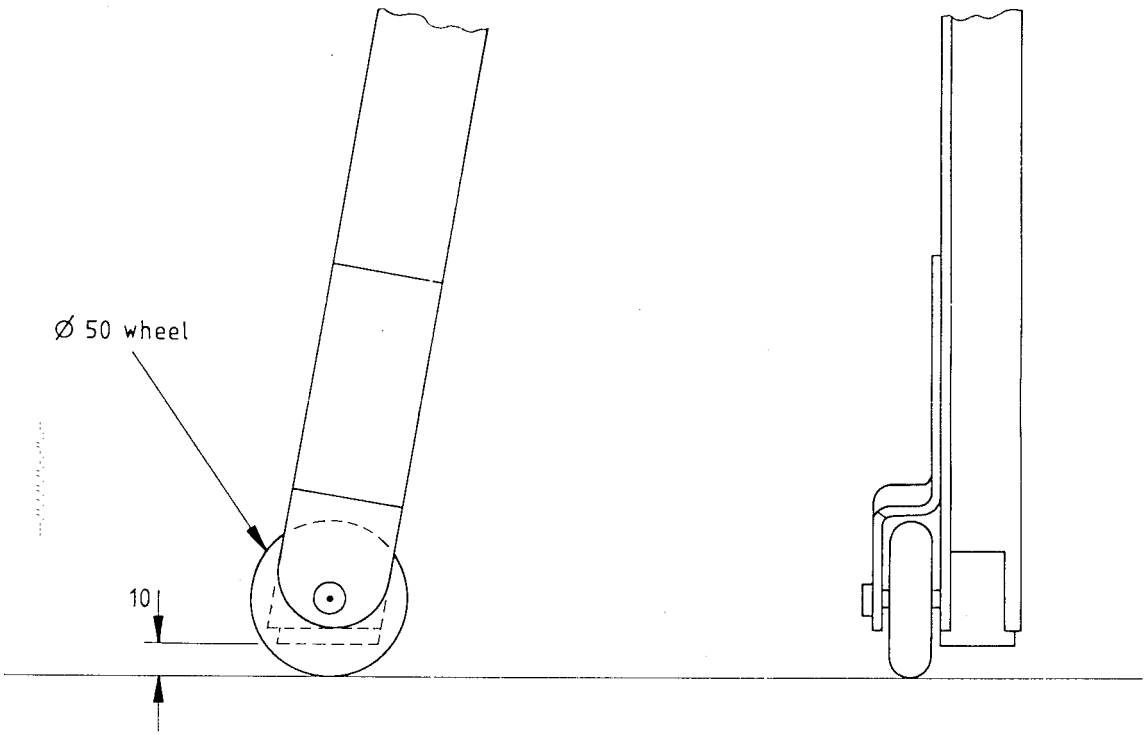
Place the trestles in the fully opened position on a level surface. Apply the appropriate preload given in table J.1 at the load centre of the cross-bearer and spread over a length of 50 mm. Maintain the preload for 1 min then remove it. Apply a test load as given in table J.1 in three equal increments at the load centre of the bearer, the load being spread over a length of 50 mm. Maintain the load for 1 min.

Remove the load and examine the cross-bearers and the whole trestle for permanent deflection or visible damage.

Repeat the procedure for each cross-bearer.

Copyright British Standards Institution, 1998
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

标准分享网 www.bzfxw.com 提供免费下载



All dimensions are in millimetres.

Figure J.1 Method of fixing wheel to bottom of backleg for step test

Annex L (normative)

Test for lightweight stagings

With the decking uppermost, support the lightweight staging, in a horizontal position, under both stiles at 150 ± 5 mm from each end.

Apply a preload of 400 kg uniformly distributed over the area of the decking between the supports and maintain the load for 1 min before removing the load.

Apply a load of 54 kg uniformly distributed as before. Take an initial reading for deflection measurements at the mid span position on each stile, (reading 1).

Increase the load to a total of 540 kg and maintain it for 1 min.

Reduce the load to 54 kg again and take a further deflection reading as above, (reading 2).

Calculate the residual deflection as reading 2 minus reading 1.

Annex M (informative)

Recommendations for the care and use of ladders

M.1 Care of ladders

M.1.1 *Handling*

Equipment should be handled with care and not subjected to unnecessary dropping, jarring or misuse. If it has fallen or received a heavy blow, it should be examined immediately and any damage made good by a competent person before putting back into service.

M.1.2 *Storage*

Equipment should be stored in such a manner as to provide ease of access and inspection and to prevent danger of accident when withdrawing for use. Ladders should be stored horizontally on racks designed for their protection when not in use. These racks should have supporting points at every 2 m to prevent any possibility of excessive sagging. At no time should any material be placed on the ladder whilst in store. Timber plant should be stored in a location where it will not be exposed to the elements but where there is good ventilation; it should not be stored near radiators, stoves, steam pipes or other places subject to excessive heat or dampness.

M.1.3 *Transport*

Ladders carried on vehicles should be adequately supported to avoid sagging and there should be minimum overhang beyond supporting points, which should be of resilient material. Ladders should be tied to each support point to minimize rubbing and the effects of road shock. Other plant should be carefully loaded so that the ladder will not be subject to shock or abrasion.

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

M.1.4 ***Maintenance***

Equipment should be maintained in good condition at all times. Hardware, fittings and accessories should be checked frequently to ensure that they are securely attached and in proper working condition. Moving parts, such as pulleys, locks, hinges and wheels, should operate freely without binding or undue play and should be oiled frequently and kept in good working order. All bolts and rivets should be in place and tight before use. Ropes or cables should be inspected frequently and those frayed or badly worn or defective should be replaced.

M.1.5 ***Inspection***

Equipment should be inspected before and after use and periodically by a competent trained person. Those items found to be defective should be suitably labelled or marked, and should be withdrawn from service. The inspection should include checking the rungs, treads, cross-bars and stiles for damage, defects and dents, checking the rung to stile connections, checking ropes and cables and all fittings, locks, wheels, pulleys, connections, rivets, screws and hinges.

M.1.6 ***Painting***

Timber equipment other than inserts may be coated with a transparent non-conductive finish such as varnish, shellac or a clear preservative, but should not be coated with any opaque covering. Preservatives for the treatment of timber components in aluminium plant should not contain copper salts. Aluminium should not be used in corrosive conditions.

M.1.7 ***Cleanliness***

Equipment should be free from oil, grease or mud or other slippery substances on climbing or gripping surfaces.

M.2 Use of ladders

M.2.1 ***General***

Ladder usage should be restricted to the purpose for which the ladder is designed and only one person should be on the ladder at any one time.

Ladders, step ladders and trestles are not designed for any degree of side loading and such abuse should be avoided. They should be kept close to the work and over-reaching avoided.

Climb or work on the middle of the rung or step. Do not stand on the top tread, bucket or tool shelf or rear parts of steps. Do not climb higher than the third rung from the top of a single extension ladder.

When ascending or descending the user should face the ladder. At no time should he climb up the side of the ladder.

Never ascend above the hinge/pivot position when using a combination ladder in a stairwell mode.

M.2.2 ***Electrical hazards***

Aluminium ladders should not be used where any electrical hazard exists.

M.2.3 ***Inspection***

The ladder should always be inspected carefully before use.

M.2.4 ***Angle of ladder***

The ladder should be erected at an angle of 75° from the horizontal, i.e. the distance of the foot from the vertical surface should be as near as possible one-quarter of the height reached by the top of the ladder.

M.2.5 ***Support***

Equipment should be placed on a secure footing on a firm level base. It should not be used on ice, snow or slippery surfaces, unless suitable means to prevent slipping are employed. It should not be placed on boxes, barrels or other unstable bases to obtain additional height.

M.2.6 ***Fixing of the ladder***

The point on which the top of a ladder rests should be reasonably rigid and have ample strength to support the applied load. The ladder should be securely fixed to this point. If such a fixing is impracticable the ladder should be securely fixed at or near the lower end either by staking or by roping.

M.2.7 ***Overlap***

The length of the overlap depends on the design of the ladder and is to be determined by the manufacturer. The function and carrying capacity of the overlap are to be verified in accordance with annex B and annex C.

Copyright British Standards Institution, 1998
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

标准分享网 www.bzfxw.com 提供免费下载

Annex N (normative)
Torque test for round rungs

N.1 This test shall only be carried out on round rungs.

N.2 Clamp a single section or a short section of the ladder, comprising of at least one rung and two stiles, in a vertical position. Clamp a 50 mm wide torque arm centrally on a rung in such a way that it has maximum torsional grip without damaging the rung and protrudes equally either side of the ladder for such length that the appropriate test weights can hang freely and without hinderance and in no case less than 445 mm from the middle of the rung. Coat both rung joints and the immediately adjacent areas of the rung and stile with a die marking material, and scribe a line along the rung, across the rung joint, and onto a stile at both ends of the rung.

N.3 Apply the test torque given in table N.1 a total of six times for periods of 30 s alternating the direction. Measure the displacement of the scribed line and calculate the angular rotation of the rung about its axis after the fifth and sixth torque.

Table N.1 Test torques for round rungs

Ladder duty ratings	**Test torque** N·m
Class 1	50
Class 3	30

Annex P (normative)
Test for extension ladders

P.1 Extend the ladder by at least one rung distance and place it in a vertical position. The length of the test piece will be left to the choice of the tester.

P.2 Apply a uniformly distributed test load of 2600 N vertically, to the upper part of the ladder for a period of 1 min.

After removal of the test load, there shall be no permanent distortion in hooks or locking devices, or in their fittings, or the stiles or rungs, exceeding 1 mm.

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

© BSI 1998

List of references

Normative references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS 1129 : 1990	*Specification for portable timber ladders, steps, trestles and lightweight stagings*
BS 1203 : 1979	*Specification for synthetic resin adhesives (phenolic and aminoplastic) for plywood*
BS 1449 :	*Steel plate, sheet and strip*
BS 1449 : Part 1 :	*Carbon and carbon-manganese plate, sheet and strip*
BS 1470 : 1987	*Specification for wrought aluminium and aluminium alloys for general engineering purposes: plate, sheet and strip*
BS 1471 : 1972	*Specification for wrought aluminium and aluminium alloys for general engineering purposes — drawn tube*
BS 1472 : 1972	*Specification for wrought aluminium and aluminium alloys for general engineering purposes — forging stock and forgings*
BS 1474 : 1987	*Specification for wrought aluminium and aluminium alloys for general engineering purposes: bars, extruded round tubes and sections*
BS 1490 : 1988	*Specification for aluminium and aluminium alloy ingots and castings for general engineering purposes*
BS 4300 :	*Wrought aluminium and aluminium alloys for general engineering purposes (supplementary series)*
BS 4300/1 : 1967	*Aluminium alloy longitudinally welded tube*
BS 6125 : 1981	*Specification for natural fibre cords, lines and twines*
BS 6681 : 1986	*Specification for malleable cast iron*
BS 8118 :	*Structural use of aluminium*
BS 8118 : Part 2	*Specification for materials, workmanship and protection*
BS EN 10002 :	*Tensile testing of metallic materials*

Informative references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS 729 : 1971	*Specification for hot dip galvanized coatings on iron and steel articles*
BS 1706 : 1990	*Method for specifying electroplated coatings of zinc and cadmium on iron and steel*
BS 4921 : 1988	*Specification for sherardized coatings on iron and steel*
BS EN 131 :	*Ladders*
BS EN 131-1 : 1993	*Specification for terms, types and functional sizes*
BS EN 131-2 : 1993	*Specification for requirements, testing, marking*

Copyright British Standards Institution, 1998
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS
Not for Resale

标准分享网 www.bzfxw.com 提供免费下载

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

Copyright subsists in all BSI publications. BSI also holds the copyright, in the UK, of the publications of the international standardization bodies. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI.

This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any other purpose than implementation then the prior written permission of BSI must be obtained.

If permission is granted, the terms may include royalty payments or a licensing agreement. Details and advice can be obtained from the Copyright Manager. Tel: 020 8996 7070.

BSI
389 Chiswick High Road
London
W4 4AL

--`,,`-`-`,,`,,`,`,,`---

Copyright British Standards Institution
Provided by IHS under license with BSI
No reproduction or networking permitted without license from IHS

Not for Resale