

Specification for

Permanently fixed ladders

ICS 97.145

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee B/208, Stairs and walkways, to Subcommittee B/208/1, Stairs and walkways — Industrial, upon which the following bodies were represented:

Department of the Environment for Northern Ireland
 Engineering Equipment and Materials Users Association
 Health and Safety Executive
 Office of the Deputy Prime Minister — Building Division
 Scottish Office — Construction and Building
 Spiral Stair Manufacturers Association
 Co-opted members

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 26 April 2005

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First published August 1967
 Second edition April 1987
 Third edition August 1994
 Fourth edition April 2005

The following BSI references relate to the work on this standard:
 Committee reference B/208/1
 Draft for comment 02/107760 DC

Amendments/corrigenda issued since publication

Amd. No.	Date	Comments
A.1	30 November 2008	Scope extended to incorporate permanently fixed companionway ladders
C.1	28 February 2010	See foreword
C.2	30 April 2010	Correction to diagrams

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Foreword

This British Standard has been prepared by Subcommittee B/208/1. It supersedes BS 4211:1994, which is withdrawn.

This edition represents a full revision of the 1994 edition, to align the requirements with those currently used in the access industry and to adopt, where appropriate, the requirements of BS EN ISO 14122. The revision has included the removal of class A and class B designations of ladders.

BS 4211:2005+A1:2008 supersedes BS 4211:2005, which is withdrawn.

This British Standard forms one of a group of standards covering permanent fittings to give access to high structures including high buildings and chimneys, and plant. Others in the group are as follows.

BS 3572, *Specification for access fittings for chimneys and other high structures in concrete or brickwork.*

BS 3678, *Specification for access hooks for chimneys and other high structures in steel.*

BS 5395-3, *Stairs and ladders and walkways — Part 3: Code of practice for the design of industrial type stairs, permanent ladders and walkways.*

BS EN ISO 14122, *Safety of machinery — Permanent means of access to machinery, particularly Part 4: Fixed ladders (2005).*

For portable ladders in aluminium and timber, attention is drawn to BS 2037 and BS 1129 respectively.

Attention is drawn to the requirements of the Building Regulations for England and Wales. The Building Regulations (Northern Ireland) and The Building Standards (Scotland) Regulations.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by A1 A1.

The start and finish of text introduced or altered by Corrigendum No. 1 is indicated in the text by tags C1 C1.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 25 and a back cover.

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1 Scope

This British Standard specifies requirements for ladders with single bar rungs intended to be fixed permanently to structures, including high structures such as chimneys, silos and bins, to provide means of access. Requirements for associated platforms and safety hoops are also given. **A1** This standard also covers permanently fixed companionway ladders. **A1**

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

A1 BS 449-2, *Specification for the use of structural steel in building — Part 2: Metric units.* **A1**

BS 3382-1:1961 & BS 3382-2:1961, *Specification for electroplated coatings on threaded components — Part 1: Cadmium on steel components — Part 2: Zinc on steel components.*

BS 3382-3 & BS 3382-4, *Specification for electroplated coatings on threaded components — Part 3: Nickel or nickel plus chromium on steel components — Part 4: Nickel or nickel plus chromium on copper and copper alloy (including brass) components.*

BS 3382-7, *Specification for electroplated coatings on threaded components — Part 7: Thicker platings for threaded components.*

A1 BS 4592-0:2006, *Industrial type flooring, stair treads and protective barriers — Common design requirements and recommendations for installation.* **A1**

BS 4921, *Specification for sherardized coatings on iron or steel.*

BS EN 131-2, *Ladders — Part 2: Specification for requirements, testing, marking.*

BS EN 353-1:1993, *Personal protective equipment against falls from a height — Part 1: Guided type fall arresters including a rigid anchor line.*

BS EN 353-2:1993, *Personal protective equipment against falls from a height — Part 2: Guided type fall arresters including a flexible anchor line.*

BS EN 363:1993, *Personal protective equipment against falls from a height — Fall arrest systems.*

BS EN 12329, *Corrosion protection of metals — Electrodeposited coatings of zinc with supplementary treatment on iron or steel.*

BS EN 12330, *Corrosion protection of metals — Electrodeposited coatings of cadmium on iron or steel.*

BS EN 12373-1, *Aluminium and aluminium alloys — Anodizing — Part 1: Method for specifying decorative and protective anodic oxidation coatings on aluminium.*

BS EN 12540, *Corrosion protection of metals — Electrodeposited coatings of nickel, nickel plus chromium, copper plus nickel and copper plus nickel plus chromium.*

BS EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods.*

BS EN ISO 12944-1, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 1: General introduction.*

BS EN ISO 12944-2, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 2: Classification of environments.*

BS EN ISO 12944-3, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 3: Design considerations.*

BS EN ISO 12944-4, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 4: Types of surface and surface preparation.*

BS EN ISO 12944-5, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 5: Protective paint systems.*

BS EN ISO 12944-6, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 6: Laboratory performance test methods.*

BS EN ISO 12944-7, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 7: Execution and supervision of paintwork.*

BS EN ISO 12944-8, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 8: Development of specifications for new work and maintenance.*

BS EN ISO 14122-2, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways.*

BS EN ISO 14122-3, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails.*

BS EN ISO 14122-4, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders.*

BS EN ISO 14713, *Protection against corrosion of iron and steel in structures — Zinc and aluminium coatings — Guidelines.*

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1

safety cage

assembly which serves to limit the risk of people falling from the ladder

NOTE See Figure 1, and Figure 2 and Figure 3.

3.2

stiles

side members of the ladder to which the rungs are fitted

3.3

rest platform

platform with the required protective devices, provided to enable the person climbing the ladder to rest

3.4

work platform

platform with the required protective devices, provided to enable a work activity to be carried out

A1 3.5

trap door

normally closed device which can be opened to give access through a platform or through other similar horizontal structures

3.6

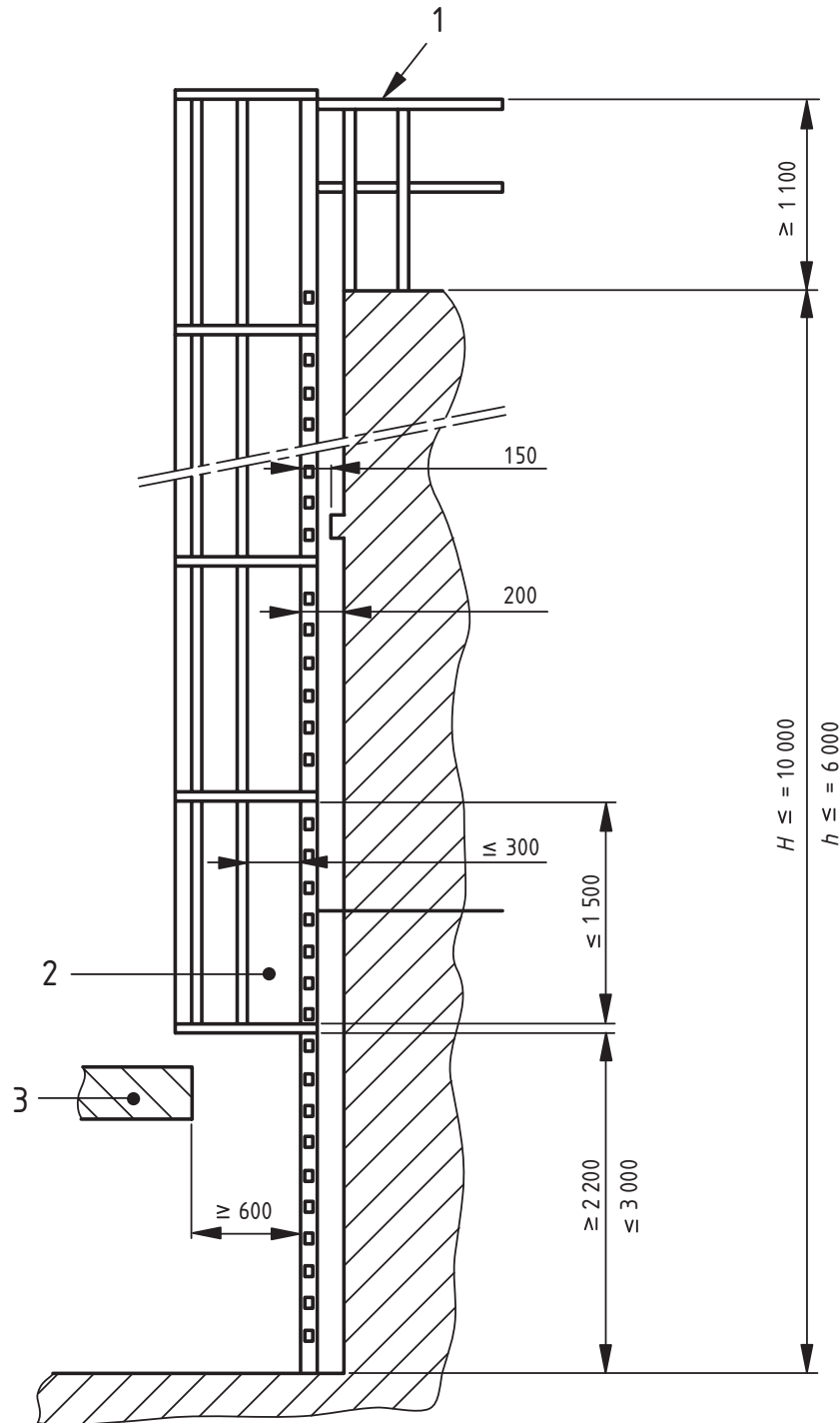
companionway ladder

consisting of a succession of horizontal levels (steps) fixed between the strings of a single flight ladder, having an angle of pitch of between 60° and 75° and allows passage on foot from one level to another

NOTE Sometimes referred to as “step-ladder” or “ship-ladder”. **A1**

C1

Dimensions in millimetres



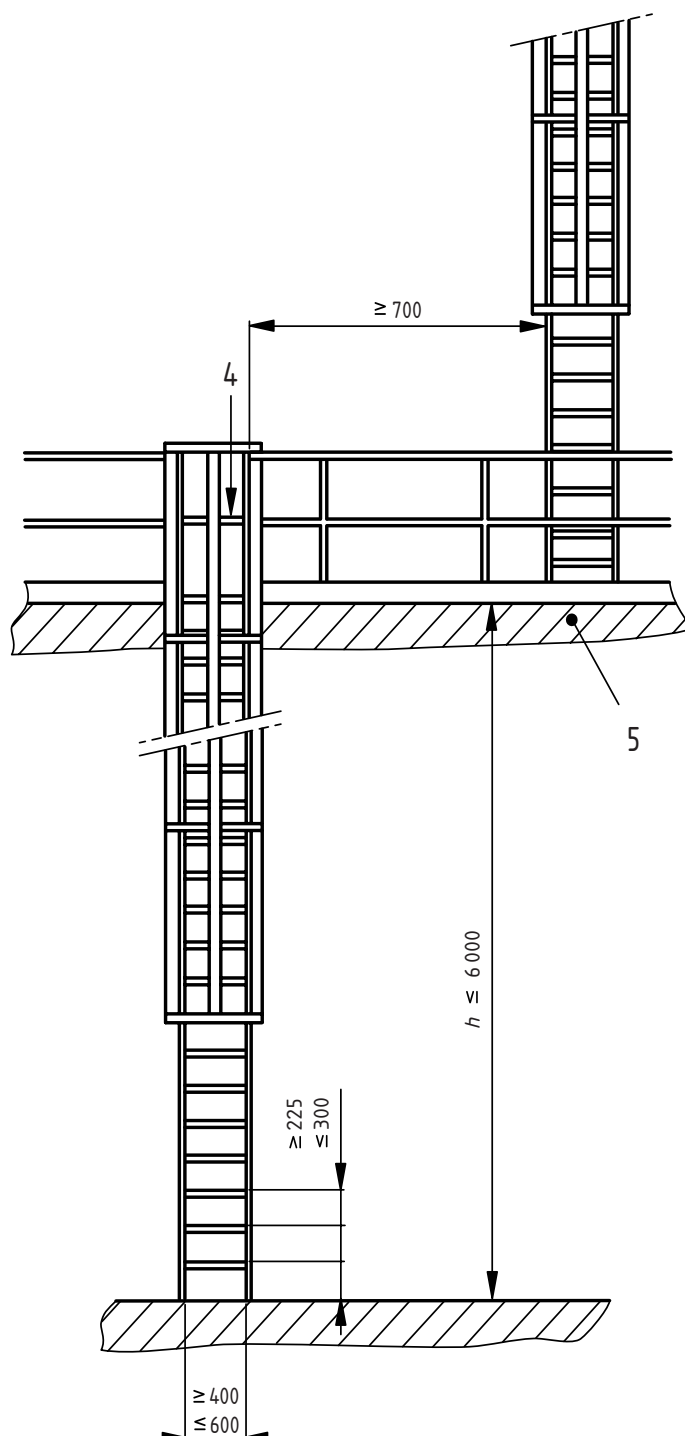
C1

Key

- 1 Connection element
- 2 To suit maximum area $\leq 0.4 \text{ m}^2$
- 3 Discontinuous obstacle

a) Side elevation on ladder with a safety cage

Figure 1 — Principal dimensions of ladders and safety cages



Key

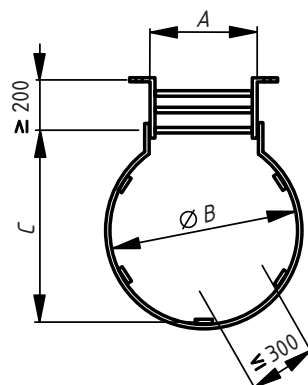
4 Gate

5 Intermediate platform

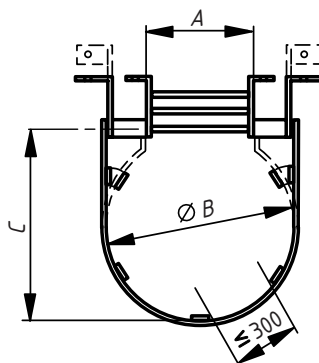
b) Front elevation on ladder with safety cage

Figure 1 — Principal dimensions of ladders and safety cages (continued)

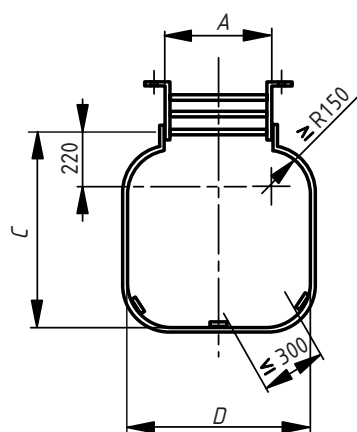
Dimensions in millimetres



a) Circular and intermediate and bottom hoop



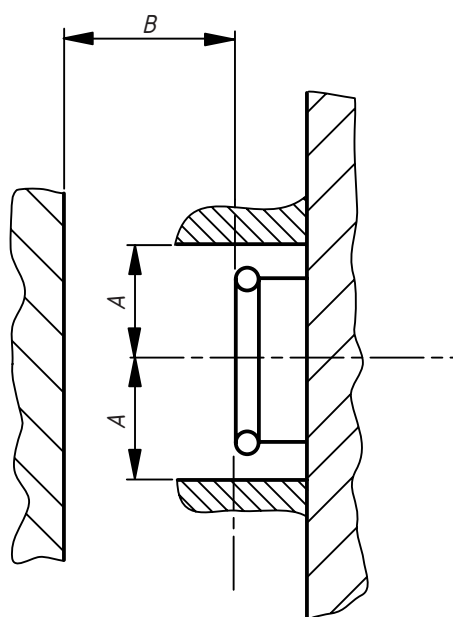
b) Top hoop connection to ladder extension



c) Rectangular intermediate and bottom hoop option

A min. = 400 mm; A max. = 600 mm C min. = 700 mm; C max. = 800 mm
 B min. = 650 mm; B max. = 800 mm D min. = 650 mm; D max. = 700 mm.

Figure 2 — Plan views of ladders with a safety cage



A min. = 325 mm; A max. = 400 mm
 B min. = 650 mm; B max. = 800 mm

Figure 3 — Plan view of a ladder with safety cage

4 Materials

NOTE The design of steel components should conform to either BS 5950-1 or BS 449-2 and the design of alloy components should be in accordance with BS 8118-1.

4.1 General

The materials and fixings used for the construction of ladders, hoops, straps, platforms and connectors shall be sufficiently robust to conform with the appropriate strength and deflection tests, and with the environmental conditions.

NOTE 1 See Table 1 for examples of minimum sizes of sections in mild steel.

NOTE 2 All dimensions shown in this standard take into account accepted industrial material tolerances.

NOTE 3 The design of ladders in other materials, such as glass reinforced plastics (GRP) are not precluded provided that they meet the same performance requirements as ladders manufactured in metal.

Table 1 — Examples of minimum sizes (in millimetres) of sections in mild steel

Cage uprights		50 × 8
Hoops		50 × 8
Rungs		20 dia.
Ladder uprights	Maximum spacing of fixing brackets	
	In steel	In concrete
65 × 10	3 700	(2 460)
65 × 12	4 100	(2 730)
70 × 10	4 000	(2 660)
70 × 12	4 400	(2 930)
80 × 10	4 600	(3 060)
80 × 12	5 000	(3 330)
70 × 50 × 8L	4 800	(3 200)
100 × 65 × 8L	6 200	(4 130)
125 × 75 × 8L	7 700	(5 130)
NOTE Fixing bracket spacings, whether in concrete or steel should be such as to accommodate the same pullout load.		

4.2 Connections

Connection between components shall be by a proven durable means selected to withstand the specified or calculated load. Traditional means are threaded fasteners and welding; where these are used, they shall be in accordance with the appropriate British Standard.

4.3 Welding

Welding shall be in accordance with the appropriate British Standard.

4.4 Finish

4.4.1 General

Construction shall be carried out in a manner that ensures no sharp ends or edges that could cut the user or hinder access.

4.4.2 Protection

Depending on the situation and atmospheric conditions in which steel ladders are to be used, they shall be given a suitable protective finish in accordance with Table 2.

The choice of protection shall be made in accordance with BS EN ISO 12944, BS EN ISO 14713 or BS EN ISO 1461, as appropriate.

NOTE The use of rivets on ladders is to be discouraged because of the possibility of embrittlement due to the hot dip galvanizing process (see BS EN ISO 1461).

Table 2 — Coatings for steel components

Component	Coating	British Standard	Grade
Steel	Electroplated zinc ^a	BS EN 12329	Zn 3
	Electroplated cadmium ^a	BS EN 12330	Cd 3
	Hot dip galvanized	BS EN ISO 1461	—
	Sherardized	BS 4921	Class 2
	Electroplated nickel	BS EN 12540	Medium application grade
	Electroplated nickel and chromium	BS EN 12540	Service condition no. 2
Screw threads	Any of the above coatings covered by BS 3382-1, BS 3382-2, BS 3382-3, BS 3382-4 and BS 3382-7	BS 3382-1, BS 3382-2, BS 3382-3, BS 3382-4 and BS 3382-7	

^a Zinc coatings are more suitable for general use, including use in industrial atmospheres, and cadmium is more suitable for use in marine environments.

Protection for aluminium components, if required, shall be in accordance with BS EN 12373-1 for anodized components, and BS EN 12540 for both electroplated nickel components and electroplated nickel and chromium components.

5 Performance requirements

5.1 General

Normally, fixed ladders shall be designed with two stiles. In exceptional circumstances (such as a continuous ladder with a varying angle of pitch or where there is insufficient space to provide two stiles), fixed ladders may be provided with only one stile.

NOTE The use of single stile ladders is not recommended in the UK. (See BS EN ISO 14122-4 for the requirements for single stile ladders for access to machinery.)

Fittings, hinges, anchor points, supports and mounting points shall hold the assembly sufficiently rigid and stable to ensure the safety of users under normal conditions of use.

5.2 Strength requirements

The ladder elements shall meet the requirements of BS EN 131-2, and see Clause 5 of BS EN ISO 14122-4.

5.3 Stiles

5.3.1 Performance criteria

Stiles shall be designed to resist the forces due to two persons each weighing 100 kg in transit on a six metre section of ladder as fixed. Deflection in any direction shall not exceed two millimetres.

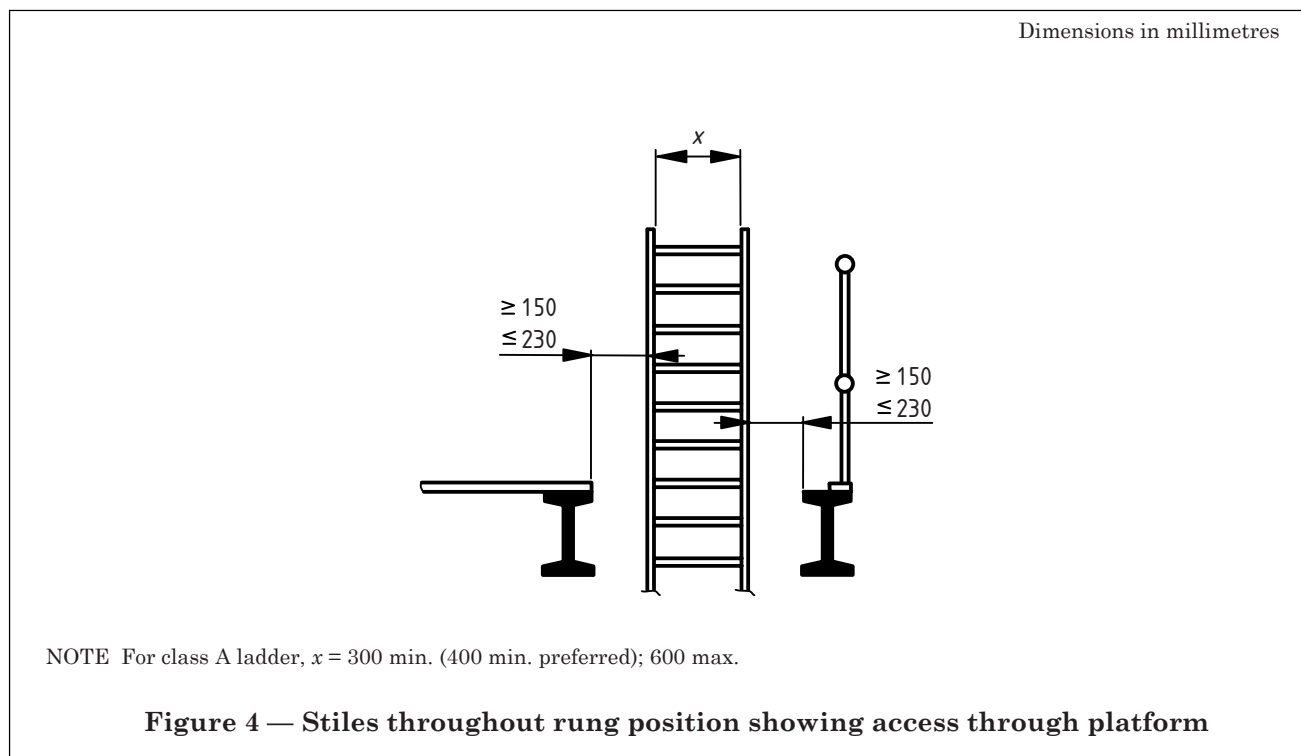
5.3.2 Design

The stiles shall be parallel and straight to a tolerance of 10 mm in a three metre length throughout the rung portion. The distance between stiles, x , measured from the inside faces, shall be between 300 mm and 600 mm (see Figure 4), with a preferred minimum of 400 mm. Before a shorter length is considered, a check shall be carried out to see if it is possible to find a more favourable position for a ladder, allowing a clear width of 400 mm or more.

5.3.3 Extension of stiles

For a step-through exit, the stiles shall extend upwards, at the same angle to the structure as the ladder, to a height of at least that of the guarding. For a side-step exit, the stiles shall extend sufficiently to allow the top rung to be at least 1 680 mm above the platform. The stiles shall be rigidly fastened at their extremities (see Figure 5a)). Such extension of the stiles shall not encroach on the clear width of the platform passageway.

Where, in order to step from the ladder onto the landing platform, it is necessary to pass between the extended portion of the stiles, these shall be opened out from platform level to provide a clear width of between 600 mm and 700 mm between them at handrail level (see Figure 3a)). The stiles of ladders attached to chimneys shall terminate 300 mm below the top of the chimney, to ensure that they do not project into the gas stream. Where access to the top of the chimney is required, consideration shall be given to the provision of a platform or other means of safe access.



5.3.4 Jointing of stiles

If it is necessary for stiles to be in more than one length, they shall be joined by a suitable means. If bolts or rivets are used, they shall be countersunk or cuphead at least on the outside of the stiles.

5.4 Rungs

5.4.1 Section

Rungs shall be of a section capable of supporting a mass of 150 kg spread over 100 mm at the centre of the rung such that the deflection is limited to two millimetres.

The diameter of the rungs shall be at least 20 mm, or the walking surface of the tread of polygonal and U-shaped rungs shall have a horizontal depth of at least 20 mm.

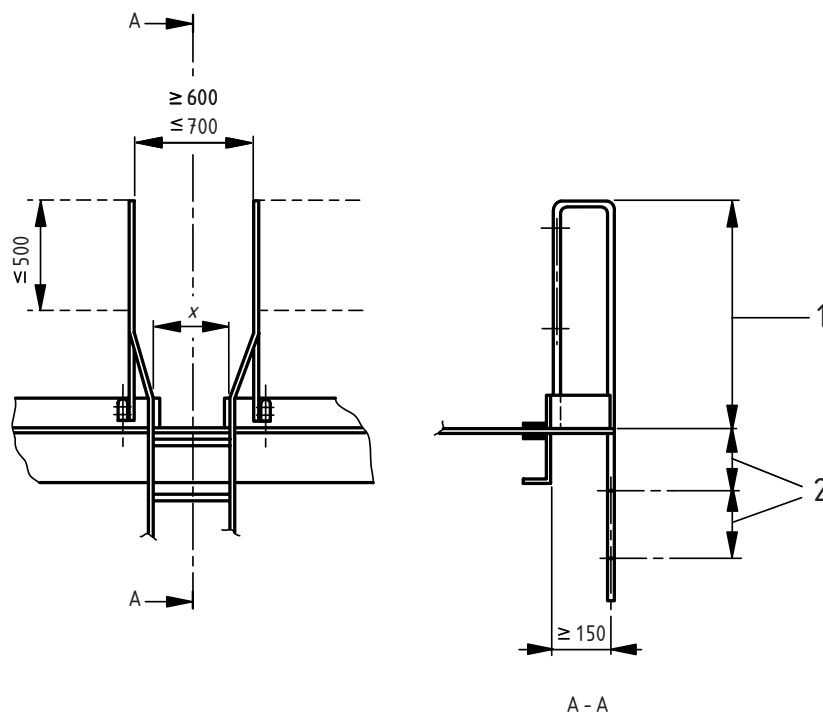
The maximum cross-sectional dimension of the rung shall not be more than 35 mm, to make it easy to grasp.

Additional measures to prevent slipping may be incorporated when there is a foreseeable risk of slipping, e.g. due to environmental conditions.

5.4.2 Spacing

The rungs in a ladder or flight of ladders shall be uniformly spaced throughout at centres between 225 mm and 300 mm (see Figure 5b)). The arrangement at the top of a ladder shall be such that the upper surface of the top rung is on the same level as the platform, which shall be extended, if necessary, to limit the gap between the top rung and platform to at least 65 mm but not more than 75 mm. Alternatively, horizontal members may be added between the top rung of the ladder and the platform, to reduce the gap to no more than 75 mm (see Figure 5c)).

Dimensions in millimetres

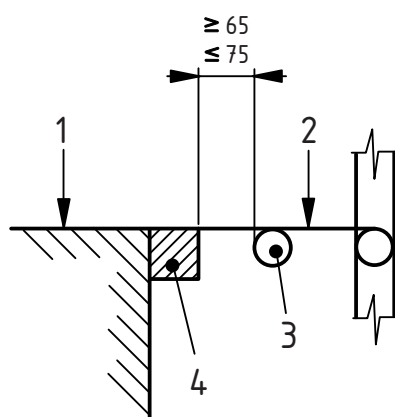


NOTE For x, see Figure 4.

Key

- 1 Class A: 1100 min.
- 2 Dimensions to be equal. Between 225 and 300.

a) Elevation and Section A-A



Key

- 1 Walking surface of the arrival area
- 2 Rung surface
- 3 Additional top rung
- 4 Platform extension

b) Position of additional top rung

Figure 5 — Extension of stiles

The distance between the top of the bottom rung and the walking level should preferably be equal to the rung spacing. Where this is not practical, the distance shall not exceed the spacing between two consecutive rungs.

5.4.3 Fixing of rungs to stiles

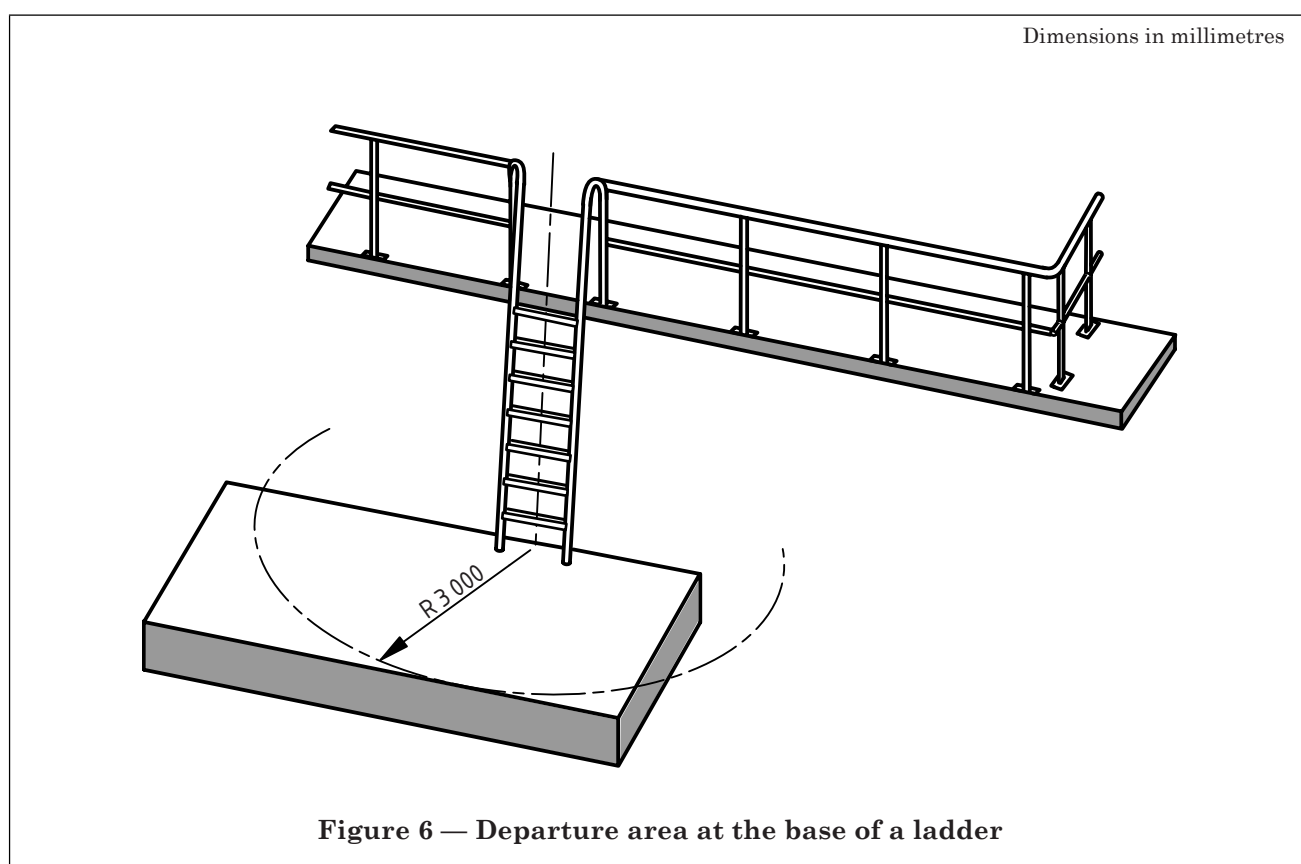
Where rungs are welded into stiles, seal welding shall not be used, due to the possibility of acid entrapment during the hot dip galvanizing process.

5.5 Fall protection

5.5.1 General

Fall protection shall be provided when:

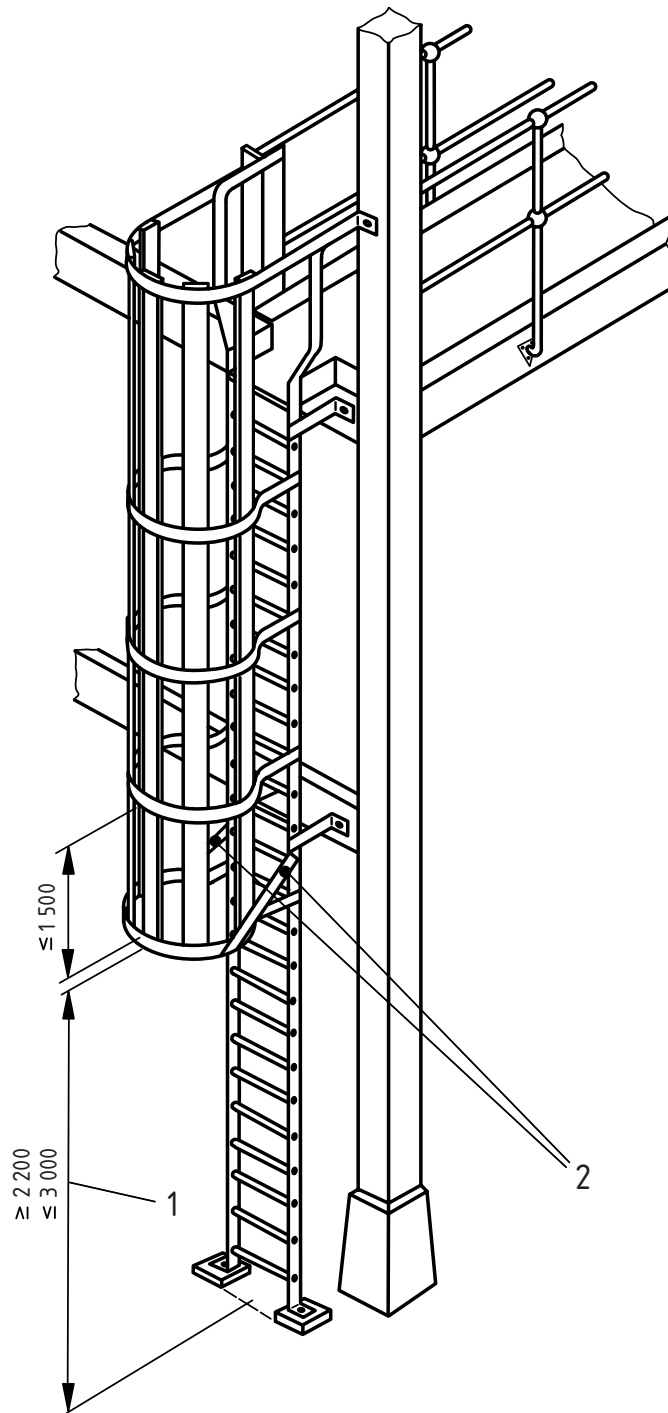
- the height of the ladder is more than two metres;
- the height of the ladder is two metres or less, but there is a risk of falling a total distance of more than two metres. This can occur when there is an unprotected side to the access platform (or similar structure) at less than a three metre radius from the centreline of the ladder. (See Figure 6.)



A passive protection system, for example, a safety cage (see Figure 7) shall be the preferred choice. Where it is not possible to use a cage, individual protective equipment shall be provided. A fall arrester shall be provided only where low frequency and specialized access (e.g. maintenance) is required.

NOTE A fall arrester is only effective if the user chooses to use it. If a harness with an incompatible sliding system is used with a guided type fall arrester, there will be a risk.

Dimensions in millimetres

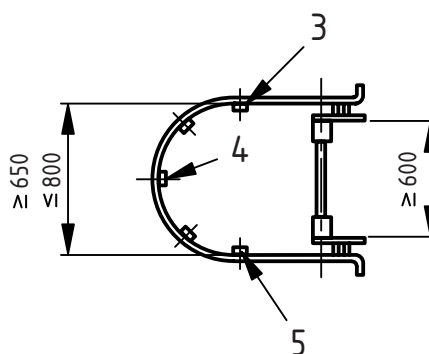


Key
 1 Distance from ground
 2 Braces

a) General arrangement

Figure 7 — Safety hoop spacing

Dimensions in millimetres

**Key**

- 3 Weld, rivet or bolt: min. bolt size M12 or M10(HT) and min. rivet size 12 diameter.
- 4 One strap on centreline
- 5 Minimum of five vertical members positioned inside hoops

b) Plan showing stile connection to the top safety hoop

Figure 7 — Safety hoop spacing (continued)

5.5.2 Safety cages

5.5.2.1 Dimensions

The lowest part of safety cage, e.g. the lowest hoop shall start at a height of between $\boxed{A_1}$ 2 200 $\boxed{A_1}$ mm and 3 000 mm above the departure area. Below the cage on the chosen access side, the safety cage shall not have elements likely to obstruct the access to the area situated in front of the ladder. At the arrival area, the safety cage shall be extended up to the height of the guard-rail of the arrival area (see Figure 1a)).

The clearance within the cage at the arrival area, measured along the transverse axis of the ladder rungs between the inside face of the cage shall be between 500 mm and 700 mm.

The clear distances within the hoop of the safety cage shall be between 650 mm and 800 mm (see D in Figure 2 $\boxed{A_1}$) for rectangular cages $\boxed{A_1}$). This applies equally to non-circular as well as circular safety cages. The distance from the rung to the safety cage shall be between 650 mm and 800 mm (see B in Figure 3). With regard to the ladder axis, the distance from the surrounding structure in the absence of a safety cage shall be between 325 mm and 400 mm (see A in Figure 3).

The distance between two hoops shall not exceed 1 500 mm and the distance between two uprights on the cage shall not exceed 300 mm. The hoops shall be placed at right angles to the uprights on the cage. The safety cage uprights shall be fixed to the inside of the hoop and be equally spaced.

The spacing of safety cage components shall be designed so that the empty spaces are in any case not more than 0.40 m².

A cage is not necessary if surrounding structures (walls, parts of machines, etc.) in front of and on the sides of the ladder provide a similar level of protection (e.g. by providing similar dimensions). (See Figure 3.)

5.5.2.2 Fixing of hoops and straps

Hoops and straps shall be fixed by riveting, bolting or welding. If bolts or rivets are used they shall be of the countersunk or cuphead type, inserted from the inside of the strap or hoop. The assembly of hoops and straps shall be braced if necessary to prevent distortion (see Figure 7).

5.5.3 Fall arrest systems

Where a fall arrest system is fitted, it shall be in accordance with BS EN 363:1993.

Where a guided type of fall arrester is fitted, it shall be in accordance with BS EN 353-1:1993 or BS EN 353-2:1993.

5.6 Prevention of unauthorized access

Consideration shall be given to the provision of suitable safeguards, e.g. locking devices, to ensure that access is only possible by authorized, trained and fully equipped operators.

5.7 Platforms

5.7.1 General

When the climbing height, H , is 10 000 mm or less [see Figure 8a)], one ladder may be supplied to cover this height. When H is greater than 10 000 mm, more than one ladder shall be supplied, where the individual ladder height, h , shall be 6 000 mm or less, to suit the climbing height. The flights of height (h) shall be staggered and a rest platform shall be provided between each ladder [see Figure 8b)].

Where there are several flights, the height h of a ladder flight between the departure area and the nearest platform between consecutive rest platforms shall be no more than 6 000 mm.

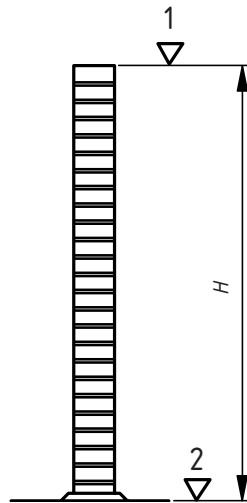
NOTE In the case of ladders fixed to chimneys the use of platforms can create design problems. Where it is not practical to have a platform, continuous lengths of ladder may be used, providing they incorporate a fall arrest system (see 5.5.3).

Platforms provided specifically as rest platforms shall be at least 700 mm × 700 mm. (See Figure 9.)

Intermediate floors or levels may also be used as rest platforms. Platforms shall have suitable guarding in accordance with BS EN ISO 14122-3.

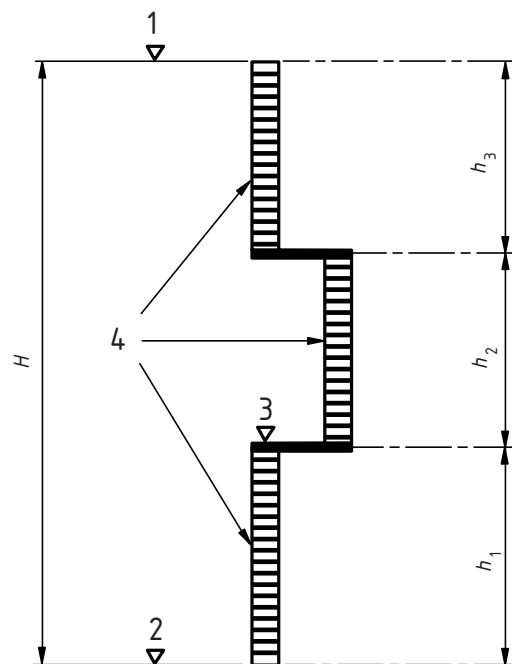
Work platforms shall be in accordance with BS EN ISO 14122-2. The clear width and length of working platforms shall be determined by the platform's intended use.

Dimensions in millimetres



H max. = 10 000 mm

a) Ladder without rest platform (single flight)



H max. > 10 000 mm
 h max. = 6 000 mm

Key

1 Arrival area 3 Intermediate platform
 2 Departure area 4 Ladder flight

b) Ladder with staggered flight

Figure 8 — Height of flights and location of platforms

Dimensions in millimetres

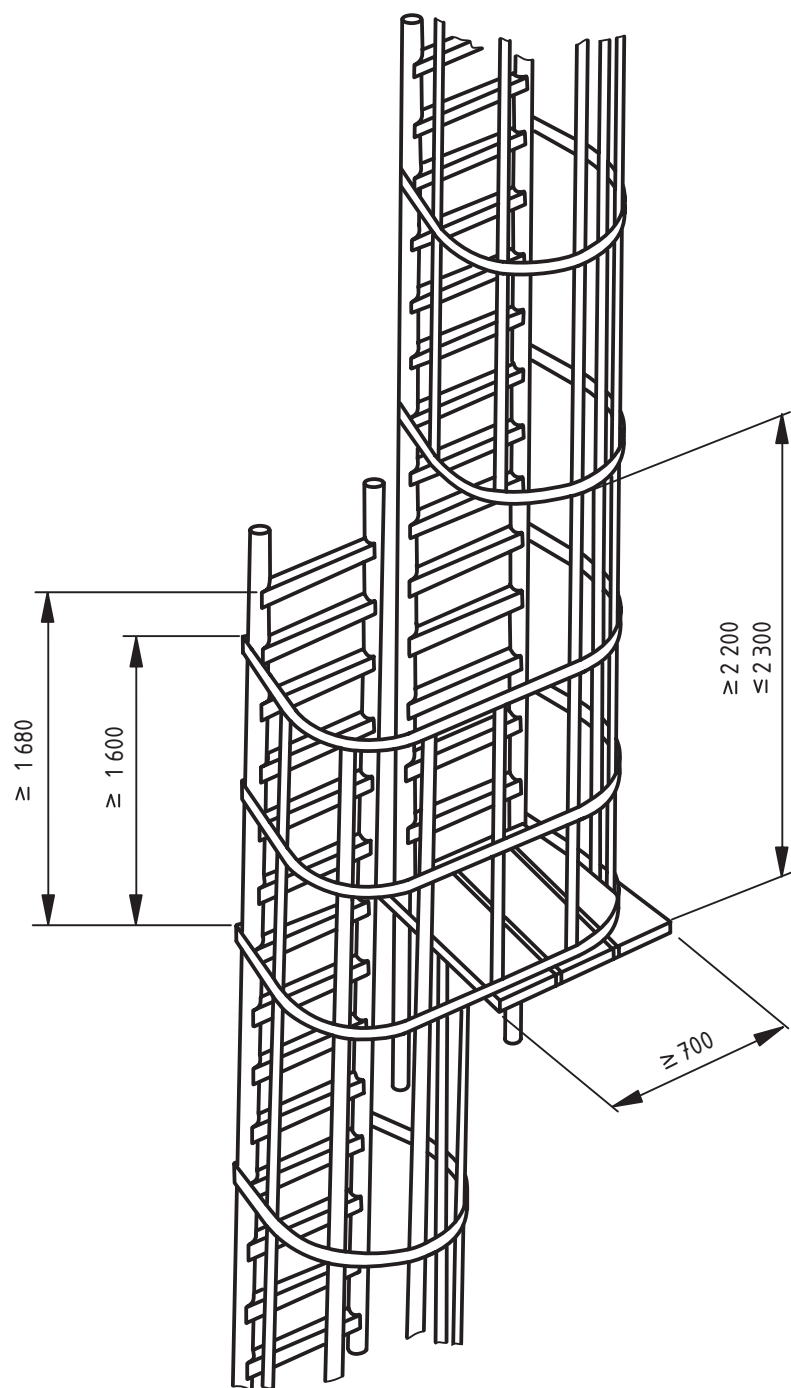


Figure 9 — Example of adjacent staggered ladder flights including a rest platform

5.7.2 Staggered ladder flights

If the layout of the machine or its environment make it unavoidable to do otherwise, two successive ladder flights may be adjacent, without a separate platform. In this case, the lower flight of the ladder shall be extended to where the highest rung is at least 1 680 mm above the platform to provide good handholds for

the user of the ladder. The height of the guarding above the platform shall be at least 1 600 mm (see Figure 9).

The clear height for the passage between the platform and the lowest complete hoop of the safety cage on the upper ladder shall be between 2 200 mm and 2 300 mm.

5.7.3 At obstructions

Where dwarf walls, parapets, copings or other obstructions interfere with a direct approach from the ladder to the level to which access is required, the ladder shall be extended to a suitably guarded platform. The platform should be at least 600 mm wide, span the obstruction and provide safe means of gaining access to the level required.

A1 5.7.4 Access through platforms by means of trap doors

Where access to a ladder is provided by an opening in a platform, protection against the risk of falling through such an opening shall be provided by a trap door or by protective barriers in combination with a gate (see Figure 10).

Protective barriers shall meet the requirements of BS 4592-0:2006, 5.4 and the gate shall be in accordance with Clause 6 of this standard.

The trap door shall be designed so that:

- a) the opening shall be at least equal to the required size of the ladder cage (see 5.5.2);
- b) the trap door shall not open downwards. It shall move upwards or horizontally;
- c) opening the trap door shall be manual and easy;
- d) the trap door shall allow safe passage of the operator whilst in the open position;
- e) closing of the trap door shall be initiated by the operator following safe passage but without the requirement for continued intervention by the operator, e.g., by using springs or hydraulic means such as gas struts;
- f) trap doors shall not be retained in the open position after safe passage of the operator. **A1**

A1

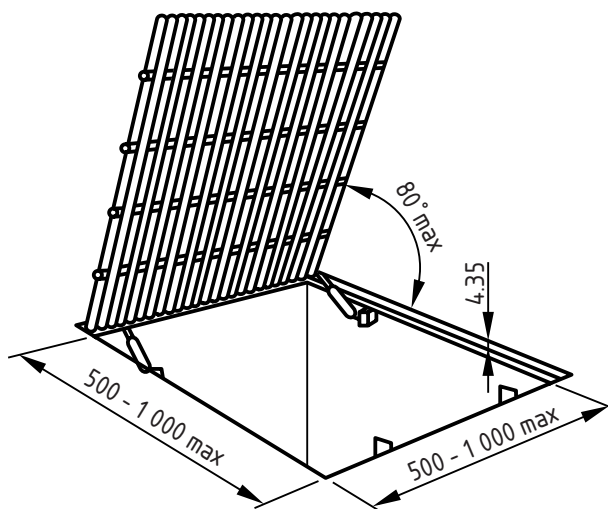


Figure 10 – An example of a self closing trapdoor

NOTE 1 Grating trapdoor made of non-slip composite material fitted with a hydraulic jack to close the system after passage of the user.

NOTE 2 The opening angle of the trapdoor is limited to 80° in order to generate a gravity-induced closing movement in every case.

NOTE 3 The use of the composite material makes it possible to reduce the weight of the trapdoor considerably ($10\text{-}11\text{ kg/m}^2$) without affecting any of the other technical characteristics.

NOTE 4 The double-action hydraulic jack can be regulated to increase or reduce the closing speed.

NOTE 5 In the closed position, the trapdoor rests on a hot-dip galvanized frame made of support angles that will either be welded to the bearing structure or fixed by means of screws and bolts (in the latter case, the frame support angles are pre-drilled in the workshop).

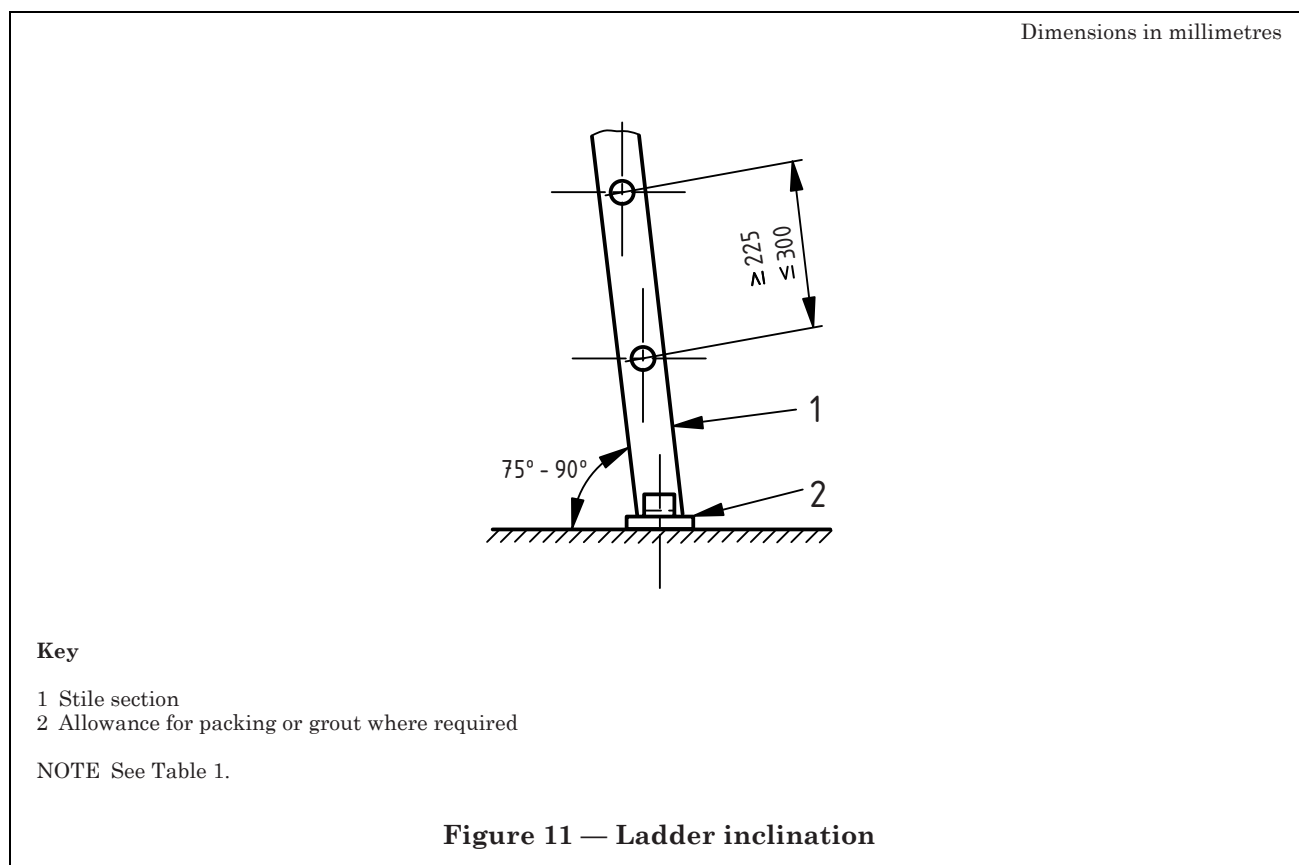
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5.8 Attachment to the structure

5.8.1 Inclination of ladder to structure

The ladder shall be vertical, parallel to the batter of a chimney or inclined towards the structure to which it is fixed at an angle not exceeding 15° from the vertical (see Figure 10).



5.8.2 Stile fixings

The anchor points and connections to them shall be pitched according to Table 1. They shall be capable of supporting a vertical load of 3 kN $\overline{A_1}$ per stile $\overline{A_1}$ together with a pull-out load of 0.5 kN.

Connectors shall be sufficiently close together to give the ladder adequate rigidity so as to restrict to 10 mm lateral movement between connectors in use. Stiles shall be fixed by means of connectors or brackets designed to resist the applied loads and to restrict stile movement at the fixing (see BS EN ISO 14122-4).

Connectors shall be of sufficient length to provide a distance of at least 200 mm from the front of the rungs, or 150 mm to any discontinuous obstacle.

In the case of ladders fixed to high structures or vessels in a continuous vertical length, provision shall be made at fixing points for any differential expansion by retaining a gap between adjacent lengths of stile with a separate fixing on each side of the gap.

A1 6 Safety gates

Potentially hazardous areas, such as a gap between handrails at the head of a ladder provided to allow passage from the ladder to an arrival area, shall be protected by a full depth self closing safety gate.

They shall be designed to open easily and close automatically, e.g., by the use of springs or the effects of gravity. Safety gates should close gently and securely.

They shall be designed to swing open only onto a landing.

They should also be designed to provide the equivalent amount of guarding as any adjacent guarding provided at the arrival area, e.g., by including at least a handrail, knee-rail and toe-plate, as defined in BS EN 14122-3:2001, **3.2**.

Chains shall not be used as a substitute for a safety gate.

NOTE An example of a typical self-closing gate is given in Figure 11.

7 Companionway ladders

7.1 General

Companionway ladders shall consist of a single straight flight of narrow steps between two levels not exceeding 3 000 mm between them (see Figure 12).

NOTE A companionway ladder is generally easier and safer to use than a vertical ladder and subsequently a stair is generally safer and easier to use than a companionway ladder. These types of ladders are usually provided when space is at a premium and the provision of a stair is physically not an available option. Users should be facing the ladder at all times during ascent and descent and carrying large or heavy items should be avoided, in order to allow at least one hand to be free to aid their ascent and descent. Alternative methods of transferring such items between floors are strongly recommended.

Table 3 — Example showing perpendicular distances between tops of strings and centrelines of ladder rails

Angle of pitch (°)	Dimension "X" (mm)
60 minimum	250
65	200
70	150
75 maximum	100

7.2 Dimensions

7.2.1 Rise

The rise for each step throughout the ladder shall be constant wherever possible.

NOTE In cases where it may not be possible to maintain the height of the rise between the level of departure and the first step, this may be reduced by up to a maximum of 15%.

There shall be no fewer than 3 and no more than 13 rises in any one flight. A rise shall be between 220 mm and 250 mm.

7.2.2 Height

The climbing height, "H", of a single flight shall not exceed 3 000 mm.

7.2.3 Going

The minimum going shall be 80 mm.

NOTE The going for each step should be uniform throughout the ladder, to within standard material tolerances. **A1**

7.2.4 Overlap

The overlap of each tread or landing shall be = 10 mm.

7.2.5 Clear spaces

The minimum clear spaces on the user side of a companionway ladder, measured at right angles to the strings shall be 1 200 mm. The front edge of the first step down from the platform level shall be a minimum of 250 mm from any vertical wall or other obstruction.

7.2.6 Strings

Strings shall be sufficiently robust to minimise lateral flexing of the structure and should not project more than 50 mm beyond the nosing of the bottom tread.

7.2.7 Treads

Treads shall be designed in the same way as treads for stairs (see BS 4592-0) and shall have a minimum width of 90 mm with an overlap > 10 mm. When the top surface of the top tread is positioned at the platform level, any gap between the platform and the rear of the tread shall not exceed the minimum dimension of any opening in the platform flooring.

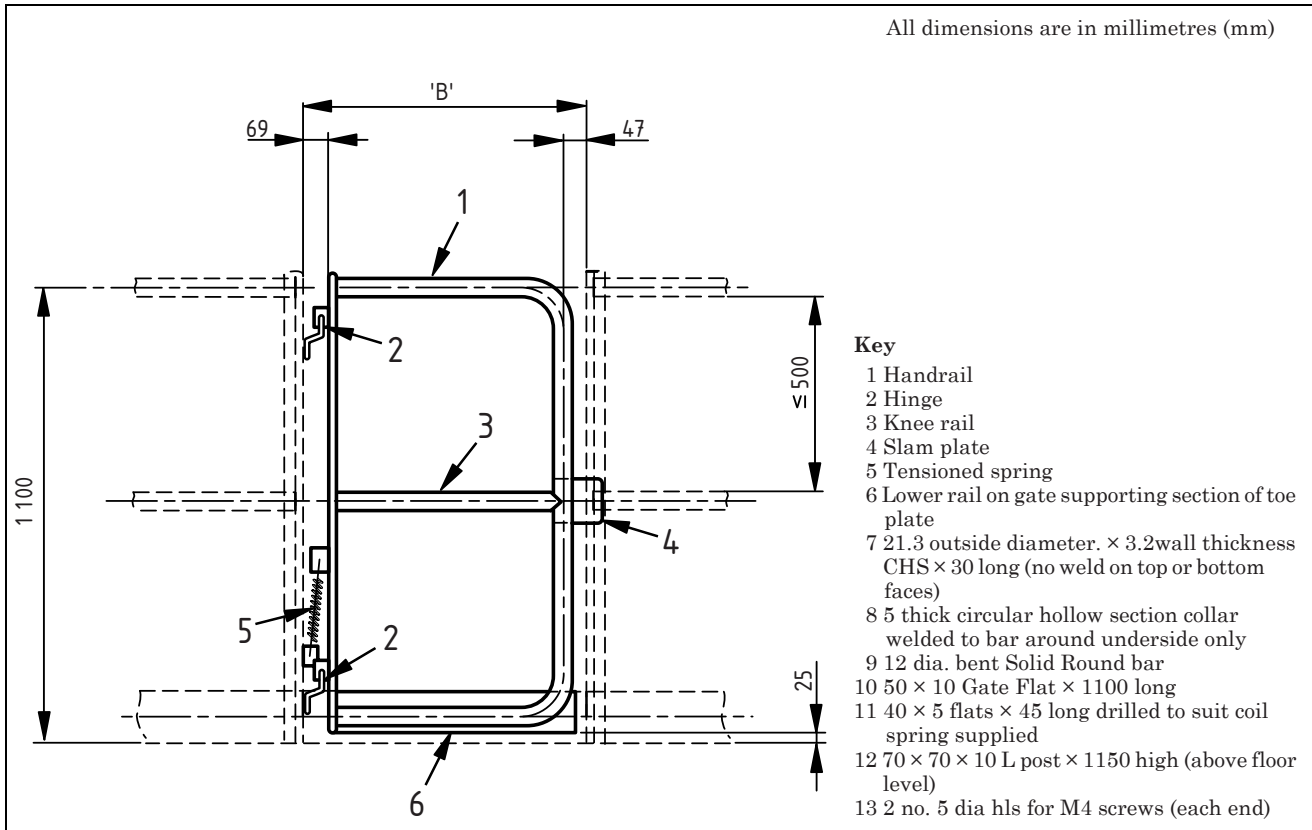
7.2.8 Handrails

A single handrail shall always be provided on each side of a companionway ladder with a minimum clear distance between rails of 540 mm and should widen out at the point of access to the platform to allow a minimum entry space of 600 mm. Where space allows, the clear width between rails should be increased to at least 600 mm throughout the entire flight.

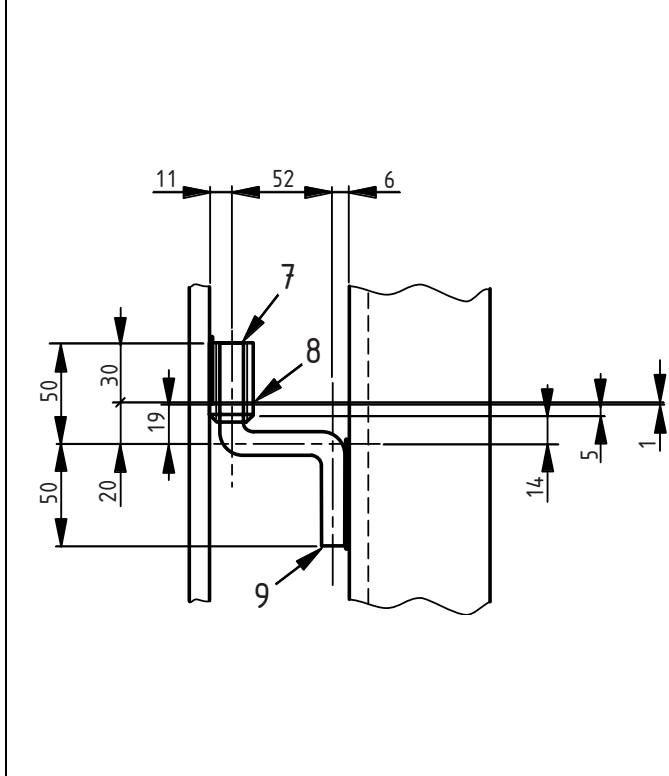
Stanchions supporting handrails shall be positioned at right angles to the strings. They shall be designed to allow the handrails to be positioned 250 mm perpendicularly above the tops of strings for ladders with an angle of pitch of 60° and 100 mm perpendicularly above the tops of strings for ladders with an angle of pitch of 75°. All other distances shall be pro rata to the angle of pitch decided upon (see Table 3 for some examples).

Handrails shall be continuous throughout the entire flight and shall be terminated on each string by being returned to them at a point of at least 1 000 mm measured vertically up from the floor level. **A1**

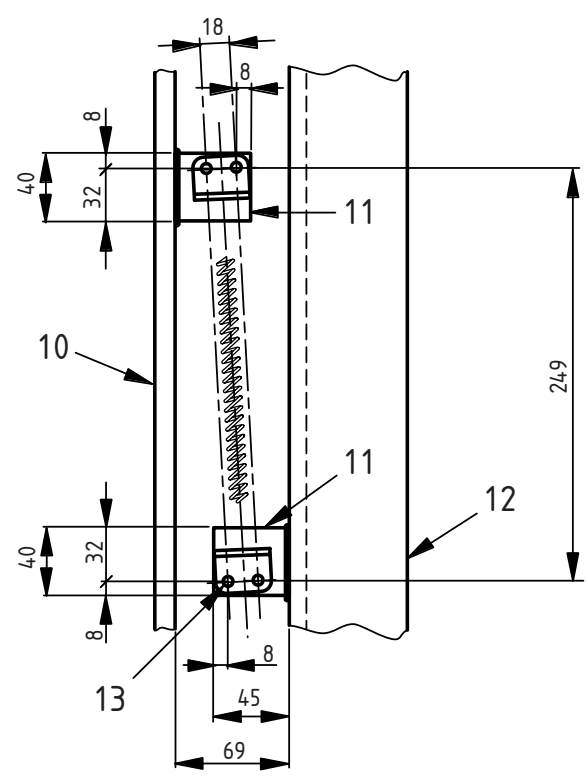
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a) Self closing safety gate at the top of a ladder



c) Hinge detail



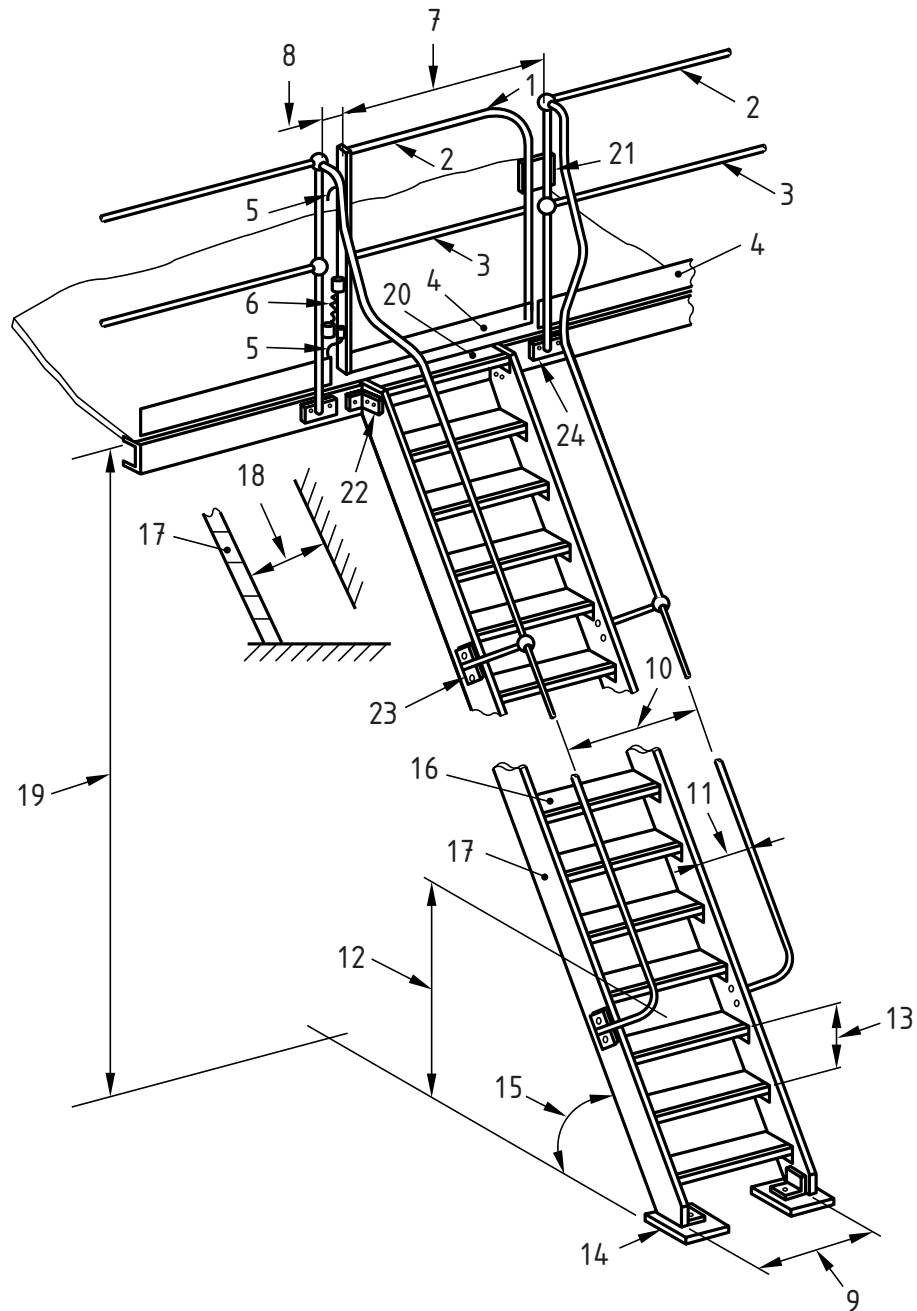
d) Spring detail

Figure 12 – A typical example of a self-closing safety gate

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**Key**

- | | |
|--|---|
| 1 Full depth self-closing safety gate | 13 Rise |
| 2 Handrail | 14 Base grout (25 mm min. depth) |
| 3 Knee-rail | 15 Angle of pitch |
| 4 Toe-plate | 16 Tread |
| 5 Gate hinge | 17 String |
| 6 Gate spring with fittings | 18 Minimum clear space perpendicular to string |
| 7 Minimum clearance when gate is open | 19 Maximum height 'H' between levels |
| 8 Minimum clear space for gate hinges and spring (69 mm) | 20 Top step (either special width top tread or floor extension) |
| 9 Minimum distance between strings (490 mm) | 21 Slam plate attached to safety gate |
| 10 Minimum distance between rails | 22 Top fixing cleat between each string and structure (on inside of string wherever possible) |
| 11 Dimension 'x' (see Table 3) | 23 2 bolt side palm fixing to ladder rail post |
| 12 Minimum distance to rail start point | 24 2 bolt side palm fixing to gate posts |

Figure 13 – Typical companionway ladder

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8 Verification of safety requirements

For verification of the safety requirements of the ladder and any fall protection device, including anchor points, see Clause 5 of BS EN ISO 14122-4.

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¹⁾ Referred to in the Foreword only.

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