

# Chapter 6.6



## Staircases

**This chapter gives guidance on meeting the Technical Requirements for staircases.**

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## Definitions for this chapter

<b>Balustrading</b>	The collective name for the complete assembly of handrails, baserails, newels, spindles and caps.
<b>Common (communal) stair</b>	A staircase serving more than one property.
<b>Continuous handrail</b>	Using lengths of connected handrail, the handrail flows over the tops of newel turnings, creating a continuous run of handrail.
<b>Going</b>	The depth from the front to the back of the tread, less any overlap with the next tread above.
<b>Guarding</b>	A barrier that denies pedestrians or vehicle access to another area, eg the floor below.
<b>General access stair</b>	A stair intended for all users of a building on a day-to-day basis, as a normal route between levels.
<b>Newel post</b>	A post at the head or foot of a flight of stairs, supporting a handrail.
<b>Nosing</b>	The edge of the tread projecting beyond the face of the riser.
<b>Pitch</b>	The angle between the pitch line and the horizontal.
<b>Pitch line</b>	A notional line connecting the nosings of all treads in a flight of stairs.
<b>Private stair</b>	A staircase wholly within one dwelling.
<b>Rise</b>	The vertical distance between the floors or landings connected by a flight. The individual rise is the vertical measurement from the top of a tread to the top of the next tread.
<b>Riser</b>	The board that forms the face of the step.
<b>Spindle</b>	A vertical member, plain or decorative, that acts as the infill between the handrail and baserail.
<b>Staircase</b>	The entire structure relating to a stair, comprising steps, treads, risers, strings, balustrading, landings, etc.
<b>Stairway</b>	The space/void provided for the stairs.
<b>Step</b>	The tread and riser combined.
<b>Tread</b>	The top or horizontal surface of a step.
<b>Utility stair</b>	A staircase used for escape, access for maintenance or purposes other than moving between levels on a day-to-day basis.
<b>Winders</b>	Radiating steps, narrower at one end, that are used to change the direction of stairs through 90° or 180°.

### 6.6.1 Compliance

*Also see: Chapter 2.1*

#### **Staircases shall comply with the Technical Requirements.**

Staircases which comply with the guidance in this chapter and relevant Building Regulations will generally be acceptable. Further guidance can be found in BS 5395-1.

### 6.6.2 Provision of information

#### **Designs and specifications shall be produced in a clearly understandable format, include all relevant information and be distributed to appropriate personnel.**

Staircase design and specification information should be issued to site supervisors, relevant specialist subcontractors and suppliers, and include the following information:

- layout of stairs, landings and position of handrails
- dimensions covering width, rise and going, handrail height, etc
- the type, size and length of fixings, their location and number, and the type of wall and joists/trimmers the stair is being secured to
- landing design and structural support arrangement.

### 6.6.3 Fire precautions

#### **Where required for fire escape, staircases shall be suitably designed.**

Staircases should be designed to meet relevant Building Regulations, taking into account the fire resistance of components and smoke ventilation. Further guidance can be found in BS 9991 and BS 9999.

6.6.4 Lighting

Also see: Part 8

Staircases shall be adequately lit.

Artificial light sources should be provided to all staircases and landings within homes and common areas, and be controlled by two-way switching. Alternatively, automatic light-sensitive controls may be used.

6.6.5 Glazing

Also see: GGF Safety and Security Glazing Good Practice Guide

Glazing near staircases (where contact could be made by someone using the stairs) shall be suitable for its location.

Where staircases are located close to glazing, any glass below the minimum guarding height, or within a zone where a user may make impact, the glass should either not break or be designed to break safely. The glazing should be at least one of the following:

- protected by a balustrade or railing (balustrade spacing should be a maximum of 75mm)
- toughened or laminated glass
  - constructed using glass blocks.

6.6.6 Structural design

Staircases shall be properly supported and transmit loads to the supporting structure without undue movement, deflection or deformation.

Staircases should be designed and comply with relevant Building Regulations and Table 1.

Table 1: Standards for stair construction

Type of staircase	Relevant standard	Additional guidance
Timber staircases (straight flights, ¼ or ½ landings)	BS 585: Part 1 or 2	The stair and landing support method and fixings should be specified  See also Chapter 3.3 Timber preservation (natural solid timber)
Reinforced concrete staircases	BS EN 1992-1-1	Should be designed by an engineer in accordance with Technical Requirement R5  See also Chapter 3.1 Concrete and its reinforcement
Steel staircases	BS EN 1993-1-1	See also Chapter 6.5 Steelwork
Proprietary staircases		Proprietary staircases should meet Technical Requirement R3

Timber stud walls may require additional noggings to provide appropriate fixing locations, and block walls should be sufficiently robust to support the required loads and to receive appropriate fixings. It should be noted that stairs generally are unable to be secured to metal stud walls.

Differential movement

When considering differential movement in relation to setting out, levels and finishes, allowances should be made for:

- casting/fabrication tolerances
  - deflection under load
  - foundation settlement
- creep and thermal movement
  - storey height.

6.6.7 Headroom and width

Staircase openings shall be adequately sized.

Stairs should have a minimum of 2m clear head room (H) over the entire length and width of the stairway and landing, as measured vertically from the pitch line or landing.

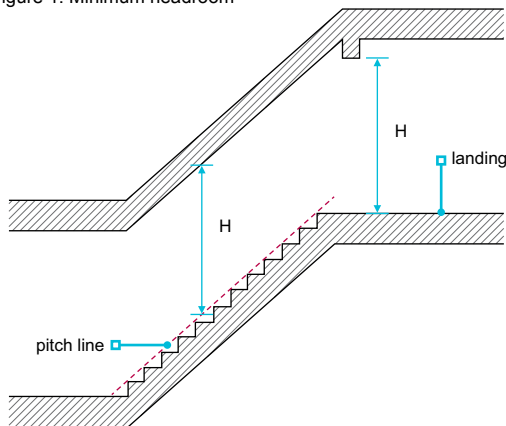
Staircases should have the minimum width as required by the relevant Building Regulations.

The overall floor opening should be checked off plan and on site prior to the stairs being installed:

- for size to accept the stairs, with sufficient clearance to enable installation
- to allow for sufficient headroom.

Where staircases form part of a means of escape, reference should be made to the relevant Building Regulations.

Figure 1: Minimum headroom



### 6.6.8 Design of steps

Also see: BS 5395

Steps shall be constructed to allow the safe use of the staircase. Issues to be taken into account include:

- 1) pitch
- 2) steps
- 3) tapered treads and winders.

#### 6.6.8.1 Pitch

The maximum angle of pitch of a stairway should not exceed:

- 42° for private stairs.

The dimensions for maximum rise and minimum going should meet relevant Building Regulations.

Private stairs should have a maximum rise of 220mm and minimum going of 220mm (225mm minimum going in Scotland).

Stairs should be dimensioned so that the rise (R) and the going (G) is between 550mm and 700mm when using the equation:  
 $2R + G$ .

Staircases should be accurately located and fixed with the string at the correct angle to ensure all treads are level.

#### 6.6.8.2 Steps

In each flight:

- treads should be level
- the rise and going of steps should be equal
- account should be taken of the thicknesses of screeds (floor finishes that reduce the bottom rise by a maximum of 12mm are acceptable)
- the treads should overlap by a minimum of 16mm (15mm in Scotland) where the riser is open
- open risers should not permit a 100mm sphere to pass through and are not permitted for common stairs.

Figure 3: Equal risers

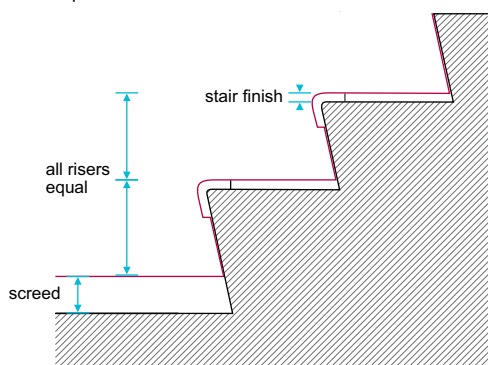


Figure 2: Pitch line

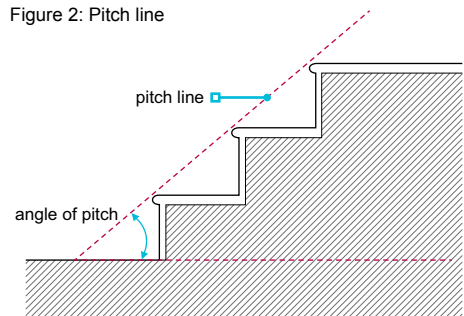
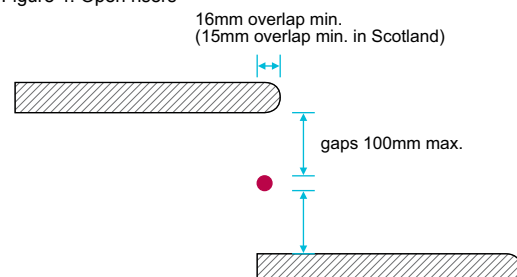


Figure 4: Open risers



Where stairs are open to the weather, designers should consider that grip may be affected by inclement weather, and one of the following should be specified:

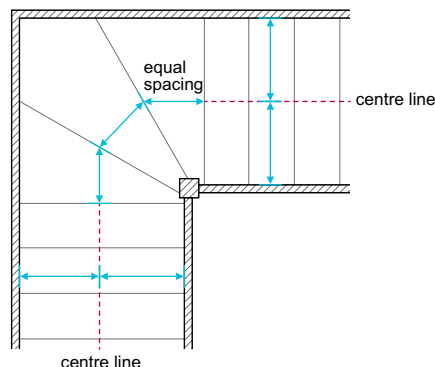
- a non-slip finish
- a non-slip insert to each tread.

### 6.6.8.3 Tapered treads and winders

The rise of tapered treads should be consistent throughout the staircase. The going should be:

- uniform and no less than the going of the associated straight flight
- a minimum of 50mm at the narrowest point
- measured in accordance with the relevant Building Regulations.

Figure 5: Measuring tapered treads (staircase less than 1m wide only)



### 6.6.9 Landings

**Landings shall allow safe use of the staircase.**

Landings should be:

- constructed in accordance with the design
- properly supported and transmit loads to the supporting structure without undue movement, deflection or deformation
- framed to provide full support and solid fixings for the tops of flights, nosings, newels, apron linings, etc

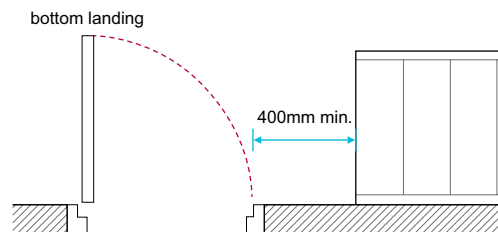
Door swings should not obstruct landings. A door may open across the bottom landing of private stairs where the swing is a minimum of 400mm from the first tread.

Pivot windows should not obstruct the landing area or stair flight when they are opened.

Landings should typically be:

- provided at the top and bottom of every flight
- level and at least the same depth and width as the width of the stair.

Figure 6: Landings next to doors (bottom of stairs only)



### 6.6.10 Guarding

**Staircases shall have adequate guarding and be constructed to reduce the risk of being climbed or falling through.**

Guarding:

- is required where the drop is more than 600mm at any point along the open sides of stairs and landings
- may be required where a stair abuts an opening window, to comply with relevant Building Regulations.

Guarding should be:

- provided along the full length of the flight, including landings
- capable of resisting forces, in accordance with Table 2 and BS 6180
- a solid wall or balustrading
- positioned at a height, in accordance with Table 3.

**Table 2:** Minimum horizontal imposed loads for parapets, barriers and balustrades for residential usages

Type of occupancy	Example use	Horizontal uniformly distributed line load (kN/m)	Uniformly distributed load applied to the infill (kN/m <sup>2</sup> )	A point load applied to part of the infill (kN)
Domestic and residential activities	All areas within or serving exclusively one single family dwelling including stairs, landings, etc but excluding external balconies and edges of roofs	0.36	0.5	0.25
	Other residential ie, houses of multiple occupancy and balconies, including juliette balconies and edges of roofs in single family dwellings	0.74	1.0	0.5

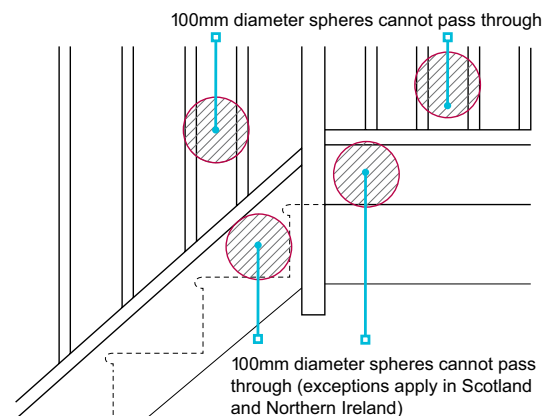
**Table 3:** Guarding height

Type of stairs	Flights — minimum guarding height (mm)	Landings — minimum guarding height (mm)
Private stairs (England, Wales, Northern Ireland and the Isle of Man)	900	900
Private stairs (Scotland)	840–1,000	900
Common stairs	900	1,100

Balustrading should:

- be fixed securely
- not be climbed easily by children, eg have no horizontal foot holds which would enable climbing
- not permit a 100mm diameter sphere to pass through any opening (in Scotland and Northern Ireland, the space between a rise in a stair and the lowest edge of the protective barrier may be larger than 100mm, provided the lowest edge of the barrier is not more than 50mm above, and parallel to, the pitch line of the stair).

Where guardrails or balustrades are long, newel posts may not be sufficient to transfer the horizontal forces to the structure, and intermediate posts may be required. The method of fixing newels should be specified, eg through-bolted to joists or alternative supports to an engineered design.

**Figure 7:** Protective guarding


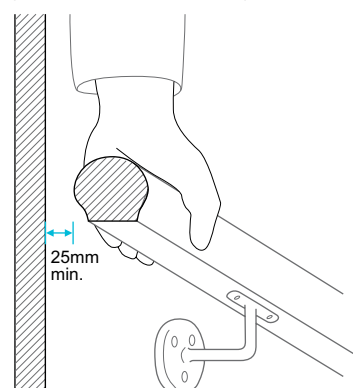
### 6.6.11 Handrails

Also see: BS 5395-1

**Handrails shall be correctly located and fixed to provide a firm handhold.**

A handrail is required for flights of stairs that rise over 600mm. The handrail (throughout the full length) should:

- be securely fixed and located in accordance with the design
- be a vertical distance of 900mm–1,000mm (or 840mm–1,000mm in Scotland) above the pitch line
- have a 25mm minimum clearance from any surface
- ensure a firm handhold
- have rounded ends or be returned to the wall to reduce the risk of clothing being caught
- be continuous and unobstructed
- have a smooth finish and be free from rough or sharp edges, including brackets or fixing heads.

**Figure 8:** Minimum clearance gap


For tapered treads/winders, where handrails to the outside of the stairs are provided, they should provide a safe handhold for the full rise of any stairs with a total rise greater than 600mm.

In England, Wales and Scotland, where the staircase has between one and four tapered treads/winders, the newel post may be used to provide a safe handhold. In Northern Ireland, a handrail should be fitted to the outside of all tapered stairs.

Figure 9: Handrail provision

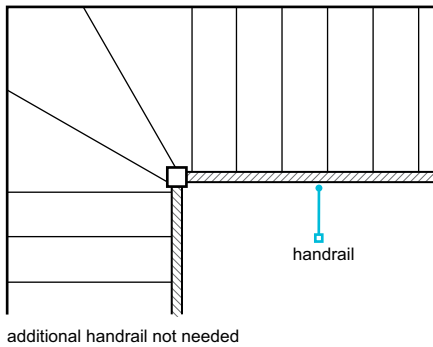


Figure 10: Handrail provision

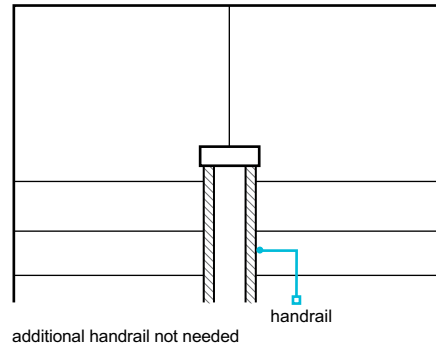


Figure 11: Handrail provision

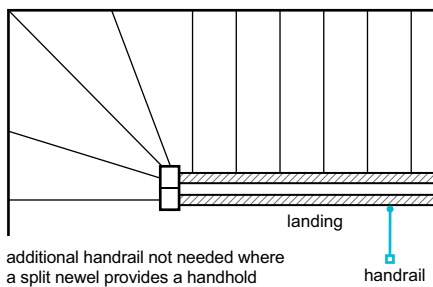
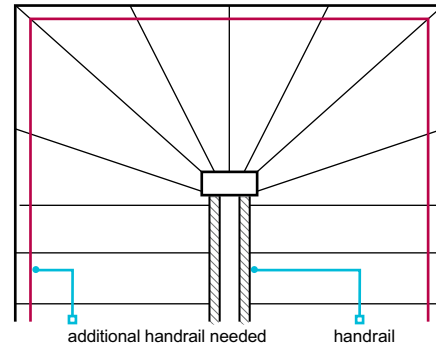


Figure 12: Handrail provision



In England, Wales and Scotland, a handrail is not required on the outside of the stairs if the newels provide a safe handhold. There should be a minimum distance between newels of 100mm to provide a hand grip.

Figure 13: Handrail provision

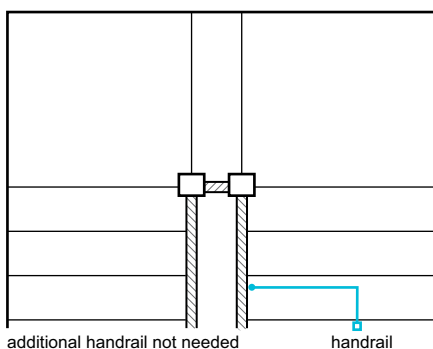
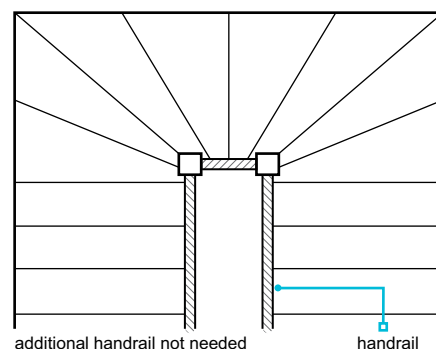


Figure 14: Handrail provision

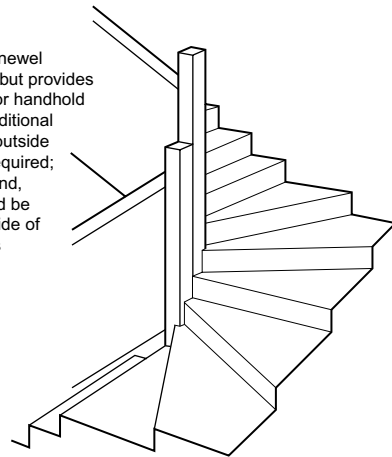




Where a handrail is needed, it should be continuous for the whole rise to avoid the need to change hands. At corners, the handrails do not need to join if they extend into the corner and provision is made for an easy transfer of a handhold from one handrail to another.

Figure 15: Handrail provision

where a double newel is not full height but provides a single newel for handhold purposes, no additional handrail on the outside of the stairs is required; in Northern Ireland, a handrail should be fitted to the outside of all tapered stairs



Also see: Chapter 3.3, British Woodworking Federation Stair Scheme Installation Guide Timber Stairs and BS 585 Parts 1 and 2

### 6.6.12 Staircases made from timber and wood-based products

**Staircases made from timber products shall be suitable for their intended purpose and of suitable quality.**

Timber staircases should be adequately fixed to the supporting structure.

Stair strings should be fixed to the wall in accordance with guidance supplied by the manufacturer or published in the British Woodworking Federation Stair Scheme Installation Guide Timber Stairs.

Where light gauge steel framing (LSF) is intended to be used to support staircases, the stud manufacturer should be consulted to ensure the framing can adequately support the staircase loads.

The wall string should be cut to sit over the floor joist to land evenly on the floor or landing.

The top nosing should be:

- level with the floor decking
- screwed into the joist.

Newel posts should be plumb, and all components, including strings, treads and risers, newel posts, balustrading and handrails, fixed securely. Particular attention should be given to fixing winders.

Strings should be glued to the newel posts and secured with dowels or screws.

Staircase fixing requirements should not impede any fire or acoustic requirements for the supporting structure.

Landings should be:

- constructed in accordance with the design
- properly supported and transmit loads to the supporting structure without undue movement, deflection or deformation

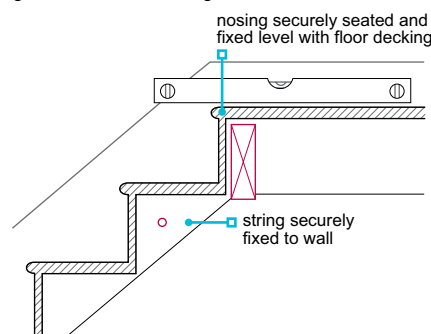
Timber external staircases, landings and any necessary support should be:

- preservative treated or have adequate natural durability in accordance with Chapter 3.3 Timber preservation (natural solid timber)
- constructed in accordance with guidance from the Timber Decking and Cladding Association Code of Practice: Raised timber deck structures on new homes.

Finished joinery should be free from splits, knocks and other damage which would impair its structural performance or finish.

Nails should be punched below the surface of the wood and stopped. Further guidance can be found in BS 1186-2.

Figure 16: Staircase fixing



### 6.6.13 Concrete staircases

Also see: Chapters 3.1 and 3.2

**Staircases made from concrete shall be suitable for their intended purpose and be of suitable quality.**

Concrete staircases should be designed and manufactured in accordance with BS EN 1992-1-1.

#### Precast construction

Precast staircases should comply with BS EN 14843, and account should be taken of:

- accurate location and levelling of units
- load paths.

#### In-situ construction

Guidance for in-situ concrete can be found in Chapter 3.1 Concrete and its reinforcement.

Shuttering for concrete elements or connections should be constructed to ensure a consistent rise and going.

Chairs or spacing blocks should be used to provide cover to reinforcement in accordance with Chapter 3.1 Concrete and its reinforcement.

Formwork should be struck in accordance with the design information.

Design information on the spacing of bolt fixings for balustrades or handrails should be followed.

Balustrading for concrete staircases should be:

- grouted into the preformed holes or pockets
- bolted to brackets cast into the concrete.

Care should be taken when using expanding fixings near the edges of concrete.

### 6.6.14 Steel staircases

Also see: Chapter 6.5

**Staircases made from steel shall be suitable for their intended purpose and of suitable quality.**

Steel staircases should be designed in accordance with BS EN 1993-1-1.

For steel staircases:

- the manufacturer's assembly and erection instructions should be available and followed
- protective coatings should be provided in accordance with Chapter 6.5 Steelwork.
- the supporting structure should be constructed within relevant tolerance limits set for the steel staircase

### 6.6.15 Proprietary staircase units

**Proprietary staircases shall be suitable for their intended purpose and of suitable quality.**

Proprietary staircases and associated components should comply with the Technical Requirements.

### 6.6.16 Protection

**Stairs shall be free from damage and unsightly marks.**

Staircases should be protected to prevent damage and unsightly marking during construction.

When storing staircases, they should be:

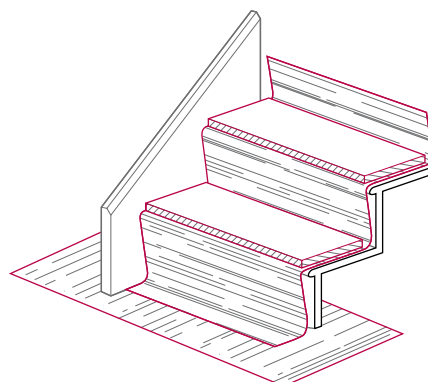
- stacked on bearers
- suitably protected from the weather.

Timber staircases should be fixed in place only when the building is weathertight.

Staircases, stair treads, nosings, balustrades and handrails may be protected with timber strips, plywood or building paper.

Timber staircases may be also affected by residual moisture contained within a concrete floor; an isolating DPC may be provided directly below the staircase to offer protection.

Figure 17: Timber staircase protection



### 6.6.17 Further information

- *BS 5395-1 Stairs — Code of practice for the design of stairs with straight flights and winders*
- *BS 5395-2 Stairs, ladders and walkways — Code of practice for the design of helical and spiral stairs*
- *BS 585-1:1989 Wood stairs — Specification for stairs with closed risers for domestic use, including straight and winder flights and quarter or half landings*
- *BS 585-2:1985 Wood stairs — Specification for performance requirements for domestic stairs constructed of wood-based materials*