

Chapter 6.6

Staircases



6.6 Staircases

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SCOPE

This Chapter gives guidance on meeting the Technical Requirements and recommendations for staircases.

DESIGN STANDARDS

6.6 - D1 Design shall meet the Technical Requirements

Design that follows the guidance below will be acceptable for staircases.

STATUTORY REQUIREMENTS

6.6 - D2 Design shall comply with all relevant statutory requirements

Design should be in accordance with relevant Building Regulations and other statutory requirements.

SAFE TRANSMISSION OF LOADS

6.6 - D3 Design shall ensure that loads are properly supported and transmitted to the supporting structure without undue movement, deflection or deformation

Generally, all stairs and staircases should comply with BS 5395 : Parts 1 and 2.

Items to be taken into account include:

(a) timber staircase construction

Timber domestic staircases with straight flights and quarter- or half-landings should comply with BS 585. Particular attention should be paid to the performance requirements for strength, deflection and vibration under load, given in BS 585 : Part 2.

The method of fixing flights to the surrounding structure should be specified.

(b) concrete staircase construction

Reinforced concrete staircases should be designed to BS EN 1992-1-1 and comply with Chapter 2.1 'Concrete and its reinforcement' (each section) and, where appropriate, designed by an Engineer in accordance with Technical Requirement R5.

(c) steel staircase construction

Steel staircases should be designed to BS EN 1993-1-1.

(d) proprietary staircase construction

Proprietary staircases should:

- comply with an assessment in accordance with Technical Requirement R3
- be suitable for their required use and location.

(e) differential movement

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

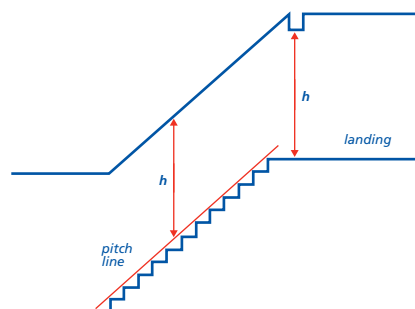
- casting tolerances
- deflection under load
- foundation settlement
- creep and shrinkage
- storey height.

STAIRCASE WIDTH AND HEADROOM

6.6 - D4 Staircase design shall ensure adequate provision for:

(a) headroom

The minimum headroom above stairs should be measured vertically from the pitch line. The clear headroom (h) over the entire length and width of a stairway, including landings, should be 2.0m.



(b) minimum unobstructed width

No recommendations are given for minimum widths in England, Wales and the Isle of Man. Where staircases form part of means of escape, reference should be made to the relevant Building Regulations.

Dimensions for stair widths in Scotland and Northern Ireland should be in accordance with relevant Statutory Requirements.

DESIGN OF STEPS

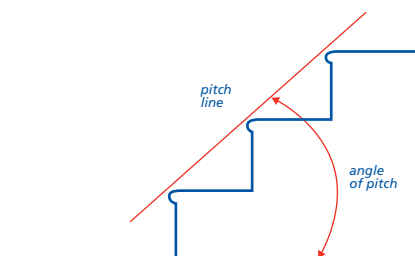
6.6 - D5 The design of steps shall allow safe use of the staircase

Items to be taken into account include:

(a) pitch

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

- 42° for private stairs
- 38° for common or access stairs.



The dimensions for maximum rise and minimum going should be:

Type of stairs	Maximum rise [mm]	Minimum going [mm]
Private stairs	220	220
Common stairs (not Scotland)	190	250
Access stairs (Scotland)	190	250

The dimensions of the rise (R) and the going (G) should usually be related so that $2R+G$ is between 550mm and 700mm.

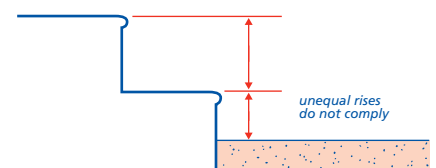
A design aid giving the relationship between rise and going is given in Appendix 6.6-A.

Further information on staircase design may be found in BS 5395.

(b) consistent rise and going

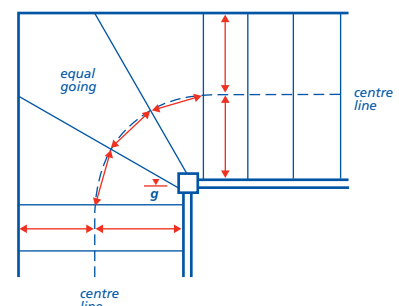
In each flight of stairs all the steps should have the same rise and going.

The thicknesses of screeds and floor finishes should be taken into account.



(c) tapered treads and winders

The rise of tapered treads should be the same as that of adjacent parallel treads. The going should be uniform and not less than the going of the associated straight flight. The going should be measured from the centre line of the straight flight (as shown below).

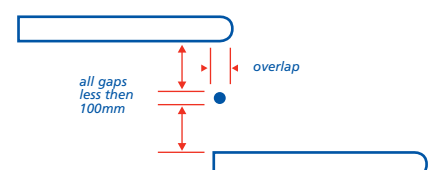


	Minimum going (g) [mm]
England and Wales	50
Scotland	50
Northern Ireland	50
Isle of Man	50

(d) safe foothold

All steps should have level treads.

Stairs with open risers should have treads that overlap 16mm minimum.



Where stairs are open to the weather or may otherwise become wet, a non-slip finish or an insert to each tread should be specified.

6.6 Staircases

LANDINGS

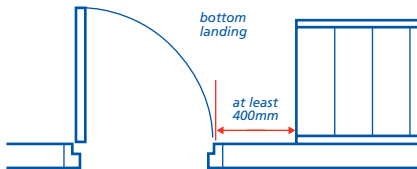
6.6 - D6 Landings shall be designed to allow safe use of the staircase

Landings should be provided at the top and bottom of every flight. The width and depth of landings should be at least the same as the width of the stair.

Landings should be properly framed to provide full support and secure fixings for flights, nosings, newels, etc.

Where pivot windows are being used, they should not obstruct the landing area or stair flight when in the open position.

Generally, door swings should not obstruct landings. However, a door may open across the bottom landing of a flight of private stairs if the swing is at least 400mm from the first tread and the dwelling is not over two storeys high.

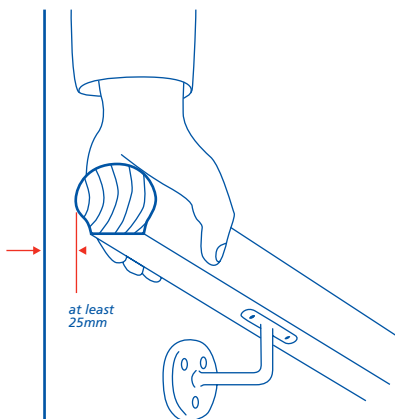


HANDRAILS

6.6 - D7 Handrails shall be designed to provide a safe handhold

A handrail is required to all flights of stairs that rise over 600mm.

Where winders are used, Building Regulations (Northern Ireland) require a handrail to be fitted on the side where tapered treads have the greater going.



Handrails should be at a height between 900mm (840mm in Scotland) and 1000mm.

Design should ensure:

- a firm handhold
- that trapping or injuring the hand is prevented
- a minimum 25mm clearance at the back of the handrail
- secure fixing

- that handrail ends do not project to catch clothing, etc.

GUARDING

6.6 - D8 Guarding shall be designed to prevent accidents by falling

Items to be taken into account include:

(a) resistance to loads

Guarding should be:

- capable of resisting a horizontal force of 0.36kN/m at its minimum required height
- a solid wall or balustrading.

Where guardrails or balustrades are long, the newel posts may not be sufficient to transfer horizontal forces to the structure and intermediate posts may be needed.

The method of fixing newels should be specified (eg through-bolted to joists).

Any glazing in the guarding should be toughened or laminated glass, or glass blocks. Wired glass is not regarded as safe for this purpose and should not be used.

(b) dimensional requirements

Guarding should be provided along the full length of the open sides of all stairs and landings when the drop is more than 600mm at any point. To comply with relevant Building Regulations, guarding may be required where a stair abuts an opening window.

Guarding is not needed when the rise is less than 600mm and when the stair or landing is not a means of escape.

Balustrading should be designed so that it is not easily climbed by children.

No opening in the balustrade should be large enough for a 100mm diameter sphere to pass through.

Type of stairs	Minimum guarding height [mm]	
	flights	landings
Private stairs (England, Wales, Northern Ireland and the Isle of Man)	900	900
Private stairs (Scotland)	840	900
Common stairs	900	1100

FIRE PRECAUTIONS

6.6 - D9 Staircases shall provide the necessary means of escape in case of fire

Timber staircases are acceptable within a single family dwelling where there are no more than four storeys, excluding the basement.

Houses of three or more storeys and flats in buildings of three or more storeys

should comply with the relevant Building Regulations.

Ventilation of staircases serving flats in buildings of three or more storeys should comply with BS 5588.

LIGHTING

6.6 - D10 Lighting shall be provided to ensure safe use of the staircase

Artificial light sources should be provided to all staircases and landings. Within dwellings, lighting to stairs should be controlled by two way switching.

Where the Public Lighting Authority specify and maintain control of entrance lighting, their requirements should be met. Otherwise, landings and staircases in common areas to dwellings should be provided with adequate artificial lighting. Manual two way switching, controlled by people using these areas is acceptable. Automatic light sensitive controls may be used, provided lights can also be switched two way manually.

Reference should be made to Chapter 8.1 'Internal services' (Design) for further details on lighting.

Where staircases are lit by glazing, any glass below the minimum height of guarding (see Table to Clause D8(b)) should be:

- protected by a balustrade or railing, or
- glass (toughened or laminated), or
- constructed of glass blocks.

PROVISION OF INFORMATION

6.6 - D11 Designs and specifications shall be produced in a clearly understandable format and include all relevant information

Usually, staircase drawings and specifications should show:

- layout of stairs
- dimensions covering width, rise and going, handrail height, etc
- fixings of stairs, treads, risers, strings, balustrades, newel posts and handrails, as appropriate
- the length of time before formwork can be removed from in-situ concrete stairs
- whether precast concrete or steel staircases can be used immediately after erection or whether time should be allowed to cure grouted connections.

6.6 - D12 All relevant information shall be distributed to appropriate personnel

Ensure that design and specification information is issued to site supervisors and relevant specialist subcontractors and/or suppliers.

MATERIALS STANDARDS

6.6 - M1 All materials shall:

- (a) meet with Technical Requirements
- (b) take account of the design

Materials that comply with the design and the guidance below will be acceptable for staircases.

Materials for staircases should comply with all relevant standards, including those listed below. Where no standard exists, Technical Requirement R3 applies (see Chapter 1.1 'Introduction to the Standards and Technical Requirements').

References to British Standards and Codes of Practice include those made under the Construction Products Directive (89/106/EEC) and, in particular, appropriate European Technical Specifications approved by a European Committee for Standardisation (CEN).

STAIRCASE UNITS

6.6 - M2 Proprietary staircases and associated components shall comply with the design and Technical Requirements

Where proprietary staircases or associated components are proposed, they should meet the statutory and design requirements for stairs, as detailed in the drawings and/or specification.

Manufacturers of staircases and balustrading, etc should be sent all relevant drawings and other information to ensure their products meet the design requirements.

Allowance should be made for tolerances or actual site dimensions.

TIMBER AND WOOD-BASED PRODUCTS

6.6 - M3 Timber and wood-based materials shall be of sufficient quality and durability for use in staircases

Items to be taken into account include:

(a) timber

Timber for joinery should:

- comply with BS 1186 : Part 1
- be Class 3 or better, and
- be free of resinous knots, splits, shakes and wanes.

Fits of joints, construction of joints, moving parts, glueing, laminating, construction of finger joints and surface finish should be to BS 1186 : Part 2.

Timber which is to be exposed to the weather should be suitably durable or be pre-treated with preservative against fungal attack in accordance with Chapter 2.3 'Timber preservation (natural solid timber)'.

(b) plywood

Plywood should be used only for risers and should comply with BS EN 636.

(c) chipboard

Chipboard should comply with Type P5 of BS EN 312.

(d) oriented strand board

Oriented strand board should comply with Type OSB3 of BS EN 300.

(e) medium density fibreboard

Fibre building boards should comply with BS 1142 : Part 2.

(f) laminated timber

Glued laminated timber structural members should comply with BS 4169.

IN-SITU AND PRECAST CONCRETE

6.6 - M4 Concrete shall be of the mix proportions to achieve adequate strength as required by the design

Reference should be made to Chapter 2.1 'Concrete and its reinforcement' (Design and Materials) for guidance on concrete, reinforcement and additives.

FIXINGS

6.6 - M5 Fixings shall be of adequate strength and durability and comply with the design

Fixings should be checked for compliance with the design and whether they are provided by the supplier, especially for:

- timber and steel staircases
- newel posts
- handrails
- guarding and balustrading.

SITWORK STANDARDS

6.6 - S1 All sitework shall:

- (a) meet the Technical Requirements
- (b) take account of the design
- (c) follow established good practice and workmanship

Construction that follows the design and the guidance below will be acceptable for staircases.

LOCATION AND FIXING

6.6 - S2 Staircases shall be correctly located and fixed

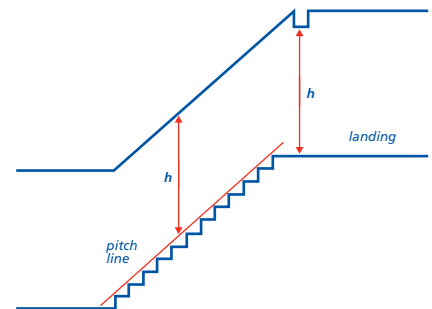
Items to be taken into account include:

(a) headroom

The overall floor opening should be checked for size to accept the stairs and to allow sufficient headroom.

The minimum headroom above stairs should be measured vertically from the pitch line. The clear headroom (**h**) over

the entire length and width of a stairway, including landings, should be 2.0m.



(b) overall vertical rise

Staircases are normally manufactured off site so the floor-to-floor dimensions should be accurate. An allowance should be made for floor finishes to structural floors or staircase treads.

(c) pitch

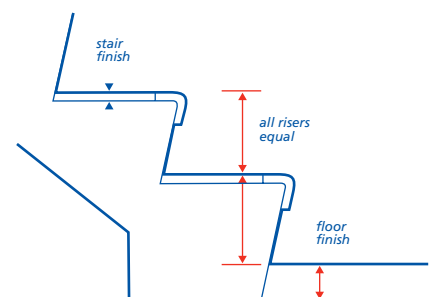
Staircases should be accurately located and fixed with the string at the correct angle so all treads are horizontal.

(d) landings

Landings, where required, should be properly framed to provide full support to and secure fixings for flights, nosings, newels, apron linings, etc.

(e) floor finishes

Allowance should be made for stair and floor finishes to ensure that all risers are equal.



TIMBER STAIRCASES

6.6 - S3 Timber staircases shall:

- (a) have secure component parts, including strings, treads and risers, newel posts, balusters and handrails
- (b) be securely fixed to the supporting structure

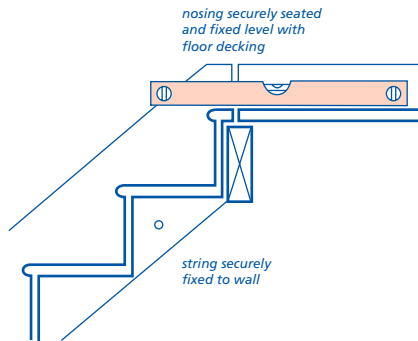
Strings should be glued to newel posts and secured with dowels or screws. Particular attention should be given to winders; remedying problems, such as deflection and/or squeaking, can be difficult, especially if the soffit covering has been fixed.

Landings should be framed to provide full support and solid fixings for the tops of flights, nosings, newels, apron linings, etc.

6.6 Staircases

Newel posts should be plumb and fixed securely.

The top nosing should be level with the floor decking and should be fixed firmly.



6.6 - S4 Finished joinery shall be free from unsightly blemishes

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

Handrails should have a smooth finish, free from rough edges. No handrail bracket or screw head should present a sharp edge.

Nails should be punched below the surface of the wood and stopped.

CONCRETE STAIRCASES

6.6 - S5 The structure shall be set out and constructed to ensure that staircases are correctly located and levelled

PRECAST CONSTRUCTION

When setting out levels, account should be taken of the thickness of finishes to the floor or landing, as well as any finish to be applied to the stair treads. Particular care is needed at the top and bottom of each flight.

Precast units should be accurately located and levelled.

IN-SITU CONSTRUCTION

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

FLOOR FINISHES

For both precast and in-situ staircases, allowance should be made for the thickness of finish at the top and bottom of flights.

6.6 - S6 Concrete staircases shall be constructed to provide satisfactory final performance

Items to be taken into account include:

(a) correct placing of reinforcement to give the required cover

Chairs or spacing blocks should be used to give the following minimum cover to reinforcement:

	Minimum cover [mm]
Internal staircases	25
Staircases open to the weather	50

(b) allowance for nosings and any cast-in finishes

Allowance should be made for pre-formed nosings or non-slip finishes, if specified (see also Clause S5).

(c) correct striking of formwork

Formwork should be struck in accordance with the design, normally:

- side formwork - after 24 hours
- soffit and support formwork - after 28 days.

6.6 - S7 Appropriate measures shall be taken when concreting in cold weather

Reference should be made to Chapter 1.4 'Cold weather working' when concrete, mortar, grout or other materials containing water are used.

STEEL STAIRCASES

6.6 - S8 The supporting structure shall be accurately set out to receive steel staircases

The supporting structure should be constructed within the tolerance limits set for the steel staircase. Treads should be checked for level. The correct fixings should be available.

6.6 - S9 All work shall be carried out strictly in accordance with manufacturers' instructions

Manufacturers' assembly and erection instructions should be available and followed.

HANDRAILS AND BALUSTRADES

6.6 - S10 A handrail shall be correctly located and fixed to provide a safe handhold

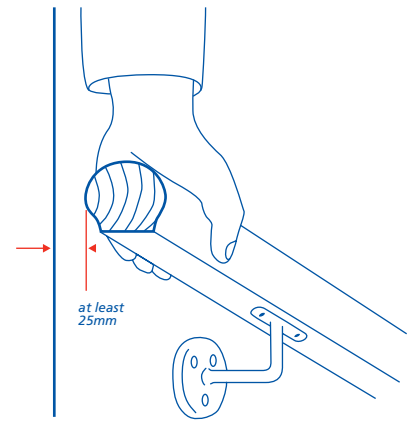
A handrail should be provided for any flight that rises 600mm or more. The handrail should be fixed between 900mm (840mm in Scotland) and 1000mm vertically above the pitch line.

The ends of the handrail should be shaped or returned to the wall to prevent clothes catching on projections.

Throughout its whole length the handrail should be:

- fixed securely
- continuous
- smooth and unobstructed
- at least 25mm from any surface.

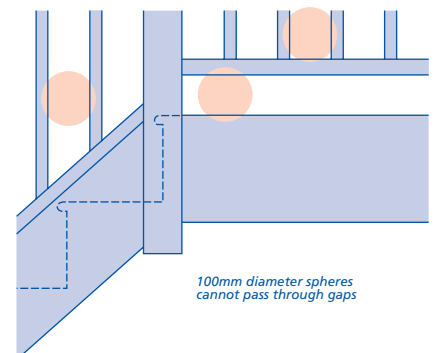
Check that fixing and location are in accordance with the design.



6.6 - S11 Balustrading shall be securely fixed and constructed to reduce the risk of it being climbed up or fallen through

Statutory regulations require that balustrading:

- is fixed securely
- cannot be easily climbed, and
- has no gaps which would allow a 100mm diameter sphere to pass through.



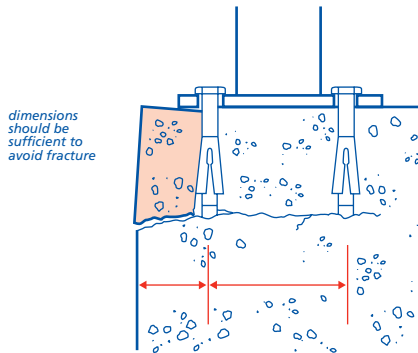
In concrete staircases, balustrading may be:

- grouted into pre-formed holes or pockets
- bolted or screwed into pre-drilled holes
- bolted to brackets cast into the concrete.

Fixing methods for balustrading should allow a degree of tolerance. It may be preferable to take measurements from the completed staircase, whether of in-situ or precast construction, before manufacturing the balustrading. This will ensure that the fixings are positioned correctly and allow for variations in the surrounding structure.

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

Care should be taken when using expanding fixings near the edges of concrete (whether in-situ or precast).

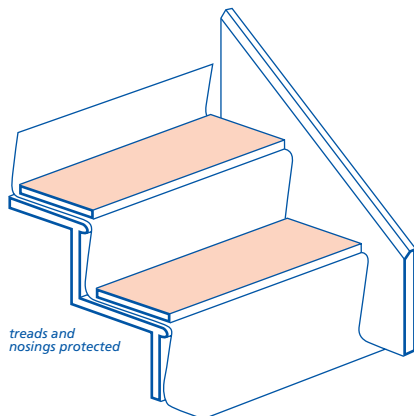


PROTECTION OF FINISHED WORK

6.6 - S12 On completion, staircases shall be undamaged, fixed properly and suitable for handover

When stored, staircases should be stacked on bearers. Wood staircases should be stored under cover and be fixed in place only when the building is weathertight.

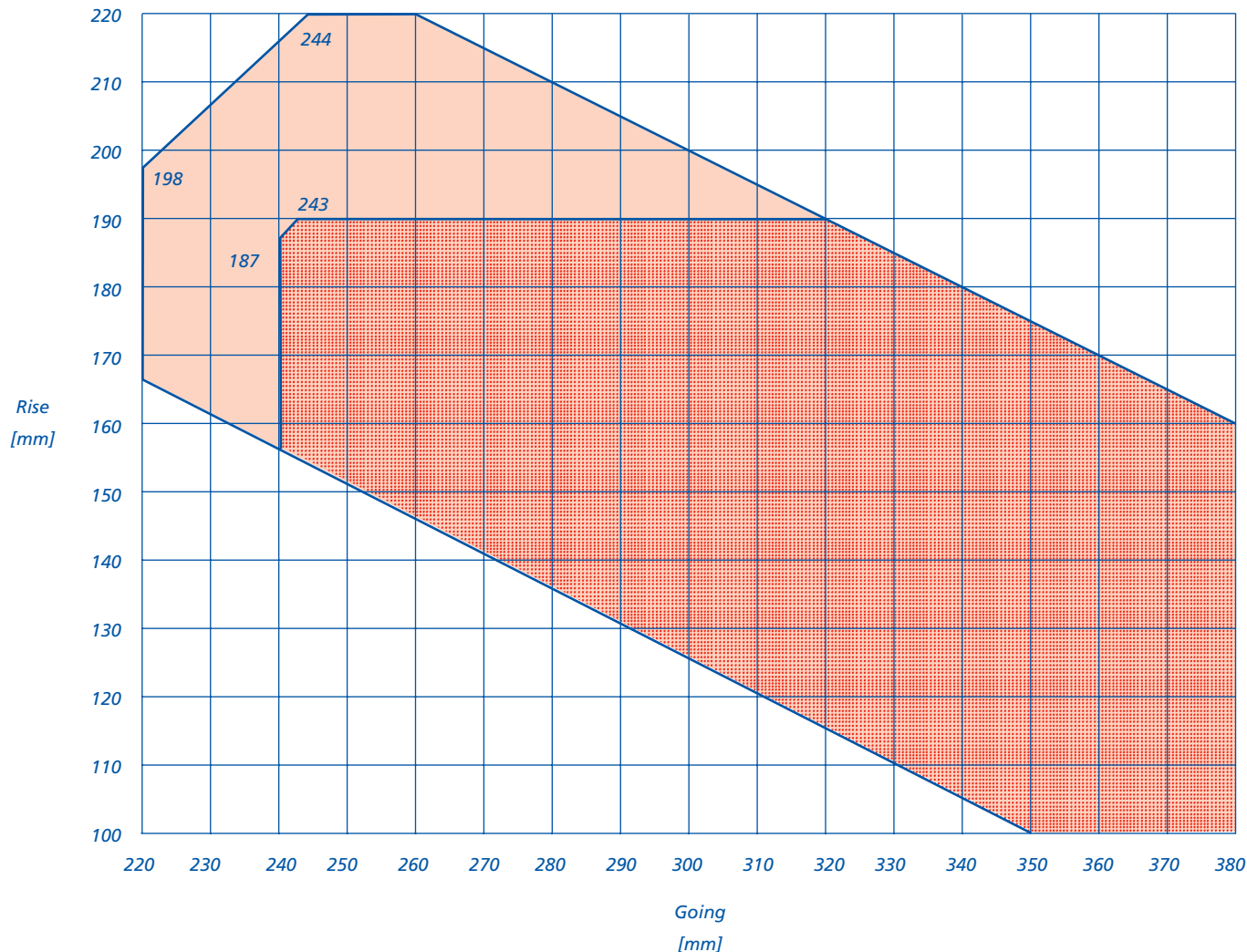
Staircases, stair treads, nosings, balustrades and handrails may be protected with timber strips, plywood or building paper. Plastic sheeting should not be used to protect stairs because it gives a slippery surface which is not safe to walk on.



APPENDIX 6.6-A

Design aid for rise and going

Rise and going which intersect within the relevant shaded areas meet the criteria 2R+G between 550mm and 700mm.



Key
Private stairs - whole of shaded area
Common stairs - hatched area only
Based on Figure 11 in BS 5395 : Part 1.

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