standard

4.3

mandatory

Every *building* must be designed and *constructed* in such a way that every level can be reached safely by stairs or ramps.

4.3.0 Introduction

Half of all accidents involving falls within and around *buildings* occur on stairways, with young children and elderly people being particularly at risk. This risk can be greatly reduced by ensuring that any change in level incorporates basic precautions to guard against accident and falls.

Stairs and ramps should be *constructed* to be within limits recognised as offering safe and convenient passage and designed so that any person who is likely to use them can do so comfortably and safely, with the minimum amount of difficulty. Design should also address the issue of appropriate guarding, where a level change is made, and seek to eliminate any possible trip hazards.

Explanation of terms

The following terms are explained to provide clarity to their meaning in the Technical Handbooks.

Private stair means a stair wholly within a *dwelling*. It may also apply to any stair within the *curtilage* of a single *dwelling*, which is not accessible to the public. This might include, for example, a stair from a *dwelling* to a private garden, or a stair providing access to or within a domestic garage. It should not, however include any external stair that forms a part of an accessible route to the *dwelling*.

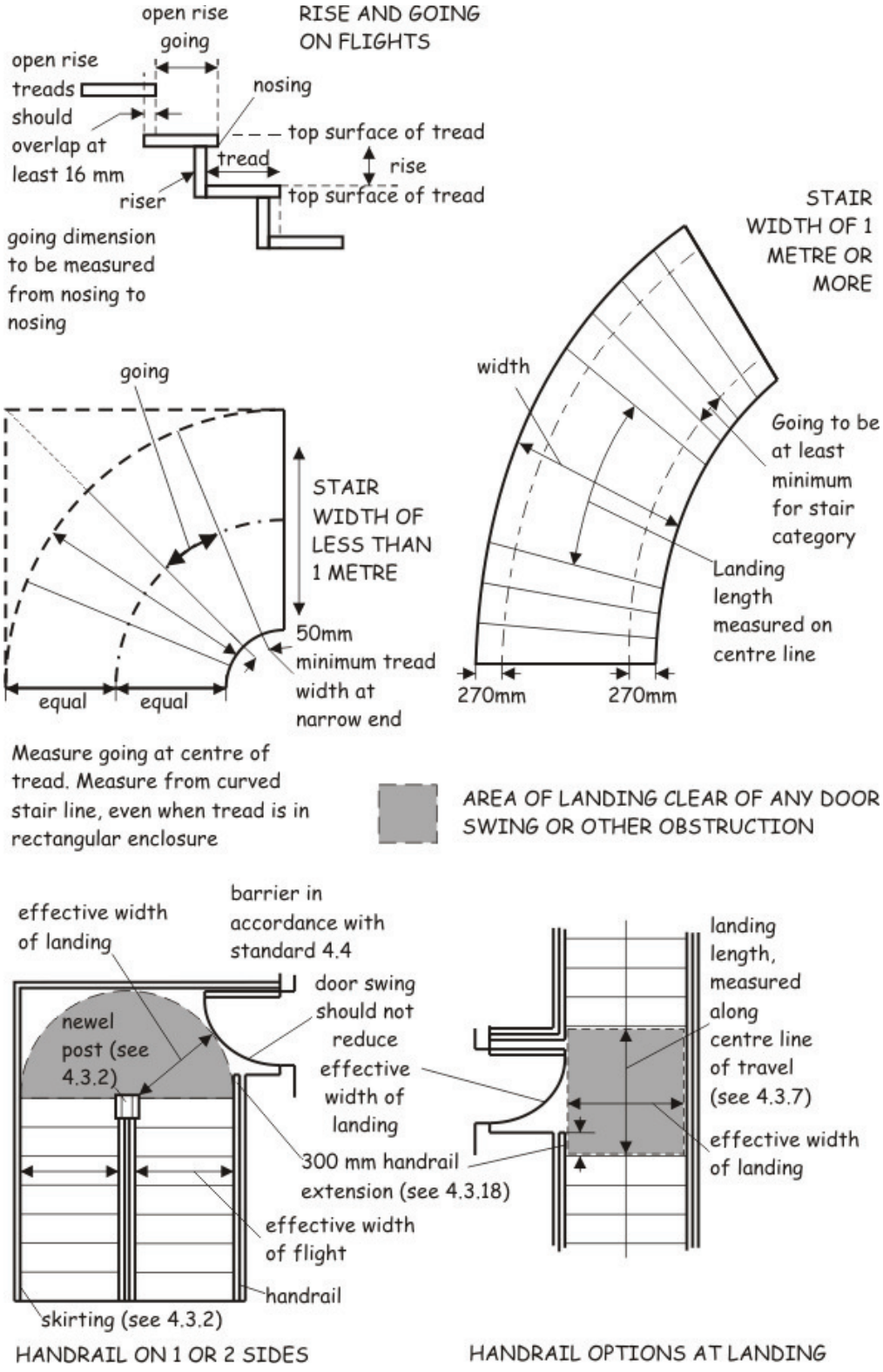
Tapered tread means a stair tread in which the nosing is not parallel to the nosing of the tread or landing next above.

Conversions

In the case of conversions, as specified in regulation 4, the *building* as *converted* shall meet the requirements of this standard in so far as is *reasonably* practicable, and in no case be worse than before the *conversion* (regulation 12, schedule 6).

4.3.1 Measurement for stairs

Measurement for stairs



4.3.2 Rise, going, tread and pitch of stairs

The geometry of a stair *flight* can have a significant effect on the ability of people to use a stair safely and conveniently and limits should be placed on the rise and going of a stair, and steepness of pitch.

The pitch of a *private stair flight* may be steeper than that of a public *flight* (any other stair) in recognition that users, as occupants, will be more familiar with the stair through frequent use.

To provide safe and convenient access, the rise, going, tread and pitch of a *flight* in a stair should be in accordance with the following table:

Stair geometry – private stair

Minimum rise (mm)	Maximum rise (mm)	Minimum going (mm)	Tread	Maximum pitch
100	220	225	not less than going	42º

Stair geometry – Any other stair, including to a domestic building or within the common area of a building containing flats or maisonettes

Minimum rise (mm)	Maximum rise (mm)	Minimum going (mm)	Tread	Maximum pitch
100	170	250	not less than going	34º

Notes:

1. All rises in a *flight* should be of uniform height;
2. In a straight *flight*, or in a part of a *flight* that is straight, measurement should be uniform along the centreline of the *flight*;
3. Where a *flight* consists partly of straight and partly of tapered treads, the going of the tapered treads should be uniform and should not be less than the going of the straight treads;
4. The going measured at the narrow end of a tapered tread should be at least 50 mm (see diagram to clause 4.3.1);
5. The aggregate of the going and twice the rise should be at least 550 mm and not more than 700 mm. For example, stairs provided with the minimum going of 250 mm would result in rises of at least 150 mm;
6. The maximum rise and minimum going on a *private stair* should not be used together as this will result in a pitch greater than the recommended maximum;
7. Clause 4.2.10 should be referred to for exceptions where a *private stair* should meet the above recommendations for ‘any other stair’.

The most comfortable combination of rise and going varies between individuals but in general, a going in excess of a minimum value, resulting in a figure in the upper end of the range in note 5, above, will increase both safety and amenity.

4.3.3 Width of stair flights and landings

The clear, or effective, width of a stair should allow users to move up and down unhindered and, on stairs giving access to a *dwelling* or *domestic* building, permit people to pass on a flight.

The effective width should be measured between handrails or, where there is no handrail present, between any walls or protective barriers. It should be clear of obstructions, as described in the diagram to clause 4.3.1. The effective width of a stair should be in accordance with the recommendations of the following table:

Effective widths of flights and landings

Private Stair	Any other stair
900 mm [1], such as from one *storey* to another or connecting levels within a *storey;* or 600 mm where serving only *sanitary accommodation* and/or one room, other than accessible *sanitary* accommodation, a *kitchen* or an enhanced apartment.	1.0 m generally, such as to an external *flight* to a *domestic building* or a common access within a *building* containing *flats* or maisonettes; or 900 mm to an external *flight* serving a single *dwelling,* to which the public have access.

Notes:

1. The effective width of a *private stair* may be 800 mm where a continuous handrail is fitted to both sides of a *flight*.

The projection of any stringer or newel post into this width should be not more than 30 mm.

Stair lifts

A stair lift may be fitted to a *private stair* and may project into the effective width of the stair. However in such cases, at least 1 handrail should be present as described in clause 4.3.14 and, when not in use, the installation should:

a. permit safe passage on the stair *flight* and any landing; and
b. not obstruct the normal use of any door, doorway or circulation space.

Clause 4.2.8 gives guidance on the space to be provided adjacent to a stair *flight* to accommodate a future stair lift installation.

4.3.4 Number of rises in a flight

The act of climbing stairs can be tiring to many people. Whilst landings can provide a safe resting point, the *flight* itself is not intended to do so. The maximum number of rises between landings should therefore be limited.

Generally, a *flight* should have not more than 16 rises.

Below a minimum number of steps, it becomes difficult to signal a change of level, which can contribute significantly to a trip hazard.

Generally, a *flight* should have at least 3 rises.

However people tend to take greater care at certain locations, such as at an external door, and a single step or 2 steps may be appropriate under certain circumstances. There may be less than 3 rises:

a. other than at an accessible entrance, between an external door of a *building* and the ground or a balcony, conservatory, *porch* or private garage; or
b. wholly within an *apartment* other than where affecting provisions within an enhanced apartment (see clause 3.11.2); or
c. wholly within *sanitary* accommodation, other than accessible *sanitary accommodation* (see clause 3.12.3); or
d. between a landing and an adjoining level where the route of travel from the adjoining level to the next *flight* changes direction through 90º (i.e. on a quarter landing as the first step).

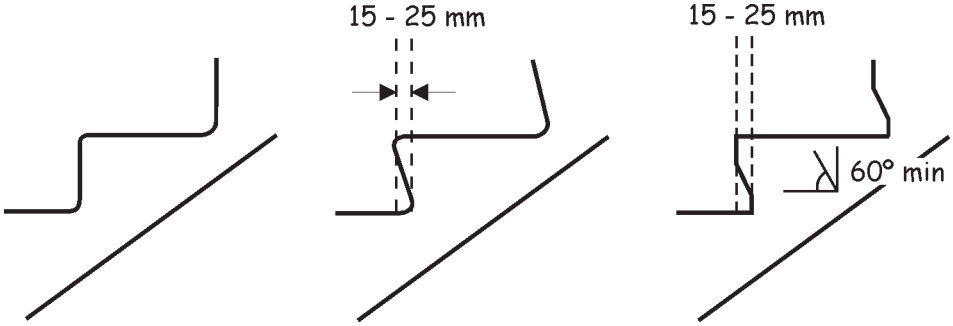
4.3.5 Risers and treads

All stairs providing access to and within *buildings* should be designed to be accessible by most persons with reduced mobility.

Open risers on a *flight* can be a hazard. When ascending a stair, people may be at risk of trapping the toes of shoes beneath projecting nosings, and of tripping as a result. In addition, many may feel a sense of insecurity when looking through spaces present between treads.

A stair should have contrasting nosings to assist in identifying the position of treads and risers should be profiled to minimise tripping as shown below. Open rises should not be used unless a stair is intended for descent only, such as in a dedicated *escape stair* on an *escape* route.

Diagram – Step profile examples



However a *private stair* may be *constructed* with open risers and without contrasting nosings as occupants will be more familiar with the stair through frequent use.

Small children can climb or fall through gaps in stair treads and the size of such gaps should be limited to prevent this. In a *flight* with open rises, the treads should overlap by at least 15 mm. Any opening between adjacent treads in a *flight* should be small enough to prevent the passage of a 100 mm sphere.

4.3.6 Stair landings

Clear space is needed to the head and foot of any stair *flight* to allow people to move between a *flight* and an adjacent level surface safely. People may also wish to pause on stairs, particularly during ascent, and any intermediate landing should provide a temporary respite and be of a size to allow this whilst still permitting others to pass safely.

A stair landing should:

- be provided at the top and bottom of every *flight.* A single landing may be common to 2 or more *flights;* and
- be level except, in external locations, for any minimal crossfall necessary to prevent standing water; and
- have an effective width of not less than the effective width of the stair *flight* it serves; and
- be clear of any door swing or other obstruction, other than to a *private* stair, as noted below.

Length of a landing

The minimum length of a stair landing, measured on the centreline of travel, should be either 1.2 m or the effective width of the stair, whichever is less. However where, on an intermediate landing, a change of direction of 90º or more occurs, the centreline length need not be measured if the

effective width of the stair is maintained across the landing.

On landings to external stair flights, where tactile paving is used, the minimum length of landing should be 1.2 m.

Flights not needing a landing

Other than at an accessible entrance, a landing need not be provided to a *flight* of steps between the external door of:

- a *dwelling* and the ground, balcony, conservatory, *porch* or private garage, where the door slides or opens in a direction away from the *flight* and the total rise is not more than 600 mm; or
- a dwelling, or *building* ancillary to a dwelling, and the ground, balcony, conservatory, or porch, where the change in level is not more than 170 mm, regardless of method of door operation.

Obstructions

On a *private* stair, other than on an intermediate landing, common to 2 flights:

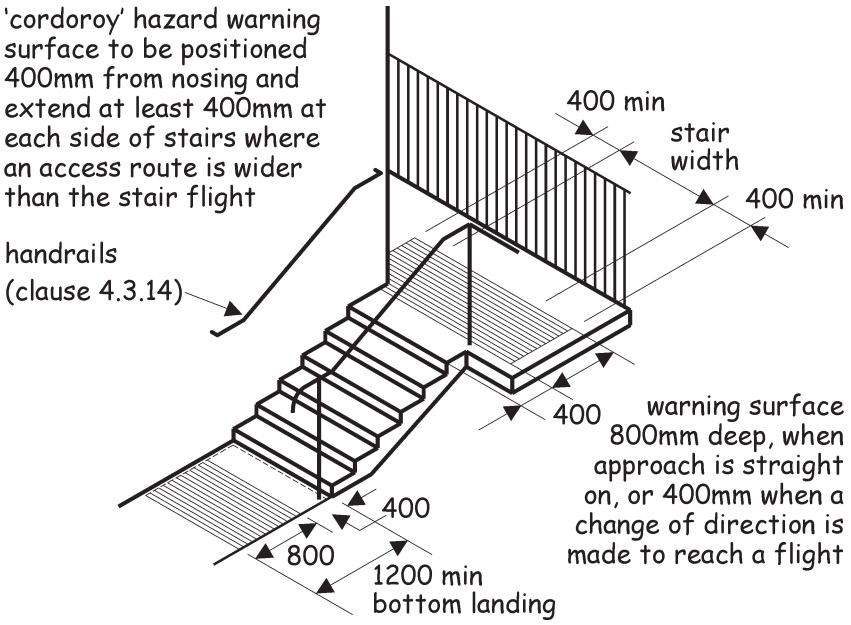
- a door to a cupboard or duct may open onto a top landing if, at any angle of swing, a clear space of at least 400 mm deep is maintained across the full width of the landing;
- a door may open on to a bottom landing, if, at any angle of swing, a clear space of at least 400 mm deep is maintained across the full width of the landing and the door swing does not encroach within space designated for future installation of a stair lift (see clause 4.2.8).

4.3.7 Warning surfaces to landings of external steps

A sudden and unguarded change of level on an access route can present a hazard to a person with a visual impairment. Therefore, on external routes serving more than one dwelling, tactile paving should be used to alert people to the presence of a *flight* of steps.

The use of 'corduroy' tactile paving identifies this hazard and advises users to 'proceed with caution'. It should be provided at the head and foot of any *flight* of external steps, forming a strip 800 mm deep, positioned 400 mm from the first step edge, as noted below.

Use of corduroy tactile paving



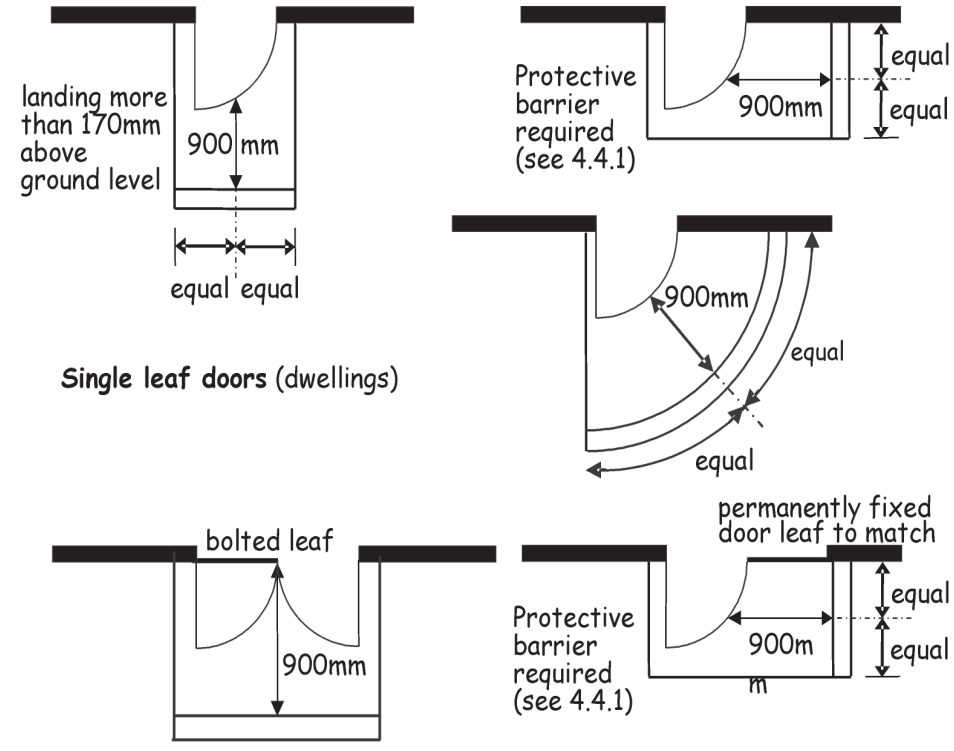
On any landing mutual to a *flight* of steps and a ramp, tactile paving should lie outwith the landing area of any ramp flight, to prevent possible confusion which might lead to injury.

General information on use of tactile paving, including options on intermediate landings, is given in 'Guidance on the Use of Tactile Paving Surfaces'.

4.3.8 Stair landings serving outward opening fully glazed doors

Conservatories and similar extensions are an increasingly prevalent addition to many *dwellings*. If the *conservatory* or extension is intended to be the accessible entrance, the guidance to standard 4.1 should be followed. If the entrance is not the accessible entrance and has an outward opening fully *glazed* door, a landing, of a length shown in the following diagram should be in accordance with the guidance in clause 4.3.6. These recommended landing lengths may also be appropriate for fully *glazed* doors leading from a *dwelling* directly into a *conservatory*.

Landings serving outward-opening fully glazed doors



Single leaf doors (dwellings)

Double leaf doors (dwellings)

4.3.9 Stair flights consisting of both straight and tapered treads

On that part of a *flight* consisting of tapered treads, the going of the tapered treads should be uniform and should not be less than the going of the straight treads. At the inner end of the tread, the going should be at least 50 mm. Tapered treads on a stair should be *constructed* in accordance with BS 585: Part 1: 1989, Appendices B1 and B3, irrespective of material or whether it contains open rises. However guarding should be in accordance with the guidance in clause 4.4.2.

In a *flight* less than 1 m wide the going should be measured at the centre line of the *flight* as described in clause 4.3.1. In a *flight* 1 m wide or more the going should be measured at 2 points, 270 mm from each end of the tread, as described in clause 4.3.1 and the minimum going should be at least the going of the straight treads.

4.3.10 Stair flights consisting wholly of tapered treads

Stairs formed from tapering treads, particularly where forming a spiral, can present greater difficulties in use for many people than straight flights. There should be an appropriate level of safety and amenity on such stairs, particularly where used as a primary means of access.

A *flight* consisting wholly of tapered treads, forming a helix or spiral, should be *constructed* to give safe passage. To achieve this, it should be *constructed* in accordance with the guidance in BS 5395: Part 2: 1984, but account should be taken of the following guidance clauses:

- minimum and maximum rise should be as recommended in clause 4.3.2; and
- the effective width should be as recommended in clause 4.3.3; and
- the maximum number of rises on a *flight* should be as recommended in clause 4.3.4; and
- other than on a *private* stair, risers and treads should be as recommended in clause 4.3.5; and
- handrails should be as recommended in clauses 4.3.14 and 4.3.15; and
- protective barriers should be as recommended in clause 4.4.2.

4.3.11 Pedestrian ramps

Surfaces with a gradient of 1 in 20 to not more than 1 in 12 are considered to be ramps and recommendations are made on such surfaces to ensure the safety and amenity of users. Gradients of more than 1 in 12 are considered too steep to negotiate safely and are not recommended.

Steep gradients require both greater effort to ascend and more care when descending. As a general principle, the steeper the gradient of a ramp, the shorter the *flight* should be. A pedestrian ramp should be *constructed* in accordance with the following table:

Gradient, length and rise of a flight in a pedestrian ramp

Maximum gradient of *flight*	Maximum length of *f light*	Maximum rise
1 in 20	10 m	500 mm
1 in 15	5 m	333 mm
1 in 12	2 m	166 mm
More than 1 in 12	Not recommended	not recommended

Notes:

1. The maximum *flight* length for a particular gradient can be interpolated as follows: 3 m long for a gradient of 1 in 13, 4 m long for a gradient of 1 in 14, and so on.

4.3.12 Width of ramps flights

The width of a ramp should relate to the intensity of use. For example, an unobstructed width of 1.8 m is the minimum that will allow two wheelchair users to pass safely. As a ramp *flight* will normally be enclosed between flanking handrails or guarding, it is important that this width still offers safe and convenient passage.

The effective width of a ramp *flight* should be at least 1.0 m. Effective width is measured between handrails, or where there are no handrails, the protective barrier or inside face of any wall or guarding kerb, and should be clear of any obstructions.

4.3.13 Ramp landings

Clear space is needed to the head and foot of any ramp *flight* to allow people to move between a *flight* and an adjacent level surface safely. This should permit manoeuvring of a wheelchair without obstructing passage or the need to encroach into circulation routes or onto a ramp flight.

A ramp landing should:

- be provided at the top and bottom of every *flight.* A single landing may be common to 2 or more *flights;* and
- be level except, in external locations, for any minimal crossfall necessary to prevent standing water; and
- have an effective width not less than the effective width of the *flight* it serves; and
- be clear of any door swing or other obstruction.

The unobstructed length of a landing should be not less than 1.5 m, to allow space for wheelchairs or prams to stop after travelling down a *flight* and to provide manoeuvring space.

Where the entire length of a series of ramp *flights* is not visible from either the top or bottom landing, intermediate landings should have an effective width of not less than 1.8 m, to provide passing places during ascent or descent.

4.3.14 Handrails to stairs and ramps

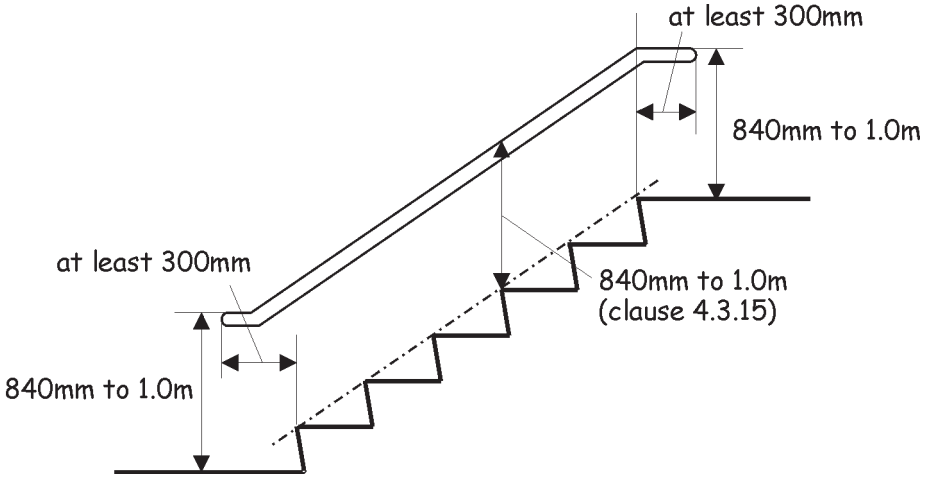
Handrails to a stair and ramp *flights* will provide support and assist safe passage. As the full width of a *flight* may be used, either by people passing or by person who favours one side, a handrail should generally be provided to both sides of a stair or ramp flight.

A handrail should be provided to both sides of any *flight* where there is a change of level of more than 600 mm, or where the *flight* on a ramp is longer than 2 m. However:

- handrails may be omitted to the *flight* of a ramp, serving a single dwelling, where the change in level is less than 600mm; and
- a handrail need only be provided to one side on a *flight* of a *private* stair.

Where a handrail is provided to only one side of a *private stair* flight, the side on which a handrail is not fixed should permit installation of a second handrail at a future date. A second handrail will provide additional support to a person using the stair and may be installed provided a clear width of 800 mm is maintained.

Handrails to stairs and ramps



The extension of a handrail at landings allows an individual to steady themselves before ascending or descending. For a person with impaired vision, the change in slope of the handrail and its return into a wall can also signal the start or finish of a flight.

A handrail on a stair or ramp *flight* should:

a. extend at least 300 mm beyond the top and bottom of the *flight* as shown in the diagram above. However the 300 mm extension may be omitted where the handrail abuts a newel post; and
b. have a profile and projection that will allow a firm grip; and
c. end in a manner, such as a scrolled or wreathed end, that will not present a risk of entrapment to users; and
d. contrast visually with any adjacent wall surface.

However only sub clause b need be provided on a *private stair* or to a ramp providing access within a single dwelling, as users are likely to be familiar with the layout and use of the flight.

A stair or ramp that is more than 2.3 m wide should be divided by a handrail, or handrails, in such a way that each section is at least 1.1 m and not more than 1.8 m wide. This does not apply to a stair between an entrance door to a *building* and ground level, where not forming part of an *escape* route.

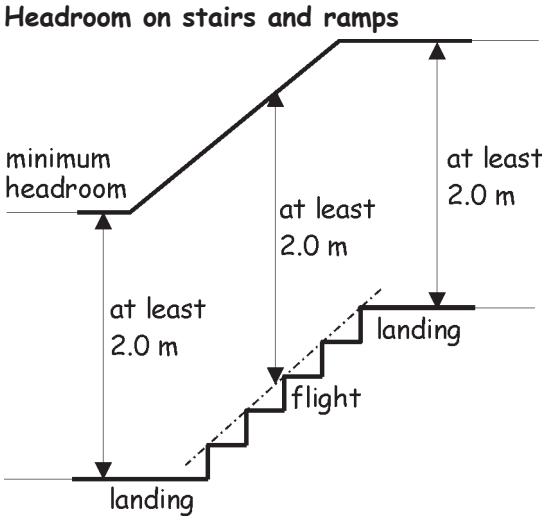
4.3.15 Height of handrails

A handrail should be fixed at a height of at least 840 mm and not more than 1.0 m, measured vertically above the pitch line of a *flight* on a stair or ramp and on a landing where a handrail is provided.

4.3.16 Headroom on stairs and ramps

A *flight* or landing on a stair or ramp should have clear headroom of at least 2.0 m extending over the whole of the effective width. Height should be measured vertically from the pitch line of the *flight* or from the surface of the landing.

In a *dwelling* where any portion of a *flight* or landing lies outwith the area needed to maintain the effective width of a *flight* or landing, a reduction in headroom may be considered, provided that no dangerous obstructions or projections are created.



4.3.17 Industrial stairs and fixed ladders

An industrial stair or fixed ladder serving an area in any *building* to which only limited access is provided should be *constructed* so as to offer safe passage. This method of access is not for public use and would only be expected to be provided in places such as plant-rooms. A stair or ladder should be *constructed* in accordance with:

a. BS 5395: Part 3: 1985 or BS 4211: 2005, as appropriate; or
b. BS 5395: Part 2: 1984 where the stair is a spiral or helical stair.