Building for Everyone:

A Universal Design Approach

External environment and approach

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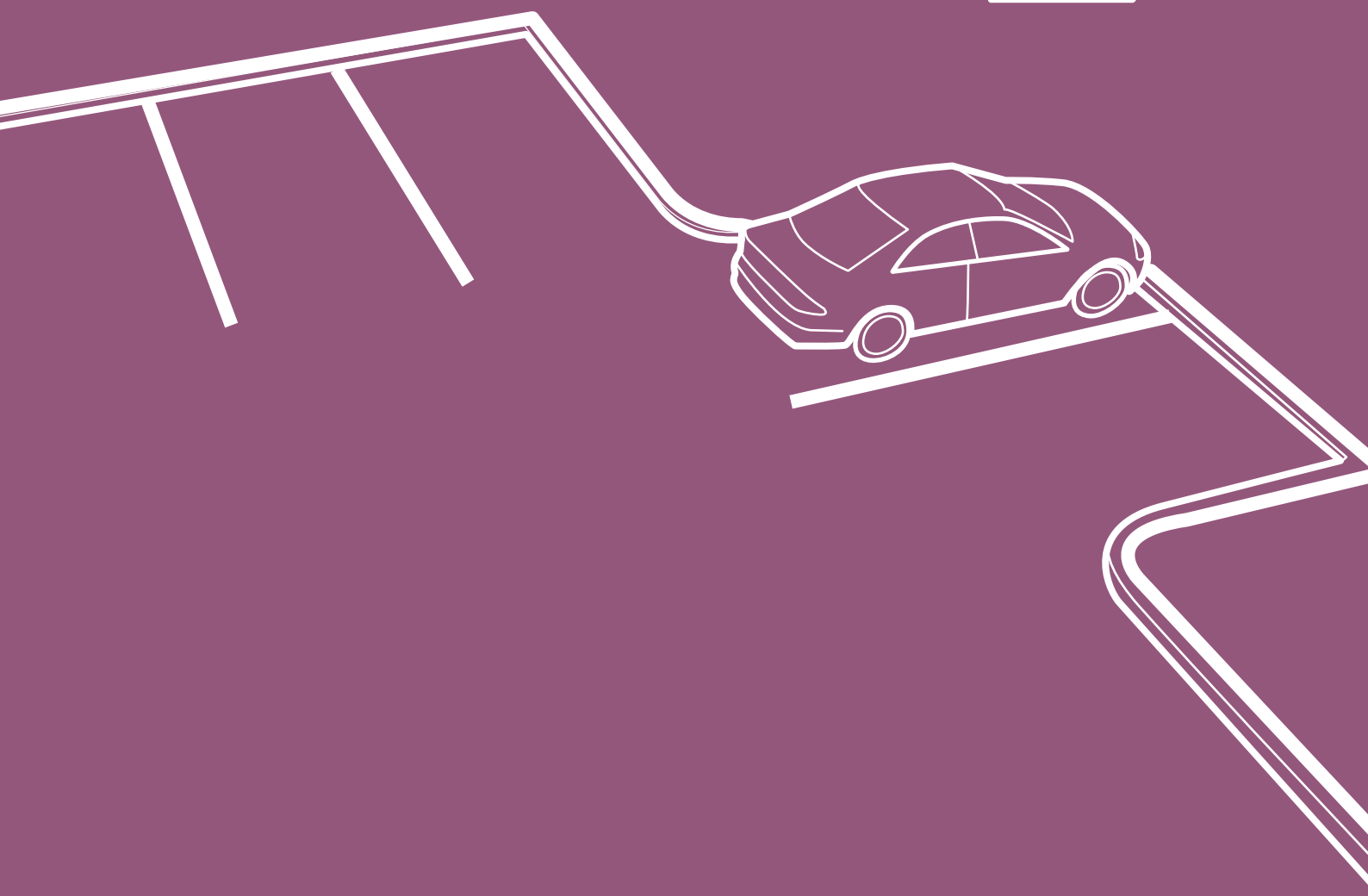


Centre for Excellence in Universal Design

Creating an environment that can be used by all people, regardless of their age, size, disability or ability.

The National Disability Authority's Centre for Excellence in Universal Design has a statutory role to promote the achievement of excellence in universal design in:

- the design of the built and external environment
- product/service design
- information and communications technologies (ICT)
- the development and promotion of standards
- education and professional development
- raising awareness of universal design

More information and updates on the website at: **www.universaldesign.ie**

Building for Everyone

Booklet 1 - External environment and approach

The other booklets from the Building for Everyone series:

Booklet 2 - Entrances and horizontal circulation

Booklet 3 - Vertical circulation

Booklet 4 - Internal environment and services

Booklet 5 - Sanitary facilities

Booklet 6 - Facilities in buildings

Booklet 7 - Building types

Booklet 8 - Building management

Booklet 9 - Planning and policy

Booklet 10 - Index and terminology

Contents

1.0 Objectives

The guidance in this booklet promotes the concept and philosophy of universal design and encourages developers, designers, builders and building managers to be innovative and think creatively about solutions that meet the needs of all building users.

The objectives of the series of booklets are to:

- identify and promote best practice with regard to universal design of the built and external environment
- provide best practice guidelines while recognising existing regulations in Ireland
- provide guidelines that are usable by and accessible to the target audience
- promote the achievement of universal design in Ireland

This booklet aims to:

- identify and promote best practice for access to and understanding of the external environment and approach to buildings with regard to universal design
- increase awareness of, and encourage designers to identify, the needs of all those who require access to the external environment in order to undertake daily activities
- highlight the wider benefits experienced by all when accessible and universal design features of the external environment and approaches to buildings are provided
- encourage designers to provide universal design solutions for the external environment and approaches to buildings that look beyond the recommended requirements of national building regulations

1.1 Introduction

This booklet is part of the series "Building for Everyone – A Universal Design Approach," which aims to provide practical guidance on the universal design of buildings, places and facilities.

Universal design places human diversity at the heart of the design process so that buildings and environments can be designed to meet the needs of all users. It therefore covers all persons regardless of their age or size and those who have any particular physical, sensory, mental health or intellectual ability or disability. It is about achieving good design so that people can access, use, and understand the environment to the greatest extent and in the most independent and natural manner possible, without the need for adaptations or specialised solutions (see full definition in **Appendix A1**).

Why universal design?

People are diverse - some are left-handed and some right-handed - and vary in their age, size and functional capacities. Illness or disability (whether temporary or permanent) can also affect characteristics such as a person's mobility, dexterity, reach, balance, strength, stamina, sight, hearing, speech, touch, knowledge, understanding, memory, or sense of direction. A reference list with these booklets indicates some of the key differences in human abilities that should guide the design of buildings and of outdoor places. (See full description of Human Abilities in **Appendix A2**).

People of diverse abilities should be able to use buildings and places comfortably and safely, as far as possible without special assistance. People should be able to find their way easily, understand how to use building facilities such as intercoms or lifts, and know what is a pedestrian facility and where they may encounter traffic.

Given the wide diversity of the population, a universal design approach, which caters for the broadest range of users from the outset, can result in buildings and places that can be used and enjoyed by everyone. That approach eliminates or reduces the need for expensive changes or retro fits to meet the needs of particular groups at a later stage.

It is good practice to ascertain the needs of the range of expected users as early as possible, and to check the practicality and usability of emerging designs with a diverse user panel.

Designing for one group can result in solutions that address the needs of many others. For example:

- level entry (Step-free) entrances facilitate not just wheelchair users but also people with buggies; people with suitcases or shopping trolleys; people using walking or mobility aids; and people with visual difficulties
- larger toilet compartments provide easier access to wheelchair users; those with luggage or parcels; parents with pushchairs or accompanying small children; those using walking or mobility aids; and larger-sized people
- clear, well-placed signage that uses recognised symbols or pictograms helps people with reading or cognitive difficulties, and those whose first language is neither English nor Irish

Sometimes one solution will not suit all and a range of options will need to be provided. For example:

- providing both steps and a ramp where there is a change in level
- providing parking ticket machines that offer slots at different heights to facilitate use at standing height, sitting height, and by people of small stature

This series of booklets is for architects, engineers, planners, developers, designers, building contractors, building workers, building managers and others involved in designing, commissioning and managing buildings and their surroundings. It provides guidance on a universal design approach to all new buildings, and the use and adaptation of existing environments.

Those who commission, design, construct or manage any part of the built and made environment also have a duty of care to adhere to relevant legislation and regulations including equality legislation, building regulations and health and safety regulations.

The guidance is based on a best practice approach, drawing on up-to-date international best practice; guidelines and standards; previous guidance by the National Disability Authority; and extends beyond disability access matters to incorporate a universal design approach. The series is fully compatible with Part M (2010) of the Building Regulations and associated Technical Guidance Documents related to Part M.

A disability access certificate is required for new buildings other than dwellings (including apartment buildings) and certain other works (as set out in Article 20 D (1) of SI 351 of 2009) to which the Requirements of Part M of the Building Regulations apply, which commence or take place on or after 1 January 2012. Further details on these and other relevant standards, codes of practice, and professional codes of practice are listed in **Appendix A3** Further Reading.

The detailed guidance provided here does not represent the only possible solution. Designers may come up with other ways to meet a diversity of users. New materials and technologies that emerge may open up further possibilities of accommodating the diversity of the population.

Checklists are provided throughout the series and while they provide a summary of main considerations and technical criteria, they should not be regarded as a substitute for the main text or an exhaustive list.

A comprehensive **index** is also available for the suite of booklets.

The Building for Everyone series is available online at **www.nda.ie** and **www.universaldesign.ie**. Electronic links are provided to relevant sections in the different booklets. As standards and requirements develop, the electronic versions of these booklets will be updated.

The electronic version is produced in accessible PDF format, in accordance with the Web Content Access Guidelines 2.0. If you have any difficulties in this regard or require the document, or particular sections, in alternative formats, please contact the Centre for Excellence in Universal Design at the National Disability Authority, **info@ceud.ie** or (01) 6080400.

1.2 Terminology

Accessible design – Design focussed on principles of extending standard design to people with some type of performance limitation to maximize the number of potential customers who can readily use a product, building or service.

Access route – Any route in an internal or external environment whether it is level, gently sloped, ramped or stepped that is available and understandable for a person to use. In external environments, access routes comprise paths, pavements and other pedestrian routes, such as a right of way through a public space.

Building – A permanent or temporary structure of any size that accommodates facilities to which people have access. A building accommodating sanitary facilities may include a toilet block in a public park or shower facilities at a campsite. A temporary building may include portable toilet facilities such as those provided at outdoor events.

Building user – A person regardless of age, size, ability or disability using facilities in a building or associated external environment.

Designated car parking – Car parking spaces reserved for the use of car users with disabilities, whether as motorists or passengers.

Dropped kerbs – A lowered section of kerb between a pavement and carriageway forming a level or flush crossing point. Also referred to as dished kerbs.

Grille or grill – An opening of several slits side by side in a wall or metal sheet or other barrier, usually to let air or water enter and/or leave but keep larger objects including people and animals in or out.

Laid to falls – Paving and drainage that relies on fall to carry away water. Fall may also be referred to as slope or, more correctly, gradient. By making one part of the pavement higher than another, gravity will cause the water to move in a preferred direction.

Park and ride – The formal provision of car parking linked with either bus or rail services.

Path – A pedestrian route that has no adjacent vehicle carriageway and includes paths in countryside locations as well as paths in urban and residential environments.

Pavement – A pavement is the part of a roadway used by pedestrians and is adjacent to the vehicle carriageway.

Setting-down point – A designated area close to a building entrance or other facility where passengers can alight from a car or taxi.

Soffit – The underside of any construction element, the underside of a flight of stairs.

Step nosing – The leading edge of a step or landing.

Street furniture – Items located in street and other pedestrian environments such as lamp posts, litter bins, signs, benches, and post boxes.

Tactile paving surface – A profiled paving or textured surface that provides guidance or warning to pedestrians with visual difficulties.

Universal Design = Useable = Understandable - Understanding user needs – For example an older person may require many resting places due to discomfort when walking for long distances.

1.3 Design Issues

1.3.1 Topographical constraints

Creating an accessible and understandable external environment is potentially the most challenging task facing designers due to constraints posed by the natural landscape and spatial limitations of the existing built environment.

Designers have limited influence over the natural topography of an area and must seek to optimise accessibility and understanding through the creative placement of routes and features.

This involves strategic thinking during the earliest design stages to ensure, for example, pedestrian access, that routes and building entrances are positioned to provide convenient access with minimal changes in level. Building entrances that are raised to a podium level for the purpose of enhancing visual impact and site presence are likely to be less convenient to access and may present a barrier to some people.

Designers of road and street environments are often constrained by the location and arrangement of existing buildings and road layouts as well as the existing

topography, but must ensure that pavements and access routes are safe, convenient and understandable for everybody to use, whether as pedestrians, motorists or passengers. Where there is a sloping site, level access should be provided at various points to ensure barrier-free access for all. Please note that travel distances should be minimised where possible.

1.3.2 Safety and convenience

The design of vehicular environments, such as car parks and setting-down points, must honour the needs of motorists and pedestrians, but above all, provide environments that are safe for all to use.

Car parking facilities should be sufficient for the expected level of use and include spaces for people who require proximate access to the building or facility served by the car park. For example: older persons, parents with young children, or deliveries.

The design of pedestrian environments should be easy to understand, logical and consistent. This will help people who use an environment regularly to memorise a route and to develop a mental map of the area. It will also help people who encounter an area or route for the first time. Well-designed features will help guide and orientate a person and provide a degree of predictability within an environment.

1.3.3 A balance of needs

In some situations, the provision of a particular feature in the built environment may benefit some people while presenting a potential hazard or inconvenience to others. Where this is the case, the needs of all people should be considered and a balance achieved in the final design. Safety for pedestrians and road users should be the priority in all situations.

Raised kerbs are an example of a common feature in the external environment that is particularly useful to people with visual difficulties, because they provide a physical indication of the pavement edge. However, raised kerbs cannot easily be traversed by wheelchair users; parents with strollers; guide dog users; people with visual difficulties; and those with walking aids. At crossing points, it is accepted that kerbs have to be level or flush with the carriageway to meet the needs of

all pedestrians. The location of dropped kerbs should match on both sides of the road. In such instances, the use of a tactile paving surface can be used to warn of the absence of a kerb and to guide pedestrians with visual difficulties in the direction of the crossing.

Image 1.1 Example of a man pushing a stroller along a city pavement. The pavement is wide and provides good space for pedestrians of all ages, sizes, abilities or disabilities.

Tactile paving surfaces themselves, however, can present a tripping hazard and may be uncomfortable for some people to stand on or walk across. People who have increased sensitivity in their feet may find it extremely difficult to cross. Wheelchair users; parents with strollers; guide dog users; people with visual difficulties; and those with walking aids may also find it difficult to traverse due to the uneven surface.

If used incorrectly, such as in situations for which it was not designed or in an incorrect configuration, tactile paving can be a risk to people with visual difficulties by conveying the wrong information.

Wherever possible, the pedestrian and roadway environment should be designed in a logical manner so that it is easy for everybody to understand and to limit the

need for tactile paving surfaces. Also the location of dropped kerbs should match on both sides of the road.

Good lighting is essential for people with visual difficulties, but also improves safety and usability for everyone. Access routes that have a generous clear width and are free of obstacles enable two wheelchair users or parents with strollers to pass, and provide sufficient space for a person to walk with the support of sticks or a frame. They will also provide space for people to walk alongside each other, such as parents with young children. Designing with consideration for all people will achieve external environments that are universally designed, safe, and easy for everyone to use as independently as possible.

Checklist - Design issues
• Consider access routes, levels, gradients and site layout at earliest design stage.
• Locate car parks and access routes to promote safety and convenience.
• Ensure pedestrian environments are logical and clear to understand.
• Match dished kerbs on opposite sides of the road at crossing points.

1.4 Vehicular Environments

1.4.1 Car park provision

Car parks should be accessible, easy to use, and should provide sufficient parking spaces within a well-designed environment to meet the needs of all people expected to use them. The provision of an adequate number of off-street parking spaces should discourage indiscriminate parking, which can obstruct access and make the roadway environment hazardous for everybody.

Wherever car parking facilities are provided, they should consider the needs of all car users, including parents and carers with young children; people who need to load and unload goods and shopping; people who may not be able to walk very far or carry goods over a long distance; people with visual difficulties; people with

hearing difficulties; and people who use larger vehicles such as vans with rear hoists that enable wheelchair users to travel while seated in their wheelchair.

The provision of designated spaces for car users with disabilities is commonplace within all car parks, and the section below includes guidance on the recommended number, location, size, and characteristics of such spaces. The provision of parent and child parking spaces in car parks serving shopping developments is also now accepted good practice. Less common is consideration of the needs of people who require larger bays, proximate parking and easy access, but who are not entitled to use designated spaces or parent and child bays.

In many locations, the criterion for occupying a designated car parking space is that the driver or a passenger in the vehicle is the holder of a parking permit, such as a Disabled Parking Permit. This precludes access by people who are temporarily injured; pregnant women; people who are unwell; and people who are not able to walk long distances due to a medical condition but who are not otherwise holders of a Blue Badge parking permit.

Designers and developers should consider the needs of everybody likely to use a car park and provide facilities that are convenient and safe for all.

Checklist – Vehicular environments
• Ensure adequate parking facilities for the expected number of car users.
• Provide designated parking spaces and parent and child spaces.
• Supply suitable spaces for other people who need large bays and proximate parking.

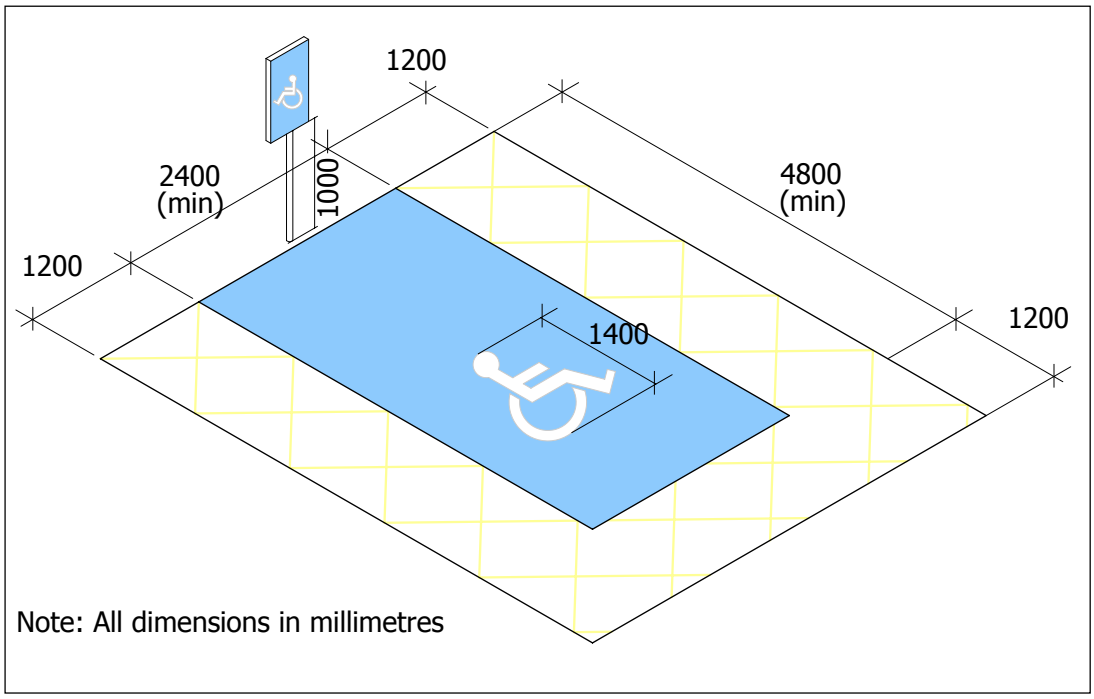
1.4.2 Car parking spaces

Standard head-on (perpendicular) car parking spaces are typically 2400mm wide x 4800mm long and in-line (parallel) parking spaces 2400mm wide x 6100mm long.

When configured in rows or alongside a boundary or street, these dimensions serve to accommodate as large a number of vehicles as possible, irrespective of vehicle size or the ability and needs of the occupants. While there will always be a need

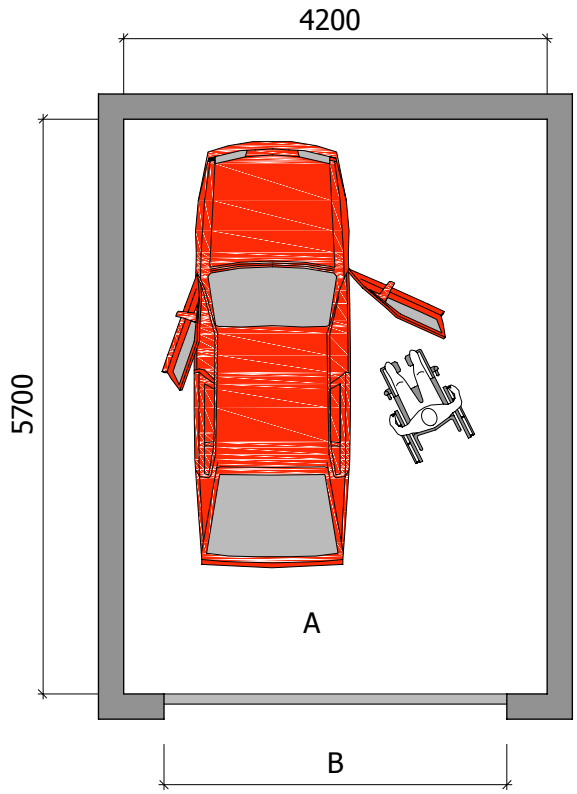
to maximise car park capacity within the constraints of a site, this should be balanced with the provision of spaces that offer opportunities for easier access, ease of understanding, and useability.

Figure 1.1 Example of perpendicular parking.



Wherever possible, a number of car parking spaces that are larger than the standard dimensions should be provided to make it easier for people who drive larger vehicles; for people who need to load or unload via side doors; and for people who need more space to conveniently get in and out of a car. Creative and efficient planning of a car park should enable some larger bays and safe access zones to be provided without unduly compromising the overall capacity.

Figure 1.2 Example of enclosed parking space. Image shows an example of why side space is needed for accessible parking spaces.



Key

A. Space for wheelchair access at the rear of the vehicle
B. Full width door opening provides flexibility in positioning the car within the space and therefore allows wheelchair transfer from either driver or passenger side

Note:

- An increase in width of 750mm is required if both driver and passenger are wheelchair users
- All dimensions in millimetres

All car parks should incorporate designated spaces for car users with disabilities. Car parks should be arranged so that designated spaces are located as close as possible to the building entrance or facility they serve and preferably within 25m. Where this is not possible, a covered path with seating at intervals is beneficial.

Where provided, parent and child parking spaces should also be located close to the entrance or relevant facility, but with priority given to the designated spaces for car users with disabilities. The route between the designated spaces and 'parent and child' spaces and the building or facility should be accessible, understandable and safe to use.

Image 1.2 Example of the importance of providing space to the side of an accessible car parking space.

Image 1.3 Example of an accessible parking space.

Image 1.4 Example of insufficient accessible parking spaces. Please note the lack of a post-mounted sign with the international symbol of access fixed to it and the lack of dropped kerbs.

Image 1.5 Example of an accessible/designated car parking space.

In large car parks, such as those serving shopping malls, designated parking spaces and parent and child spaces should be provided close to entrances, lifts and walkways in any adjoining multi-storey car parks.

In transport terminals such as railway stations and airports, short- and long-term designated parking spaces should be provided close to the building entrance. Where there are several terminals such as in large airports, designated parking spaces should be provided close to the entrance of each terminal.

1.4.3 Car parking signage

Image 1.6 Example of the international symbol of access.

Image 1.7 Example of an accessible/designated car parking space sign.

Image 1.8 Example of an alternative accessible/designated car parking space sign.

Image 1.9 Possible accessible parking signage that could be used in conjunction with the pole-mounted version.

1.4.4 Designated car parking spaces

The number of parking spaces to be designated for car users with disabilities depends on the building type. The following guidelines are recommended:

For shops, leisure and recreational facilities and other buildings to which the public has access: 6% of the total capacity plus one space for each employee with a disability who is a motorist. Four percent of the total capacity should be given to enlarged spaces 3000mm x 6000mm. Also, at least one space, 4800mm x 8000mm, for larger vans should be included.
For buildings not normally visited by the public, such as offices and other places of work: 5% of the total car parking capacity. Five percent of spaces should be provided for accessible car parking spaces and 5% should be provided for larger vans (enlarged spaces).

Premises used by a high proportion of people with disabilities need a larger than required number of designated spaces. The parking requirement for such building types should be calculated in relation to the anticipated demand.

Car parking should be laid out in a uniform order, clearly distinguishing between parking and pedestrian areas. Large, featureless car parks may disorientate some people with visual difficulties, therefore it is advantageous to incorporate features to aid orientation such as pathways, planting and tactile surfacing

Car parking spaces designated for car users with disabilities and parent and child spaces may be arranged perpendicular or parallel to a path, pavement or other walkway.

The design criteria set out below is applicable to both types of space. A perpendicular arrangement is characteristic of off-street parking facilities such as large car parks and parallel parking more typical of on-street parking spaces. In both arrangements, there should be sufficient space for a person to alight from a car and to safely move around parked vehicles to an accessible, understandable and useable pedestrian route.

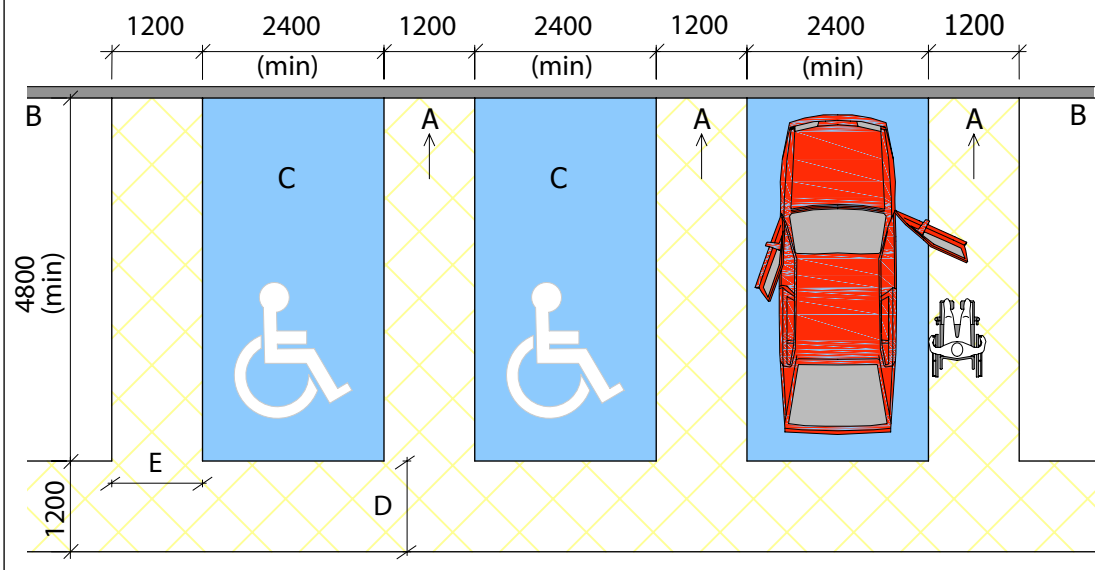
Designated accessible parking spaces and parent and child spaces should be clearly marked both on the roadway surface and with a post- or wall-mounted sign at the end of the bay. Roadway markings are insufficient on their own as they are not easy to see when the bays are in use and can be covered by snow or leaves.

Post- or wall-mounted signs should be at least 300mm wide x 450mm high and positioned 1500 to 2500mm to the centreline from ground level. Painted roadway symbols should be at least 1400mm in plan height.

The location of designated spaces and parent and child spaces should be clearly signed from the car park entrance.

Signage indicating the location of designated spaces should incorporate the International Symbol of Access.

Figure 1.3 Off-street designated parking spaces.



Key

A. Preferred access route with dropped kerb or level access avoiding travel behind parked cars
B. Dropped kerb or level access
C. Standard 2400 (min) x 4800 (min) designated parking space
D. 1200mm wide safety zone for boot access and cars with rear hoists, outside the trafic zone
E. 1200mm wide marked access zone between designated parking spaces

Note: All dimensions in millimetres

(Extract from Department of Transport, UK 'Traffic Signs Manual'). Off-street (perpendicular) designated parking spaces should be 2400mm (min) wide and 4800mm (min) long, with a layout based on **Figure 1.3.** Each space should have a recommended 1200mm clear access zone to both sides and the end of the space.

Adjacent spaces may share a side-access zone. The access zones to the side of the space enable car doors to be fully opened and drivers and passengers, including infants carried in removable car seats, to transfer in and out of the vehicle without being obstructed by an adjacent car. The access zone to the end of the space provides a safe area for access to the car boot and for cars with rear hoists.

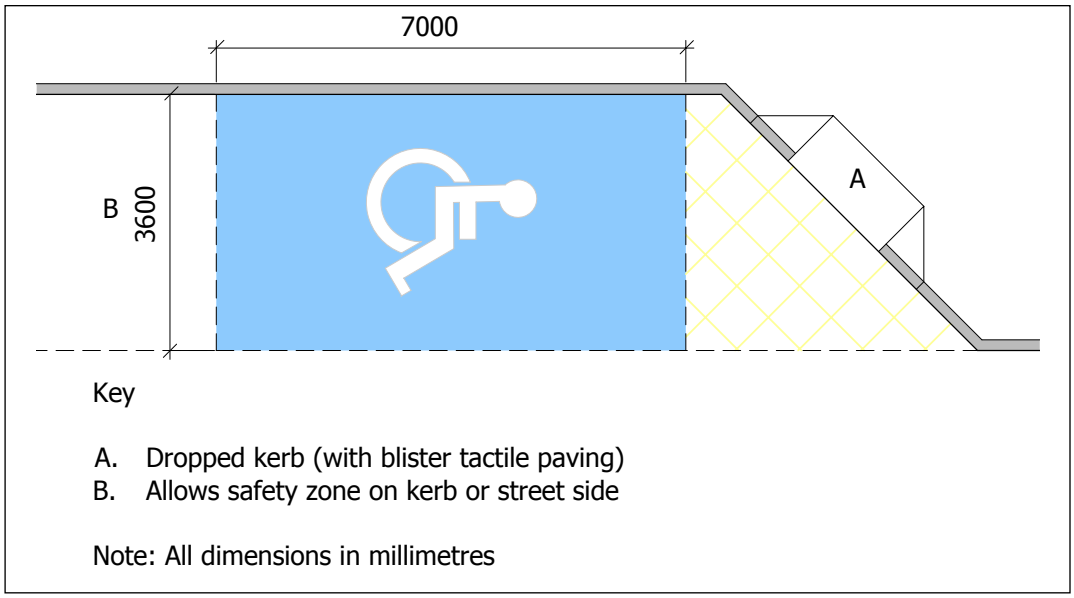
On-street (or parallel) designated parking spaces should be 7000mm in length, with a layout based on **Figure 1.4**.

These dimensions enable a driver or passenger to safely transfer in or out of a car where there is passing traffic and to access the rear of the vehicle using a ramp or tail lift.

On-street bays should be located where the road gradient and camber are no greater than 1 in 50. A steeper camber may present difficulties to people using a side lift in their vehicle to facilitate transfer to a wheelchair.

Image 1.10 Woman using an electric scooter that can be loaded into a modified vehicle. This image indicates the importance of providing adequate space for accessible car parking spaces. This extra space would also be useful for parents loading strollers and buggies into a vehicle.

Figure 1.4 On-street designated accessible parking space and parent and child parking spaces.



Note: Where designated parallel parking bays are provided in series, or in combination with standard parking bays, an additional 2000mm buffer zone should be provided at the rear of the designated space. The length of the designated parking bay may be reduced to 5800mm long in this instance. (Extract from Department of Transport 'Traffic Signs Manual').

When parking in on-street parking spaces, some people, either by preference or necessity, will have to transfer into and out of a car directly onto the pavement. This can be very difficult if the kerb is high, as the person has to raise and lower themselves over a greater height.

Transfer for wheelchair users is also more difficult as it necessitates lifting a wheelchair out of the car up onto the raised pavement level, and then the person raising themselves up onto the wheelchair from the car seat. In some situations, particularly where the pavement width is restricted, it may be appropriate to lower the pavement to road level for the full length of the parking space. There should be no street furniture obstructing egress on the pavement side.

Where designated bays are at a different level to an adjacent path or pavement, a dropped kerb should be provided to facilitate easy access for wheelchair users. A dropped kerb should incorporate the appropriate tactile marking, as **Section 1.5.6.**

All parking spaces should be firm, level and even, with no variation in surface profile exceeding 5mm. A 1-in-50 maximum cross-fall gradient is acceptable where necessary to ensure water run-off. An uneven surface or an inclined bay makes transfer into and out of a car very difficult and may present a hazard to some pedestrians.

Checklist – Car parking
• Provide designated car parking spaces and parent and child spaces as close as possible to building entrance or facility.
• Ensure the route between the car park and the entrance to the building or facility is accessible and easy to understand.
• Provide clear signage to highlight location of designated parking spaces within the car park.
• Include roadway marking and wall- or post-mounted signs for all designated spaces.
• Ensure off-street spaces are 2400mm (min) x 4800mm (min) with 1200mm-wide access zones to both sides and end of space.
• Provide on-street spaces 3600mm wide x 7000mm long.
• Be careful that no street furniture is obstructing the pavement side.
• Supply level or flush access route away from vehicles.
• Provide firm and level surface with cross-fall gradient not exceeding 1 in 50.

1.4.5 Multi-storey and underground car parks

Designated car parking spaces should be provided for drivers and passengers with disabilities as in all car parks. Where the car park serves a shopping development, parent and child spaces should also be provided.

Designated spaces and parent and child spaces should be on the most convenient level and at the most convenient position for entrance and exit to the building or environment they serve. The spaces should be located adjacent to street or lift exits so that exposure to exhaust fumes is minimized.

Multi storey and underground car parks should be designed with adequate passive ventilation. Where this is not possible mechanical ventilation may sometimes be required.

Image 1.11 Example of designated accessible car parking space.

Image 1.12 Example of alternative designated accessible car parking space.

Image 1.13 Example of designated car parking spaces for users with disabilities and their proximity to entrance to shopping centre.

Image 1.14 Entrance to shopping area.

In underground car parks, the route from the car park to the building entrance should be accessible and easy to follow by all car users.

Where a passenger lift serves car parking above or below the main entrance level, direct access should be provided to the building at all levels. This is to avoid having to transfer into an alternative lit at ground floor or other level.

Clear signage should be provided to highlight the location of designated parking spaces; parent and child spaces; ticket machines; lifts; any storey or final exit; and the building entrance, where appropriate.

Image 1.15 Example of car parking signage.

Image 1.16 Example of information provided on electronic displays that can be updated frequently.

Image 1.17 Designated spaces with adequate vertical clearance.

The vertical clearance to a vehicle height barrier, through the car park to the designated parking spaces and to the exit should be at least 2600mm to enable access by high-top conversion vehicles. Projecting elements such as signs and lighting should be taken into account and should not intrude into the 2600mm clear space. In existing car parks, if this clearance cannot be maintained, drivers should be given sufficient warning of height restrictions before they enter the car park and directed to a suitable alternative car parking space.

Image 1.18 Example of car park ticket pay stations with different heights of ticket slot.

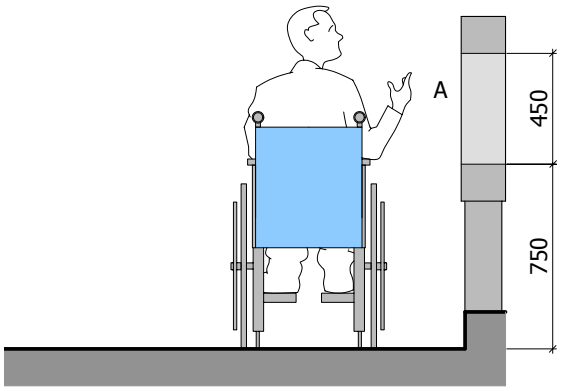
Checklist - Multi-storey and underground car parks
• Locate designated parking spaces in a convenient location in relation to entrance and exits.
• Ensure car park levels are served by lifts providing access to all floors.
• Provide a vertical clearance of 2600mm throughout car park.
• Make sure ticket dispensers are conveniently located, accessible, understandable and useable by all motorists.
• Include intercom and visual display for all ticket machines.
• Make prepay ticket machines (before return to car) available in different heights to accommodate wheelchair users or shorter people.

1.4.6 Paid parking

Ticket dispensers should be accessible as well as easy to use and understand by everyone.

Where ticket machines are provided for pedestrian approach (as opposed to machines reached while in the vehicle), the ground surface should be level and free of obstructions and provide a clear area at the front of the machine of at least 1850mm depth and 2100mm width and the height of the ticket machine should take into account persons of different heights including those using a wheelchair, as illustrated in **Figure 1.5**.

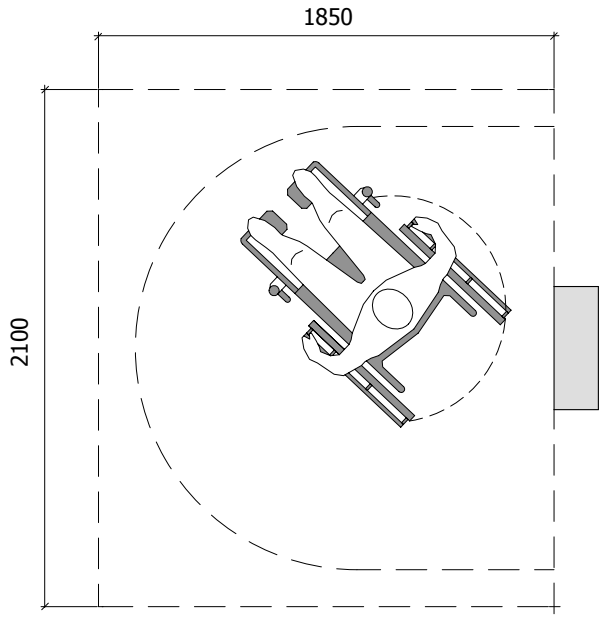
Figure 1.5 Ticket machine.



Key

A. 50mm high zone for control buttons, coin slot and ticket release

Note: All dimensions in millimetres



If ticket machines are mounted on a plinth, the edges of the plinth should not project beyond the face of the machine as this can make approach difficult for wheelchair users.

Coin and card slots, buttons, ticket release slots, and other controls should be positioned within the range 750mm to 1200mm above ground level and should contrast visually with the surrounding surface. Instructions should be clear and logical, incorporating symbols or diagrams in addition to text, where possible.

Ticket machines at car park entrances and exits that are designed to be reached from inside the car can present difficulties to some people and a bell or intercom should always be provided so that a motorist can call for assistance from a member of staff. Tickets should be available for purchase without leaving the car, they should also be made available in advance online and should be able to be changed through the internet. For more guidance on public access terminals please see the National Disability Authority's 'IT Accessibility Guidelines' at **www.accessit.nda.ie**

Image 1.19 Example of ticket machines at two heights.

If payment is made to a member of staff at a car park exit, a visual display of the transaction amount should always be provided and the counter should be reachable. In car parks where tickets are pre-paid before returning to the car, notices to this effect should be obvious.

Where a car park is provided for a specific venue or facility and car park staff are available, a means of communication such as a direct-line telephone with a

text capability for users with hearing difficulties should be provided to enable motorists to gain assistance if required.

Image 1.20 Example of assistance via an intercom system for car park users.

Image 1.21 Example of ticket machines located within easy access of entrance to and from the car park.

1.4.7 Setting-down points

Setting-down points provide a suitable location for passengers to alight from a car close to the principal entrance of a building. People who need to be dropped off as close as possible to a building might arrive via taxi, a dial-a-ride service, or in another person's car. A setting-down point will enable this to happen.

Setting-down points should be provided in addition to designated car parking spaces. Setting-down points are essential where designated parking spaces cannot be provided close to the building.

Wherever possible, setting-down points should be covered to provide protection from the weather. A canopy height of 2600mm to the underside of the canopy facilitates access for most passenger vehicles.

Setting down areas should be easily located. If necessary, signage should be provided.

Setting-down points should be flush with the roadway surface to enable easier transfer to and from cars and taxis. Where the road and footway surfaces are flush, the appropriate tactile markings should be used for the benefit of people with visual difficulties, as **Section 1.5.6**.

Setting-down points should be level with a firm, even surface. Items such as manhole covers, dished gullies, and grilles should be avoided in the area where people will be transferring into and out of vehicles as they can impede access and may present a trip hazard to some people. Where grilles or mesh covers are laid, the mesh size should be maximum 10mm x 20mm. The long side of the mesh should be used in the direction of travel for easier use by guide dogs.

In venues where local bus services provide on-site access close to the building entrance, such as at some supermarkets and shopping malls, an area of raised kerb should be provided adjacent to the setting-down point. The area of raised kerb will make it easier for people who need to use a ramp in order to board a taxi or bus, or who need to step up into a high-floor minibus.

Setting-down points should not obstruct circulation routes. Transfer directly onto a footpath should be avoided unless the footpath is at least 2000mm wide so that other people are not obstructed.

Checklist - Setting down points
• Provide setting-down point close to building entrance.
• Ensure a canopy height clearance of 2600mm.
• Make sure the road surface is flush with the path or pavement, with the appropriate tactile surface.
• Avoid dished gullies, grilles and manhole covers.

1.4.8 Taxi ranks

Taxi ranks should be provided in association with railway, coach and bus stations; adjacent to major visitor attractions and shopping malls; and in appropriate town and city centre locations. Where taxi ranks serve a specific venue, they should be located as close as possible to the entrance and be clearly signposted, both within the venue and outside.

Taxi ranks should be orientated so that passengers can alight and board on the nearside of the taxi. Pavements should be at least 4040mm wide to allow adequate space for a wheelchair user to manoeuvre and for a wheelchair ramp, which can extend 2000mm from the side of the vehicle.

When designing a taxi rank, consideration should also be given to parents with strollers; guide dog users; people with visual difficulties; and those with walking aids when designing a taxi rank.

A pedestrian crossing-point with dropped kerb and the appropriate tactile markings should be provided close to the taxi rank. (See **Section 1.5.6** for tactile surfaces.)

Wherever possible, queuing areas should be undercover and incorporate seating, or provide seating close by.

Image 1.22 Example of a well-lit accessible taxi rank with seating for those waiting.

Checklist - Taxi ranks
• Provide taxi ranks in appropriate locations.
• Orientate taxi ranks to enable passengers to alight and board on the nearside of a taxi.
• Ensure pavement width is 4040mm to allow for wheelchair ramp and manoeuvring space.
• Provide undercover queuing areas with seating.

1.5 Pedestrian environments

1.5.1 Access routes

Access routes in the external environment include paths, pavements and other rights of way, such as pedestrian routes through a public space. An access route may be a path through a rural location; a pavement alongside a city centre street; or a route of travel between a car park and building entrance. All access routes where possible should be designed for use by everyone.

Image 1.23 Wheelchair user on access route with adequate passing and turning space.

The width of an access route should be sufficient to enable people to move in both directions and pass each other with ease.

A clear width of 2000mm is recommended to enable people to walk alongside each other and for two wheelchair users or parents with strollers to pass comfortably. The width should be increased where there is simultaneous use by a large number of people.

Where a clear width of 2000mm is not possible, such as where there are existing obstacles, a width of 1500mm is acceptable. This will enable a wheelchair user or parents with a stroller and another person to pass each other.

Image 1.24 Wheelchair user on path.

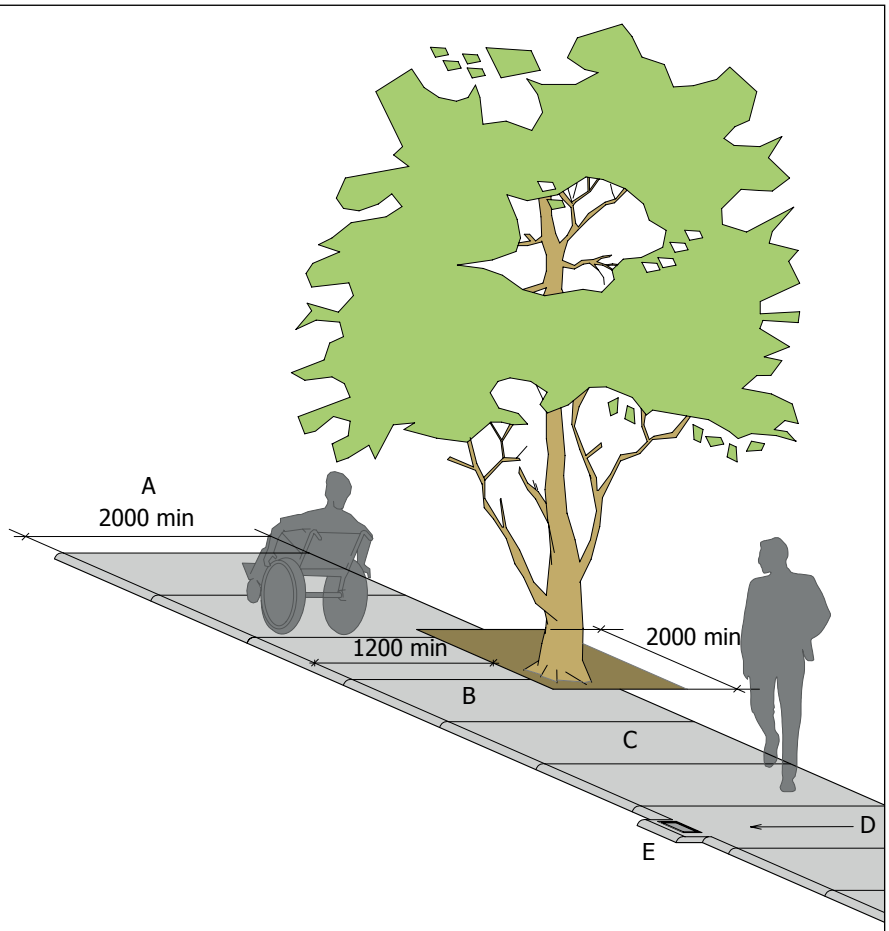
Image 1.25 Wheelchair user on path between buildings.

Where the clear width of an access route is less than 2000mm, passing places should be provided. Passing places should be 2000mm wide x 2500mm long, at a reasonable frequency and located within sight of another passing place, subject to a maximum distance of 25m. This will allow groups of people to pass each other, particularly on busy routes. On long routes, level resting places should be provided off the path of travel at intervals of no more than 30 metres.

Where the clear width of an access route is constricted, such as by existing trees or walls, the width may be reduced to 1200mm for a distance not exceeding

2000mm. A 1200mm wide path is too narrow for people to pass each other, so passing places should be provided either side of the constricted section.

Figure 1.6 Urban environment pavement layout.



Key

A. 2000mm minimum to allow two wheelchairs to pass each other
B. Width reduced to 1200mm minimum for not more than 2m in length around existing obstructions
C. Gradient should either be level along its length or should be gently sloping or incorporate ramp or ramps in accordance with building standards
D. Crossfall gradient not more than 1:50
E. Drainage gratings offset from access route where possible

Note: All dimensions in millimetres

Pavements in urban environments should be as wide as necessary to accommodate the number of people using them, subject to a recommended 2000mm.

At bus stops in front of shops, the pavement should be increased to a recommended width of 3000mm and 3500 to 4500mm, wherever possible. This

will help to minimise congestion and the inconvenience that it can cause. The pavement width should be sufficient to enable people to pass in the opposite direction without stepping into the path of a passing vehicle.

Pavements should be separated from the traffic by a kerb, a railing or barrier, or by using tactile paving surfaces. Designated crossing points should be provided, as described in **Section 1.5.5**. Tactile paving surfaces are discussed in **Section 1.5.6**.

Image 1.26 Example of a pavement in an urban setting with adequate width to accommodate a young family.

1.5.1.1 Drainage

Access routes should be laid to even falls to allow proper drainage and prevent the formation of puddles. The cross-fall gradient to any access route should not exceed 1 in 50, except when associated with a dropped-kerb. Steeper gradients tend to misdirect prams, pushchairs and wheelchairs.

Where the cross-fall is insufficient, silt may accumulate after rain and cause the surface to become slippery. Puddles can also cause the surface to become slippery; lead to glare in bright sunshine after other parts of the path or pavement have become dry; and become a hazard in frosty weather.

The gap between paving slabs and any vertical deviation between slabs should not exceed 5mm.

Any break in the surface, for example drainage channels, or gaps between boards on a walkway, should not be greater than 10mm wide and should be perpendicular to the direction of movement. This will prevent walking sticks, heels of shoes and wheels getting caught in the gaps. Where grilles or mesh covers are laid, the mesh size should be maximum 10mm x 20mm. The long side of the mesh should be used in the direction of travel for easier use by guide dogs.

Service covers to manhole and inspection chambers should not be positioned on pavements, particularly at crossing points. They can be dangerous when opened for inspection, forming a trip hazard and reducing the clear width.

If there is a change in level to either side of a path or to the rear of a pavement, edge protection should be provided to prevent people from falling. Edge protection may take the form of an upstand kerb, 150mm high and visually contrasting with the path or pavement, where the change in level is between 200mm and 600mm. A guardrail or barrier can be used where the change in level is greater than 600mm.

1.5.1.2 Guardrails

Guardrails or barriers should be 1200mm high and should visually contrast with the surrounding surfaces so that they are readily identifiable by all pedestrians and road users.

Galvanised railings are not acceptable. Metal handrails should be avoided as they can become very cold in winter weather conditions. People who need to firmly grip handrails in order to safely negotiate a ramp will find a cold handrail extremely uncomfortable and possibly painful to use.

Preferred materials that are not cold to the touch include timber and plastic-coated steel.

Handrails can be used by some people not only for support but also to pull themselves up and to reduce speed of descent when going down when using a ramp or stair.

In extremely cold weather, for someone not wearing gloves their skin could stick to a very cold handrail. Such a shock could also trigger medical complications. It is unsafe to have handrails that are problematic in cold weather.

Handrails whose surface is of a low thermal conductivity, such as timber or nylon-sleeved steel tube, are the most comfortable to touch in extremes of temperature. Handrails fabricated from metals with a relatively low thermal conductivity, such as stainless steel, are more suitable in locations where resistance to vandalism and/or low maintenance are key factors.

Guardrails should be designed so that people with a lower eye level, including children, people of smaller stature, and wheelchair users, can see and be seen through the railings, and to prevent assistance dogs from walking underneath. If the top of the guardrail is intended to provide support to pedestrians, it should comprise a tubular rail, 40 to 50mm in diameter. An oval rail 50mm x 40mm can also be used.

Where the ground level to the side of an access route is flush with the path or pavement surface, a change in the surface treatment at the edge of a path, such as grass or a ground flora verge, will help prevent people from straying off the path.

Checklist - Access routes
• Ensure access route has sufficient width for expected number of people.
• Provide recommended clear width 2000mm wherever possible.
• Provide passing places where clear width is less than 2000mm.
• Include resting places at intervals on long routes.
• Ensure width is not less than 1200mm on short constricted sections of an access route.
• Widen pavements in front of shops and where there are bus stops.
• Use firm, smooth and even surface on access routes, with maximum cross-fall gradient of 1 in 50.
• Avoid gaps and vertical deviations between paving slabs greater than 5mm.
• Keep any break in surface or gap such as a drainage gulley no greater than 10mm and perpendicular to line of travel.
• Prevent accidents at changes in level to side of access route with kerb upstands, barriers or guardrail.

1.5.2 Changes in level

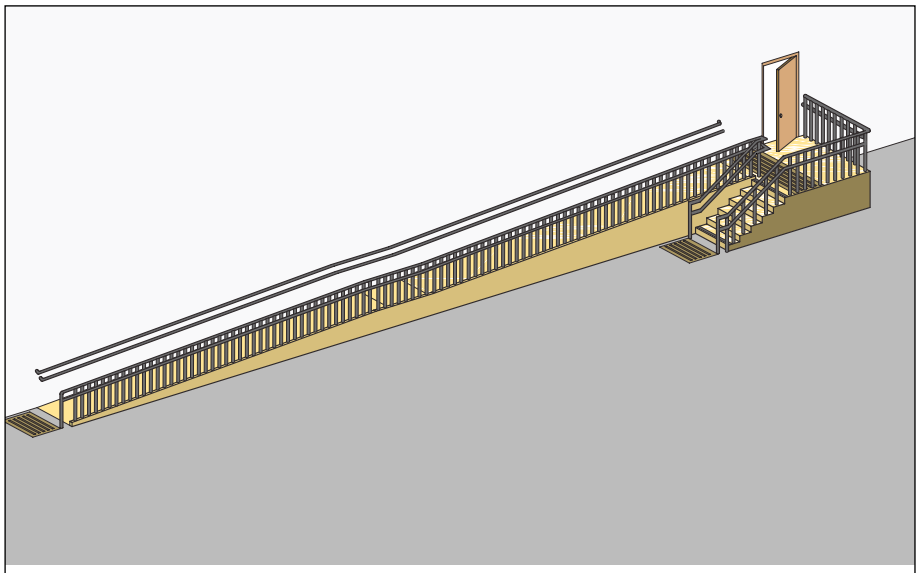
Changes in level frequently pose challenges to designers. In adapting an existing environment, it is appropriate to consider the impact on the general environs, rather than a piecemeal approach. It may be possible to adjust ground levels more broadly to eliminate the need for a ramp or steps altogether.

Arbitrary changes of level should be avoided. For instance, in creating a sense of importance for a building approach, a change in the quality of paving or street furniture can have the desired effect, rather than introducing a level change. When a terrace or steps or podium becomes a necessity for a designer, however, the result need not always be an obstruction for people with functional difficulties if the design is well considered.

On all sites, a suitable, understandable and useable access route should be provided from the site entrance to the building entrance; from an on-site car park to the building entrance; and between buildings where there is more than one building on a site. Suitable access routes should also be provided around a site where there are external facilities or features for people to enjoy, such as paths around a park or garden.

For newly developed sites and new buildings, designers should consider from the outset how best to minimize the level difference along principal access routes, such as between the site entrance and building entrance, and to locate features accordingly. Trying to incorporate a ramp after the initial design has been conceived will lead to undesirable solutions.

Figure 1.7 An example of an external ramp with adjacent steps.



External Ramp

- Ramps at gradient of 1:20, with a clear width of 1200mm and individual flights no longer than 9.0m
- Landings to be as long as the clear width of the ramp or 1300mm which ever is the greater
- Provide continuous handrails on both sides of the ramp, to finish 900 - 1000mm over the ramp surface and 900 - 1100mm over landing. Hand rails to turn into supporting wall as shown, or turn down for min 150mm
- A second handrail is desirable, finishing 600 - 750mm over ramp surface
- 1800 x 1800 turning space at top and bottom of ramp
- Always provide stairs as an alternative
- 75mm raised kerb on open sides
- Slip-resistant surface
- Tactile strips to be located at top and bottom landings

Note: All dimensions in millimetres

Where the topography of the site is such that changes in level are unavoidable, access routes should be designed for ease of access. They should be understandable, useable, and offer choice.

Some routes may have a gradual incline over a long distance and some may have shorter sections with a steeper gradient and level landings or rest areas. The steeper the incline, ramp or steps, and the greater the change in level, the more frequent the need for landings and resting places. Where resting places are located on landings they should be out of the way of the line of travel.

Access routes with a gradient of 1 in 25 should have level landings at maximum 19m intervals and routes with a gradient of 1 in 33 should have landings at no more than 25m intervals. The interval of landings for access routes with gradients between 1 in 25 and 1 in 33 can be established by linear interpolation. Access routes with gradients above 1 in 25 should be designed as external ramps.

Image 1.27 Example of the difficulties and hazards that can be encountered in the built environment. A good design solution would involve an accessible ramp located nearby to the steps.

Where the change in level is such as to require steps or a ramp, both should be provided to meet the needs of all building users.

Some people with mobility difficulties find steps easier to use than ramps, while ramps are beneficial for people using wheelchairs and people with prams, pushchairs, wheeled luggage and trolleys. The route of a ramp should be as direct as possible and easy to use. Wherever possible, the top and bottom of a ramp should be adjacent to the top and bottom of an associated flight of steps.

The location of stepped and ramped routes should be clearly obvious. Where steps and ramps are provided to gain access to a building entrance, they should both be clearly visible from the approach route. If alternative ramps or steps are not readily apparent, clear signage should be provided.

Image 1.28 Examples of signage identifying ramped access and access for less-mobile people.

All ramps, steps and landings should be kept clear of obstacles such as bins and bicycles and should be regularly swept clean of fallen leaves and any litter.

Checklist - Changes in level
• Ensure the routes between site entrance and building entrance, or from the on-site car park and between buildings is accessible.
• Consider the design of routes and levels at early planning stages.
• Design access routes so they are understandable, easy to use, and offer choice.
• Provide inclined routes with a gradient between 1 in 33 and 1 in 25 with level landings at regular intervals.
• Ensure ramped and stepped routes are clearly visible or well signed.

1.5.2.1 External ramps

Where the gradient of an access route exceeds 1 in 25, the route should be designed as an external ramp, the key features of which are illustrated in **Figure 1.8**.

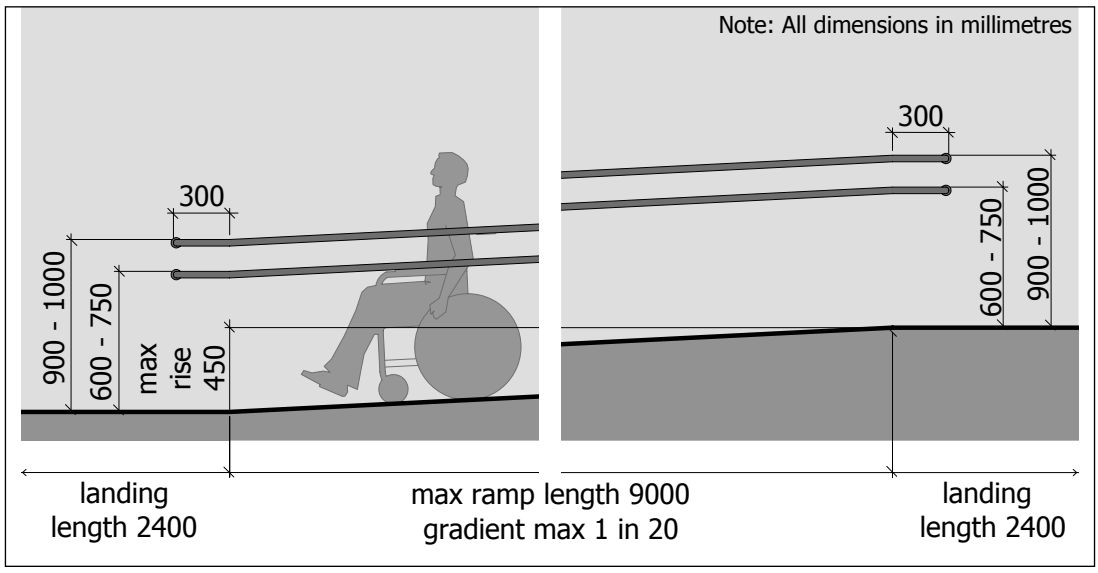
External ramps should have a gradient not exceeding 1 in 20, with a maximum rise of 450mm between landings and a corresponding maximum ramp length of 9000mm.

Where there are two or more consecutive slopes in a ramp, they should be of the same gradient. The gradient of ramps between landings should be constant.

Ramps with steeper gradients should be avoided as they can be difficult for some wheelchair users; parents with strollers; people with walking difficulties; and those using walking aids to ascend due to the strength required to propel them up the slope.

Descent may be hazardous due to the strength required to slow down and stop the wheelchair or stroller. Steeper gradients also present a risk that a person in a wheelchair will fall forwards out of a wheelchair when descending and that a wheelchair or stroller may tip backwards when ascending.

Figure 1.8 Example of an external ramp.



Ramps that are very long and have a substantial overall change in level may be too tiring for some people to use, even with regular landings and rest areas.

Where the overall rise of a ramp is more than 2000mm, an alternative means of access should be provided, such as a lift or platform lift.

The cross-fall gradient of a ramp should not exceed 1 in 50, but should be sufficient to effectively drain surface water.

All ramp slopes and landings exposed to the weather should be detailed and constructed to drain water. If the ramp surface is not adequately drained, it may become unusable in wet weather and extremely hazardous in freezing conditions.

Ramp slopes should be straight. Curved ramps should be avoided as they are more difficult for some wheelchair users; parents with strollers; and those using walking aids to negotiate.

Changes in the direction of travel should occur at an intermediate landing.

The clear width of a ramp should be determined by the expected level of use and whether people are likely to be using the ramp in both directions simultaneously. In any case, the clear width should not be less than 1500mm.

Where a large number of people are expected to use the ramp at any one time and in both directions, a clear width of 1800mm or more may be appropriate.

Landings should be provided at the top and bottom of a ramp and should be 2400mm x 2400mm to provide turning space for wheelchair users and parents with strollers. Intermediate landings should be 2000mm long and equal to the width of the ramp. If the ramp is long, or is likely to be used frequently by wheelchair users or parents with strollers, the intermediate landing should be increased in width to 1800mm to provide a suitable passing place.

Image 1.29 Example of a woman using an electric scooter on a ramp to access a building. Note the lack of handrails to both sides of the ramp.

1.5.2.2 Handrails

Handrails should be provided to both sides of the ramp and should be continuous to the full length of the flight and around intermediate landings.

Handrails should be positioned with the upper surface 900 to 1000mm above the ramp slope and 900 to 1100mm above landings. The provision of a second lower handrail, with the upper surface positioned 600 to 750mm above the ramp and landing surface is desirable and will benefit people of different heights.

It is recommended that handrails should extend 300mm beyond the top and bottom of the ramp to provide support to people as they move from a level surface onto a slope and vice versa.

Handrails should be easy to grip and be either circular in cross-section or non-circular with a broad horizontal face, with a diameter of 40 to 50mm, as **Figure 1.9**.

Where a second lower handrail is provided, the diameter may be 25 to 32mm in recognition that it is likely to be used predominantly by children and that a smaller profile will make it easier to grip.

An oval profiled handrail's dimensions should be 50mm wide and 38mm deep with rounded edges with a radius of at least 15mm. For both rails, a clearance of 50

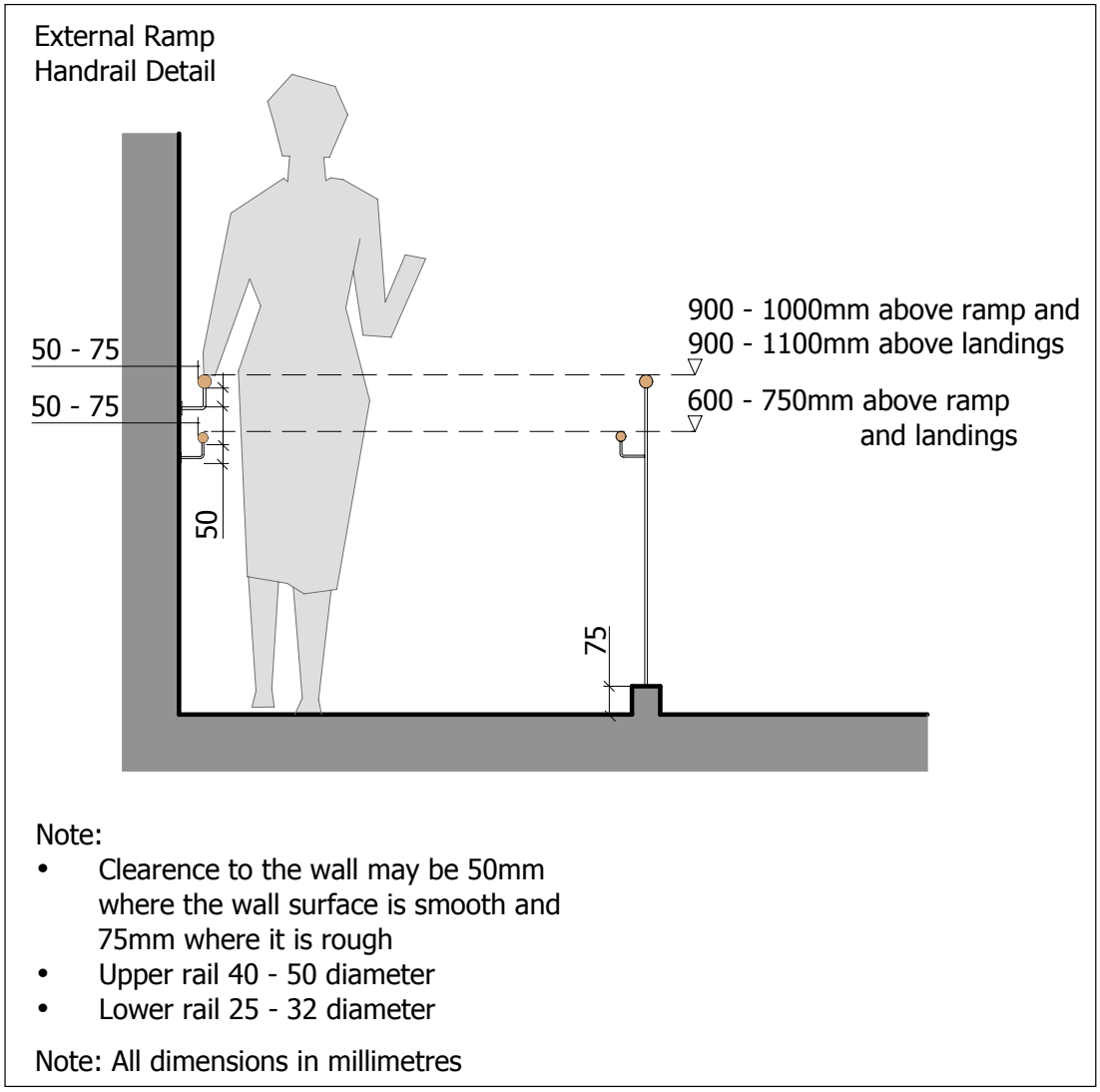
to 75mm between the rail and any support wall or mounting surface should be maintained along the full length of the rail, as **Figure 1.10**.

Support brackets should be fixed to handrails centrally on the underside so that a person can run their hands along the full length of the rail without interruption. If the position of handrail-supports requires a person to release their grip on the handrail, the person may feel insecure and may not be able to support themselves adequately.

The vertical clearance between the underside of the handrail and any angled support brackets should be 50mm.

The ends of handrails should terminate in a way that signifies that the top or bottom of the ramp has been reached.

Figure 1.9 Handrail details.



This can be achieved by turning the handrail towards the wall or downwards for a recommended 150mm. This arrangement also reduces the likelihood of clothing or bags being caught on the end of the handrails as a person approaches the ramp slope.

Handrails should visually contrast with the surfaces they are viewed against so that they are readily apparent to all users.

The selection of appropriate materials for handrails is not only important in aesthetic terms, but can greatly influence the usability of the ramp for many people.

Metal handrails should be avoided as they can become very cold in winter weather conditions. People who need to firmly grip handrails in order to safely negotiate a ramp will find a cold handrail extremely uncomfortable and possibly painful to use.

Preferred materials that are not cold to the touch include timber and plastic-coated steel.

1.5.2.3 Ramp surface and edge protection

The surface of the ramp should be non-slip in both wet and dry conditions. The ramp slopes should contrast visually with landing surfaces to highlight the change in plane to people with visual difficulties.

Where the ground level to either side of a ramp is different to that of the ramp slope and landings, a kerbed upstand or other form of edge protection should be provided.

A kerbed upstand should be 100mm high (above the ramp and landing surface) and contrast visually with the ramp surface. If a balustrade or guarding is provided to the side of a ramp, this is able to provide appropriate edge protection, as long as the gap between the ramp surface and lower edge of the balustrade or guarding is no more than 50mm.

Where a ramp is bordered by landscaping and the ground level rises up from the ramp, a kerbed upstand or other edge protection is not considered necessary.

Isolated kerbed upstands adjacent to open landscaping are not recommended as they can present a trip hazard.

Ramps should be illuminated so that they can be used safely when it is dark. Lights should be positioned carefully to adequately illuminate the ramp and landing surfaces and to highlight changes in gradient. Lights that present a source of glare and create strong pools of light and dark or harsh shadows should be avoided as these can be visually confusing, particularly to people with visual difficulties. The recommended illuminance at the ramp surface is 150 lux.

Checklist - External ramps and handrails
• Design access routes with a gradient exceeding 1 in 25 as a ramp.
• Ensure the maximum gradient of a ramp is 1 in 20, maximum rise 450mm and maximum length 9000mm.
• Make the gradient of a ramp slope constant and consistent with consecutive ramp slopes.
• Provide an alternative means of access where the overall rise of a ramp exceeds 2000mm.
• Ensure the cross-fall gradient is no greater than 1 in 50.
• Design surfaces to drain water effectively.
• Avoid curved ramps. Ramp slopes to be straight.
• Provide clear width to suit expected level of use, but not less than 1500mm.
• Plan for top and bottom landings to be 2400mm x 2400mm and intermediate landings 2000mm long (multiplied by) ramp width.
• Locate handrails on both sides of the ramp and continuously around intermediate landings, as figures 1.8 and 1.9.
• Provide a kerb upstand or guarding to the side of ramp where adjacent ground is at a lower level.
• Illuminate ramp and landing surfaces to 150 lux.

1.5.2.4 External steps

External steps should always be provided in conjunction with ramps to offer choice and to provide routes that are usable by all. A flight of steps will generally provide a shorter route between two points than a corresponding ramp and this is beneficial to many people, even though it involves a steeper change in level. Some people find it difficult to walk on an inclined surface such as a ramp slope due to the angled position of the foot and prefer the flat surface of steps to negotiate a change in level.

Figure 1.10 External Steps.

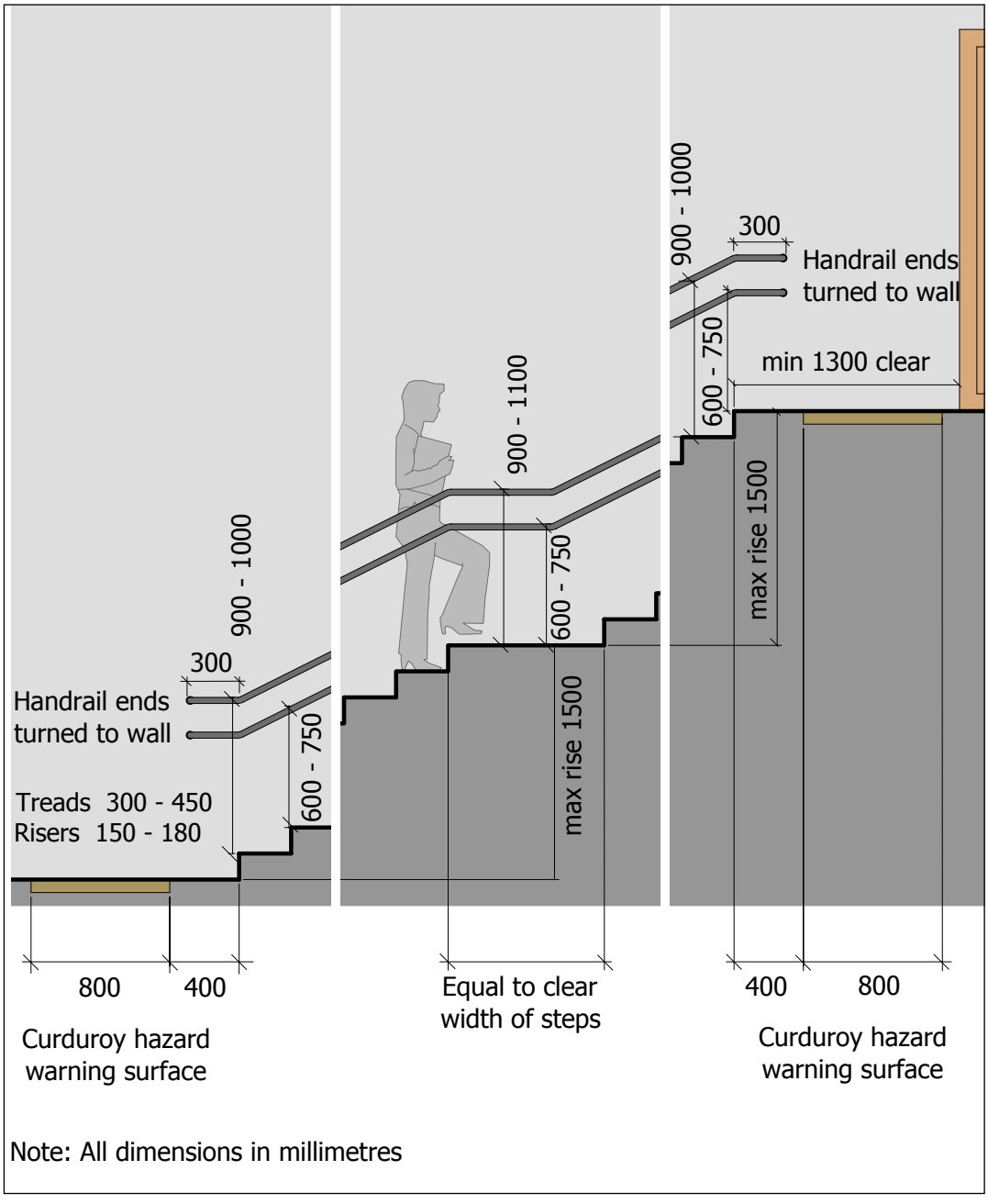
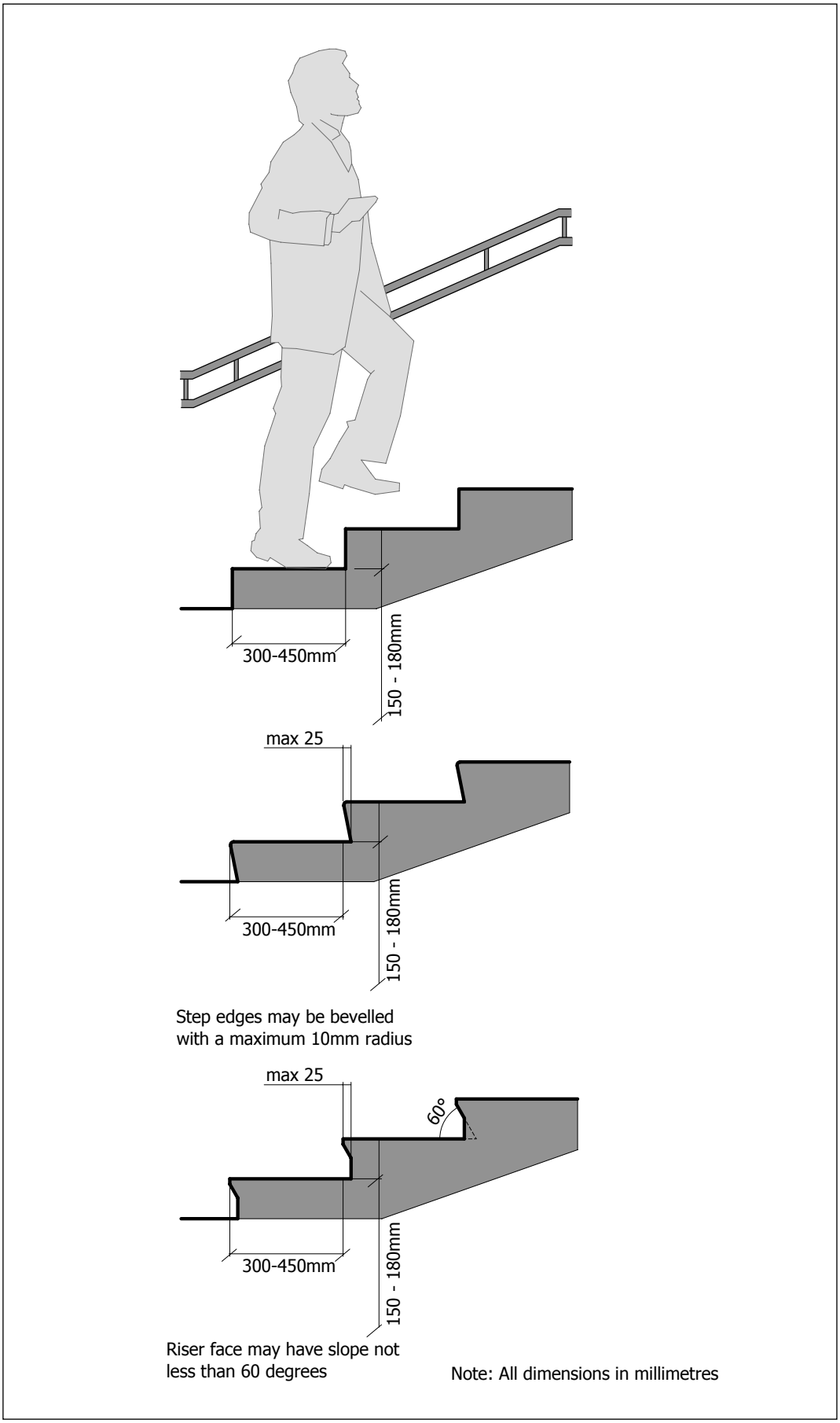


Figure 1.11 Step nosing profiles.



The dimensions of steps should be consistent throughout a flight. The rise of external steps should be in the range 150 to 180mm. The going (depth) should be in the range 300 to 450mm.

The profile of steps should be in accordance with **Figure 1.11**. Steps without projecting nosings are preferred, but if a projection is required, the riser face should be chamfered to an angle of at least 60 degrees and the overlap limited to 25mm. The leading edge of each step may be bevelled with a radius not exceeding 10mm. Projecting nosings that have an underside perpendicular to the riser face should not be used as these present a trip hazard, particularly to people who ascend steps by sliding their feet up the surface of the riser. For the same reason, all step risers should be solid. Open risers can also be a source of visual confusion and are disconcerting for many people to use.

Step treads and landing surfaces should be non-slip and should be well drained to avoid water pooling.

Each step edge should have a non-slip applied nosing or contrasting strip to visually highlight the step edge. The nosing or strip should extend to the full width of the step and be 50 to 70mm deep, measured from the leading edge of the step. Where nosings comprise a metal frame with a coloured plastic insert, the insert should be a single colour. Nosings comprising two parallel strips of different colours should not be used as these can give a false impression of the location of the step edge.

The clear width of external steps should be determined by the expected level of use, but should not be less than 1200mm.

The total rise of a flight of steps between landings should be no more than 1500mm, as **Figure 1.10**. If more than one flight is required, the number of steps in each flight should be the same.

Single steps in an access route should be avoided as they are less readily apparent than a longer flight of steps and may present a trip hazard. If the change in level of a route is equivalent to the rise of a single step, the surface should be gently graded to provide a level approach that is universally designed. Landings should be provided at the top and bottom of each flight. The landing length should be equivalent to the clear width of the steps and should be unobstructed by any door swings or gates.

Figure 1.12 External steps.

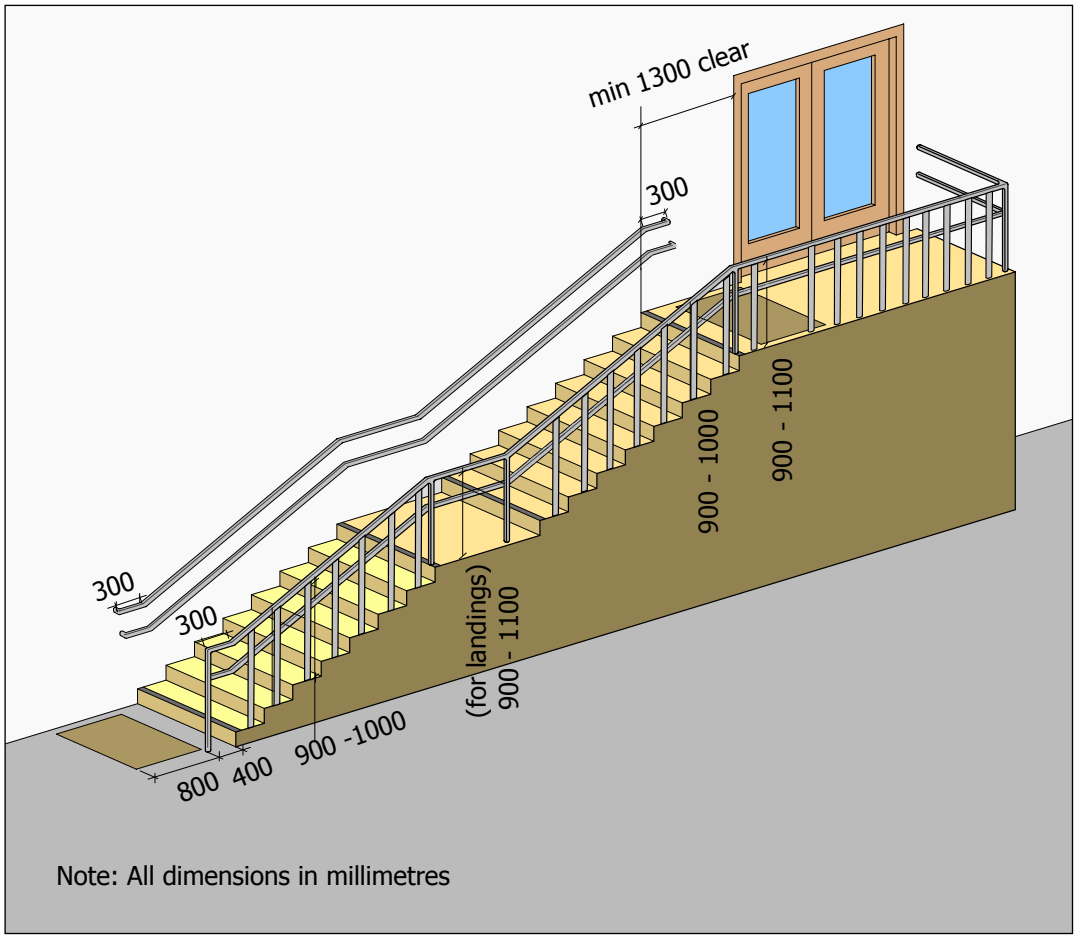
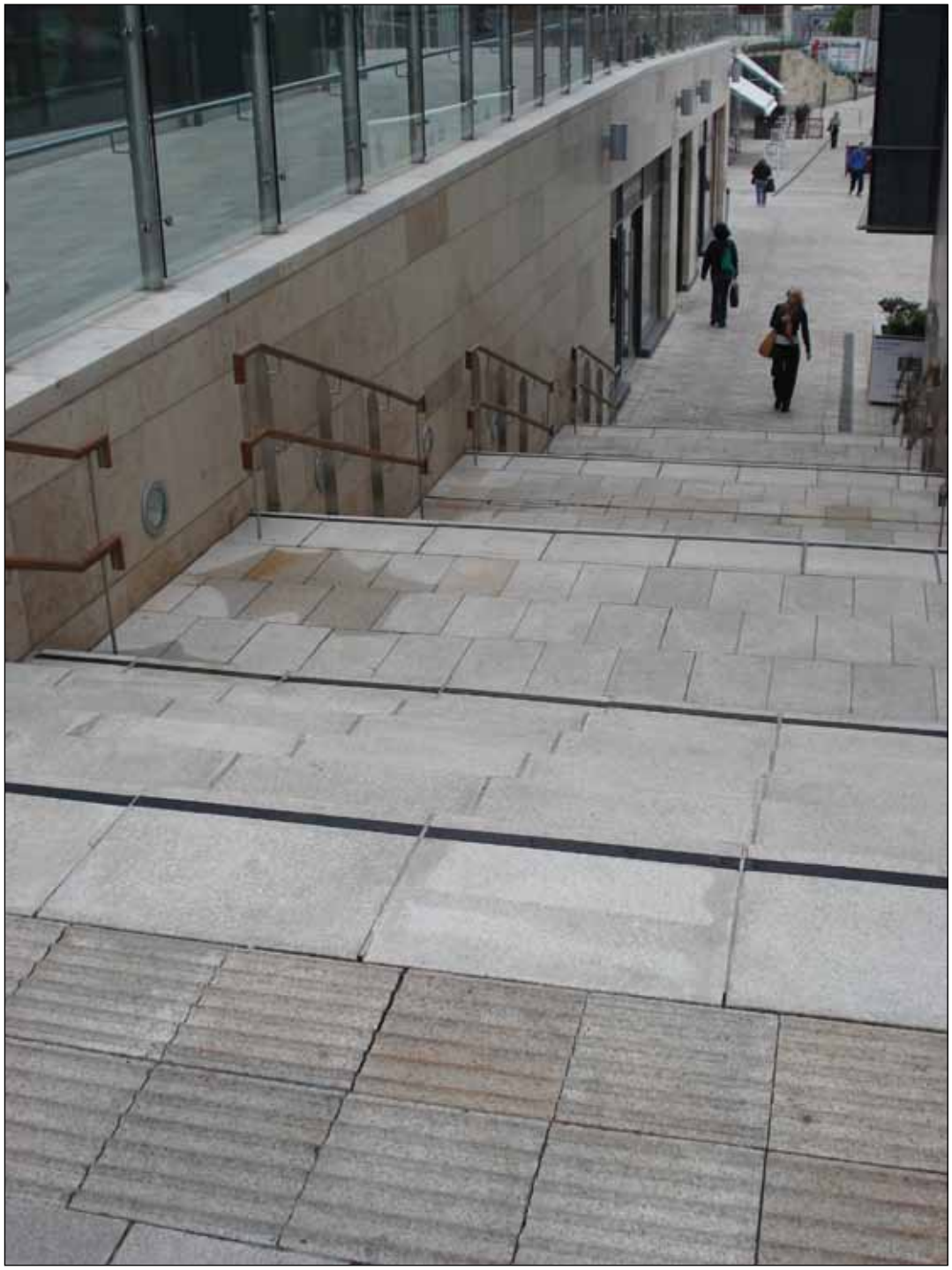


Image 1.30 Example of tactile strip, top step highlighted plus 2 levels of handrails that contrast with surrounds. Note however the lack of highlighting to the nosing of the last step plus the handrails do not extend beyond the last step by 300mm. Also there is no tactile strip at the bottom step however the change of material from timber to stone may work.

Image 1.31 Example of exterior steps, corduroy hazard warning strips, top and bottom steps with contrasting colour strip, handrails plus landings. Note gap between handrails on each landing. The handrails should continue to help those needing additional support. Note also the lack of a permanent contrasting strip to the nosings of the steps between the top and bottom step plus there should be a tactile warning strip at the bottom of the steps.

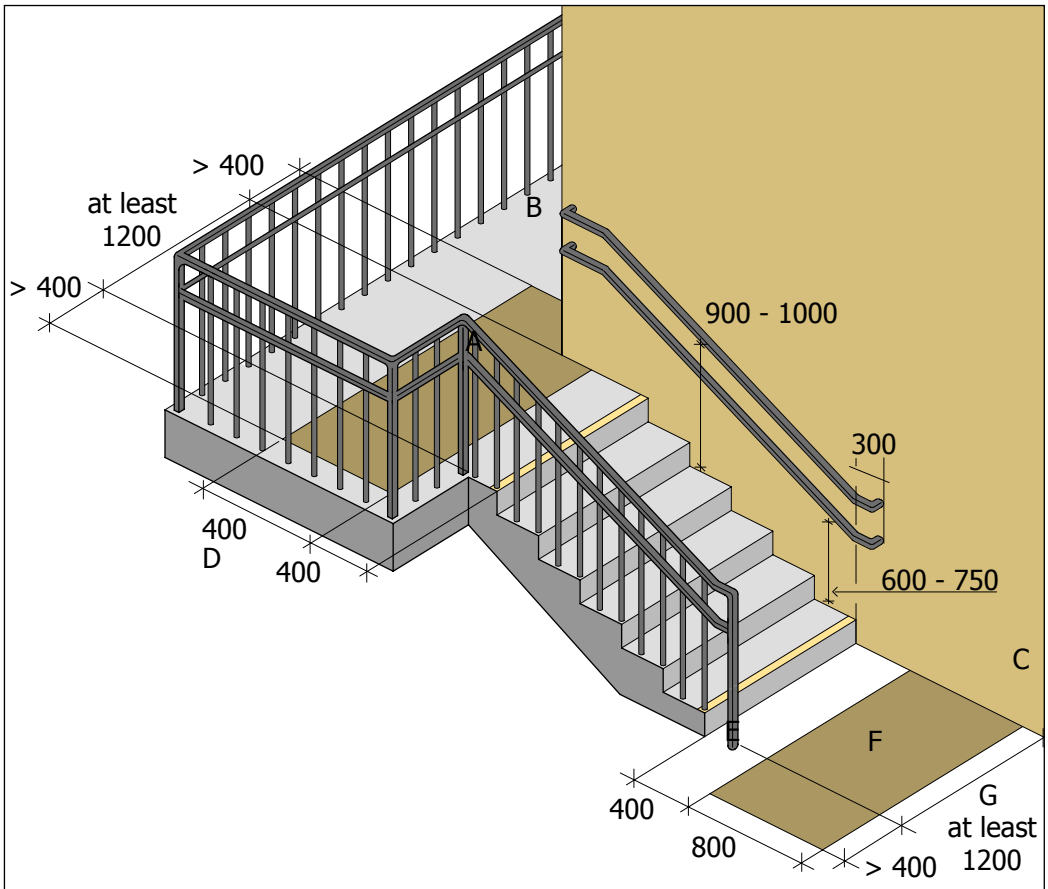


Steps can present a hazard to people with visual difficulties, particularly when they are located in the direct line of travel. The use of a tactile hazard warning surface at the top and bottom of a flight of steps provides a means of highlighting the approaching change in level. However, it must be of the appropriate type and be installed correctly in order to convey the right message and to provide adequate warning to pedestrians.

Image 1.32 Example of corduroy hazard warning strip at top and bottom of exterior steps. Note the lack of a permanent contrasting strip to the nosings of the top and bottom steps plus the steps in between. The handrail could also be extended to where the hazard warning strip begins. Steps should include lower handrail as well.

The hazard warning surface should be positioned sufficiently in advance of the steps to give adequate time to stop. It should also extend a sufficient distance in the direction of travel to ensure it is detectable to all pedestrians. If only a narrow strip is provided, a person may step over it with a single stride and be unaware of the approaching hazard. The location and dimensions of hazard warning surfacing for external steps are illustrated in **Figure 1.13**.

Figure 1.13 External steps with corduroy hazard warning surface at top and bottom of stairs.



Key

A. Curduroy hazard warning surface at top of stairs to extend at least 400mm at each side of stairs and to stop 400mm from nosing
B. Handrail fixed to side wall and terminated with a closed end at top and bottom
C. Side wall to staircase
D. 800mm when the approach is straight on and 400mm when a conscious turn is required to reach the step
E. Handrail to be treminated in a way that reduces the risk of clothing being caught
F. Corduroy hazard warning surface at bottom of stairs
G. Surface width of stair at least 1200mm wide

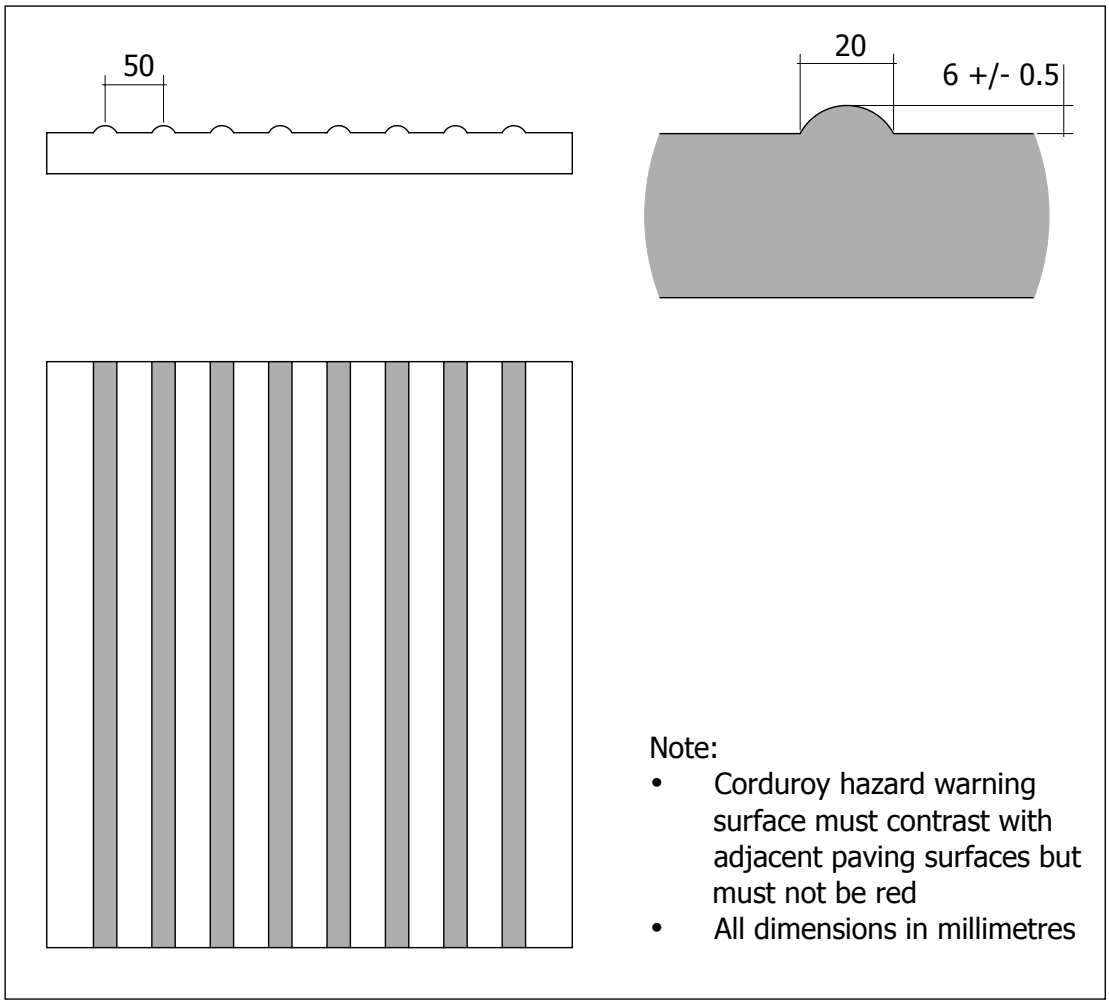
Note: All dimensions in millimetres

Hazard warning surfacing should not generally be used on intermediate landings as this can give the false impression that the end of a flight has been reached. The exception to this is if the stepped route can be joined at intermediate landing level from another direction, such as via a doorway or adjoining path. Also, if an

intermediate landing is significantly longer than would otherwise be expected and the handrails are not continuous, the use of tactile warning surfacing could be used on the basis that there were two separate flights of steps.

The correct type of hazard warning to use at the top and bottom of external steps has a ribbed profile, as illustrated in **Figure 1.14**, and is commonly termed a 'corduroy' hazard warning surface. See also **Section 1.5.6**.

Figure 1.14 Corduroy hazard warning surface.



Handrails should be provided to both sides of steps and be continuous along intermediate landings. Where the clear width of a flight of steps is greater than 2000mm, an additional handrail (or handrails) should be provided to divide the steps into channels. This will improve safety and be beneficial to many people, particularly when the steps are being used by a large number of people at any one time.

No individual channel in a flight of steps should have a clear width less than 1200mm.

Image 1.33 An example of an external staircase with continuous handrails. Note, however, the lack of corduroy hazard warning strips at the bottom of the steps, the gap in the handrails fixed to the wall of the building and the lack of contrast strips to the nosings of the treads. The handrails should also be painted a different colour to contrast with the stone steps. The lighting set into the risers can lead to confusion if not laid properly.

It is preferred that the area beneath an external flight of steps is enclosed in order to avoid the potential for a person colliding with the soffit or any supporting elements. Where steps are free-standing, any area where the clear height is less than 2100mm should be protected to prevent access. Means of protection could include a permanent raised flower bed or tubs at least 900mm high or a protective guard rail incorporating a low-level tapping rail.

Guidance for the height, length and profile of handrails for stairways is the same as for ramps.

External steps should be illuminated so that they can be used safely when it is dark. Refer to the guidance for ramps above.

Checklist - External steps
• Provide steps in conjunction with a ramp.
• Ensure step dimensions and profile are consistent with **Figure 1.11.**
• Visually highlight each step edge.
• Ensure that the clear width of steps suits expected level of use, but is not less than 1200mm.
• Ensure the total rise of flight between landings is no more than 1500mm.
• Provide consistent number of steps in consecutive flights.
• Avoid single steps in an access route.
• Include clear landings at top and bottom of steps, with the length equivalent to the step width.
• Create tactile hazard warning surface at top and bottom of flight, in accordance with **Figure 1.13.**
• Provide handrails to both sides of the steps and continuous around intermediate landings, as **Figures 1.12** and 1.**13.**
• Provide an additional central handrail where the steps are more than 2000mm wide.
• Protect any area below steps which has headroom less than 2100mm.
• Light step and landing surfaces adequately to 150 lux.

1.5.3 Surface materials

Surface materials for access routes and adjoining areas should be carefully selected, designed and detailed to provide safe and robust environments for everyone to use. The logical and creative selection of materials can make it easier to demarcate different zones, for example, to clearly delineate between pedestrian and vehicular zones in a typical street profile.

The surface of all access routes should be hard and firm with a good grip. Smooth paving surfaces are easier for everyone to navigate and are particularly valued by people pushing prams and pushchairs and by people who use wheelchairs and

walking aids. Uneven surfaces such as cobbles and bare earth and surfaces such as loose gravel and sand should be avoided. These are difficult and uncomfortable for many people to cross and may present a tripping hazard. Surfaces should be slip-resistant when wet and dry, with a dry friction coefficient between 35 and 45.

Surface materials should be selected to reduce the potential for glare from bright sunlight or other light sources such as street lights.

The ground surface should not have a strong pattern as this can be a source of visual confusion. The use of contrasting lines or bands should be avoided in locations where they may be perceived by some people as highlighting a step edge.

A significant factor in the selection of surface materials is the ease of making repairs. An expensive stone from a faraway place, or unusual colour of macadam, is less likely to be repaired properly than a local stone or standard colour of macadam that is readily available. This is not to say that special places should not be celebrated by the use of special materials. They will, however, require a high degree of care when repairing any damage.

Regular and effective maintenance should prevent or replace cracked and uneven paving slabs and those with loose joints, as they become tripping hazards and are difficult to walk on, cause puddles to form and become slippery.

1.5.3.1 Natural and tempered landscapes

Gravel, currently a common surfacing material in natural and tempered landscapes, should be used only if it is of a grade which is well compacted, with no loose stones greater than 5mm. This will ease the passage of prams, pushchairs and wheelchairs, and reduces the possibility of tripping for people who are unsteady on their feet. Regular maintenance will be required to repair potholes and erosion.

Alternatively, a bound gravel surface, where a top dressing of gravel is applied to a bitumen layer, gives the feel and appearance of gravel on a firm base. This surface will wear with use, requires regular maintenance and is not suitable for intense vehicular movement.

New surface dressings should not be so deep to make access more difficult. As these surfaces require occasional top dressing, gravel from a local source should be selected, so that it is readily and cheaply available.

Epoxy bound gravel is a more expensive surface that gives the appearance of gravel. Bound in a clear resin, the colour of the gravel comes through but the surface is very firm, non-slip and requires little maintenance. Bitumen macadam has the effect of 'suburbanising' a landscape but may be necessary where paths are used intensively or where maintenance is sporadic.

Different colours are available, made from clear bitumen coloured with a dye and mixed with stone chippings of a similar colour. Buff and red colours are readily available and the source should be local so that repairs are easy to implement. Red is typically used for cycle paths and it may be appropriate to use the same material as a continuation of a wider network of cycle paths in the environs in order to avoid confusion.

Sustainable solutions to hard landscapes should specify permeable surfaces to allow direct percolation of water to the soil substrate.

Where grass tracks are used, a reinforcing system can be used below the surface to give a firm but free-draining layer on which grass can grow. It should be installed so that the edges do not become a tripping hazard. The disadvantages of grass surfaces are that they inhibit the use of wheelchairs, prams and pushchairs and that the grass can conceal trip hazards for people who are frail, unsteady on their feet or who have visual difficulties. Wide expanses present a further disadvantage to people with visual difficulties who will find it difficult to orientate themselves in the space. A mown grass path contrasting in texture and colour with meadow grass, even after the meadow has been mown, may be of some limited assistance with orientation.

1.5.3.2 Urban environments

The unit size of materials used in surfacing is often related to the function or load it is expected to handle. Large slabs can be employed for light pedestrian use, although the larger the surface area of the slab, the thicker it should be to prevent it from cracking. Large slabs can be unwieldy and difficult to lay evenly, even with a hoist.

The smaller the unit size, the more resistant the paving unit will be to vehicular loads. However, the surface itself may become distorted through use, unless a strong enough bed has been laid. Problems can be rectified easily when the units

are bedded in sand, but are more difficult when the joints are mortared. Light traffic on small modular paving bedded on sand can encourage grass and moss to grow in the joints which may present a tripping hazard and be a hindrance for wheelchair users; parents with strollers; people with walking difficulties; and those using walking aids. This type of surface requires regular maintenance. Differential settling can result in an uneven surface that becomes a trip hazard.

Polished surfaces cause glare and are not suitable in a damp climate, as they remain slippery in a moist atmosphere, even after rain has passed. Likewise, fine-grained stones with high calcium content can erode quickly with use, forming a polished surface that will be slippery in wet weather. There are numerous mechanical finishes to stone paving, from a simple cleaving or sawing, to pin- and bush-hammering, which produces a non-slip textured finish. Different finishes will also draw out different qualities in the stone.

Checklist - Surface materials
• Ensure logical and creative use of materials to enhance legibility of external environment.
• Ensure all surfaces are firm, hard and slip-resistant.
• Avoid uneven and loose surfaces.
• Be aware that some surfaces are a potential source of glare.
• Avoid surfaces with a strong pattern or contrasting lines that may be visually confusing.
• Consider the ease and cost of future repairs.

1.5.4 Street furniture

Furniture in the external environment consists of a variety of elements such as lighting columns, junction boxes, electrical pillars, mini pillars, seats, picnic tables, litter bins, information panels, traffic signs, parking meters and post boxes, often installed independently over time and without coordination.

The placement of these elements can result in an obstacle course for most people and present particular difficulties for people with visual difficulties, wheelchair

users, people using walking aids, those with walking difficulties and people pushing strollers and buggies.

In both rural and urban situations, furniture should be placed at or beyond the boundary of an access route, subject to the widths given in **Section 1.5.1**.

Good placement and coordination of furniture will result in a tidy, easy to follow pathway or street that is easy for everybody to travel along. Elements should be placed in straight lines. For instance, where lighting columns define the main zone of street furniture, other objects such as bollards, traffic signs and post boxes can follow this line.

Bulky objects such as parking meters and post boxes should not be placed where they will become a visual obstruction, for example at crossing points.

1.5.4.1 Lighting and signage

Lighting columns and signs should be mounted on buildings or walls wherever possible to reduce the frequency of interruption at path or pavement level. Where this is not possible, they should be placed as close as possible to the back of the pavement, subject to a maximum distance of 275mm from the outer face of the post or column to the property line. Where they are placed on the road side of a pavement, they should be at least 500mm from the kerb edge, or 600mm if the road has a steep camber or cross-fall. Posts and columns should be at least 1000mm apart.

Overhead signs and any item suspended above a path or pavement such as wall-mounted lights or overhanging trees should provide a vertical clearance of at least 2300mm to the footway surface.

In some instances, such as on pedestrian-only areas within rail or bus stations, signs may be mounted to provide a clearance of 2100mm, but in any areas where cyclists are likely to use a route, a clearance of at least 2300mm must be maintained. Where trees or shrubs overhang a footway, they should be cut back to provide a clearance of 3000mm to allow room for new growth.

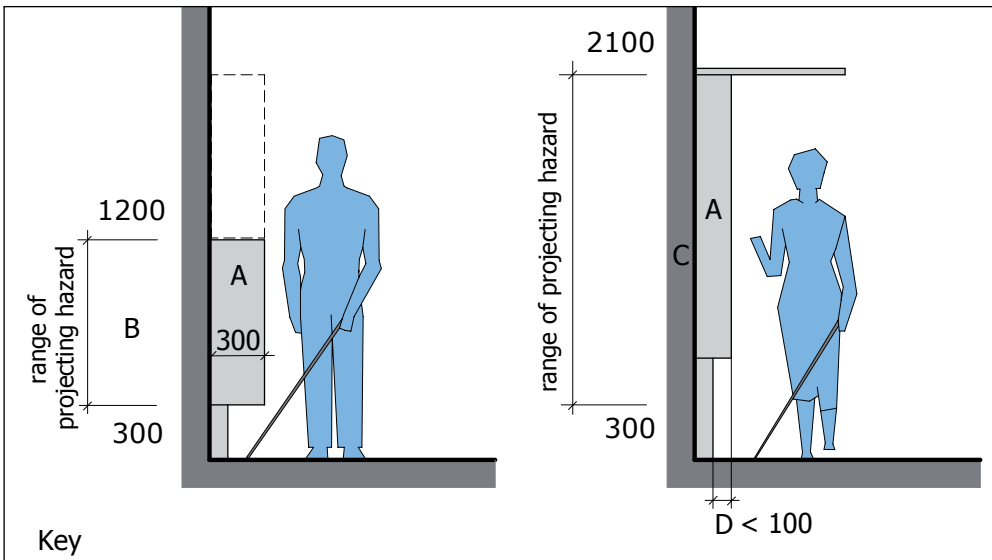
1.5.4.2 Placement of street furniture

All street furniture should visually contrast with the background against which it is seen. Grey posts and columns should be avoided as they tend to blend into the general background. Items such as free-standing posts and columns should be highlighted by means of a 150mm-high feature, such as a crest or band, positioned 1500mm above ground level, which visually contrasts with the furniture itself. Bollards can be effectively highlighted by incorporating a light into the top.

Furniture should be continuous to ground level. Pedestal-mounted objects such as litter bins, telephones and letter boxes should be avoided as the pedestal can obstruct access. Items attached to posts should face in the direction of travel so that they do not interfere with the line of movement.

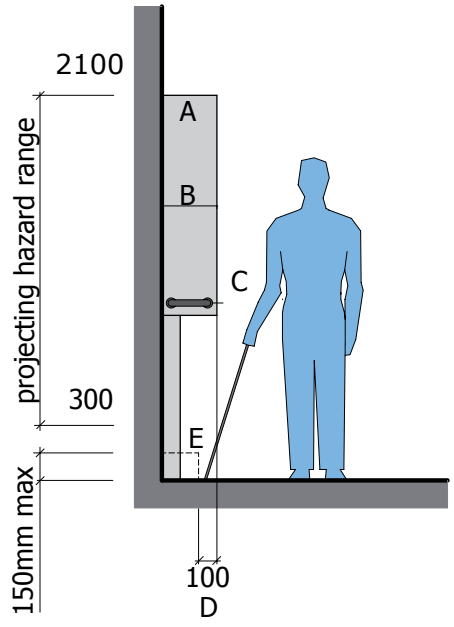
Where eye-level signs, such as maps, are supported on two vertical posts, a tapping rail located between the posts at 250 to 400mm above ground level will help prevent an unsuspecting pedestrian colliding with the sign. The sign should not extend more than 150mm beyond the posts and the rail and posts should contrast visually with the background surfaces.

Figure 1.15 Objects projecting onto access routes.



Key

A. Object projecting into an access route
B. No hazard protection required where the lower front edge of a projecting object is less than 300mm, and the upper front edge of the object is at least 1200mm above the ground
C. No hazard protection required where an object projects into an access route between 300mm and 2100mm above the ground by not more than 100mm, or by not more than 100mm in front of its base where the base projects not more than 100mm into the access route
D. Protection of an object in front of its base



Key

A. Hazard such as:
- open window;
- building projection;
- telephone booth

B. Cane detection required where an object projects into an access route between 300mm and 2100mm above the ground by more than 100mm, or by more than 100mm in front of its base
C. Guarding each side of the obstruction in addition to cane detection
D. Not more than 100mm between the front face of an object and the tapping rail
E. Tapping rail, with its underside no higher than 150mm above floor level, to provide cane detection

Note: All dimensions in millimetres

1.5.4.3 Bins

Litter bins should have an overall height of approximately 1300mm and a bin opening at 1000mm above ground level.

1.5.4.4 Bollards

Bollards are often used to stop vehicles from mounting the footpath and to keep pedestrians away from traffic. Unless positioned carefully they can form a barrier to wheelchair users and parents with strollers and are a particular hazard for people with visual difficulties. Where they are essential, such as to ensure clear escape routes, bollards should be identifiable by using contrasting colours, and be a recommended 1000mm high and 200mm wide. A recommended 1200mm-wide passage should be maintained between the kerb edge and any bollard, in both directions.

Bollards should never be linked with ropes or chains as this can present a hazard to people with visual difficulties.

1.5.4.5 Gates

Gates are sometimes hinged or sprung in such a way as to be self-closing. These should be adjusted so as not to slam shut on an unsuspecting pedestrian or to prevent wheelchair or pushchair access. The opening mechanism should be robust but easy to grip and manoeuvre. The path should extend 500mm to the side of the gate with the latch to make it easier to approach and open the gate. The approach to the gate should be a recommended 2000mm long and free of obstructions.

1.5.4.6 Drinking fountains

Where drinking fountains are provided, they should be clearly identified, understandable, useable and accessible to all users.

Image 1.34 Example of signage identifying a water fountain.

They should provide a clear knee-space for seated users and have a projection from the wall to the front of the fountain of 430 to 500mm and a spout height above the floor within the range 750 to 915mm.

The provision of two drinking fountains, one with a height at each end of the suggested range, is likely to meet the needs of most people.

A clear area of 800mm x 1300mm away from any access route should be provided in front of each drinking fountain to provide convenient and unobstructed approach. One solution is to locate a drinking fountain in an alcove so that it does not present an obstruction or hazard to other pedestrians.

The water spout should be positioned towards the front of the fountain and have a recommended 100mm height of water flow to enable a cup to be filled. Controls should be easy to operate, positioned towards the front of the unit and to both sides to enable operation by a person using either hand. A drain should be located under the drinking fountain to prevent the ground surface from becoming waterlogged or muddy. Consideration should be given to providing a shallow tray or bowl to enable assistance and other dogs to get a drink of water.

1.5.4.7 Seating

Seating should be provided at regular intervals along access routes and, wherever possible, in conjunction with changes in level such as external steps and ramps. In recreational or countryside environments, seating should be located in sheltered places and where people can enjoy a good view.

Table 1.1 Recommended maximum distances without rest	
Users	**Distance (metres)**
People with visual difficulties	150
People using wheelchairs	150
People who are ambulatory without walking aids	100
People using walking sticks or mobility aids	50

Seats should be placed 600mm (to the front of the seat) back from the line of movement so they do not obstruct adjacent access routes. The surface on which seats are placed should be flush with surrounding levels and be firm and stable. A 900mm square of firm paving beside a seat will enable a wheelchair user to sit alongside other people. It will also allow a parent with a stroller to safely park the stroller beside the seat.

Seats should be at least 450mm high and a recommended 500mm wide. Perching seats with a height of 500 to 750mm are easier for some people to use and may be provided as an alternative in some locations. A heel space at least 100mm deep makes it easier for people to stand up off the seat or perch.

Seats with backrests are useful for additional support, and armrests, positioned approximately 200mm above seat level, are also useful to lean against, as well as assisting in getting in and out of the seat. Seats positioned or linked in a row should all be of the same style, such as all with armrests or all without. A mixture of seat styles in a single row can cause confusion for some people with visual difficulties.

Picnic tables should be located in safe, pleasant areas with convenient access to any adjoining car park. They should not be so close to the car park that use of the tables is adversely affected by noise or fumes from cars. Picnic tables should be placed on level sheltered sites and served by accessible paths. The design of the table and seats should be such that they do not topple when unbalanced. A

clearance of 700mm to the underside and a tabletop surface 750 to 850mm above ground level should enable universal use.

Seating should be as described in the paragraph above. Where tables and chairs are joined in the same construction, people should not have to climb across beams or other supports in order to access the seats and space should always be available for a person of large stature, those with mobility difficulties & wheelchair users to sit at the table.

A firm, level surface 2000mm wide around the perimeter of the picnic table and seats will provide comfortable, convenient, understandable and useable access for all users regardless of their age, size, ability or disability.

Checklist - Street furniture
• Place items of street furniture at or beyond boundary of access route.
• Ensure overhead signs and fixtures provide clearance of 2300mm to the path or pavement.
• Ensure all street furniture contrasts visually with background.
• Incorporate a visually contrasting band in all free-standing posts and columns.
• Provide tapping rail wherever post-mounted items present a hazard to pedestrians with visual difficulties.
• Never link bollards with chains or ropes.
• Ensure gates are easy to operate and provide clear space adjacent to latch.
• Position drinking fountains to suit seated and standing use.
• Provide seating at regular intervals, away from line of travel.
• Design picnic tables for easy approach with clear path to full perimeter.

1.5.5 Pedestrian crossing points

The provision and location of pedestrian crossing points in any road or street environment should be carefully considered and involve detailed consultation with the relevant road authority.

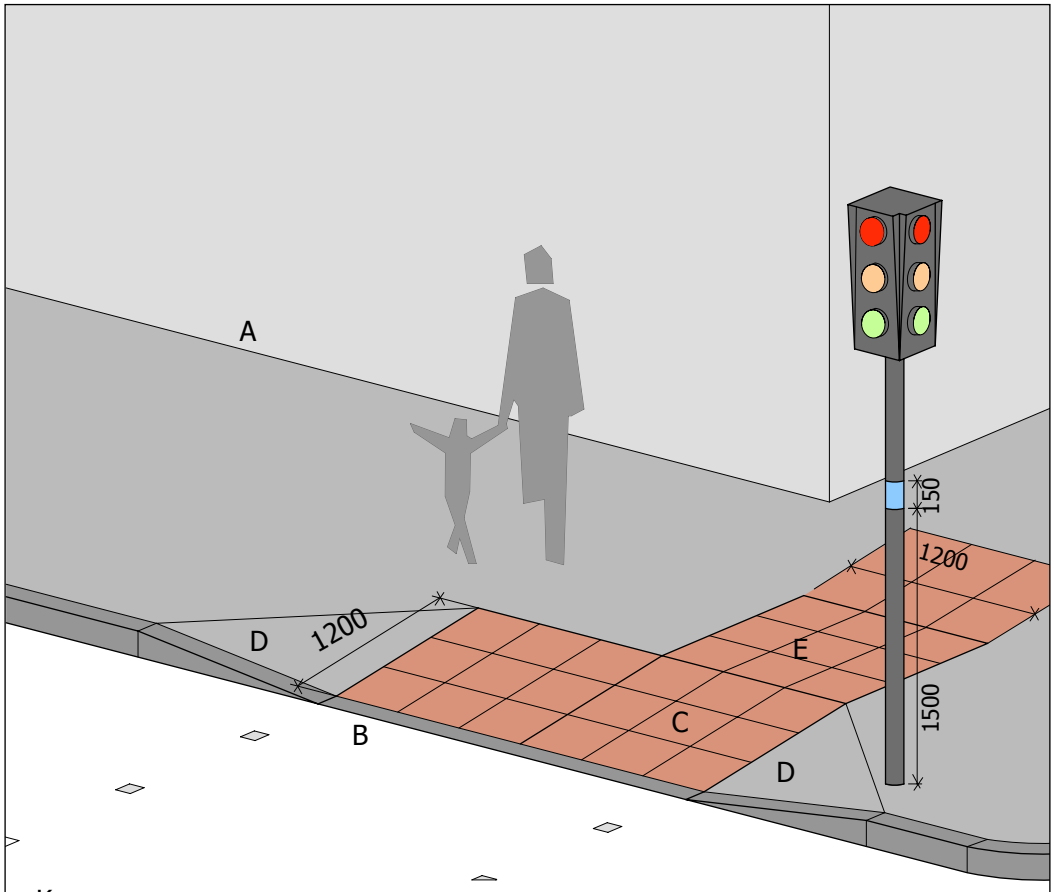
Crossing points should be located where they are clearly visible and safe for all road users, including pedestrians, and where they provide convenient, understandable and useable access.

In busy streets, controlled crossing points with traffic lights should be provided. Audible crossing signals such as pelican crossings help everyone, as well as being essential for people with visual difficulties.

Pedestrian crossing points, including Zebra and controlled crossings, junctions at side roads and other locations such as access points to car parks, should incorporate level or flush access to enable easy passage by all pedestrians. Level or flush access can be achieved with the use of a dropped kerb or a raised road crossing. In residential areas, dropped kerbs should be provided at least every 100 metres.

A dropped kerb should be flush with the carriageway although a 6mm rounded kerb edge is acceptable. The pavement should be ramped perpendicular to the road with a recommended gradient of 1 in 20, where practicable, but not exceeding 1 in 12, as **Figures 1.16** and **1.17**.

Figure 1.16a Crossing point in the direct line of travel. Dropped kerb and red blister paving surface at **controlled crossing points**.



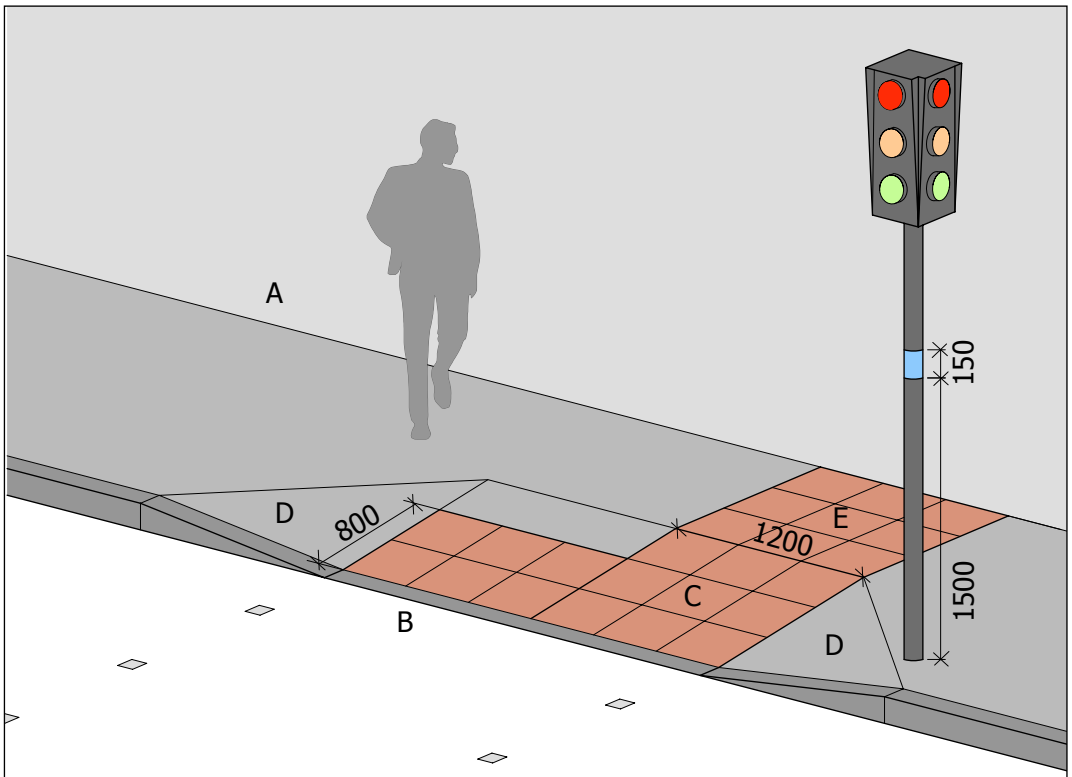
Key

A. Rear of pavement or building line
B. Dropped kerb to be flush with the carriageway, or subject to a max 6mm level difference and a rounded kerb edge. Red blister paving to full width of dropped kerb
C. Ramped section of pavement perpendicular to crossing to be 1 in 20 (max 1 in 12)
D. Flared sides or ramp to be max 1 in 11
E. L-shaped stem of blister paving to guide people to crossing point

Note:

- Red blister paving to full width of dropped kerb
- All dimensions in millimetres

Figure 1.16b Crossing point not in the direct line of travel. Dropped kerb and red blister paving surface at **controlled crossing points.**



Key

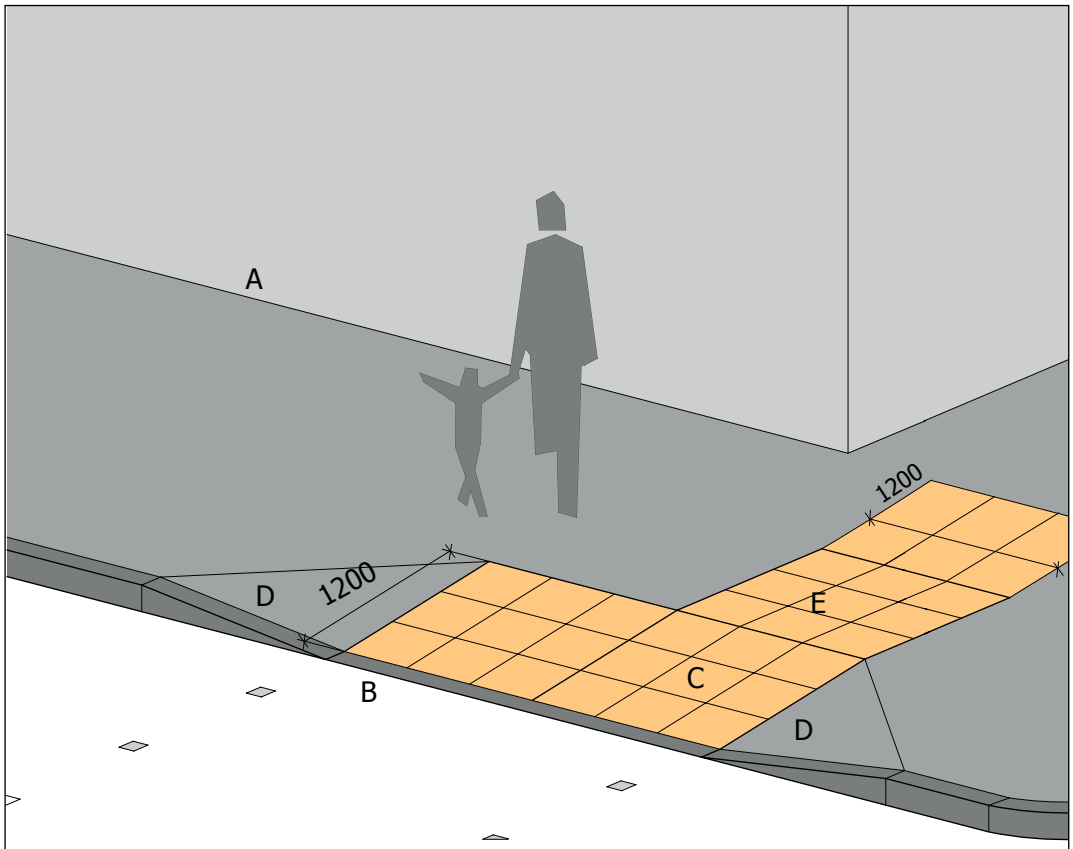
A. Rear of pavement or building line
B. Dropped kerb to be flush with the carriageway, or subject to a max 6mm level difference and a rounded kerb edge. Red blister paving to full width of dropped kerb
C. Ramped section of pavement perpendicular to crossing to be 1 in 20 (max 1 in 12)
D. Flared sides or ramp to be max 1 in 11
E. L-shaped stem of blister paving to guide people to crossing point

Note:

- Red blister paving to full width of dropped kerb
- All dimensions in millimetres

The flared sides of the ramp may have a gradient not exceeding 1 in 11. The ramped section should have a width between 1200mm and 3000mm, dependent on the intensity of use.

Figure 1.17a Crossing point in the direct line of travel. Dropped kerb and buff blister paving surface at **uncontrolled crossing points**.



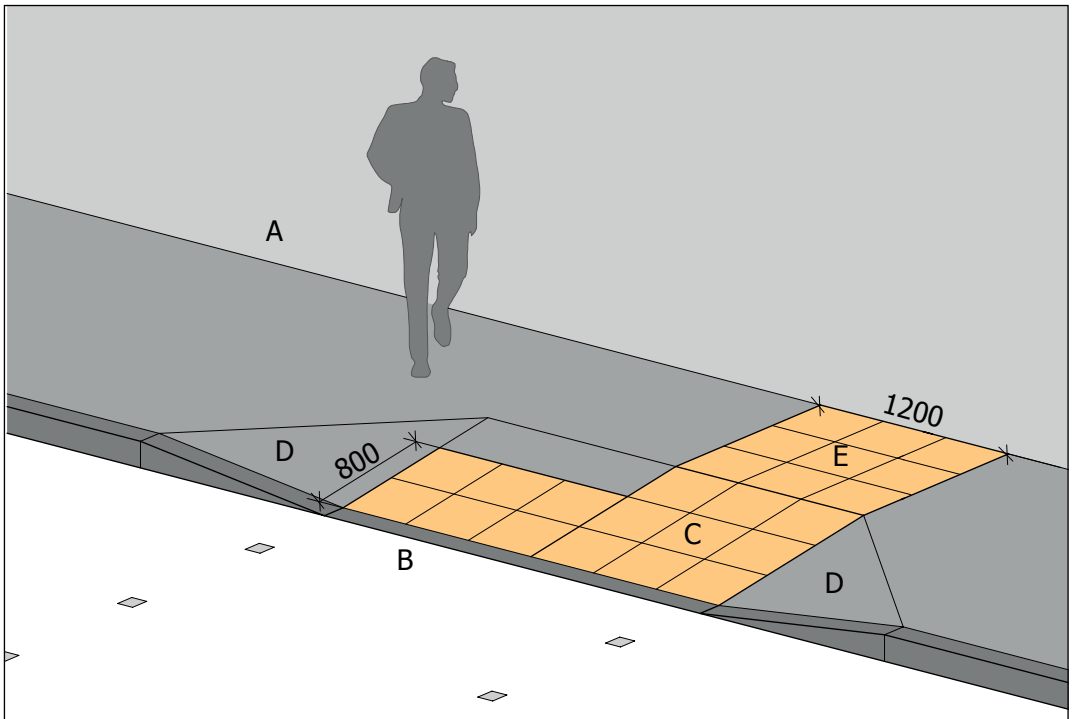
Key

A. Rear of pavement or building line
B. Dropped kerb to be flush with the carriageway, or subject to a max 6mm level difference and a rounded kerb edge. Buff blister paving to full width of dropped kerb
C. Ramped section of pavement perpendicular to crossing to be 1 in 20 (max 1 in 12)
D. Flared sides or ramp to be max 1 in 11
E. L-shaped stem of blister paving to guide people to crossing point

Note:

- Buff blister paving to full width of dropped kerb
- All dimensions in millimetres

Figure 1.17b Crossing point **not** in the direct line of travel. Dropped kerb and buff blister paving surface at **uncontrolled crossing points**.



Key

A. Rear of pavement or building line
B. Dropped kerb to be flush with the carriageway, or subject to a max 6mm level difference and a rounded kerb edge. Buff blister paving to full width of dropped kerb
C. Ramped section of pavement perpendicular to crossing to be 1 in 20 (max 1 in 12)
D. Flared sides or ramp to be max 1 in 11
E. L-shaped stem of blister paving to guide people to crossing point

Note:
- Buff blister paving to full width of dropped kerb
- All dimensions in millimetres

Where a dropped kerb is provided in conjunction with a controlled crossing, the ramped section should be the same width as the crossing, subject to a recommendation of 2400mm. Where the ramped section abuts the carriageway, the road camber should be no more than 1 in 20 for a horizontal distance of 600mm. This is to prevent the front wheels of a wheelchair or footrest becoming caught. The pavement should be sufficiently wide to provide a recommended 1200mm width of level surface to the rear of the ramped section for people to pass without having to traverse the inclined surface.

Where a raised road crossing is provided, the width of the raised area should be at least 2400mm and the surface should be flush with the pavement on both sides.

Where uncontrolled crossing points are provided at road junctions, dropped kerbs should be located away from the curve of the road. Dropped kerbs should be located perpendicular to the line of travel of a person crossing the road and directly opposite a dropped kerb on the other side. People with visual difficulties risk being misdirected by the orientation of the kerb if it is located on the curve of the road.

In street and roadway environments, kerbs are an essential indicator for people with visual difficulties to detect the edge of the pavement.

Where dropped kerbs are provided at crossing points, they should incorporate tactile paving surfaces to highlight the absence of a kerb and to orientate pedestrians to the direction of the crossing (see section below). The provision of double yellow line markings or other form of parking restriction should prevent cars parking either side of a dropped kerb and will help to ensure the area remains unobstructed.

Crossing points should always be well drained. If puddles form at the base of a ramped slope, it can render the crossing impassable. Adequate drainage should be achieved using cross-fall gradients (maximum 1 in 50) and materials that are themselves pervious or are laid to enable water to drain through joints.

Rainwater gullies should never be positioned in the immediate area of the crossing as they may present a trapping hazard for wheels or sticks.

Checklist - Pedestrian crossing points
• Provide crossing points following consultation with relevant roads authority.
• Locate crossings where they are safe and convenient for all road users.
• Provide level or flush crossing points at all controlled crossing points, junctions at side roads and other access points.
• Ensure crossing points incorporating a dropped kerb comply with **figures 1.16 and 1.17**.
• Ensure recommended 1200mm width of level surface to the rear of pavement at a crossing point.
• Make sure crossing points are well drained, with a maximum cross-fall gradient of 1 in 50.

1.5.6 Tactile paving surfaces

Tactile paving should be used on access routes to provide warning and guidance to people with visual difficulties. It should be used sparingly and only after consultation with user groups representing people with visual difficulties.

Different tactile paving surfaces have prescribed meanings and all convey important information about the external environment. Some tactile paving surfaces provide guidance and others indicate the presence of a potential hazard such as an approaching change in level or the absence of a kerb at a road crossing. It is essential that the appropriate tactile surface is used in the correct location and in a consistent manner. The incorrect use of a tactile paving surface will convey false and misleading information which could be extremely dangerous.

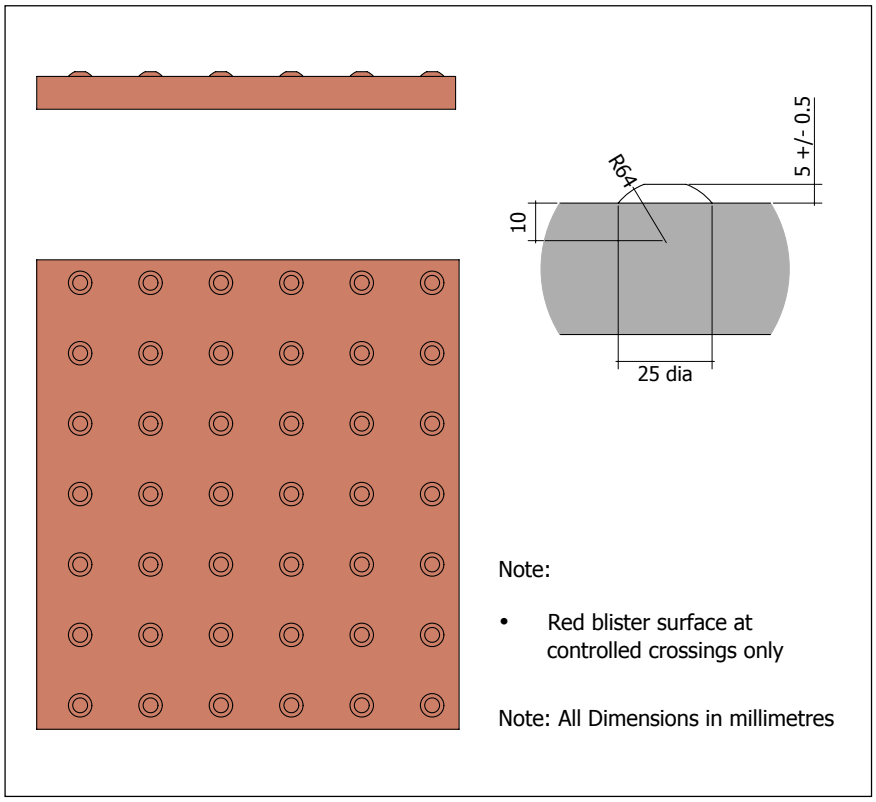
The most common types of tactile paving surface are described below, together with key principles of design.

1.5.6.1 Blister surface for pedestrian crossing points

Tactile paving with a blister surface is used to warn pedestrians with visual difficulties where a pavement ends and a carriageway begins, in locations where there is no kerb. It may be used at road crossing points with dropped kerbs,

raised road crossings and in partially pedestrianised areas where the pavement and carriageway is only differentiated using different colours or materials. At controlled crossing points, the layout of the blister surface also provides guidance by leading people to the crossing point. **Figure 1.18** illustrates the pattern of the blister surface.

Figure 1.18 Blister tactile paving surface.



A red blister surface should be used at controlled crossings only. A buff blister surface should be used at uncontrolled crossings. In all cases, the surrounding paving surface should visually contrast with the blister paving to provide visual indication of the extent of the pavement.

At controlled crossing points, where the dropped kerb is positioned in the direct line of travel, the red blister paving should extend to a depth of 1200mm and to the full width of the dropped kerb, as **Figure 1.16a**. At all other controlled crossings, the paving should extend to a depth of 800mm, as **Figure 1.16b**. At controlled crossings, a stem of blister surface 1200mm wide should extend back from the dropped kerb to the rear of the pavement, or to the building line, to guide people to the crossing point.

At uncontrolled crossing points, the buff blister surface should extend to the full width of the dropped kerb. The depth of the blister surface depends on whether or not the crossing is in the direct line of travel. If it is, the blister surface should be 1200mm deep, as **Figure 1.17a**. Where the crossing point is not in the direct line of travel, the blister surface should be 400mm deep, as **Figure 1.17b**.

Image 1.35 Example of buff blister surface at uncontrolled crossing.

Image 1.36 Example of person with visual difficulties using a guide stick on buff coloured blister surface.

Figure 1.19 Example of red blister surface at controlled crossing and offset blister used to indicate the edge of the platform at rail and tram stations.

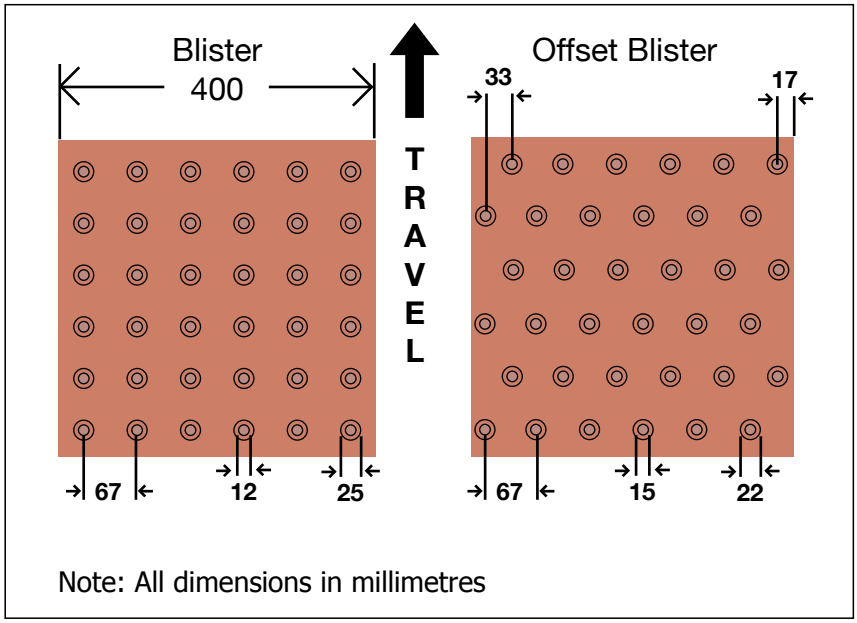


Image 1.37a Example red blister paving.

Image 1.37b and Image 1.37c Example red blister paving.

The Offset Blister units are used to indicate the edge of the platform at Rail and Tram stations, also referred to as off-street applications. Note that the orientation of the offset blister units is critical - the rows of blisters MUST be parallel to the platform edge, and they are generally placed approximately 500mm back from the edge.

Image 1.38 Example of buff coloured offset blister units.

The back edge of all blister surfacing, whether at controlled or uncontrolled crossing points should be perpendicular to the line of travel. This will help people who align themselves with the rear edge of the tactile paving to orientate themselves correctly with the direction of the crossing.

1.5.6.2 Corduroy paving for hazards

Tactile paving with a corduroy surface is used to warn pedestrians that they are approaching a hazard and should proceed with caution. It is used to identify the presence of specific hazards including steps, where a path or pavement joins a shared route, at level crossings and at the bottom of ramped approaches to on-street light rapid transit platforms.

Tactile paving with a corduroy surface should not be used on other ramps, on raised bus stops or to warn of obstacles on an access route. Corduroy hazard warning paving should visually contrast with the adjacent paving surfaces, but it should not be red as this colour is restricted to blister paving at controlled crossing points. The raised bars of the corduroy paving should be laid perpendicular to the direction of travel in all situations.

Image 1.39 and Image 1.40 Example of corduroy surface at top of steps.

Hazard Warning units use continuous half-rods, raised 6mm higher than the surface of the paving, to denote a hazard, such as the top/bottom of a flight of steps. Again, the rods should be parallel to the edge of the hazard.

Cycleway paving uses continuous flat bars to indicate a cycle lane. The bars run parallel to the direction of travel so as not to impede cycles. Where a cycleway and a footpath are adjacent, these pavings may also be used for the pedestrian section, with the bars running transversely, and a demarcation strip between the two.

Figure 1.20 Examples of hazard warning and cycleway paving.

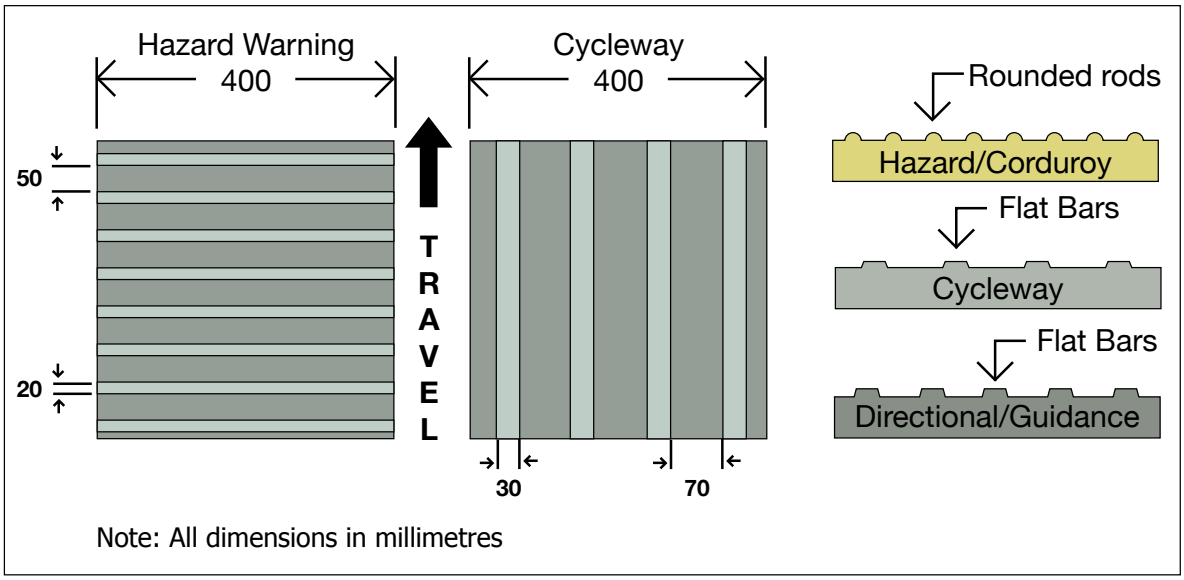


Image 1.41 and Image 1.42 Note that the tactile paving is aligned longitudinally for the cycleway section (right-hand side) and transversely for the pedestrian section (left-hand side).

Where used to warn of an approaching flight of steps, corduroy paving should extend to the full width of the steps, plus at least 400mm to either side wherever possible. However, the corduroy paving must not extend across an adjacent ramp, access route or facility such as a lift.

Corduroy paving should be positioned 400mm from the first step and extend to a depth of 800mm if the steps are in the direct line of travel or 400mm if a deliberate turn through 90 degrees is required. The dimensions and positioning are critical to alert people to the approaching hazard and to give adequate time for people to adjust their walking speed. Refer also to **Section 1.5.2** and **Figure 1.12**.

Checklist - Tactile paving surfaces
• Use tactile paving surfaces sparingly and after consultation with groups representing people with visual difficulties.
• Use tactile paving consistently and strictly in accordance with detailed recommendations.
• Use blister tactile surfacing to highlight the absence of a kerb.
• Use red blister surfaces at controlled crossings.
• Use buff blister surfaces at uncontrolled crossings.
• Use corduroy hazard warning surface at top and bottom of external steps.

1.6 Protection of Outdoor Works

The process of construction work, whether maintenance, repair or new build, can cause significant risk to passers-by unless it is carried out properly. Work to premises on privately-owned land may require the erection of scaffolding or the temporary use of areas of the footpath or roadway for storage purposes. Maintenance and repair work to underground services, such as drains, water mains, gas mains and telephone and electrical cables, often involves the excavation of public rights of way and frequently the storage of spoil and construction materials in the vicinity of the works.

Elderly people, and those with visual or mobility difficulties are particularly at risk from temporary obstructions or openings in the footpath. Using the roadway to avoid a footpath obstruction is also unsafe.

1.6.1 Construction sites

The erection of scaffolding or hoarding on pavements and public rights of way can narrow the walking space and can, unless properly protected, increase the risk of collision with protruding objects.

Where scaffolding is positioned over the pavement, clear headroom of 2200mm should be maintained. An overhead platform should be erected to the full width and length of any pavement to protect people below from falling objects. The use of cross-bracing should be avoided below 2200mm, unless it is located away from the route of pedestrian travel. Where cross-bracing is used, a tapping rail or board should be provided.

It is preferred that scaffolding in public areas is enclosed within a hoarding as this reduces the potential for collision. The hoarding should have no protruding parts, sharp edges or outward opening-doors and be well illuminated during darkness.

Any scaffolding that is not enclosed should be highlighted in a contrasting colour or tone so that it is clearly visible to all pedestrians.

Where a hoarding or scaffolding is erected on the footpath, and passage is restricted, a 1800mm unobstructed width should be maintained in busy areas or a recommended width of 1200mm in less populated areas to enable pedestrians to pass safely. Protruding parts such as pole ends should be minimised, but where they do occur, should be sleeved or boxed in. Hoardings should be highlighted with a contrasting band, at least 150mm deep, and positioned 1400 to 1600mm above ground level.

The provision of a continuous handrail 900 to 1000mm above ground level will assist pedestrians with visual difficulties in finding a safe route through scaffolding and to locate any public entrance.

If it is not practical to provide a safe route through the scaffolding, an alternative route should be provided. If pedestrians are diverted onto the roadway, the pedestrian route should be separated from the traffic and any site vehicles or equipment by a physical barrier on either side.

The name and address of the scaffolding company and of the authority which granted the hoarding licence should be clearly displayed.

1.6.2 Roadway and pavement maintenance

Work on pavements and roads, such as the renewal of surfaces, buried cables and pipes also present an inconvenience and a potential hazard to pedestrians.

All work should be protected to the full extent by a continuous barrier, which should be between 1000mm and 1200mm high and incorporate a tapping rail, 150mm to 200mm deep, with its lower edge on the ground or up to 200mm above the ground surface.

The barrier should be a rigid hoarding that cannot be knocked over and it should visually contrast with the surrounding surfaces.

Path and pavement widths around roadworks and to any temporary footpaths should follow the guidance in **Section 1.5.1**.

Where temporary paths are located on the carriageway, dropped kerbs or raised footways should be provided. If people must use the public roadway it should be clearly marked and signalled to motorists.

A1 Definition of Universal Design

Universal Design

‘Universal Design refers to the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people, regardless of their age, size, ability or disability.’

Synopsis of the Disability Act, 2005.

A2 Human Abilities and Design

The following piece of text is an extract from European Ref: CEN/CENELEC Guide 6 ‘Guidelines for standards developers to address the needs of older persons and persons with disabilities’.

It states that: Physical, sensory and mental abilities vary from person to person and for individuals as they get older. Diversity is normal. Designers need to be aware of difference across the range of human abilities, and of associated design considerations.

(a) Physical abilities

This includes walking, balance, handling, pulling, pushing, lifting and reaching. Many activities involve simultaneous use of more than one of these skills. Physical strength and stamina may also affect people’s abilities to perform these actions.

Walking

For some people walking on the level or up gradients is difficult. Some people may have a limited walking range, may have difficulty with turning movements or may use mobility devices such as crutches or a walker. They may need to stop frequently, to regain strength or catch breath. Design considerations include provision of handrails, seats at regular intervals, convenient set-down parking and adequate time for slower pedestrians at road crossings. Designers should also consider the needs of people walking and engaging in sign language when designing access to and from buildings plus within the buildings themselves.

Balance

Balance limitations can affect someone's gait or control of hand movements. Design considerations include handrails, regular seating, and providing controls within easy reach. A surface against which a person may stumble against or walk into should be designed to limit abrasion.

Handling

A significant minority of people are left-handed. Some people may have restricted use or no use of one or both hands, or may have limits on strength or precision. Facilities and components should be designed to be suitable for use with either hand or with one hand only. Handling includes gripping, grasping and manipulation. Each of these has a different purpose with specific design considerations. For instance, components should be designed to be easily held. The circumference of the supporting structure and stability are critical. Manipulation involves the moving, turning and twisting of components with a hand or hands. For those who have limited manipulation abilities, size and shape and ease of movement are critical. Another option to consider is to design for manipulation by using a pushing, pulling or pressing action using a clenched fist, or by using the wrist or the elbow.

Strength and endurance

Strength and endurance may be required on sloping paths and floors, stairways and long travel distances, when sustained effort may be needed.

For those with limited endurance, frequent resting-places are essential.

People generally find it easier to push a component, than to pull it. This is particularly so if the individual uses a wheelchair. Self-closing devices on manual doors can be difficult for some people to operate, particularly if the doors are required to resist wind forces. For these reasons, doors that open and close automatically are preferred.

Lifting

Activities such as opening a vertically sliding sash window and an upward opening access gate, should be designed to be easily operated with minimal force.

Reaching

Design has a role to play in ensuring that key components in a building or environment are in easy reach, bearing in mind the range of people's sizes and abilities. Having components within easy reach is particularly important for those with more severe limitations in mobility. The reach range is dependant on the height and arm length of the person, use of the arms, and the balance and mobility of the upper body. A 'comfortable reach range' has been defined as one that is appropriate to an activity that is likely to be frequent and in need of precise execution and that does not involve stretching or bending from the waist. Putting things within comfortable reach can ensure use by a greater number of people. An 'extended reach range' has been defined as one that is appropriate to an activity that is likely, neither to need precision nor to be frequent and that can involve stretching or bending from the waist.

(b) Sensory abilities

Speech

Some conditions affect the capacity for or quality of speech. Two-way communication can be facilitated by environments designed to minimise barriers to hearing low or indistinct speech.

Hearing

People differ in their capacity to hear sound, to determine its direction, its source, to discern pitch, frequency, volume and variation and to separate out different sounds. Hearing quality is important for communication, for information, and for detection of hazards such as traffic. Many people with hearing difficulties

use a hearing aid which amplifies all sounds caught by the microphone, making communications very difficult in noisy environments. Keeping background noise level low is essential. The selection of structural and surface materials can make a substantial difference in audibility. Auditoriums, meeting rooms and reception areas can benefit from additional sound enhancement such as a loop system. The careful design of illumination can assist in communication such as lip reading and sign language. Provision of visual information and visual alarm systems can communicate information to those who have hearing difficulties or who cannot hear. Designers should also consider the colour and size of rooms and even the furnishing arrangement as this is very important for visually based communication. Also the use of vibration as means of sensing others should be considered.

Sight

Vision allows an individual to be aware of the luminance of surfaces, objects, form, size and colour. For people who are blind or who have visual difficulties, the provision of suitable tactile walking surface indicators and tactile or acoustic warnings at hazardous locations, should provide information on using the built environment and should limit the risk of injury. The built environment can be designed for orientation by providing sound cues and tactile cues. An easily discernible system of 'way finding' should also be considered. For people with limited, but low vision, effective visual contrast between surfaces or objects helps to identify critical locations. Warning markings on glass surfaces, and markings on the edges of stair treads, help minimise hazards.

Differences in friction between one floor surface, or one stair tread surface, and the next should be avoided. Therefore, adjacent surfaces that display different standards of slip-resistance, or that depend on raised surfaces, should be carefully considered

Touch

In selecting surfaces in the built environment that people will need to touch (such as handrails, handles, knobs and controls, tactile information), it is important to select materials that avoid distress, injury or allergies. Surfaces should be free of abrasions. Metals that may cause adverse reactions when touched should be avoided.

(c) Mental abilities

Mental abilities include cognition, intellect, interpretation, learning and memory. People differ in their knowledge, their capacity to understand, reason, or interpret information. Designing for differences in these capacities helps provide a usable environment for the population at large, from the very young to the old, and people of diverse abilities. Means of communication in the environment should be designed to be immediately and easily understood, and correctly interpreted. As people age, some experience loss of memory or find it increasingly difficult to absorb new information, so changes in the environment should be carefully considered before implementation.

Design considerations that take account of mental abilities

Aural and visual messages should be simple, clear and have immediate impact. Figures, symbols and simple words are likely to be the most effective. Symbols should be instantly recognisable as representing images seen and activities undertaken in everyday life.

Way finding should be simple, such as tactile, graphic, audible or architectural cues that are easy to follow. Signage should be large and clear. Way-finding maps should be clear, indicate the person's whereabouts in the building or facility, and be free from extraneous information.

(d) Age and size

Accommodating the developing child

It is important to create environments that are safe, accessible and useable for children. Individual components should be safe and useable as age-appropriate. Learning to manage risk is an essential part of a child's development.

Accommodating ageing adults

Life span within the human population is increasing. More and more we expect to maintain an economic and social life within both the public and private domains as we age. However, many human faculties are in decline as we age, such as mobility, dexterity, stamina, strength, hearing, sight, or memory. Familiarity with a particular environment is important.

Diversity of size

The population contains a diversity of sizes and heights, from children, to the diversity in the height of fully-grown adults. The positioning of components and the heights of building elements such as steps should recognise the diversity of height. Increased weight and girth is now also a feature of the population.

Ref: CEN/CENELEC Guide 6 'Guidelines for standards developers to address the needs of older persons & persons with disabilities'.
http://www.cen.eu/cen/Sectors/Sectors/ISSS/About_ISSS/Documents/cclcgd006.pdf

A3 Further Reading

National and International standards and codes of practice

AS 1428.1-2001 Design for access and mobility. General requirements for access – New building work.

AS 1428.2-1992 Design for access and mobility. Enhanced and additional requirements – Buildings and facilities.

AS 1428.3-1992 Design for access and mobility. Requirements for children and adolescents with physical disabilities.

AS 1428.4-2002 Design for access and mobility. Tactile indicators.

BS 4800: 1989 Paint colours for building purposes (whilst the colours in this standard cannot be seen on CD-ROM or online the text can still be used).

BS 5395-1:2000 Stairs, ladders and walkways – Part 1: Code of practice for the design, construction and maintenance of straight stairs and winders.

BS 5588-8:1999 Fire precautions in the design, construction and use of buildings – Part 8: Code of practice for means of escape for disabled people.

BS 5776:1996 (incorporating amendment No.1) Specification for Powered stairlifts

BS 6440:1999 (Incorporating amendment No.1) Powered lifting platforms for use by disabled persons – Code of practice.

BS 6440:1999 Powered lifting platforms for use by disabled persons – Code of practice (partially superseded by BS EN 81-40:2008. The remainder of BS 6440:1999 will eventually be superseded by EN 81-41: 2009 Safety rules for the construction and installation of lifts – Special lifts for the transport of persons and goods – Part 41: Vertical lifting platforms intended for use by persons with impaired mobility).

BS 6465-1:2006+A1:2009 Sanitary installations. Code of practice for the design of sanitary facilities and scales of provision of sanitary and associated appliances.

BS 6571-4: 1989 Vehicle parking control equipment – Part 4: Specification for barrier type parking control equipment.

BS 7036-1:1996 Code of practice for Safety at powered doors for pedestrian use – Part 1. General.

BS 7036-4:1996 Code of practice for Safety at powered doors for pedestrian use – Part 4. Low energy swing doors.

BS 7997:2003 Products for tactile paving surface indicators – Specification.

BS 8300:2009 (Incorporating amendment No.1) Design of buildings and their approaches to meet the needs of disabled people – Code of practice.

BS 8493:2008 (+A1:2010): Light reflectance value (LRV) of a surface – Method of test.

BS 8501:2002 Graphic symbols and signs – Public information symbols (AMD 16897).

BS EN 115:1995 Safety rules for the construction and installation of escalators and moving walkways.

BS EN 15838:2009 Customer contact centres, Requirements for service provision.

BS EN81-70:2003 Safety rules for the construction and installation of lifts – Particular applications for passenger and good passengers lifts – Part 70: Accessibility to lifts for persons including persons with disability.

Building Regulations (Part M Amendment) Regulations 2010 (S.I. No. 513 of 2010).

Citizens Information Board – Accessible information for all (2009).

DD 266:2007 (Draft for Development) Design of accessible housing – Lifetime home – Code of practice.

I.S. EN 1991-1-1:2002 – Eurocode 1: Actions on structures Part 1-1: General actions – densities, self weight, imposed loads for buildings (including Irish National Annex: 2005).

I.S. EN 81-1: 1999 Safety rules for the construction and installation of lifts – electric lifts (Amd 1) (+A3:2009).

I.S. EN 81-2:1999 Safety rules for the construction and installation of lifts – hydraulic lifts (Amd 1) (+A3:2009).

I.S. EN 81-70:2003 Safety rules for the construction and installation of lifts – Particular applications for passenger and good passenger lifts. Accessibility to lifts for persons including persons with disability (Amd A1:2005).

I.S. EN 997:2003 (+A1:2006) WC pans and WC suites with integral trap (AMD Corrigendum 14805) (AMD 16965).

IEC 60118-4:2006 Electroacoustics. Hearing aids. Induction loop systems for hearing aid purposes. Magnetic field strength (ISBN 978 0 580 50047 3).

International standard for Induction loops. IEC 60118-4.

Irish Code of Practice on Accessibility of Public Services and Information Provided by Public Bodies www.nda.ie/website/nda/cntmgmtnew.nsf/0/3DB134DF72E1846A8025710F0040BF3D/$File/finaldrcode_nda.htm

Key cards should conform to EN 1332. For further information on key cards please see: http://www.universaldesign.ie/useandapply/ict/itaccessibilityguidelines/smartcards/guidelines/smartcardguidelines/cards

Lifetime Homes Standard: http://www.lifetimehomes.org.uk.

Norwegian Universal design of building standard, 2009.

Passenger Lift Design: The Machinery Directive 2006/42/EC; Lifts should conform to BS 6440.

National and international reference documents

2020 Vision – Sustainable Travel and Transport: Public Consultation Document. Department of Transport.

Bus Based Park and Ride – A Pilot Scheme. A Report to: Dublin Transportation Office. The TAS Partnership Limited, 2002.

City of London 2006 Facility Accessibility Design Standards. London, Canada, 2006 Promoting Safe Egress and Evacuation for people with Disabilities - National Disability Authority.

Gallaudet DeafSpace Design Guidelines 2010.

Department of Transport & the National Disability Authority Guidelines for Accessible Maritime Passenger Transport http://www.nda.ie/website/nda/cntmgmtnew.nsf/0/45AA46D1F77D7EF2802576DC005C5954?OpenDocument

Department of Transport, UK 'Traffic Signs Manual'.

Dublin City Council (2007) Variation (No. 21) of the Dublin City Development Plan 2005 – 2011. Available from: http://www.dublincity.ie/Planning/DublinCityDevelopmentPlan/VariationstotheDevelopmentPlan/Documents/AdoptedVariationNo21Spec.pdf.

Guidance on the use of tactile paving surfaces. Department for Transport, UK.

Guidelines for an accessible public administration. Towards full participation and equality for people with disability. Office of the Disability Ombudsman, Sweden.

Inclusive Mobility. Department for Transport, UK.

International Best Practices in Universal Design. A Global review. Canadian Human Rights Commission, 2006.

Irish Wheelchair Association: Best Practice Access Guidelines 2010.

Joseph Rowntree Housing Trust.

Parking for disabled people. Department for Transport, UK.

Promoting Safe Egress and Evacuation for people with Disabilities - National Disability Authority.

Rail Park and Ride Strategy for the Greater Dublin Area. Dublin Transportation Office, 1994.

Regulation of Bus services outside the Greater Dublin Area. Department of Transport.

"Sign Design Guide and Inclusive mobility," Oxley, P. (2003), Inclusive Mobility. Department for Transport, UK. www.mobility-unit.dft.gov.uk

Smarter Travel 'A Sustainable Transport Future' – A New Transport Policy for Ireland 2009 – 2020. Department of Transport.

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