



Tactile & Guard Surfaces

Index

Index	1	4.1 Exclusion Warning – Tooth Style	11
1 Introduction	2	4.2 Exclusion Warning – Domed Style	12
2 Use of Surfaces	2	4.3 Cobble Stones	12
2.1 Summary	2	5 Projection Protection .	12
2.2 Road Crossing Pavers	4	5.1 Overhead Obstruction	13
2.3 Rail & Light Rail	5	6 Maintenance	14
2.4 Steps & Ramps Warning ...	6	6.1 Paver Design	15
2.5 Way Guidance Pavers	7	6.1.1 Pavers for heavy vehicle use	15
2.6 Hazard Warning Pavers	8	6.1.2 Paver Studs	15
2.7 Cycle & Pedestrian Routes Marking	9	Appendix A – Reference ..	16
2.8 Information pavers/surfaces 10		British Standards Paving	16
3 Other Guidance/Warning 10		Appendix B - Disabilities .	18
3.1 Kerbs at footway edge	10	Vision loss	18
3.2 Street Furniture and Plantings	10	Hearing Loss	19
4 Other Warning/Tactile Surfaces	11	Impaired Mobility	19
		Mobility Vehicles	19

Tactile & Guard Surfaces

1 Introduction

Orientation and way finding information should be provided by the use of high visibility and, where appropriate, tactile signing and surface marking. Many visually impaired people can read signs if they are properly positioned, if the design incorporates contrasting colours and tones, are adequately sized and styled text, and have a matt finish.

In addition to tactile information those visually impaired people, who have some residual vision will also make use of the luminance contrast between surfaces for orientation and guidance. Designers, planners, engineers can therefore use those characteristics and others involved in the design of the built and pedestrian environments to accentuate the presence of hazards and amenities.

For full guidance on tactile highway and street crossing surfaces see the DfT document 'Guidance on the use of tactile paving surfaces' available from their website.

2 Use of Surfaces

All the tactile surfaces used in the UK, including the guidance path, have been evaluated by people with various disabilities including wheelchair users and have been found to be acceptable (Gallon et al, 1991; Savill et al., 1997).

2.1 Summary

Incorrect use of tactile surfaces is a danger to people with low vision and hearing as well as any companions they are accompanying. It also gives people the wrong clue which defeats the objective in using tactile pavers.

A common failing/miss application is for a mass of pavers to be installed covering a wide area; this is confusing, disliked by most people and uncomfortable to walk over.

In some locations architects have used designated use tactile pavers as decorative surfaces; this is confusing and can be dangerous as people lose confidence in tactile surfaces.

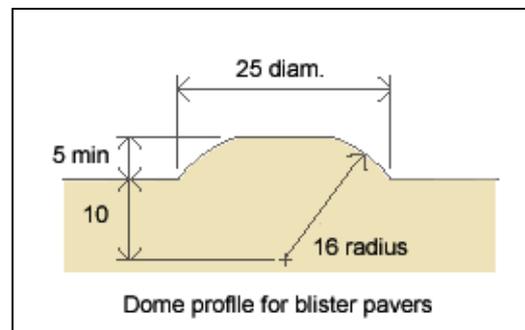
When moving around the pedestrian environment, visually and hearing impaired people will actively seek and make use of tactile information underfoot, particularly, detectable contrasts in surface texture. The ability to detect contrasts in texture underfoot varies from one individual to another. For example, older visually impaired

people and people who have lost their sight through certain medical conditions, such as diabetes, may well have reduced sensitivity in their feet. It is therefore important that textures warning of potential hazards, for example a road crossing or a staircase, are well defined and large enough to be detectable by most people but without constituting a trip hazard or causing extreme discomfort to them or others.

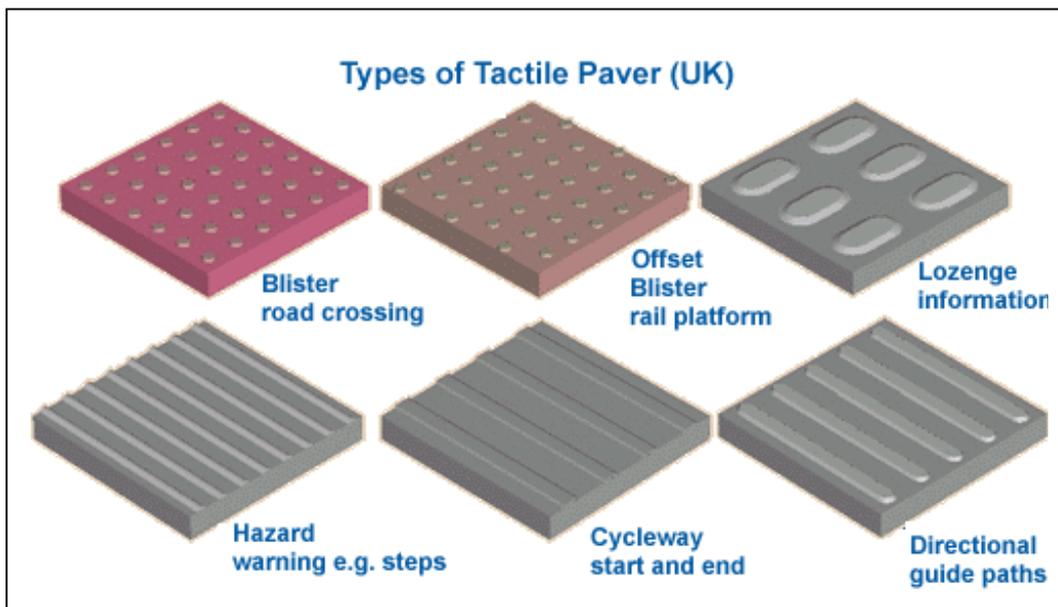
Trainers of people with visual and hearing impairment should ensure that all newly impaired people receive proper training in recognition and use of these pavers.

Any incorrectly installed pavers should be notified to The Highways and Footways Department of the Local Authority for corrective action. Highways Department and Local Authorities Departments should be aware of clause 1.8 & 1.9. of the new DDA 2005 Code of Practice for Public Authorities.

See Department for Transport "Guidance on the Use of Tactile Paving Surfaces" available on their website. This informs constructors on the appropriate use of each type of tile and where each should be used. Using the incorrect paver confuses users and can lead to accidents.



The following is a summary and does not provide all installation instructions.



Pavers are 400 x 400 mm square tiles. Standard block/brick pavers are also available.

Paver thickness depends on traffic, i.e. whether pedestrian, cyclist, horse or possible vehicle run over it.

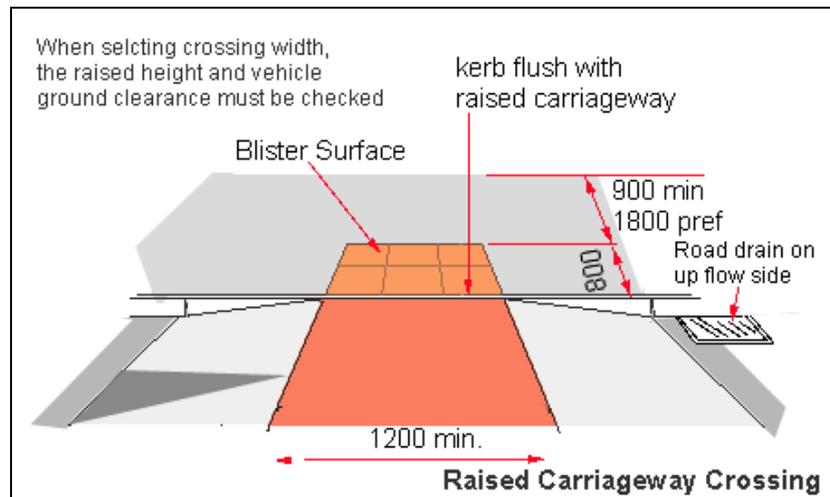
With the exception of recognised tactile paving, undulations in the surface of paving, whether paving slabs, blocks, bricks or formless materials such as concrete or asphalt, should not exceed 5 mm under a 3 M straight edge. Joints should have a maximum of 3 mm up-stand where feasible and no more than 5 mm. Gaps should be no wider than 10 mm.



Concrete pavers for footways and cycle ways can be 50 mm thick, for places where motor transport will cross the pavers a minimum of 75 mm thickness is needed,

2.2 Road Crossing Pavers

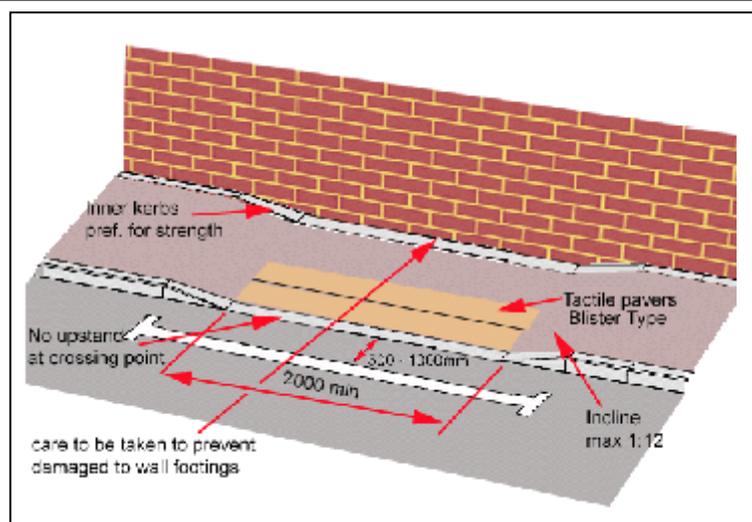
Blister pavers are red at 'controlled crossings' and buff/yellow at 'uncontrolled crossings'. If red pavers are set into red brick paved pedestrian areas they should have a contrasting border edging to



highlight the location. The direction of the blisters must be inline with the dropped kerb on the opposite side of the carriageway as these are used to indicate the direction the users should walk.

Raised carriageways used for traffic claming must have tactile pavers as a warning of the

crossing. These should extend the full width of the level section and extend at least 300 mm either side. At least two rows of pavers

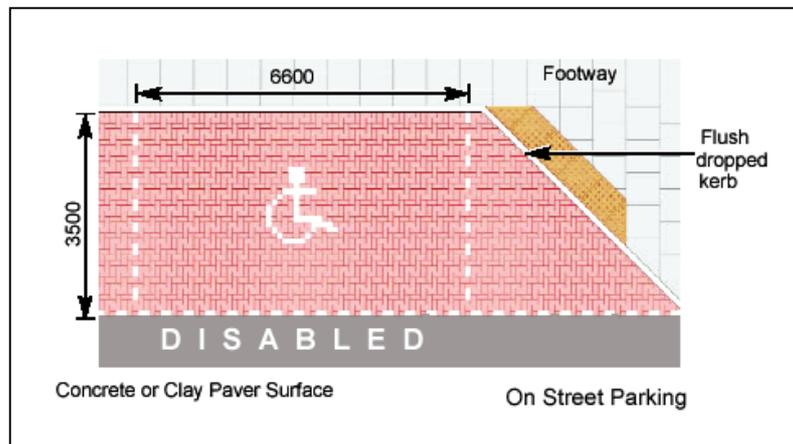
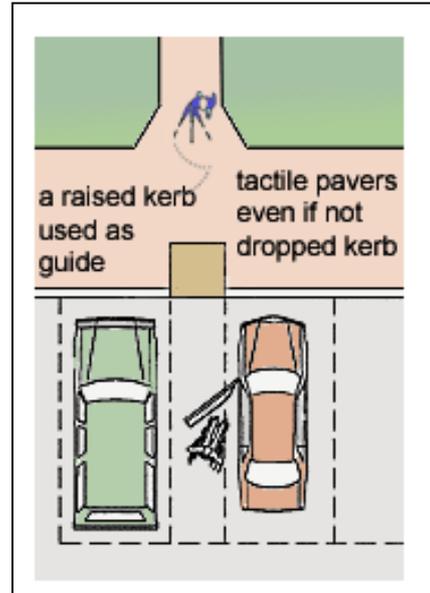


should be installed. Failure to install these pavers can lead people with low vision into the carriageway.

Where the full width of a narrow footway has been dropped to provide a flush crossing, tactile pavers should be used in the normal manner to indicate the crossing.

Tactile pavers should be used to warn of entry to a car park even when there is no dropped flush kerb otherwise people may walk into traffic areas unknowingly.

Concrete and Clay block pavers can be used to surface a parking bay; a flush dropped kerb is used at one end of the bay.



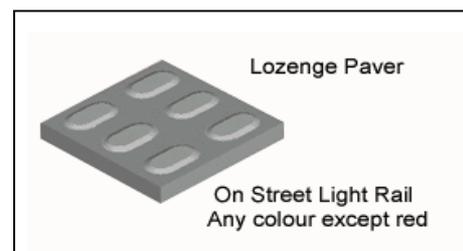
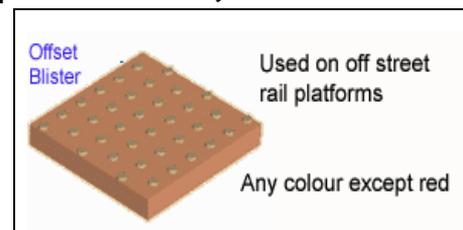
2.3 Rail & Light Rail

(For rail platforms see SRA guidance for specific details)

Offset blister pavers are used at the edge of heavy railway platforms, underground rail platforms and all off street light rail platforms as a warning of the edge. These can be any colour other than red but must provide a colour contrast with the surrounding surface.

The lozenge paver is used for on street light rail platforms.

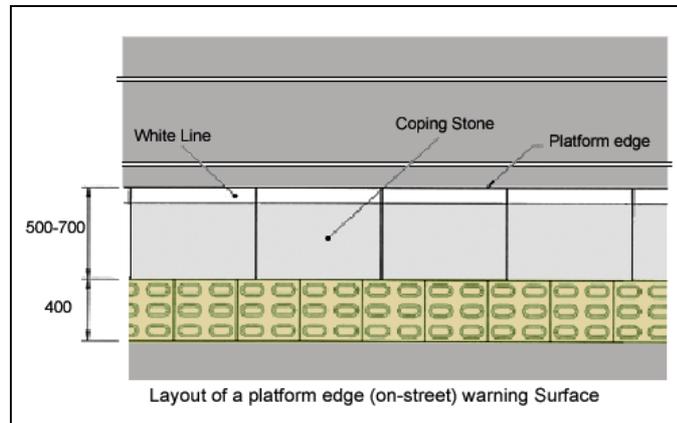
A single or pair of lozenge pavers are sometimes used to indicate where notices, tactile text or Braille signs are located. This is used to ensure that there is no confusion with kerbs and steps which have lower risers.



To help visually impaired people where trams and pedestrians mix, the preferred method of marking the swept path in pedestrian zones is for it to have a different tactile surface (such as an exposed aggregate finish) to that of the surrounding area and for there to be a suitable colour contrast between surfaces. Tripping hazards within the swept path should be avoided.

The corduroy paver should be used to indicate the start of ramped approaches to street platforms.

(See also our guide 'Country Paths and Railway Crossings')



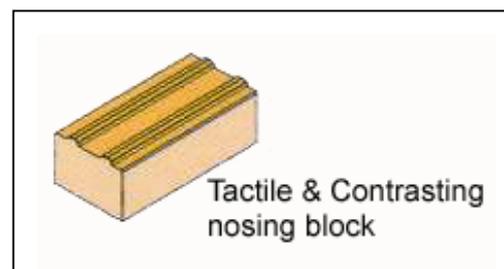
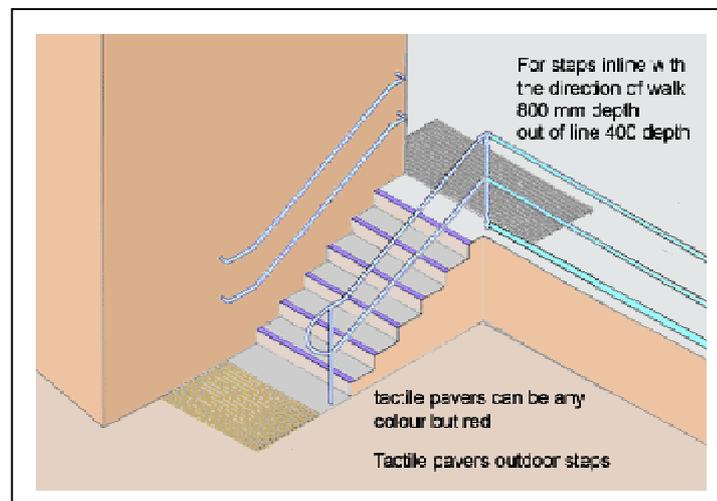
2.4 Steps & Ramps Warning

Tactile pavers are not usually required to warn of ramps. However, where a ramp is above 1:12 good practice suggests that a warning should be provided. A change of colour and/or ramp surface texture should be used to differentiate between level and inclined surface.

Outdoors tactile warning is required at the top and bottom of any series of flights of steps or where a floor joins the stairway at a landing. Staircases in shopping malls, roofed precincts and similar locations should be treated as if they were outdoor stairs. Tactile marking are not necessary for marking every flight although BS8300 (5.9.6.) requires them Part M 2004 does not. Over use is confusing and unnecessary.

Contrasting nosing on steps is required; a tactile and acoustic change for nosing is appreciated.

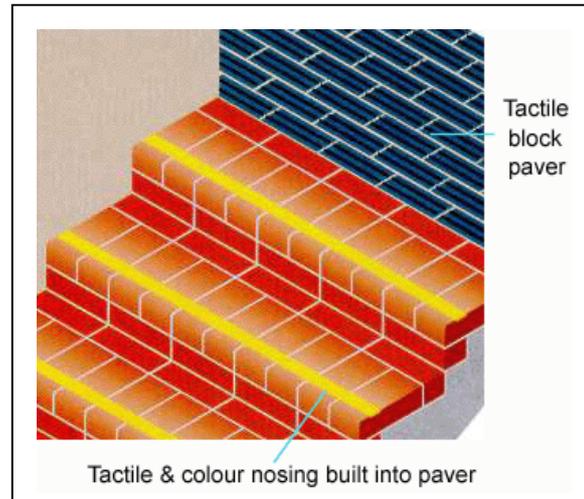
Tapping rails should always be used



at the lower edge of pipe (or similar) barriers to warn people they are approaching a drop off.

For indoor steps tactile pavers are not required at the top and bottom of the flight, however, a non-slip change of surface colour, texture and sound are recommended as a warning of stairways.

As a further protection steps and stairs should never open directly in line with pedestrian traffic. A landing with a barrier should be employed to change direction. Alternatively the warning pavers should extend to a depth of 800 mm.

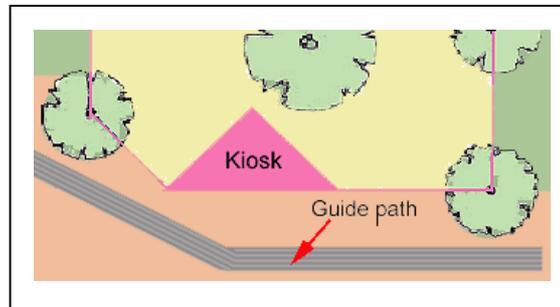


Step marker paver: The step marker paver has been developed to highlight the edges of individual treads to the visually impaired. The recessed groove near the front of the unit is filled on site with epoxy-based filler in bright contrasting colour to provide a continuous line close to the step nosing.

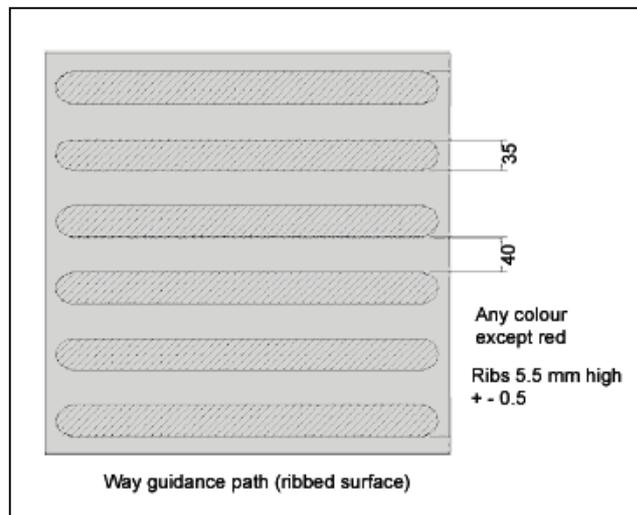
(See also our guide "Step, Riser and Stair Use")

2.5 Way Guidance Pavers

Way guidance pavers should be laid with the ribs in the direction of travel. They can be any colour except red and must form a strong colour contrast with the surrounding surface. A guidance path surface, guides visually impaired people along a route



when the traditional cues, such as a property line or kerb edge, are not available. It may also be used to guide people around obstacles, for example street furniture in a pedestrianised area. The surface is designed so that people can be guided along the route either by walking on the tactile surface or by



maintaining contact with a long cane.

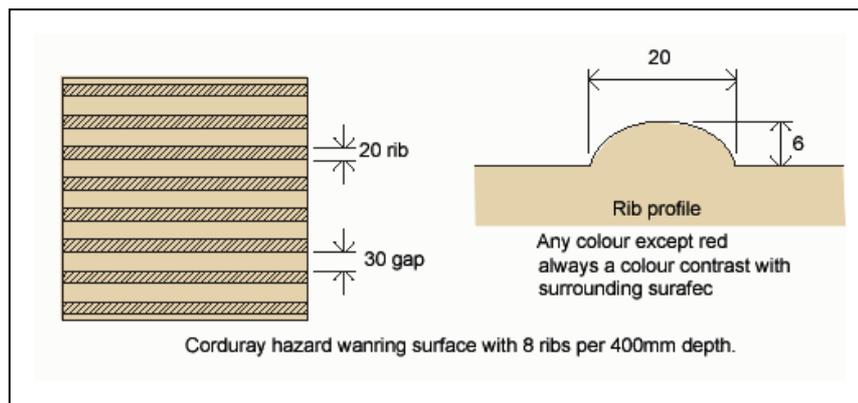
Way guidance pavers are used by both visually and hearing impaired people.

- Visually impaired people use both colour and texture as guidance.
- Hearing impaired people, and often their companions, use the colour change as a guide and the tactile as a warning. This permits conversation by lip reading and sign language while walking as users need to face each other.

Wide open areas such as squares and other open spaces in pedestrian precincts need tactile and/or colour contrasted guidance paths where the normal kerbs have been removed losing a common guide tool.

It is important that the layout of a guidance path is simple, direct and with few turns, junctions or corners. Research has shown that if the layout of guidance path is too complex, visually impaired people can lose their way or become confused at a junction (Gallon, 1992).

Guidance paths which are designed to guide people to specific entrances or facilities, should lead the users into the entrance or to the facility. In



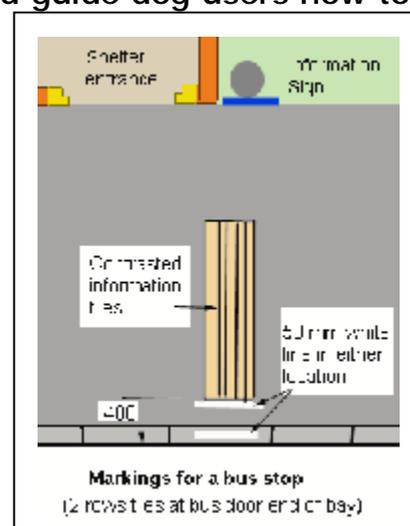
places where a tactile guidance path is not used e.g. between the entrance doorway and the concierge, a contrasting alternate texture finish guide could be provided.

Note: there is a need to train guide dogs and guide dog users how to follow the paths with their guide dog.

2.6 Hazard Warning Pavers

Hazard warning pavers are used at the top and bottom of outdoor staircases and step flights, to warn of rail level crossings.

In some parts of the UK one or two lines of pavers are employed to indicate the door position of bus doors at bus stops due to the failure of neoprene surfaces to withstand long use. Neoprene is slippery

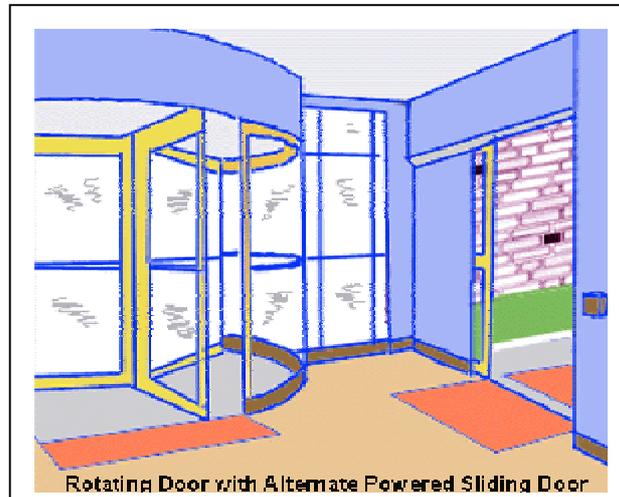


when wet becoming a slip hazard, the surface often detaches from its base becoming a tripping hazard. They are prone to vandalism.

The pavers shown in grey can be any colour except red, however, it is preferred if they contrast with the surface in which they are inset.

Tactile and colour contrasted surfaces should also be used to warn of automatic and rotating doors.

These are needed to warn people with low vision or hearing of their approach to a possible hazard. Automatic swing doors should have the tactile surface far enough from the door to allow time to stop in a safe place. (See also our guide 'Access & Door Safety')



Other locations where warning surfaces should be considered

is at the edge of reflecting pools (water features), at the edge of wharves in harbours and lock gates which were not protected by kerbs or railings.

When considering materials for use as tactile paving it is important to consider their durability wear resistance and cracking potential where heavy vehicles may run over them. They should require minimal replacement and remain effective.

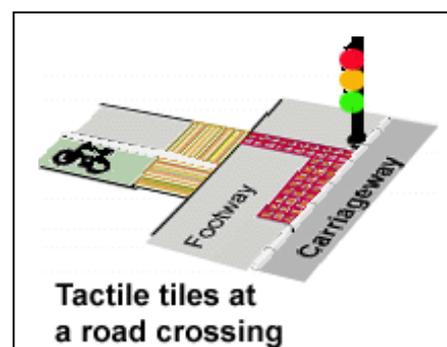
There are a number of difficulties with installing tactile surfaces which are fabricated on-site, such as moulding or stamping surfaces. The difficulties include obtaining a consistent profile of the surface, dome height and concrete hardness. Installation requires expert contractors.

2.7 Cycle & Pedestrian Routes Marking

Corduroy pavers are used to mark restricted pedestrian and cycle ways should be ended with the appropriate tactile surfaces before joining to an ordinary footway. Restricted ways should end before the tactile area at a controlled road crossing.

The ribs are in line with the direction of travel for the cycle way and transverse for footways. Buff, yellow or light grey are preferred colours.

Positive separation between cycle ways and pedestrians should be provided either by a continuous kerb or a ribbed white line which provides tactile warning



2.8 Information pavers/surfaces

The information surface (not shown) should be non-bituminous and based on a neoprene rubber or similar elastomeric compound. It should be available in a variety of colours as the use of a contrasting colour and tone to the surrounding footway is recommended so as to assist partially sighted people.

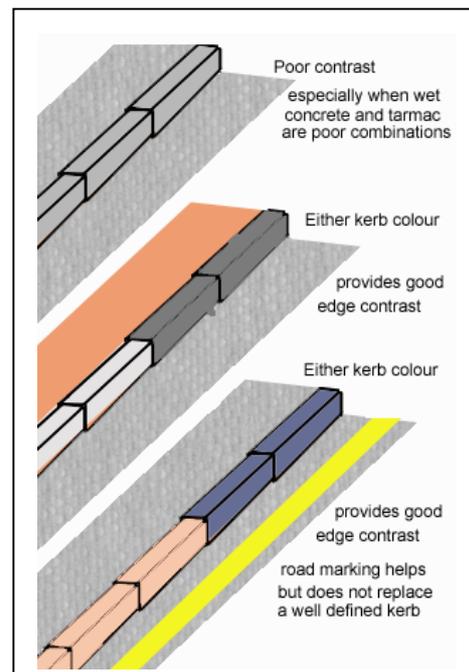
This surface has proved of little value and is rarely used today due to the probability of lifting, damage and short life-span.

3 Other Guidance/Warning

3.1 Kerbs at footway edge

Poor colour contrasts are common along footway edges due to the use of combinations of concrete for road, kerb and footway, or tarmac and concrete kerbs. The division often becomes invisible when the surfaces become wet.

Yellow and white road edge marking helps both pedestrians and road users to identify the edge of the carriageway. But for pedestrians is not a complete answer as the marking is often 200-400 mm from the kerb edge.

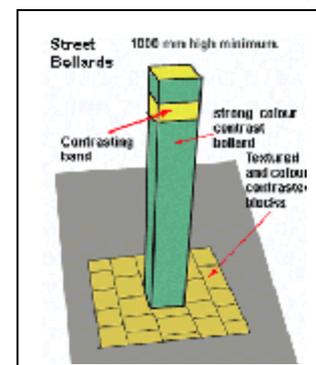


3.2 Street Furniture and Plantings

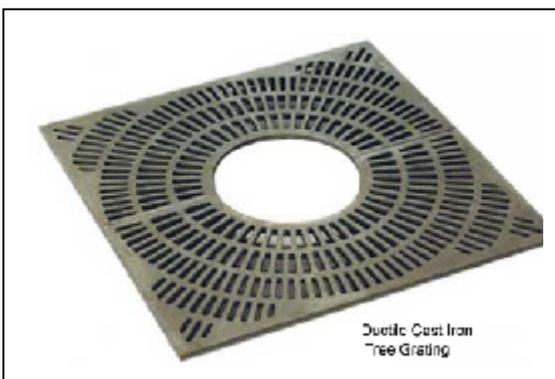
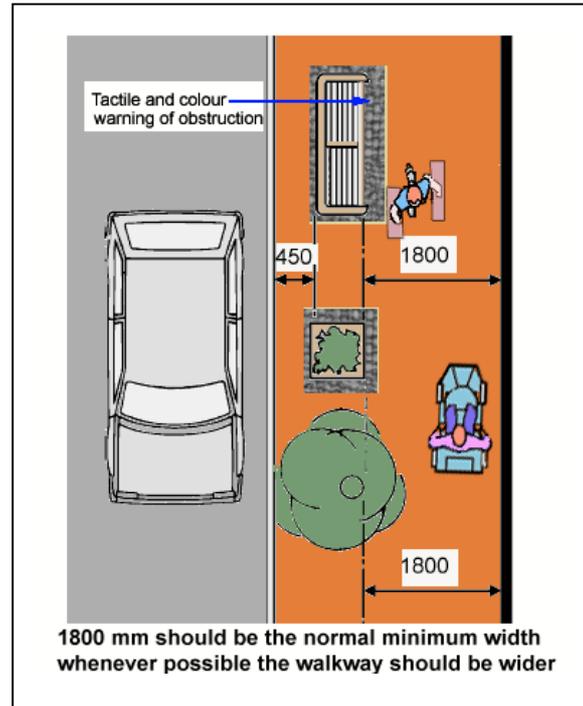
While it is not essential that bollards are provided with tactile warning surfaces; i.e. cobbles, warning can be helpful to people with low vision and hearing.

Tactile surfaces other than exclusion surfaces do not affect the minimum widths of footways and can be calculated as part of a usable pathway. However, remember that a seated person needs about 400-600 mm for their legs and feet.

Street seating in line with routes can be a tripping hazard as the unit is often low and poorly contrasted to the background.



Trees set in footways can be a tripping hazard as their roots tend to break up the surrounding surface. Deep rooting trees should be chosen with a grating with narrow gaps used to allow water penetration while filling the open space around the tree. Care must be taken that the grating design will not trap or deflect wheels on wheelchairs and baby buggies.



4 Other Warning/Tactile Surfaces

4.1 Exclusion Warning – Tooth Style

These are intended for marking the edge of hazards which can overhang and intrude into walkways below 2100 mm, e.g. windows.

Other places they have been found useful is alongside entry gates and at car park edges.

Locations where these are employed must be chosen with sensitivity and care so that they do not become a tripping hazard themselves. The upraised edges can cause injury if



people fall onto the surface.

Their use must not reduce the footway width. They can be a hazard when wet, icy or covered with snow or sand.

Level footway crossing points should interrupt edge marking at an 1800 mm (min) wide gap to permit safe pedestrian and cycle access.

Strips should be colour contrasted and in bands no less than 4 blocks wide.

4.2 Exclusion Warning – Domed Style

These are used in the same way as the tooth style to warn of low obstructions and no entry zones.

Again sensitivity and care must be taken when selecting locations where these paver blocks will be used. People should not come upon them unexpectedly as if they are placed in a line of travel they can become a tripping hazard.



4.3 Cobble Stones

Cobble stones may also be used as an exclusion surface as these are difficult to use by people with mobility impairments and arthritis, they are impassable by wheelchairs and other mobility vehicles and should not be used as a footway surface.

Where a carriageway is paved with cobble stones smooth crossings should be provided at flush dropped kerbs at reasonable intervals (30 metres) along the road.

5 Projection Protection

Windows and other features which may project below 2100 mm into walkways must have protection to prevent people walking into them

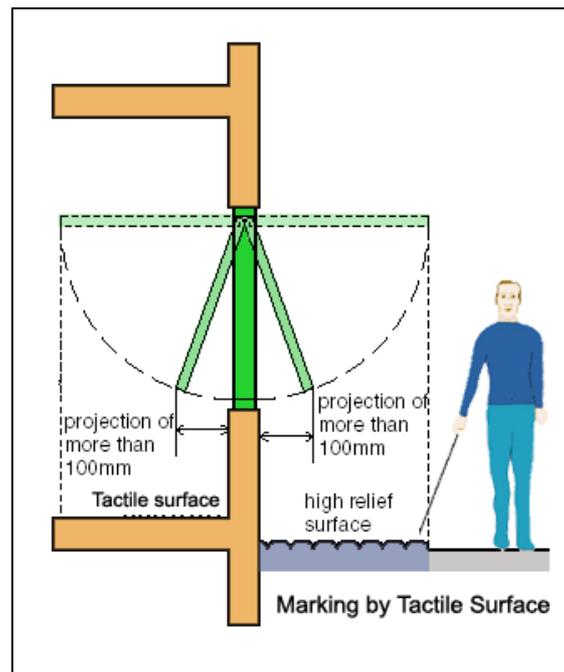
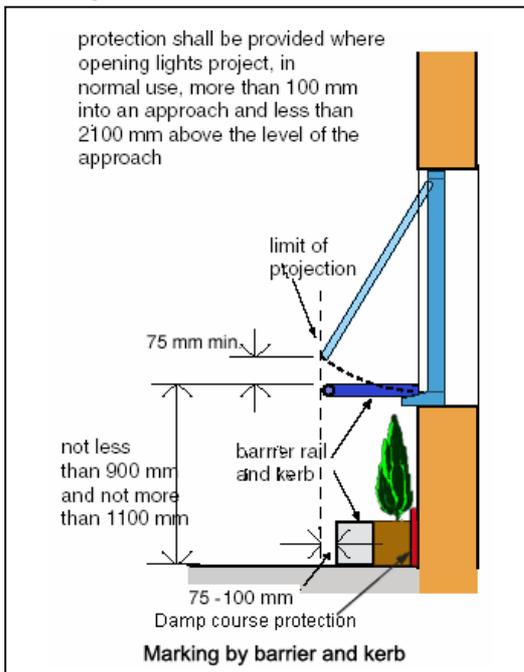
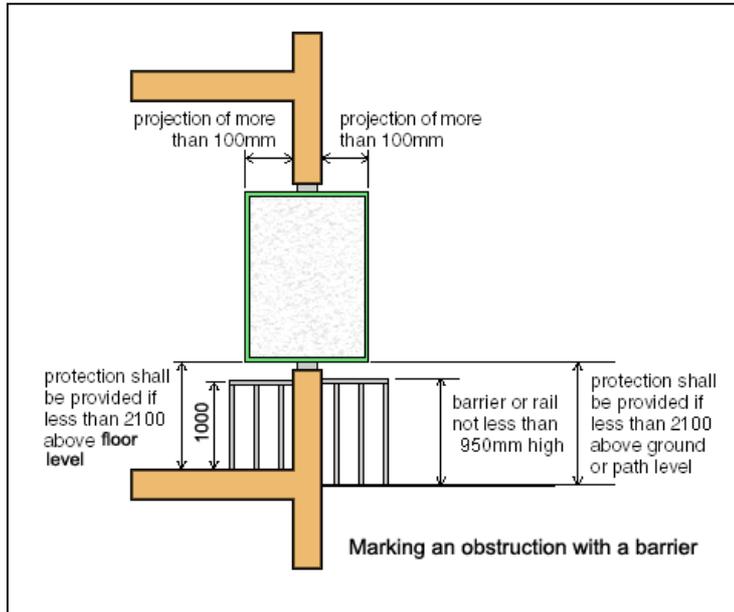
This can be achieved either by the use of barriers or by use of tactile surfaces. This improves safety for everyone especially people with visual and hearing impairments.

Kerbs and rails may also be used as obstruction warning, combining this with a suitable (soft, non shedding foliage) planting can help by use of smell. Care must be taken not to damage the damp course of

the building by extending walls or soil filler across the Damp Course Level.

Outdoor warning can be achieved using the exclusion pavers where these will not form a tripping hazard

Indoors a change of surface texture and resonance can be used to warn of a hazard. A flooring colour contrast will further aid identification of the hazard. Projecting windows and barriers should provide colour contrasts with the background.



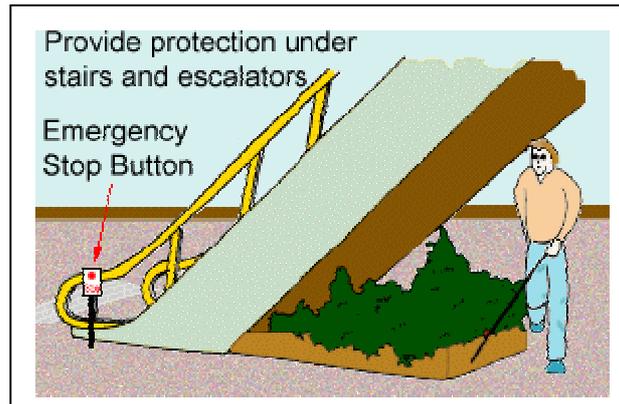
5.1 Overhead Obstruction

Low overhead obstructions (below 2100 mm pedestrian and 2400 mm cycle routes) need to have protection provided to prevent people passing under the low headroom and banging their heads. This can be achieved by use of walls, planters or tactile surfaces.

Tactile surfaces should project at least 4-800 mm beyond the low height obstruction. The surface should contrast in colour with the general surface/

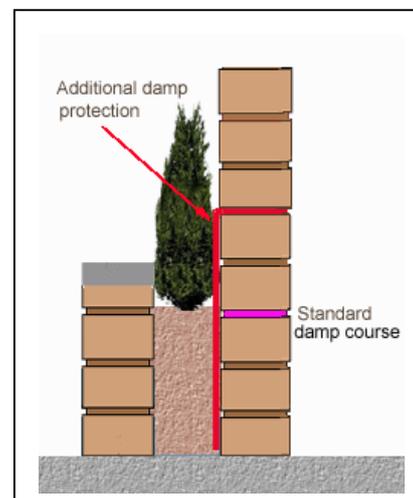
Squared cobbles are preferable to rounded river stone cobbles, providing a more consistent surface with less tripping hazard in

footways. For warning surfaces either rough finished squared block or rounded pebbles can be used.



6 Maintenance

The New Roads and Street Works Act 1991 (NRSWA) and its Code of Practice (UK) requires the reinstatement of the guidance (or warning) surface when it is removed or disturbed in the course of opening the footway by the party disturbing the surface. It is essential that any reinstatement of the surface conforms with the advice in the Highways Agency Tactile Paver Guidance. Local Authorities should periodically check all roads and footways to ensure that contractors and utility companies have reinstated surfaces



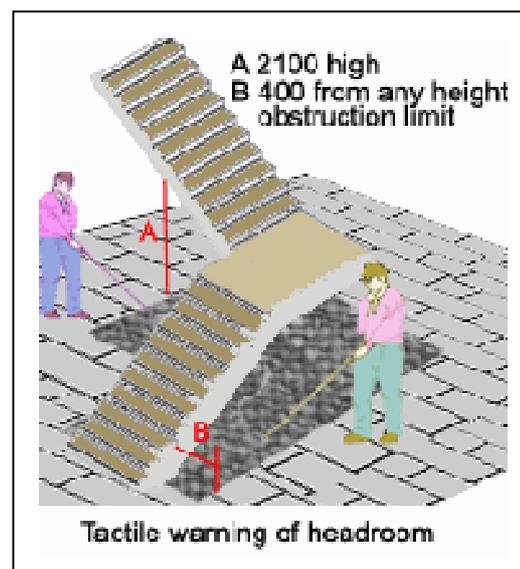
and that correct compaction techniques have been used to prevent dishing of surface due to foundation collapse.

Cracked, broken and unstable pavers are a trip hazard and should be corrected at the earliest opportunity.

Where planters etc. are constructed to provide guarding the damp course layer must be protected.

Lead or geotextile barriers supplemented by painting/spraying the affected wall section with a silicon sealant will provide protection.

See also our guide 'Safety & Accessibility of Flooring' for information about the safety of surfaces.



6.1 Paver Design

6.1.1 Pavers for heavy vehicle use

- Paver concrete 450x 450 x 70 mm
- Base 100 mm CBM1
- Sub-base 150-165 mm
- Subgrade CBR>5%

Highways Agency HD39/01 chapter 7 pavement design. Alternatively see HD 26

It should be noted that pavers must be set on well compacted sub-base otherwise vehicles are likely to cause subsidence and cracking of the paver. A common fault is incorrect reinstatement by contractors after completing their work. It is not unusual to see a maintenance contractor remove 'waste' base materials at the end of work due to insufficient compaction.

6.1.2 Paver Studs

Use of brass (or other metal) stud type pavers should not be considered as these form a tripping/slip hazard for people using mobility aids such as crutches and walking sticks in wet and icy conditions.

Pavers should be inspected regularly to ensure that raised portions do not wear below 5 mm height, below which height they need replacement.



Appendix A – Reference

Department of Transport's 'Inclusive Mobility'

Department of Transport (Highways Agency) - Guidance on the use of tactile paving surfaces. Available to download from -

http://www.dft.gov.uk/stellent/groups/dft_mobility/documents/pdf/dft_mobility_pdf_503283.pdf

Traffic Advisory Leaflet 4/91, 'Audible and Tactile Signals at Pelican Crossings'

(Available from Charging and Local Transport Division, Department of the Environment, Transport and the Regions, 76 Marsham Street, London SW1P 4DR)

Traffic advisory leaflet 5/91, 'audible and tactile signals at signal controlled junctions'

(Available from Charging and Local Transport Division, Department of the Environment, Transport and the Regions, 76 Marsham Street, London SW1P 4DR)

Other guidance is available for various crossings from the DfT website.

Concrete Paving Association - <http://www.paving.org.uk> with a range of design, construction and reinstatement guidance.

Rail Safety Advisory Board report - The best flooring materials for stations. Available to download from their website.

The Health & Safety Executive have produced guidance on measuring slip resistance of surfaces – 'The assessment of pedestrian slip risk'

<http://www.hse.gov.uk/slips/information.htm>

British Standards Paving

BS 6677 : PART 2 - DESIGN FOR CLAY PAVERS - BLOCK PAVING The full title is :- BS 6677 : Clay and calcium silicate paver for flexible pavements : Part 2 : Code of practice for design of lightly trafficked pavements

BS 6677 : PART 3 - CLAY PAVER PAVEMENT CONSTRUCTION - BLOCK PAVING The full title is :- BS 6677 : Clay and calcium silicate paver for flexible pavements : Part 3 : Method for construction of pavements

BS 6677:PART 1 - CLAY PAVERS - BLOCK PAVING The full title is :- BS 6677 : Clay and calcium silicate paver for flexible pavements : Part 1 : Specification for pavers

BS 6717 - PRECAST CONCRETE PAVING BLOCKS The full title is :- BS 6717 : Precast concrete paving blocks : Part 1 : Specification for paving blocks : Part 3 : Code of practice for laying



BS 7533 - FLAGS-PAVERS - BLOCKS PAVEMENT DESIGN the full titles are: - **BS 7533: Guide for structural design of pavements constructed with clay, or concrete pavers, and BS 7533: Part 4: Code of practice for the construction of pavements of precast concrete flags or natural stone slabs**, has been issued as a draft. These are comprehensive design guides and are well worth consulting. Parts of this British Standard are still in draft form and will eventually replace BS 7263 with regards to clay pavers, concrete blocks and other modular systems.

BS 7533-1: Part 1: 2001: Pavements Constructed With Clay, Natural Stone or Concrete Pavers Part 1: Guide for the Structural Design of Heavy Duty Pavements Constructed Of Clay Pavers or Precast Concrete Paving Blocks

BS 7533-2: Part 2: 2001: Pavements Constructed with Clay, Natural Stone, or Concrete Pavers - Part 2: Guide for the structural design of lightly trafficked pavements constructed of clay pavers or precast concrete paving blocks

BS 7533: Pavements constructed with clay, natural stone, or concrete pavers - Part 4: Code of practice for the construction of pavements with precast concrete flags or natural stone slabs.

BS 7533-7: 2002: Pavements constructed with clay, natural stone, or concrete pavers - Part 7: Code of Practice for the construction of pavements of natural stone setts and cobbles This part of BS 7533 gives recommendations for the laying of natural stone setts and cobbles intended for pavements, roads, industrial areas and other paved surfaces subjected to all categories of static and vehicular loading and pedestrian traffic.

BS 7533-10: 2004: Pavements constructed with clay, natural stone or concrete pavers - Part 10: Guide for the structural design of trafficked pavements constructed of natural stone sets. This part of the standard provides guidance on the design of pavements surfaced with natural stone setts manufactured in accordance with BS EN 1342 and laid in accordance with BS 7533-7. It applies to all pavements including those subjected to commercial vehicular traffic, e.g. delivery vehicles.

BS 7997: 2003: Products for tactile paving surface indicators – Specification This standard specifies requirements for products for tactile paving surface indicators of pedestrian paving units, manufactured in concrete, stone or clay and used to convey information for visually impaired people, including the nominal size of paving products, dimensions for raised surfaces, patterns, colour, engineering properties and installation.

Appendix B - Disabilities

Vision loss

The nature of visual loss varies considerably between individuals. The overall picture is a complex one, but generally the result of different eye conditions will lead to the following types of impairment:

- A limited field of vision - being unable to see to the sides or up and down;
- Some loss of central vision - limiting the ability to see fine detail;
- Acute short sightedness - seeing the world as a continuous blur;
- Uncontrollable oscillations of the eyeball leading to an inability to see objects clearly;
- Night blindness - sensitivity to light and a tendency to be dazzled by glare.

Those who move around independently will do so either solely by using their residual sight or by using a mobility aid. The most common mobility aid used by pedestrians with poor sight to facilitate their independent mobility is a long white cane. This is used to scan the ground in front of the person. The scanning takes the form of sweeping the cane in an arc from one side to the other to just beyond the width of the body. This technique will usually locate potential obstructions such as street furniture, provided that there is some element at ground level, and distinct changes in level such as a kerb upstand or a step. An increasing number of people are using a long cane with a roller tip. The roller tip maintains contact with the ground as the cane is swept and may indicate the presence of distinct changes in texture underfoot, as well as the features usually detected by the more traditional type of long cane. Once any feature has been located and possibly identified, the pedestrian will decide how to proceed. Alternatively, a visually impaired person may have a guide dog to assist them with their mobility.

A guide dog is trained to lead its owner around obstructions and to stop at distinct changes of level, for example, a kerb upstand, a flight of steps, or a hole in the ground. Guide dogs are generally unable to respond to changes in texture or colour underfoot. If a guide dog stops at a particular feature, for example a kerb edge, the owner has to decide how and when to proceed.

Hearing Loss

When people have a loss of some or all of their hearing their walking pattern alters. There is a tendency for the person with hearing loss to look at the face or hands of any companions. Their companions also tend to look at the other person. Both companions benefit from contrasting and tactile warnings and come to rely on their guidance to avoid obstructions.

Impaired Mobility

People may use mobility aids to walk or may not lift their foot clear of surfaces when walking (scuffing their feet). It is essential that gaps and surface level inconstancy is kept to a minimum.

Use of large areas of tactile (blister) surfaces can be painful for some people with foot or back injury and should be installed over no greater area that needed.

Mobility Vehicles

(Mobility vehicles – wheelchairs, scooters, tricycles, pushchairs)

Mobility vehicles are affected by poorly laid surfaces, side inclines/cross falls they have to traverse, steps and abrupt rises/dips. It is therefore, important that all surfaces are well laid and that inclines are kept within recommended tolerances.

Likewise gratings and manhole covers can form a tipping or deflection hazard if not installed properly, e.g.:

- Poorly laid dropped kerbs are a common hazard.
- Cross fall the full width of the footway.
- Cross falls too steep.
- Flares not calculated when installed on sloping footways.
- Pavers not set correctly leaving projecting edges.

©Croft Consultants



This document reflects best practice at the time of writing. While every effort is made to ensure the contents are accurate Croft Consultants does not accept any responsibility for the use made of this information.

This document may be reproduced by access groups so long as the source is acknowledged and content is not changed. Other organisations please contact us.