THE DEVELOPMENT OF SURFACE TACTILE INDICATORS

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ABSTRACT

The original base document for tactility is the document, Environment, Transport and Regions Guidance on the use of tactile paving surfaces, which is being transformed into a British Standard. The paper discusses and details the development of a pan European Standard for Tactility and Visibility.

Tactile paving is grouped into two categories, firstly, warning surfaces and secondly, amenity surfaces, and the paper will describe and identify the nature of visual impairment, mobility techniques, the key design principles and will explain in detail the use of tactile information.

The paper will illustrate and give guidance on the preferred layout for all tactile paving including controlled and uncontrolled crossings, hazard warning for tops and bottoms of stairs, platform edge for railway and light tram systems, directional and guidance, shared surfaces and information surfaces.

It will develop and discuss visibility, which is under review currently in the European Draft Standard.

1. INTRODUCTION

Research[1] has determined that visually impaired people can reliably detect, distinguish and remember a limited number of different tactile paving surfaces and the distinct meanings assigned to them. Recognising that the needs of people with physical and sensory disabilities could create potential conflicts, the research which led to the development of the tactile paving surfaces involved not only the target group, i.e. blind and partially sighted people, but also others with a wide range of other disabilities including wheelchair users and people with walking difficulties, particularly people with painful conditions such as arthritis.

Tactile paving surfaces can be used to convey important information to visually impaired pedestrians about their environment, for example, hazard warning, directional guidance, or the presence of an amenity. Each type of tactile paving surface should be exclusively reserved for its intended use and consistently installed in accordance with these guidelines. Visually impaired people are becoming increasingly mobile, both within their local area and more widely, and it is, therefore, very important that conflicting and confusing information is not conveyed.

2. MOBILITY OF VISUALLY IMPAIRED PEOPLE

The successful use of tactile paving also depends on visually impaired pedestrians understanding the different meanings assigned to the paving and being made aware of the presence of such facilities in their area.

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 shortsightedness - seeing the world as a continuous blur;
- uncontrollable oscillations of the eyeball leading to an inability to see objects clearly;
- night blindness - a sensitivity to light and a tendency to be dazzled by glare.

3. MOBILITY TECHNIQUES

Visually impaired people will either move around independently or with the aid of a sighted person who will act as a guide. 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.

It is clear therefore that a visually impaired person walking independently without the benefit of a mobility aid such as a long cane or a guide dog, may only recognise the edge of the footway by stepping off a conventional kerb.

Important information about the environment should be conveyed by the use of non-visual features, for example, audible and tactile features. A loss of sight is not accompanied by an increase in the effectiveness of other non-visual senses. However, visually impaired people generally place more emphasis on information received via other senses, for example the sense of touch.

Whatever mobility aid is being used, a kerb upstand is an essential indicator of the edge of the footway. However, in recognition of the needs of other pedestrians, it is accepted that it is necessary to have level or ramped crossing points in certain locations. In such locations, tactile paving compensates for the absence of a kerb.

4. KEY DESIGN PRINCIPLES

There are certain key design principles which, when applied, make it easier and safer for visually impaired pedestrians to move around. Layouts of all pedestrian areas should be simple, logical and consistent. This will enable people to memorise environments that they use regularly and predict and interpret environments that they are encountering for the first time.

Contrasts in colour and tone should be used to accentuate the presence of certain key features. This will enable many people to use their residual vision to obtain information. Orientation and way finding information should be provided by the use of high visibility and, where appropriate, tactile signing. Many visually impaired people can read signs if they are properly positioned, if the design incorporates contrasting colours and tones, is adequately sized and styled text, and has 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. This paper cannot deal with luminance contrast since it relies on the difference between adjacent surfaces, that need not both be tactile surfaces. However, manufacturers should be aware of this issue in considering the range of colour and tones they provide in their tactile products.

5. THE USE OF TACTILE INFORMATION

When moving around the pedestrian environment, visually 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 rigorous enough to be detectable by most people but without constituting a trip hazard or causing extreme discomfort.

6. DEVELOPMENT OF A EUROPEAN STANDARD FOR TACTILITY.

As part of the mandate for paving, CEN committee, TC 178 needed to address the issue of tactility and visibility and a working group was formed to produce a specification for submission to the members of the CEN organization.

Meetings have been held and this document addresses all Member States product type and specification. The information contained in this paper formed the basis of the draft document for the initial discussion. The proposed draft for public comment contains all the sizes currently being sold or currently under investigation, following the EEC rules on ‘barriers to trade’

7. THE IMPORTANCE OF LUMINANCE CONTRAST

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. This paper cannot deal with luminance contrast since it relies on the difference between adjacent surfaces, that need not both be tactile surfaces. However, manufacturers should be aware of this issue in considering the range of colour and tones they provide in their tactile products.

8. REQUIREMENTS FOR SURFACES OF PRODUCTS

All units shall be manufactured in such a way that, including any joints, the profile of the whole surface has the same dimensions as the profile of the individual units.

8.1Blister surface – type 1

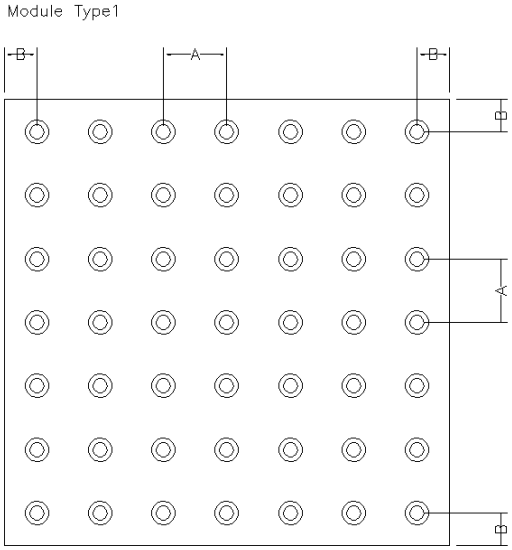

Figure 1. Blister paving.

The blister surface, Figure 1, provides a warning to visually impaired people who would otherwise find it difficult to differentiate between where the footway ends and the carriageway begins, in the absence of a kerb upstand greater than 25 mm high. In the UK, for controlled crossings the colour of the unit shall be a red colour and for uncontrolled crossings they shall be a contrast colour generally buff colour which contrast (commonly a buff colour) with the surrounding paving.

The profile of the blister surface shall comprise rows of flat-topped blisters 5.0 mm ± 0.5 mm high and ± 2.0 mm of the specified dimension.

Where required, the blister tactile surface should be installed in the absence of an upstand at both controlled and uncontrolled crossing points: - where the footway has been dropped flush with the carriageway; or where the carriageway has been raised to the level of the footway.

8.2 Blister surface – type 2

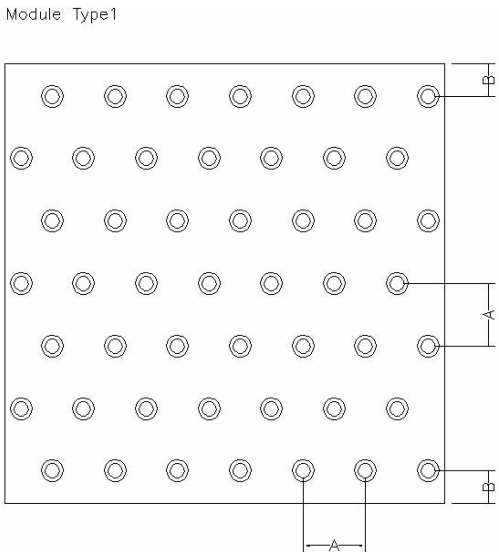

Figure 2. Blister paving.

A platform edge (off-street) surface, Figure 2, warns visually impaired people of the edge of all off-street railway platforms.

The profile of the platform edge (off-street) warning surface shall comprise offset rows of flat-topped blisters 5.0 mm ± 0.5 mm high, spaced 66.5 mm ± 2.0 mm apart from the centre of one blister to the centre of the next. The surface shall be any colour other than red and provide a good contrast with the surrounding area to assist partially sighted people.

8.3 Blister surface – type 3

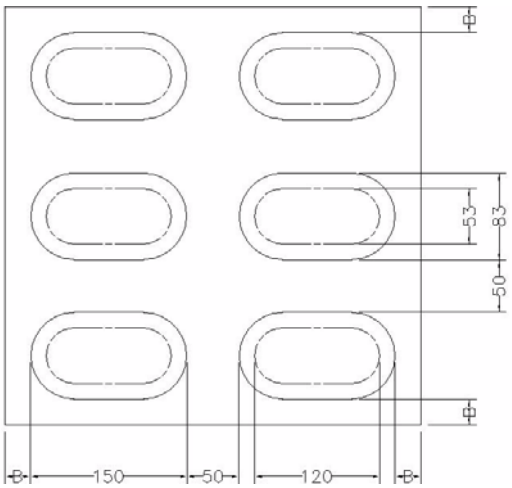

Figure 3. Blister paving.

A platform edge (on-street) warning surface warns visually impaired people that they are approaching the edge of an on-street light rapid transit (LRT) platform.

The profile of the platform edge (on-street) warning surface shall comprise rows of lozenge shapes. The lozenge shapes shall be 6.0 mm ± 0.5 mm high and have rounded edges. Where required, the platform edge lozenge surface should be used at on-street LRT platform edges. It shall not be used at off-street platforms where the flat-topped dome platform edge (off-street) warning surface shall be used. The surface is not recommended for use at raised bus stops.

8.4 Ribbed surface – type 1

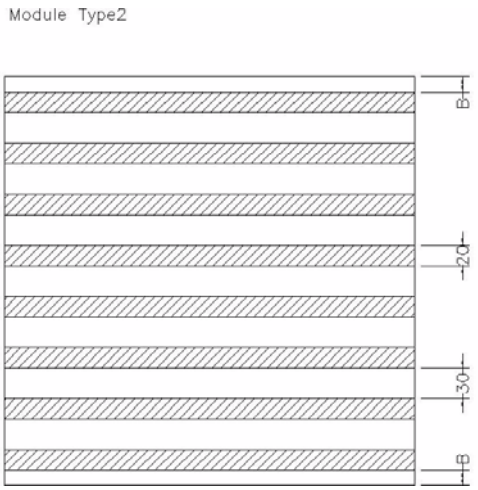

Figure 4. Ribbed surface.

The corduroy surface, Figure 4, warns visually impaired people of the presence of specific hazards, for example steps, level crossings or the approach to on-street light rapid transit (LRT) platforms. It is also used where a footway joins a shared route. It conveys the message "hazard - proceed with caution".

The profile of the corduroy surface shall comprise rounded bars running transversely across the direction of pedestrian travel. The bars 6 mm ± 0.5 mm high, 20 mm ± 1.0 mm wide and spaced 50 mm ± 2 mm from the centre of one bar to the centre of the next. It is recommended that the surface be in a contrasting colour to the surrounding area so as to assist partially sighted people.

Where required, the corduroy surface should be used (except at pedestrian crossing points) where visually impaired people need to be warned of a hazard and advised to proceed with caution, for example: - at the top and bottom of steps, at the foot of a ramp to an on-street light rapid transit (LRT) platform, but not at any other ramps, at a level crossing, at where people could inadvertently walk directly on to a platform at a railway station, at where a footway/footpath joins a shared route. The surface should not be used to warn of obstacles, for example, cycle stands, where people should be advised not to proceed and need to change direction. The surface is not recommended on raised bus stops.

Where required, the corduroy surface should be used for installation, on the cyclist's side, where a footpath or footway joins a segregated shared route for cyclists and pedestrians.

Where required, the platform edge-warning surface is for installation should be used at off-street rail platforms including: -heavy rail platforms; off-street light rapid transit (LRT)_ platforms.

8.5 Ribbed surface – type 2

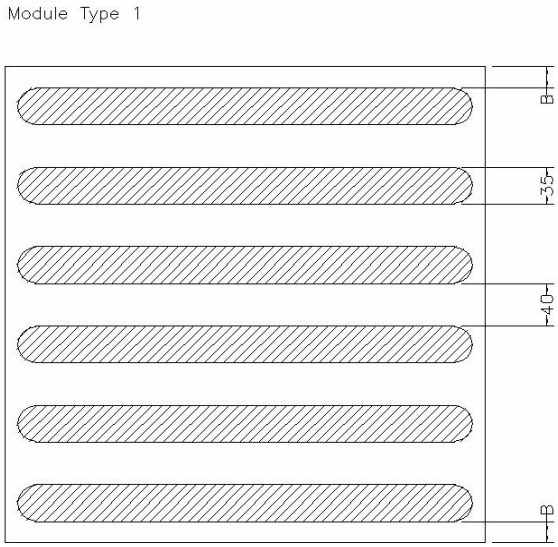

Figure 5. Ribbed surface.

A guidance path surface, Figure 5, 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.

The profile of the guidance path surface shall comprise a series of raised, flat-topped bars running in the direction of pedestrian travel. The bars shall be 5.5 mm ± 0.5 mm high, 35 mm ±1 mm wide and spaced 45 mm ± 2 mm apart. The guidance path shall be in a contrasting colour to the surrounding area so as to assist partially sighted people. It shall not be red, which is restricted to the blister surface at controlled crossings.

Where required, the guidance path should be used in the following circumstances, where the traditional guidance given by a standard footway between the property line and carriageway does not exist (for example, in a pedestrian precinct) and where pedestrians need to be guided around obstacles (for example, in a pedestrian precinct).

8.6 Ribbed surface – type 3

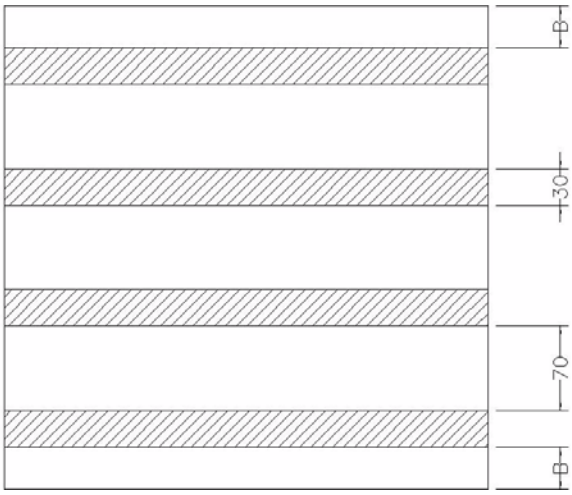

Figure 6. Ribbed surface.

A segregated shared cycle track/footway, Figure 6, advises visually impaired people of the correct side to enter. The central delineator strip shall help visually impaired pedestrians keep to the pedestrian side. The central delineator is normally installed along the length of the route dividing the pedestrian side from the cyclist side.

The profile of the tactile surface shall comprise a series of raised, flat topped bars, each 5.0 mm ± 0.5 mm high, 30.0 mm ± 2 mm wide and spaced 70.0 mm ± 2 mm apart. The central delineator strip shall be 12.0 to 20.0 mm high, 150.0 mm wide with sloping sides and a flat top of 50.0 mm. The material shall have a white finish.

Complete segregation of pedestrians and cyclists by providing for cyclists on the carriageway or the segregation of the footway and cycle track by a continuous physical barrier such as railings, or a level difference, should be the aim of highway authorities, particularly in new developments. This will not only assist visually impaired people, but will also be helpful to other vulnerable pedestrians such as those with impaired hearing and those with walking difficulties.

9. INFORMATION SURFACE

An information surface helps people locate amenities, for example, a telephone box or a ticket office. They are helpful to visually impaired people who are regular users of a particular area and will become familiar with the type of amenity indicated.

The information surface should not have a raised profile and shall be detectable by being softer underfoot than conventional paving materials. The surface shall have a matt finish and be slip resistant. The applied profile shall not be deleterious, which results in impaired performance.

10. INSTALLATION

The installation of units should be in accordance with the relevant standards for construction and the layout configuration should be the same wherever the use of tactile information pavement is used. A typical layout for a controlled crossing is shown in Photograph 1. The different surface indicators can be used in conjunction with each other, a typical application is shown in Photograph 2 where directional paving (ribbed type 2) and hazard warning (blister surface type 3) have been installed.



Photograph 1. Typical layout for controlled crossing.



Photograph 2. Directional and hazard warning.

11. GUIDE TO THE APPLICATION OF TACTILE SURFACES

Table 1 illustrates the various applications for each type of tactile paving.

12. CONCLUSIONS

The British Standard for Tactile Paving is currently going through the last editing process and will be published early next year. The European draft, which is being based on the proposed British standard, incorporates the different tactile profiles from every country within the European Union and the Scandinavian countries tactile paving. This document will be forwarded to the CEN organisation for country approval by the middle of 2003.

The wide spread use of tactile paving in the UK has enabled the visually impaired people to enjoy the city and town centres feeling safe, recognising the different messages they detect through their feet or from limited vision.

Table 1. Application guide.

Tactile surface indicator	Application
Blister	Installation in absence of kerb upstand at controlled and uncontrolled crossings. a) where footway has been dropped to be flushed with carriageway. b) where carriageway been raised to level of footway
Corduroy	Installation where visually impaired people need warning of hazard and advised to proceed with caution, for example a) top and bottom of stairs b) foot of ramp to an on-street light rapid transit (LRT) but not at any other ramp c) at a level crossing d) where people can inadvertently walk directly onto a platform at a railway station e) where footway/footpath joins a shared route Note: do not use to warn of obstacles or raised bus stops
Platform edge (off-street)	Installation at off-street rail platforms including :- heavy rail platforms off-street light rapid transit (LRT) platforms
Platform edge (on-street)	Installation at on-street (LRT) platform edge
Segregated shared cycleway/footways	Installation where there is no physical barriers or level difference exists between pedestrians and cyclists
Central delineation strips	Installation to indicate boundary, pedestrian and cycle side of segregated routes
Guidance path	For installation a) where traditional guidance given by a standard footway between the property line and carriageway does not exist e.g. in a pedestrian precinct b) where pedestrians need to be guided around obstacles e.g. in pedestrian precinct c) where a number of visually impaired people need to find a specific location d) in transport terminals to guide people between facilities

13. REFERENCES

Environment, Transport and Regions 1995 Guidance on the use of tactile paving surfaces. UK

CEN TC 178. Technical Committee for Paving Units and Kerbs.

British Standards BS 7997: 2003 UK

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Biography

Dr Allan J. Dowson began his career in 1956, working for the British Precast Concrete Federation at their laboratories located at the Cement and Concrete Association at Wexham Springs, Stoke Poges. Among the research areas was the developments of waterproof cements, freeze thaw testing, crazing of Cast Stone and the development of the ISAT test method.

After eight years, was appointed as Head of Technical Research and Development with Marshalls PLC, the largest producer of these products in the UK, a position held for 36 years. During this time was responsible for all quality aspects of concrete products, the development of new products including the introduction of concrete block paving and vehicle over-run flags and the technical advice given to all types of customers for the complete range of the company's products. Also, he specialising in concrete block paving and paving flags design, construction and maintenance.

Throughout this period has been involved with several national working parties related to concrete block paving and paving flags. Has been President of the British Precast Concrete Federation, Chairman of Interpave Main committee and Technical committee, National Paving and Kerb Association and a member of Stone Federation Technical Committee, Concrete Society Technical Executive Committee and Chairman of the Joint Concrete and Clay Industry Committee.

Currently a member of B507 Precast Concrete, Stone and Clay Products, Chairman of B507/1 Precast concrete products, Chairman of B507/2 Natural Stone, Secretary to B507/4 Slip/skid group and B507/5 Tactile paving. Responsible for writing standards on concrete block paving, concrete flags and natural stone.

Is a UK expert on European Committees CEN 178 (main committee), CEN 178/WG1 Concrete products, TC 178/WG2 Natural Stone, TC 178/WG4 Slip/Skid Group, and was a member of TC 229/WG3/TG4 Linear Drainage and the European Standards committee for Pigments.

Is the Chairman of TC178/WG5 -Tactile paving committee.

Obtained Doctor of Philosophy Degree at Newcastle by researching construction methods and laying course and jointing sands for use in block paving construction.

In September 2001, he established 'Allan Dowson Consulting' as an organisation to provide a service to producers and users in all aspects of design, construction and maintenance of precast, clay and natural stone pavements. He is also a Consultant to Interpave and a Visiting Industrial Lecturer at the University of Leeds, where he lectures on concrete block paving to MSc students.

Has presented over forty papers at different international conferences, ranging from mix design, construction methods, materials and product standards, pigmentation, development of urban areas, designing for the disabled, bedding sand quality, maintenance to slid skid properties. Also made many company and trade association presentations.