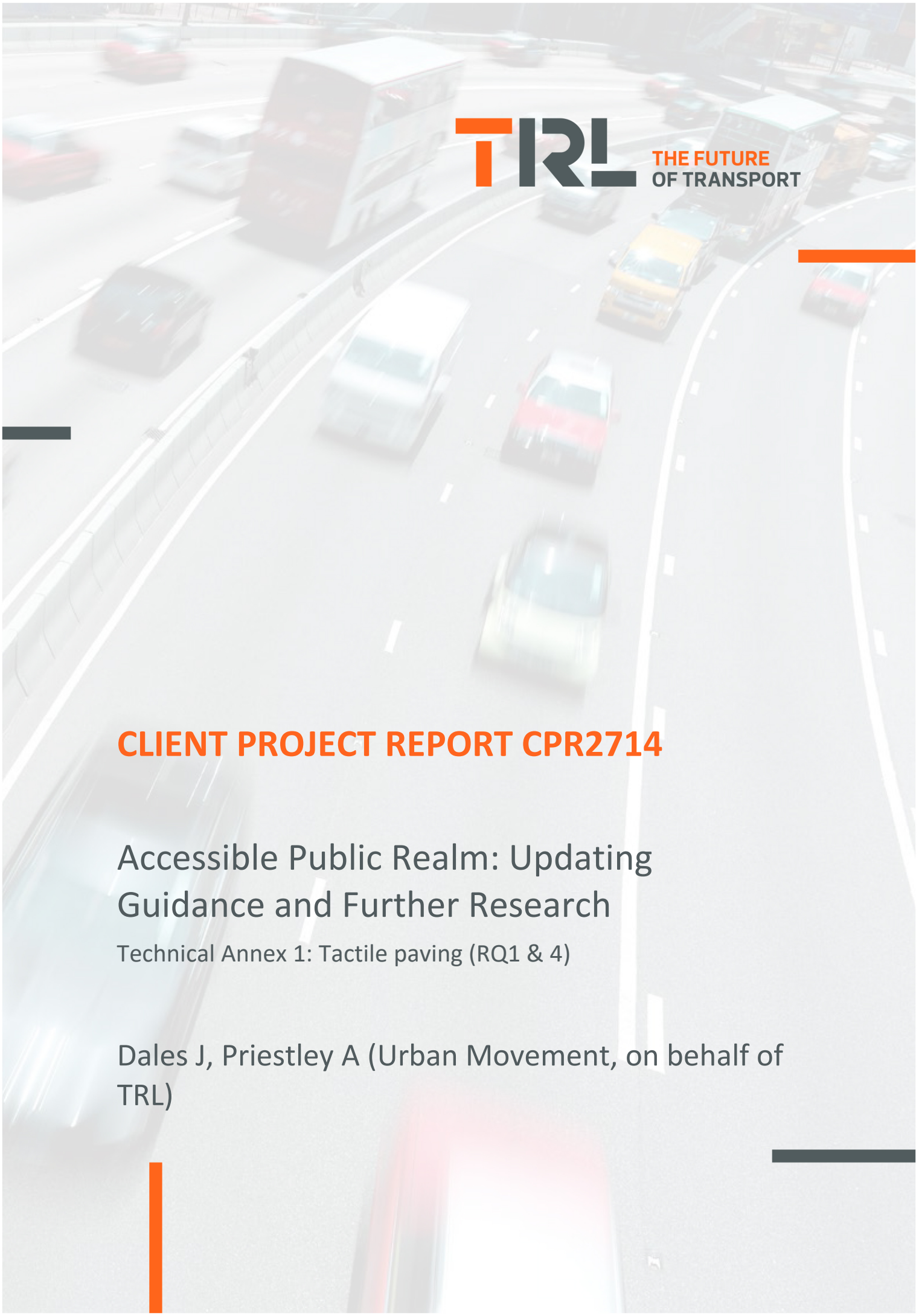

THE FUTURE OF TRANSPORT

CLIENT PROJECT REPORT CPR2714

Accessible Public Realm: Updating Guidance and Further Research

Technical Annex 1: Tactile paving (RQ1 & 4)

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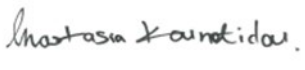
Anastasia Kounatidou (Project Manager)		Marcus Jones (Technical Reviewer)	

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Executive Summary

This document forms a Technical Annex to the *report Accessible Public Realm: Updating Guidance and Further Research* prepared by TRL for DfT. It sets out the detailed methodology and findings from a project workstream focused on two research questions concerning tactile paving:

- Why does the implementation of tactile paving often differ from guidance?
- How do users understand and differentiate between the different types of tactile surface?

The study involved the following tasks:

1. A literature review of documents prior to the publication of *Guidance on the Use of Tactile Paving Surfaces.*
2. Semi-structured, anonymised interviews with local authority practitioners in towns/cities where non-compliance with the guidance was known; followed by a wider survey of practitioners.
3. Two focus groups (one in England and one in Scotland) with visually impaired people and other forms of impaired mobility and officers from representative bodies.
4. A user survey, designed to explore issues raised in the two focus groups.
5. Site visits involving walk/wheel-arounds with with groups of people with visual and mobility impairments (a total of 24 users) in Edinburgh, Glasgow, Manchester, London and Bristol.

While 76% of users correctly understood the meaning of blister paving, 49% correctly understood corduroy, and only 15% correctly understood at least one other surface type. Likewise, practitioners had good awareness of blister and corduroy, but the others were less well known. During site visits, participants generally found that the difference between the blister surface and all other surfaces was easily distinguishable but reported much greater difficulties with distinguishing between the linear surfaces.

Based on what has been found to be effective in current practice, a simplified approach to guidance is recommended: the (little-used) 'information' surface should be eradicated and consideration should be given to further reducing the number of surface types. A key principle is that the need for tactile paving should be considered from the very start of schemes, following an integrated inclusive design process that reflects the public sector's obligations under the Equality Act. A well-designed scheme will minimise the requirement for tactile paving in the first place.

A number of specific recommendations are made for updating the guidance and propositions suggested where further research and consultation is recommended before specific design recommendations can be made. There a several current initiatives by DfT, Transport Scotland, and other government bodies that have a bearing on the design of the built environment, and more specifically cycling infrastructure, shared-space, side-road crossings and new personal mobility devices; these will all need to be considered in any future updates.

1 Introduction

1.1 This document

This document forms a Technical Annex to the report *Accessible Public Realm: Updating Guidance and Further Research* prepared by TRL for DfT to support the updating of the government's guidance on the accessible public realm. It sets out the detailed methodology and findings from Research Questions 1 and 4 (RQ1 and RQ4), concerning tactile paving.

1.2 Background to the research

A Scoping Study previously carried out by the project team (*Updating Guidance on the Accessible Public Realm*: Greenshields, Wells, Barham & Dales, 2018) noted that there were often discrepancies between the guidance set out in *Guidance on the Use of Tactile Paving Surfaces*, and the tactile paving that could be seen within the built environment. This could have a direct impact upon people who are visually impaired, as there may be safety or accessibility issues where the built environment does not adhere to the guidance, and users familiar with the guidance may not find conditions as they expect. The Scoping Study also recommended that the number of tactile paving surface types should be reviewed following research into how these are understood, detected and differentiated by users in the real world. The research described in this report sought to answer two research questions that reflect the recommendations of the Scoping Study:

- RQ1 – to understand the reasons for non-compliance with the current guidance, so that guidance which leads to better outcomes can be produced.
- RQ4 – the number of tactile paving surface types described within *Guidance on the Use of Tactile Paving Surfaces* should be reviewed following research into how these are understood, detected and differentiated by users in the real world. More specifically, this task should consider the ongoing need for the 'information surface'.

When *Guidance on the Use of Tactile Paving Surfaces* was first written, the use of blister paving as a warning device at controlled and uncontrolled pedestrian crossing points was already established. The Guidance covered the use of the blister surface and six additional types of tactile surface to which different meanings were assigned. The Guidance stated that 'research 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'. Over 20 years on, this research study is intended to enable a better understanding of how users in the real world understand, and can distinguish between, different surfaces.

There are also important questions about how well understood, and therefore implemented, the different types of surface are by practitioners, and this is addressed within Research Question 1 of this wider project. This plainly has implications for the levels of confidence users have that, when they encounter a given surface, it is communicating the message they think it is supposed to convey.

The client has requested that the needs of non-visually impaired people are also taken in to account as, whilst they do not require the tactile paving for guidance, it has the potential to

present a risk to them and/or cause them discomfort. (For example, wheelchair users may be jarred while travelling over raised tactile surfaces, and older and ambulant disabled people may be at greater risk of tripping.)

Some surfaces are in common usage and seem reasonably well understood, while others are less well-used and may also be less well-understood. In this regard, part of the purpose of this study is to explore the extent to which a reduction in the number of surfaces used may (or may not) be of benefit, bearing in mind that layouts should be simple, logical and consistent (a core design requirement set out in *Guidance on the Use of Tactile Paving Surfaces*).

2 Method

The study involved the following tasks:

1. A literature review of documents prior to the publication of Guidance on the Use of Tactile Paving Surfaces, in order to understand the origins of the various surface types. The project team also explored issues relating to the differences between English and Scottish building standards.
2. Semi-structured, anonymised interviews were undertaken with local authority practitioners in towns/cities where non-compliance with the guidance was known. These interviews were informed by prior site visits, so that specific cases could be referred to. The purpose of the interviews was to understand, in as much detail as possible, the principal causes for non-compliance with guidance.
3. The findings of the interviews were used to design a survey for practitioners. This was to gain a better understanding of how widespread non-compliance is, to widen the cast for possible additional causal factors, and to use these findings as prompts for possible revisions to current guidance, covering both principles and details.
4. Two focus groups (one in England and one in Scotland) were conducted with people with a range of visual and mobility impairments and officers from representative bodies, to understand the various issues and questions which may arise around the use and understanding of the various tactile paving surface types.
5. A user survey was undertaken, informed by the findings from the two focus groups.
6. Site visits involving walk/wheel-arounds with a total of 24 users in Edinburgh, Glasgow, Manchester, London and Bristol.

2.1 Literature review method

The aim of the literature review was to answer the following research question: “What is the basis or origins for the present tactile paving surfaces within *Guidance on the Use of Tactile Paving Surfaces*”. The project team conducted a literature review of relevant UK papers that were produced prior to the publication of *Guidance on the Use of Tactile Paving Surfaces* in order to understand the origins of the various surface types:

- ‘Delineation for cyclists and visually impaired pedestrians on segregated, shared routes’ (Savill, Gallon & McHardy, 1997)

- ‘Tactile surfaces in the pedestrian environment: experiments in Wolverhampton’ (Gallon, 1992)
- ‘Tactile markings for the guidance of visually handicapped pedestrians’ (Williams, 1991)
- ‘Tactile footway surfaces for the blind’ (Gallon, Oxley & Simms, 1991)
- ‘Disability Unit Circular 1/91: The use of dropped kerbs and tactile paving at pedestrian crossing points’ (Department for Transport [DfT], 1992)
- ‘Methods of training blind and partially sighted people to use tactile surfaces’ (Cranfield University, 1996)

Additionally, the project team conducted a brief literature review of tactile paving practice in other countries, using the following papers:

- ‘Assistive products for blind and vision-impaired persons – tactile walking surface indicators (ISO 23599:2019)’ (International Organization for Standardization [ISO], 2019)
- ‘Dimensions and patterns of raised parts of tactile ground surface indicators for blind persons (JIS T 9251:2001)’ (Japanese Industrial Standards [JIS], 2001)
- ‘2010 ADA standards for accessible design’ (Department of Justice, 2010)
- ‘Design for access and mobility. Part 44.1 Means to assist the orientation of people with vision impairment – tactile ground surface indicators (AS/NZS 1428.4.1:2009)’ (Standards Australia, 2009)

2.2 Practitioner interviews method

The process of designing and conducting practitioner interviews involved four steps:

- From the knowledge of team members and colleagues, a shortlist was prepared of towns/cities where there are numerous known instances of non-compliance with *Guidance on the Use of Tactile Paving Surfaces*. (N.B. Most towns/cities contain numerous examples of non-compliance.)
- The local highway authorities for these locations were contacted to obtain agreement that their officers would discuss the issues arising at a semi-structured face to face interview. The locations and authorities were selected to cover the widest possible range of reasons for non-compliance (i.e. not simply those authorities with adopted local policy/guidance that is at variance with *Guidance on the Use of Tactile Paving Surfaces*). Two of the locations/authorities were in England, and two in Scotland.
- Visits to these four locations were undertaken to document non-compliance.
- Interviews were conducted with practitioners from the four locations/authorities, to understand their reasoning for non-compliance and how this might best be addressed. Interviews were anonymised in order to enable officers to be frank and the root causes of non-compliance to be clarified.

2.2.1 Shortlist of towns/cities

The towns and cities chosen and agreed with the project Steering Group are listed in Table 1. In each case there are good working relationships, and therefore trust, between Council officers and TRL team members. They were chosen due to their wide range of street environments and numerous tactile paving (TP) installations that could be observed within a single site visit. Other reasons are cited in Table 1.

Table 1: Shortlist of towns/cities

Town	Country	Reason for selection
Ealing, London	England	Representative of a London Borough. No reputation for non-compliance with *Guidance on the Use of Tactile Paving Surfaces*. Has own borough-wide highway design guidance.
Manchester	England	Opportunity to observe and understand tactile layouts by Transport for Greater Manchester and some of the ten Districts (e.g. Manchester City Council, and City of Salford Council). No over-arching local streetscape guidance.
Edinburgh	Scotland	Diverse range of environments to observe, including World Heritage Site. Has own recent Streetscape Guidance.
Glasgow	Scotland	No adopted local streetscape guidance, but guidance is in production (at draft stage).

2.2.2 Agreement to interview

Each town/city on the shortlist was contacted in order to arrange an anonymised interview with one or more practitioners with jurisdiction over the design and installation of tactile paving. In each case, Council officers were happy to meet the TRL team and share their experience, knowledge and views.

2.2.3 Site visits to identify and document non-compliance

Each selected town/city was visited, and a representative walk undertaken in order to find and photograph instances of where tactile paving was not compliant with *Guidance on the Use of Tactile Paving Surfaces*. This data captured a selection of tactile paving types and locations, which were later used to prompt questions at the interviews with local authority practitioners.

2.2.4 Interviews with practitioners in each town/city

The broad purpose of the interviews was to understand to what extent and how *Guidance on the Use of Tactile Paving Surfaces* is used in practice, to ascertain – directly or indirectly – reasons for non-compliant arrangements, and to gather views on what parts of the existing guidance are considered most helpful and which (in the practitioners' opinions) might usefully be amended. In order to encourage interviewees to be as frank as possible, it was made clear to them that the interviews would be anonymised and that, as far as possible, the findings would not be attributed to any specific city. (It is accepted as unavoidable that the location of some photographs may be identifiable by some readers.)

The findings from the interviews were used to guide the drafting of the practitioner questionnaire (Appendix A).

2.3 User research

2.3.1 Focus groups

In order to inform the user questionnaire regarding tactile paving surface types, two focus groups were held with visually impaired people, people with other forms of impaired mobility, and officers from representative bodies (including from the project Steering Group). One focus group was held in Scotland (on May 30th in Edinburgh) and one in England (on June 4th in London).

The Scottish group comprised nine participants, and there were eight participants in the English group. Ten people had agreed to come to each, but a total of three people sent their apologies on the day.

Focus group members were recruited by project lead John Dales via existing contacts in Scotland and England (including officers at both RNIB and Guide Dogs). Each focus group lasted for 2½ hours, and the research questions, informed by findings from the literature review, were used to guide the discussions in both cases. The ensuing discussions were very informative and covered a wide range of issues from different perspectives concerning both the use/knowledge of the national Guidance and the real-world experience of users. Several references were made to what some users considered potentially better practice in other (European) countries.

2.3.2 User survey

The outcomes from the focus groups were used to inform the preparation of a survey about tactile paving that was distributed to visually impaired people, and people with other mobility impairments, to gauge their understanding of tactile paving surfaces and the nature of their experience of tactile paving in the real world. The objective was to obtain at least 200 responses, and just over 250 responses were received by the end of July. The user questionnaire itself is reproduced in Appendix C with a summary of the responses.

2.4 Method for site visits and walk/wheel-arounds with users

2.4.1 Initial site visits and observations

In order to understand more about the user experience of tactile paving in the real world, team members visited five local authority areas to identify routes for undertaking walk/wheel-throughs with groups of people with visual and other forms of mobility impairment. The idea was to find routes that encompassed different street types, where a wide range of tactile paving would be encountered; and where there were examples of non-compliance with *Guidance on the Use of Tactile Paving Surfaces*.

The original proposal was that there would be two routes in each town/city; one in a central and one in a suburban location; and both of between 500m and 1km in length. On advice

from prospective participants (with limited time and ability to travel longer distances) and since suburban locations were generally found to have little variety in terms of tactile paving provision, it was decided to select single, diverse routes of around 1.5km in length.

The towns/cities chosen were influenced by the information obtained and contacts developed through the work on RQ1:

- Edinburgh
- Glasgow
- London (Westminster and the City of London)
- Manchester
- Bristol

In each location, initial visits were undertaken by team members to help identify the best route for the purpose of the study. Advice was also provided by local users as to suitable routes. Key considerations being:

- the presence/absence of different tactile paving surfaces;
- the extent to which the tactile paving observed reflects its proper meaning;
- whether or not provision is compliant with Guidance (design or construction);
- ease of access for group participants.

2.4.2 Walk/wheel-abouts

For each walk/wheel-about, team members were accompanied by a small group of people with visual and other mobility impairments, and in some cases by their helpers (the average group size was five people with visual or other mobility impairments.) Group participants were recruited through contact with local representatives of Guide Dogs, RNIB, Access Panels, etc. During each site visit, group members were observed in how they used the various layouts encountered and, as appropriate, prompted to comment on their specific experience at that time and their general experience of similar layouts, and invited to ask their own questions.

3 Findings

3.1 Literature review findings

'Delineation for cyclists and visually impaired pedestrians on segregated, shared routes' (Savill et al., 1997)

This research covered ten types of delineating strips. Types 1 and 3 were taken forward as the delineator described in Chapter 5/Figure 28 of *Guidance on the Use of Tactile Paving Surfaces*.

'Tactile surfaces in the pedestrian environment: experiments in Wolverhampton' (Gallon, 1992)

This research covered five types of surface: Guidance Path, Information Surface; Corduroy, Blister and a Platform Edge warning surface. All five were taken forward within *Guidance on the Use of Tactile Paving Surfaces*, respectively in Chapters 6, 7, 2, 1 and 3.

'Tactile markings for the guidance of visually handicapped pedestrians' (Williams, 1991)

This paper describes six types of surface and describes them as having been developed to be "available for trials on public sites where they will need to be monitored for their effectiveness". It is likely that these proposed trials are largely those covered by CR317 (above). The six surfaces are those that are featured in Chapters 1, 2, 3, 5, 6 and 7 of *Guidance on the Use of Tactile Paving Surfaces* (i.e. the On-Street Platform Edge ('lozenge') warning surface was not included in this paper).

'Tactile footway surfaces for the blind' (Gallon et al., 1991)

This research covered 20 different types of surface, to explore which were most readily detectable and distinguishable from the others. Some of the surfaces tested, or variants, went on to be included in *Guidance on the Use of Tactile Paving Surfaces*: red blister paving, ladder paving, buff corduroy paving, guidance path, and the information surface.

'Disability Unit Circular 1/91: The use of dropped kerbs and tactile paving at pedestrian crossing points' (DfT, 1992)

This Circular concerns the use of Blister paving at crossing points where there is no vertical upstand/kerb. Different types and arrangements of Blister paving are covered, including the use of this surface as stems to form 'L' or 'T' shapes. Much of the Circular found its way into Chapter 1 of *Guidance on the Use of Tactile Paving Surfaces*, including the use of red Blister paving at controlled crossing, and the preference for the 'L' shape arrangement over the 'T' shape. (Chapter 1 of *Guidance on the Use of Tactile Paving Surfaces* states that it formally supersedes the Circular 1/91.)

'Methods of training blind and partially sighted people to use tactile surfaces' (Cranfield University, 1996)

This research was undertaken to establish the effectiveness of a modified information pack designed to inform blind and partially sighted people about tactile surfaces and how to use them. The information pack contains all seven tactile surfaces featured in *Guidance on the Use of Tactile Paving Surfaces*. The research found that "there is a clear need for blind and partially sighted people to be advised of the existence and meanings attached to the seven recommended tactile surfaces" and that "if the information pack were made easier to use… postal receipt of the pack may be a suitable method of training people". It is understood, however, that no formal progress with the completion and distribution of the information pack was made.

'Assistive products for blind and vision-impaired persons – tactile walking surface indicators (ISO 23599:2019)' (ISO, 2019)

The latest ISO document was published earlier in 2019 and uses the term 'Tactile Warning Surface Indicators'. It covers just two basic patterns: the Attention pattern (warning/hazard) and the Guiding pattern (providing directional information). These, respectively, are equivalent to the UK Blister and Guidance Path Surfaces. The Attention pattern covers situations for which both Blister and Corduroy paving are used in the UK. There is a sinusoidal variant of the Guiding pattern, for use 'in geographic areas where snow is common' (because that option is less prone to damage by snow ploughs than flat-topped bars). This two-surface approach is also common in other countries (see below).

'Dimensions and patterns of raised parts of tactile ground surface indicators for blind persons (JIS T 9251:2001)' (JIS, 2001)

Japan is often considered the home of tactile paving. The country's latest standards document covers just two types of surface, described (in English) as 'raised part in dots shape' (equivalent to UK Blister surface) and 'raised part in bar shape' (similar to UK Guidance Path surface). The former is for use at "the position at which attention is to be called" (i.e. for warning), while the latter is described as being "for indicating the moving direction" (i.e. for guidance).

'2010 ADA standards for accessible design' (Department of Justice, 2010)

North American standards concerning tactile paving provision are highly cursory. Section 705, entitled 'Detectable Warnings' covers just one type of surface, described as 'truncated domes', equivalent to flat-topped blister paving. Parameters for size and spacing of the domes are provided. The only additional guidance given is that 'Detectable warning surfaces shall contrast visually with adjacent walking surfaces either light-on-dark, or dark-on-light' and that 'Detectable warning surfaces at platform boarding edges shall be 24 inches (610 mm) wide and shall extend the full length of the public use areas of the platform'.

'Design for access and mobility. Part 44.1 Means to assist the orientation of people with vision impairment – tactile ground surface indicators (AS/NZS 1428.4.1:2009)' (Standards Australia, 2009)

The Australia/NZ approach to the provision of 'Tactile Ground Surface Indicators' (TGSI) covers two basic types: Warning/Hazard TGSIs and Directional/Leading TGSIs. Broadly speaking, the Warning surface is similar to the UK Blister paving but is used in the situations covered in the UK by both Blister and Corduroy paving. The Directional surface is similar to the UK Guidance Path surface and used in the same situations for which that surface is intended.

3.1.1 Discussion of literature review findings

What stands out clearly from the review is the differences in detail and complexity between UK and international practice. *Guidance on the Use of Tactile Paving Surfaces* specifies seven different types of tactile paving: five are intended to denote transitions/edges; one is intended to be followed; and the other is the information surface. These seven types were selected from a wide range of alternatives which were the subject of different research studies.

Putting aside the highly cursory US guidance, the ISO (which seems to be the main reference document in most of continental Europe), Japanese and Australia/NZ standards all focus on just two types: one to denote transitions/edges and another which is intended to be followed. It is not known what research lies behind this simpler approach to provision.

Guidance on the Use of Tactile Paving Surfaces establishes a key design principle that "the layouts of all pedestrian areas should be simple, logical and consistent". International guidance would seem, at face value, to be more likely to enable this principle to be delivered in practice; and it will be important to explore the extent to which the UK approach, which adopts a greater number of different surfaces to denote a wider range of different types of hazard, is more or less helpful to users in the real world. In other words, might the benefits of providing more detailed information be offset by the complexity thereby introduced? This question was raised in focus groups with users and in interviews with practitioners (described later in this report).

In connection with this, it is especially notable that, although UK guidance does contain the guidance path surface, it is only used sparingly in practice. In other countries, the surface is used to guide people to transition/edge locations, but *Guidance on the Use of Tactile Paving Surfaces* does not specify its use for such a purpose. Rather, "The purpose of the guidance path surface is to guide visually impaired people along a route when the traditional cues, such as a property line or kerb edge, are not available. It can also be used to guide people around obstacles, for example street furniture in a pedestrianised area" (*Guidance on the Use of Tactile Paving Surfaces* 6.1).

Instead of the guidance path surface, *Guidance on the Use of Tactile Paving Surfaces* specifies the use of blister paving for 'stems' to guide people to transition/edge locations that are also denoted with blister paving: "The stem will be encountered by visually impaired people walking along the footway and can be followed to the controlled crossing point" (*Guidance on the Use of Tactile Paving Surfaces* 1.5.1.2). This is despite the fact that,

in the core statement of purpose for blister paving (*Guidance on the Use of Tactile Paving Surfaces* 1.1), UK guidance states that, "The purpose of the blister surface is to provide a warning to visually impaired people who would otherwise, in the absence of a kerb upstand >25mm high, find it difficult to differentiate between where the footway ends and the carriageway begins."

The specification of blister paving in *Guidance on the Use of Tactile Paving Surfaces* as both a surface that provides a warning and a surface to be followed seems to be at odds with the 'simple-logical-consistent' principle; especially bearing in mind that *Guidance on the Use of Tactile Paving Surfaces* does also contain a surface (guidance path) that has the core purpose of being followed. Unfortunately, none of the UK documents reviewed explains how/why blister paving came to be specified for use as stems; and the use of blister paving for stems simply appears in *Guidance on the Use of Tactile Paving Surfaces*, also unexplained. This was question was discussed in several of the interviews undertaken with practitioners (described later in this report).

3.1.1.1 Comparison of English and Scottish building standards

The Building (Amendment) Regulations 2018 came into force in England late in 2018, prompted by recommendations of the Hackitt review (Ministry of Housing, Communities & Local Government, 2018), a comprehensive evaluation of the rules governing building safety following the Grenfell Tower fire. Comparable new regulations will be introduced as legislation in Scotland later in 2019. Conversations with the project Steering Group have suggested that there are differences between English and Scottish building standards as they apply to tactile paving. These are unlikely to be affected by the post-Grenfell reviews, but it has been suggested that it would be best to await the publication of the new Scottish regulations before confirming what the differences are as regards tactile paving, and how this might affect practice north and south of the border.

While any differences between building regulations will relate to tactile paving provision in the private realm, rather than in the public highway, it may be helpful to understand these in relation to the key issue of consistency of provision throughout the built environment.

3.2 Practitioner interview findings

A representative selection of anonymised photographs from the practitioner interviews is shown in Figures 1 to 8.

Figure 1: Experimental rubber-based blister paving still in situ, despite failing.

Figure 2: Yorkstone blister/paving at signals in town centre area. No tonal/colour contrast or stem.

Figure 3: Non-standard quasi-tactile paving at signals in heritage area. No stem. Some tonal contrast. Steep gradient.

Figure 4: Blister surface formed of metal studs set into stone slabs. One-off public realm scheme in heritage area.

Figure 5: Corduroy surface used in place of ladder surface and not extending across the full width of the footway.

Figure 6: No tactile (corduroy) marking of steps at bus stop. Heritage area.

Figure 7: Guidance path surface used as a carriageway edge marker; buff, not red, blister paving used at a zebra.

Figure 8: Tactile paving absent from signalised crossing, despite recent maintenance resurfacing. Channel drain issue.

3.2.1 Interviews with practitioners in each town/city

Key findings from the interviews were:

- There is high awareness of the existence of *Guidance on the Use of Tactile Paving Surfaces*, and it is considered standard guidance in the design of streets. It is not, however, regularly referred to, since most practitioners consider that they know the basics and generally only refer to *Guidance on the Use of Tactile Paving Surfaces* when encountering awkward locations where standard practice is difficult to implement.
- In practice, 'tactile paving' seems almost synonymous with 'blister paving', as this is the surface that is, by far, the most commonly installed. Indeed, practitioners whose jobs relate primarily to traffic signals rarely have any need to consider other types of surface.
- There is good awareness generally of the corduroy/hazard surface, the use of which is associated very strongly with the tops and bottoms of steps, and to a lesser extent with the thresholds of shared areas.
- Few of the practitioners spoken to have been directly involved in the installation of on- or off-street platform edge surfaces. This is largely because both are, in a sense, 'specialist subjects'. Highway engineers generally are not involved in train or tube platforms; and even where there are on-street trams (e.g. Edinburgh and Manchester), the infrastructure tends to be designed and installed by dedicated teams (which may comprise chiefly of consultants and contractors).
- The segregated shared cycle track/footway surfaces ('ladder' and 'tramline') were well-known but seem to be the source of some questioning and concern which may in turn be a source of non-compliance. The questioning generally relates to the fact that some practitioners consider it could be preferable for the ladder surface to be on the cycling side, to act as a rumble strip. The concern generally relates to anecdotal evidence (backed by specific reports) of cyclists being literally 'tramlined' by tramlines causing them to fall (especially in wet weather).
- It was pointed out that, in several instances observed, the corduroy surface had been incorrectly used in place of ladder/tramline. The general view of those interviewed was that this would most likely have been the result of the incorrect interpretation of drawings by contractors, not incorrect drawings themselves.
- An additional concern raised about ladder/tramline concerned the difficulties posed in the vicinity of dedicated cycle tracks, which are becoming more prevalent, and especially with associated bus stops. The key issue discussed was that of people now needing to cross cycle tracks/paths, not just walk alongside. It was felt that 'by the book' delineation of different areas in these circumstances would be difficult to work out on paper and very confusing to encounter in practice.
- There was very limited knowledge of the guidance path surface. No practitioners interviewed had ever installed any or knew of any in their areas.
- The information surface was, essentially, unknown to the practitioners interviewed.

- Summarising, practitioners' knowledge of the different surfaces specified in *Guidance on the Use of Tactile Paving Surfaces* generally seems to follow an increasingly steep downward curve after the end of Chapter 1 (blister paving).
- There was strong practitioner support for the guiding principle in *Guidance on the Use of Tactile Paving Surfaces* that "layouts of all pedestrian areas should be simple, logical and consistent".
- This support was matched by the concern that the size and complexity of the first section, on blister paving (around 35 pages with 18 figures), does not to conform to that principle. "It quickly loses its way" and "It grows arms and legs" were sample comments.
- Similar concerns were raised concerning there being seven different surfaces within the Guidance; along with clear scepticism that this wide range of surfaces could be reliably detected and interpreted by users, even if deployed 'by the book'.
- In the same vein, interviewees felt there was a logical disconnection between the initial statement of purpose for blister paving ("to differentiate between where the footway ends and the carriageway begins") – itself very clear and helpful – and the later, unannounced instruction that "a stem of the surface… should extend from the flush dropped kerb to the back of the footway".
- Two of the authorities involved in the interviews have adopted local streetscape guidance documents that cover tactile paving. These largely conform to *Guidance on the Use of Tactile Paving Surfaces*, but there are some departures. For example, both documents specify that there should be no buff or red blister paving in designated centres/heritage areas. (This departure seems generally quite common, even in local authority areas where there is no published local guidance.)
- In both instances where there is local guidance, this is intended to take precedence over *Guidance on the Use of Tactile Paving Surfaces*. Some practitioners in those authorities nevertheless still prefer to refer to *Guidance on the Use of Tactile Paving Surfaces* where the local guidance seems non-compliant. Others do not.
- Different practitioners (including colleagues from different departments and/or consultants) take different views as to which guidance they consider the core reference (if there is a local option) and as to how rigidly they adhere to it. This is obviously likely to be a key source of inconsistency within the same local authority area.
- A common technical challenge relating to compliance is at the corners of junctions where there are two defined crossings that are perpendicular to one another in a confined space. Resolving overlaps between the distinct arrangements is problematical.
- Problems at corners are exacerbated where there are large corner radii. Practitioners need to make decisions about alternatives, neither of which is considered optimal: to have 'wedges' of blister paving on the radius (which make navigation tricky and are considered unsightly and more costly); to offset the crossing point away from the natural desire line, to where the footway is parallel to

the carriageway; to keep the crossing on the desire line, but reduce the size of the blister 'wedge' by providing less depth than the 800mm minimum in the guidance; or to cut the tactile slabs so as to create a blister curve of an even depth of 800mm around the radius.

- Another source of non-compliance is where footways/crossings have been untouched in the 'post-*Guidance on the Use of Tactile Paving Surfaces* era'. In one instance, this 'legacy' effect is compounded by a cost-saving policy under which maintenance/resurfacing works simply reinstate/perpetuate the pre-existing layouts rather than bringing them up to the current standard.
- The practitioners interviewed were predominantly highway, traffic or road safety engineers involved in both capital schemes and maintenance works. Some reported that colleagues from different departments (e.g. urban design, landscape architecture) tend generally to take different approaches to tactile paving provision in the capital schemes for which they are responsible and are more liable to be influenced by townscape or aesthetic considerations.

3.3 Practitioner survey findings

A questionnaire for a survey of practitioners was designed, exploring the issues raised in the interviews. The questionnaire is provided in Appendix A. A total of 27 individual responses from 20 separate authorities were ultimately achieved. Where there were multiple responses from one authority, these were from people with different professional roles. Table 2 provides further details.

Table 2: Questionnaire response level

Authority	Country	No.	Local guidance?
Brighton and Hove City Council	England	1	
Bristol City Council	England	3	
Buckinghamshire County Council	England	1	
Cambridgeshire County Council	England	1	
Cumbria County Council	England	1	
City of **Edinburgh** Council	Scotland	3	Yes – some departures
Glasgow City Council	Scotland	2	
Transport for **Greater Manchester**	England	1	
Hampshire County Council	England	1	
Hertfordshire County Council	England	1	
City of **London** Corporation	England	1	
Transport for **London**	England	1	Yes – some departures
Newcastle City Council	England	1	
London Borough of **Newham**	England	1	
Perth and Kinross Council	Scotland	1	
Salford City Council	England	1	
Southend-on-Sea Borough Council	England	1	
Surrey County Council	England	2	
Westminster City Council	England	1	Yes – knowingly non-compliant

Authority	Country	No.	Local guidance?
Worcestershire County Council	England	2	

3.3.1 Analysis of responses

The views of the 27 different practitioners were often at odds with one another. This seemed to relate principally to the role of the respondent (e.g. highways engineer *cf*. walking and cycling officer), and to varying levels of professional risk aversion. Some respondents prefer rigid guidance that tells them what to do (which, if followed, reduces the risk of being blamed for failures) while others are comfortable with user-sensitive and context-responsive designs that may be harder to codify so rigidly.

Notwithstanding these differences, the following synthesis of key points arising can be used to guide the revision of *Guidance on the Use of Tactile Paving Surfaces*:

- There is clear in-principle support for simplifying layouts and reducing the number of surfaces.
- However, concern about the cost and potential confusion of any substantive changes. This raises the issue of what changes to guidance/practice would be best in theory but challenging in practice/use.
- The desire from some very keen for 'guidance' to be turned into 'standards', was offset by the repeated point from almost all respondents that it's very hard to do the ideal layout in many real-world situations. There was suggestion that guidance could include occasional DMRB-like 'black boxes' to show where departing from the standard is unacceptable.
- The call for 'standards' was also offset by calls for engineers to be allowed to use judgement in complex situations. Guidance should set limits on the scope for such judgement while also showing 'allowable adaptations' from the norm.
- Concerns were repeated about confusing/clashing layouts at signal-controlled junctions with constrained corners and/or large radii. Some suggestions that guidance path for stems would help resolve some clashes. This is also an area where guidance on 'allowable adaptations' would be particularly helpful.
- In terms of practitioner familiarity/experience with different surfaces, this is plainly in descending order from blister, to corduroy, to ladder/tramline, though the downward curve is steep. Off-street platform edge surface is understandably little-known by highway engineers, while experience of the on-street platform edge surface is generally limited to cities with trams. Guidance paving is understood, though little used, and the information surface is essentially unknown.
- There was a repeated theme that corduroy and ladder/tramline surfaces are often confused.
- Another repeated concern was that cyclists are reported to be prone to slipping on tramline surfaces (and some prefer the ladder 'rumble strip' instead).

- Unsurprisingly, some practitioners would prefer to defer to VIPs/groups as to what changes to guidance might be appropriate.
- Very clear that most practitioners have very little understanding of actual user needs or their real-world experience.
- A repeated issue raised was that even if the drawings are right, contractors get the layouts and types of surface wrong. This is due to poor training on their part, which leads even to the wrong types being ordered, compounded by the lack of LA site supervision resources.
- A repeated theme was that new guidance needs to address two design approaches that have come to the fore in recent decades: 'shared space' and cycling infrastructure.
- Recognition that interface of walking and cycling provision at junctions can lead to very complex arrangements that, though 'correct', will confuse and/or be ignored.
- Few responding authorities have their own guidance. Edinburgh's and TfL's contain modest departures, mostly to do with relaxations in heritage areas. Westminster has its own 'Westminster Way' which knowingly disregards *Guidance on the Use of Tactile Paving Surfaces*.
- Despite not having their own formal guidance, practice in heritage areas/town centres in some authorities is to go with non-contrasting or only mildly contrasting tactiles (e.g. uniform yorkstone or granite.)
- Several respondents commented that the age of *Guidance on the Use of Tactile Paving Surfaces* automatically reduces its credibility. Everyone knows we have learned things over the past 20 years, and that new design approaches have introduced new challenges.
- Technical drawings are generally considered very helpful by practitioners.

3.4 User research findings

3.4.1 Focus groups

Although the focus groups did not provide a series of specific answers to set questions, they were very helpful in confirming the supremacy of the key design principle (set out in the existing Guidance) that 'the layouts of all pedestrian areas should be simple, logical and consistent'. Both updated Guidance and future practice should hold tightly to this principle.

Another key issue discussed was the status of the Guidance and the importance of doing as much as possible to enable compliance by practitioners. There seemed to be consensus around the importance of making a clear link between compliance and the Public Sector Equality Duty (and other provisions) established by the 2010 Equality Act, and around the need to emphasise the road safety effects of tactile paving (experience being that practitioners tend to focus on the navigational aspects).

These and other key findings from the focus groups (all anonymised) are summarised in a separate note that forms Appendix B to this report. Arising from the focus group discussions, this note also includes draft questions for the questionnaire that was later sent to a wider group of users (see 2.3 below).

3.4.2 User questionnaire

The user questionnaire and key anonymised findings from the responses are provided in Appendix C. Key points to note are:

- 256 responses were received, with two-thirds of respondents being from England and one quarter from Scotland.
- 40% of respondents were in the 50-64 years-old age group and 20% in the 65-79 years-old group.
- Around 55% of respondents were women.
- 172 respondents (around 67% of the total) identified as being blind or partially sighted.
- Of the respondents who identified as being blind or partially sighted:
    - 130 (76%) understand the meaning of blister paving
    - 85 (49%) understand the meaning of corduroy paving
    - 25 (15%) were able to correctly identify at least one other type of tactile paving
    - The difference between blister paving and other linear types of tactile paving (such as corduroy paving) was widely reported as distinguishable.
    - However, some respondents noted that it is difficult to distinguish the more subtle differences between, for example, the street edge blister surface and the platform-edge (off-street) blister surface; or between the corduroy surface and the ladder/tramline surface.
    - Of the 131 blind or visually impaired people who responded to the relevant question, 57 (44%) said there were other factors that helped them to distinguish tactile paving, with colour and (tonal) contrast being the most used ways of identifying tactile paving, as well as the presence of a kerb.
    - Of the total of 172 blind or visually impaired respondents, 58 (34%) said they had received some training in understanding and using tactile paving. 105 people (61%) said they had not received any training and 9 people (5%) did not answer this question.

3.5 Findings from site visits and walk/wheel-arounds with users

A brief report from each of the site visits is presented below and a summary of the key findings based on user feedback from all the walk/wheel-abouts is provide in Appendix D.

3.5.1 Edinburgh

3.5.1.1 Description of route and group

The Edinburgh route was around 1.8 km long. It began at the tram stop in St Andrew's Square in the New Town and continued via York Place and Leith Walk to Pilrig Street (see map). The walk/wheel-about included a break for refreshments. The group comprised two people with guide dogs, one powered-wheelchair user and an ambulant disabled person who uses two crutches. An additional group member (another powered-wheelchair user) had been going to take part but was unwell on the day.

3.5.1.2 Tactile paving surface types encountered

Table 3: Types of tactile paving surfaces encountered as part of the site visits and walk/wheel-arounds in Edinburgh

Tactile paving surface type	Encountered?	Notes
Blister surface for crossings	Yes	
Corduroy hazard warning surface	Yes	
Platform edge (off-street) surface	No	
Platform edge (on-street) surface	Yes	
Segregated shared cycle track/footway surface and central delineator strip	Yes	
Guidance path surface	Yes	Deployed in non-compliant way
Information surface	No	

3.5.1.3 Sample photographs

The following photographs, taken on the Edinburgh route, show examples of non-compliant or questionable uses of different surfaces. The captions provide further description.

Start of a shared walking/cycling area with no tactile indicators

Start of parallel footway and cycleway, separated only by a painted line and with no tactile threshold

Corduroy paving (800mm depth) used to warn of a loading bay at footway level

Non-contrasting blisters at perpendicular crossings, with both stems ending in open space

Guidance path surface (400mm depth) used to delineate the edges of a footway level cycle track

A T-shaped, rather than L-shaped blister paving arrangement at a signalised crossing

3.5.2 Glasgow

3.5.2.1 Description of route and group

The Glasgow route was around 1.9 km long. It began at the Concert Hall steps at the north end of Buchanan Street continued via Sauchiehall Street, Douglas Street, Bath Street, West Nile Street and Gordon Street to Glasgow Central Station. The walk/wheel-about included a break for refreshments. The group comprised two long-cane users, one person with a guide dog, a manual-wheelchair user, and an ambulant disabled person who uses a stick to walk.

3.5.2.2 Tactile paving surface types encountered

Table 4: Types of tactile paving surfaces encountered as part of the site visits and walk/wheel-arounds in Glasgow

Tactile paving surface type	Encountered?
Blister surface for crossings	Yes
Corduroy hazard warning surface	Yes
Platform edge (off-street) surface	Yes
Platform edge (on-street) surface	No
Segregated shared cycle track/footway surface and central delineator strip	Yes
Guidance path surface	No
Information surface	No

3.5.2.3 Sample photographs

The following photographs, taken on the Glasgow route, show examples of non-compliant or questionable uses of different surfaces. The captions provide further description.

'Fading' steps with no corduroy or other tactile indicators

Blister paving at a signalised junction alongside non-standard ribbed paving over nominal vehicle path

Metal stud blisters used for a stem but with two stud-free slabs inset to the arrangement

Conflicting blister tails on a flush radius, with the decision taken to cut one very short

Non-contrasting blisters used for both edge and stem at a signalised crossing

Corduroy as cycle path edge marker, next to ladder used as rumble strip, and blisters at cycle path zebra

3.5.3 Manchester

3.5.3.1 Description of route and group

The Manchester route was around 2.4 km long. It began at Hardman Square in the Spinningfields district and continued via St Peter's Square, Piccadilly Gardens and a loop through the Northern Quarter back to near Piccadilly Gardens. The walk/wheel-about included a break for refreshments. The group comprised a guide-dog user with some residual sight, a partially-sighted person and a manual wheelchair user.

3.5.3.2 Tactile paving surface types encountered

Table 5: Types of tactile paving surfaces encountered as part of the site visits and walk/wheel-arounds in Manchester

Tactile paving surface type	Encountered?	Notes
Blister surface for crossings	Yes	
Corduroy hazard warning surface	Yes	
Platform edge (off-street) surface	No	
Platform edge (on-street) surface	Yes	
Segregated shared cycle track/footway surface and central delineator strip	Yes	Non-compliant arrangement with no delineator strip encountered
Guidance path surface	No	
Information surface	No	

3.5.3.3 Sample photographs

The following photographs, from the Manchester route, show examples of non-compliant or questionable uses of different surfaces. The captions provide further description.

Badly specified parallel footway/cycleway: corduroy used in place of ladder and no delineator strip.

Blisters at signalised crossing with no stem and significant section well below 800mm in depth.

Confusion between stems at closely-associated perpendicular crossings.

Badly worn blisters at controlled crossing with stem formed from metal studs, many of which are missing

Linked crossings of tram tracks; interstitial footway pattern attempts to give additional visual clues

Confusing, poorly-contrasting, worn blisters, with insufficient coverage for both crossing directions

3.5.4 London (Westminster and City of London)

3.5.4.1 Description of route and group

The London route was 2.1km long. It started in Westminster on the concourse at Charing Cross mainline station and principally followed Strand and Fleet Street, with a diversion via Southampton Street, Tavistock Street, Wellington Street and the Aldwych. Crossing into the City of London, from Fleet Street, the route followed Whitefriars Street, Tudor Street and New Bridge Street to Blackfriars station. The walk/wheel-about included a break for refreshments. The group comprised three partially-sighted people, two people with guide dogs, one blind long-cane user, and one mobility scooter user. An additional group member (ambulant disabled) had been going to take part but was unable to on the day.

3.5.4.2 Tactile paving surface types encountered

Table 6: Types of tactile paving surfaces encountered as part of the site visits and walk/wheel-arounds in London (Westminster and City of London)

Tactile paving surface type	Encountered?
Blister surface for crossings	Yes
Corduroy hazard warning surface	Yes
Platform edge (off-street) surface	Yes
Platform edge (on-street) surface	No
Segregated shared cycle track/footway surface and central delineator strip	No
Guidance path surface	No
Information surface	No

3.5.4.3 Sample photographs

The following photographs, from the London route, show examples of non-compliant or questionable uses of different surfaces. The captions provide further description.

Poorly contrasting curved arrangement: uniform 800mm depth avoids wedges; but no stem

Poorly-contrasting stick-down tactiles at a zebra: helps cover utility trays, but no stem.

Metal studs used as blister surface at a controlled crossing, without a stem

Very badly-worn, low-contrast blisters

No blister provision at a side street crossing

No corduroy provision at top or bottom of these 'fading' steps

3.5.5 Bristol

3.5.5.1 Description of route and group

The completed Bristol route was 1.2km long. It started by the Redcliffe Way Bascule Bridge and continued west across Welsh Back, along the south side of Queen Square, across Prince Street, along Farr's Lane, and across Pero's Bridge. Turning north along the Waterfront, the route then passed through The Centre (between Anchor Road and Broad Quay), and then east along Baldwin Street as far as Queen Charlotte Street. The walk/wheel-about included a break for refreshments but did not restart afterwards due to heavy rain. The group comprised two manual wheelchair users, two powered wheelchair users, and a deaf-blind manual wheelchair user. Two additional group members (one guide dog user and one long-cane user) had been going to take part but was unable to on the day.

3.5.5.2 Tactile paving surface types encountered

Table 7: Types of tactile paving surfaces encountered as part of the site visits and walk/wheel-arounds in Bristol

Tactile paving surface type	Encountered?	Notes
Blister surface for crossings	Yes	
Corduroy hazard warning surface	Yes	
Platform edge (off-street) surface	No	
Platform edge (on-street) surface	No	
Segregated shared cycle track/footway surface and central delineator strip	Yes	No delineator strip – guidance path used instead
Guidance path surface	Yes	Used as delineator strip
Information surface	No	

3.5.5.3 Sample photographs

The following photographs, taken on the Bristol route, show examples of non-compliant or questionable uses of different surfaces. The captions provide further description.

Corduroy used instead of ladder at this shared arrangement transition

Guidance path surface used instead of delineator strip in ladder/tramline arrangement

Metal stud blisters on uncontrolled diagonal crossing with starts/lands (near side) in cycling path

Ladder surface used to denote transition from footway to shared area: should be corduroy

Non-compliant use of tramline and ladder at closely-associated controlled and uncontrolled crossings.

Clearly-defined cycle path through shared area with no edge tactiles – confusing/mixed messages

3.6 Summary of practitioner and user research on each surface type

The user (RQ4) and practitioner (RQ1) feedback from the different research methods used was brought together and compared. Headline findings from users are as follows:

- Of the 172 questionnaire participants who identified as blind or partially sighted (67% of total):
    - 76% correctly understood the meaning of the blister surface
    - 49% correctly understood the meaning of the corduroy surface
    - 15% correctly understood the meaning of at least one other type of surface
- During site visits, participants reported that the difference between the blister surface and all other surfaces was generally easily distinguishable

- However, participants generally reported much greater difficulties in distinguishing between the linear surfaces (e.g. corduroy and ladder/tramline)
- Cognitive overload: is there a need for so much and so many types of tactical paving? Keep it simple' and 'less is more'
- Tonal contrast is very useful for visually impaired users
- Consistency is key

Key findings from the practitioners were:

- Guidance should follow the ‘simple-logical-consistent’ principle.
- Confusing layouts can arise from attempts to apply (perceived) complex guidance to complex streets
- Practitioners awareness is good for blister and corduroy, declines for ladder/tramline- others are not well known
- Concerns that corduroy and ladder/tramline are often confused
- Concerns about cyclists slipping on ladder/tramline
- Contractors often made mistakes and aren’t properly supervised on site
- Simplified guidance, with updated technical drawings, would be welcomed

A detailed comparison of user and practitioner comments on each surface type is given in Appendix E.

4 Recommendations

The research undertaken for RQ1 and RQ4 supports several specific recommendations in relation to updating the guidance. In addition, several other propositions can be made which will require further consultation, and possibly focused research and trials, before determining whether they should be incorporated within updated guidance. During this process, other initiatives should be considered, including those that are being undertaken by the DfT, Transport Scotland and other government bodies and which have a bearing on the design of the built environment (particularly in relation to cycling infrastructure and shared space).

Recommendations for updating the design guidance are grouped into recommendations concerning the structure of the revised guidance, and recommendations giving specific design advice.

Recommendations on the structure and content of the guidance:

- The revised guidance should follow the 'Simple-Logical-Consistent' (SLC) principle (as established in 'Key design principles' in the introduction to the existing guidance)
- The overall structure should follow Introduction > Factsheets > Technical Drawings (one Factsheet of between two and four pages per surface is proposed)
- The 'Technical Drawings' section should provide examples of 'tricky situations', as well as guidance on how to avoid such situations by considering the needs of blind and partially sighted (and other) users much earlier in the design process

Specific design recommendations:

- The guidance should recommend (and describe) a design process that considers the needs of blind and partially sighted people from the outset of a scheme, within an integrated and genuinely inclusive design process, reflecting the public sector obligations under the Equalities Act
- Guidance should stress the importance of avoiding the need for tactile paving in the first place and describe how this can be achieved through more thoughtful design of the public realm from the start of the design process
- Guidance should recommend that the overall design of schemes should avoid cognitive overload and describe (with examples) how this can be achieved
- Guidance should emphasise the road safety function of tactile paving provision, in addition to its roles in aiding navigation and providing information
- The platform edge (off street) surface should be used only within railway/ underground stations and should therefore be described in a separate section from the other surfaces, which are for deployment on the public highway
- Information surfaces can be deleted from the guidance
- The primacy of tonal contrast over colour contrast should be emphasised (and shown in the examples).

The 'Technical Drawings' section should provide examples of 'tricky situations', as well as guidance on how to avoid such situations by considering the needs of blind and partially sighted (and other) users much earlier in the design process. Common 'tricky situations' are encountered at the physically constrained junction corners where the tactile arrangements for perpendicular crossings clash/overlap and at the interface of the footway with segregated cycle tracks, especially where the cycle track arrangements are themselves complex (e.g. swap from one side of the road to the other at a crossing).

Propositions for further research and consultation

- Blister- this should only be used in accordance with the stated core purpose to warn of a crossing point where there is no detectable kerb, and not for stems leading to the crossing points (for which the guidance path surface is preferable (see below))
- Hazard/corduroy- should be used as currently and as a replacement for ladder/tramline (see below)
- Platform edge (on-street)/lozenge- should be used for all tram/RT platforms (including, for consistency, those which may be off-street) and on raised bus stop platforms
- Ladder/tramline- should no longer be used due to widespread user and practitioner confusion, and to safety concerns of cyclists; and should be replaced by hazard/corduroy laid in 'ladder' orientation across the whole path. (Safety concerns re cycling may be largely anecdotal but justify further exploration). The delineator strip can continue to be used.
- Guidance- should continue to be used as currently specified, as well as for stems leading to the blister surface at controlled crossings
- How best to assess tonal contrast, for different materials in the wet and dry, may require further discussion/research

More information about these recommendations and propositions, including potential revisions to the structure of the guidance, is provided in Appendix F.

The proposed changes would represent an evolution and simplification of current practices rather than requiring current infrastructure to be replaced. Even for the more far-reaching propositions, the intention is that people who are accustomed to current arrangements would not be confused when encountering surfaces laid out as proposed, as the primary meanings are largely maintained and safety critical meanings are unchanged.

It is recognised that the rail industry uses its own standards and will continue to use blister paving at platform edges in stations for consistency with current practice in the UK and elsewhere.

Further areas for potential research

Several additional issues relating to tactile paving arrangements were raised by various participants during the conduct of the RQ1 and RQ4 research, and the following may be considered worthy of further deliberation.

Some continental European crossing layouts **have parallel crossings for wheelchair users and visually impaired people**. The arrangement for wheelchair users typically is a dropped kerb with no tactile paving, and this is alongside a kerb upstand with blister paving to which visually impaired users are reliably guided by a stem of guidance path. If used in the UK, this arrangement could possibly reduce the discomfort experienced by wheelchair users without compromising the safety of visually impaired people.

In Bristol (and elsewhere), **dropped kerbs without tactile paving are used**, to enable people on cycle to transition between the carriageway and shared areas. Concerns have been raised that visually impaired people might inadvertently walk into the carriageway, and so some people have suggested tactile delineation is necessary. This arrangement would, however, appear to be analogous to conventional footway crossovers by which motor vehicles transition from the carriageway to, e.g., driveways, where no tactile delineation is required.

Different visually impaired users reported using **different means of determining the direction in which they should cross**. At controlled crossings, some use the stem if it is both perpendicular to the kerb and in line with the safe crossing direction. Some use the back edge of the blister arrangement at the footway edge if it is perpendicular with the safe crossing direction. Some use the alignment of the blisters themselves at the footway edge. Further discussion of this issue would be helpful because, in some instances, having stems that are not perpendicular to the kerb would be helpful in enabling the stem to reach the building line (rather than end in space); and also because there are some merits in adopting the 'Westminster curve' where a consistent 800mm depth of blister paving is provided but the back edge is therefore not perpendicular to the safe crossing direction. The suggestion has also been made that tactile arrows on top of push-button boxes, or on poles, felt by hand, could help resolve the challenges of ascertaining direction through tactile paving alone.

Several participants raised the issue of how **near-future technological developments** could help remove the need for/reliance on tactile paving to provide certain types of information for visually impaired users. This is both a sensitive area (because some users are resistant to the possible replacement of familiar arrangements by tools requiring using of modern communications technology) and requires a better understanding of the technological possibilities than was obtained through this study.

Professional training

The questionnaire included prompts concerning supportive actions (such as training or an illustrated best practice handbook) that might be of benefit outside of an updated *Guidance on the Use of Tactile Paving Surfaces* document. The following recommendations are made:

- In response to strong support for training from practitioners, the launch of revised guidance should be accompanied by a nationwide training/CPD programme.

- It would be best if this programme were run in association with representative groups (national and local) and with professional institutions (e.g. CIHT, IHE, ICE).
- Training should also embrace urban designers and landscape architects (and their professional bodies – LI, RIBA, UDG).
- Training should be practical and be delivered in part by blind and partially-sighted people; with input also from representatives of other groups (e.g. wheelchairs users).
- The updated guidance should be as simple as possible to engage with, so that it can be disseminated easily. For example, including a section containing concise 'fact sheets' for each of the surface types, with 'technical information' – guidance on specific layouts, with drawings – placed in a separate section/appendix.
- All training/dissemination should be delivered in the context of the Equality Act/Public Sector Equality duty, with safety aspects at the foreground.
- Generally, practitioner training should improve the understanding of the 'why' of tactile paving surfaces, and the 'how', not just 'what' templates.

5 References

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Appendix A Practitioner questionnaire

As part of a wider Department for Transport project to consider updates to the Guidance on the Use of Tactile Paving Surfaces document (first published in 1998), this questionnaire has been prepared to enable practitioners to contribute their perspectives. The project is being undertaken by TRL with partners Urban Movement and Philip Barham Freelance Consulting Ltd; this survey is managed by Urban Movement. Please view the GDPR privacy notice here https://trl.co.uk/privacy-notice *Responses will be anonymised to encourage frank answers; although employer type and job title is requested to understand respondents' roles and the context in which they are involved in the built environment and any local policy issues. Please complete in as much detail as you feel necessary to answer each question. Many thanks in advance.* *Please email your responses to Amy Priestley: a.priestley@urbanmovement.co.uk.* If you require assistance completing the questionnaire, please contact Amy on 020 3567 0710. *Please also contact Amy if you have any questions regarding this questionnaire, or the wider project.* *Note that the survey closes for responses on 24th July 2019.*		
1. Personal Information		
Employer type (e.g. local authority, design company, construction company etc.):		
Job title:		
2. How do your role and responsibilities relate to the provision of tactile paving in the public realm?		
3. Considering your experience as a user of the current *Guidance on the Use of Tactile Paving Surfaces*:		
a. How often do you refer to it, and why/when?		
b. Which chapters do you tend to consult most often?		
c. What format(s) of *Guidance on the Use of Tactile Paving Surfaces* guidance do you generally use? *(Tick any that apply)*	(i) Hardcopy (original or self-printed)	
	(ii) Electronic copy (e.g. pdf on your own computer)	
	(iii) Online copy (e.g. pdf hosted on DfT website)	
4. *Guidance on the Use of Tactile Paving Surfaces* covers seven different types of tactile paving surface, listed below. Please comment on each in turn, concerning your familiarity with their purpose, your experience with their use, and any generic problems or other issues that you have encountered (or are aware of) with their deployment in the real world.		
a. Blister surface		

b. Corduroy hazard warning surface	
c. Platform edge (off-street) warning surface	
d. Platform edge (on-street) warning surface	
e. Segregated shared cycle track/footway surface ('ladder and tramline') and central delineator strip	
f. Guidance path surface	
g. Information surface	

5. Discussions with practitioners to date have revealed the following specific issues to be of concern:

- **The importance of tonal contrast compared with colour contrast**
- **The justification for the depth of tactile paving that *Guidance on the Use of Tactile Paving Surfaces* specifies for certain layouts (e.g. minimum 800mm blister at crossings on corner radii; 1200mm for blister paving stems; and 2400mm for ladder/tramline)**
- **The use of blister paving for stems, bearing in mind both the stated core purpose of blister paving for edge definition and the availability of the guidance path surface as an obvious alternative.**

If you have any detailed comments on these issues, or others, and if you have not already mentioned these in your response to Question 4, please provide them here.

6. The first Key Design Principle set out within *Guidance on the Use of Tactile Paving Surfaces* is that "Layouts of all pedestrian areas should be simple, logical and consistent". Do you have any suggestions – general or specific – as to how updated guidance might better enable the delivery of this principle in practice?

7. Does your local authority have any adopted polices, guidance or practice that covers the provision of tactile paving? If so, please provide details/links. To your knowledge, do or might these local policies/approaches lead to non-compliance with *Guidance on the Use of Tactile Paving Surfaces* in practice?

8. Other than conflicting local guidance, what do you consider to be the main reasons why tactile paving provision in the real world is often non-compliant with *Guidance on the Use of Tactile Paving Surfaces*?

9. A review of international guidance reveals that, in keeping with ISO 23599, many other countries use just two tactile paving surfaces: blister and guidance path. Do you consider that there could be benefits in reducing the number of surfaces used in the UK? Please describe your thoughts, providing whatever detail you think helpful.
10. Please provide any further comments on what you consider to be the key strengths or weaknesses of the existing *Guidance on the Use of Tactile Paving Surfaces* and/or anything else you think may be helpful in respect of the proposed update.
11. Do you think formal training for practitioners in the design and implementation of tactile surfaces would be beneficial? If yes, would it be beneficial to include visually impaired users in delivering such training?

Thank you for completing this questionnaire.

Please email it to a.xxx@urbanmovement.co.uk

Appendix B Summary of English and Scottish focus groups

Two Focus Groups were convened: Edinburgh on 30th May; and London on 4th June.

The Scottish Focus Group was attended by nine invitees, including representatives from the RNIB, Guide Dogs, the Mobility and Access Committee for Scotland, Inclusion Scotland, the Edinburgh and North Lanarkshire Access Panels, and Transport Scotland. Five members of the group were blind or partially-sighted (a mix of guide dog and long-cane users), and one was a wheelchair user.

The English Focus Group was attended by eight invitees, including representatives from the RNIB, Guide Dogs, the Disabled Persons Transport Advisory Committee, and Wheels for Wellbeing. Two members of the group were blind or partially-sighted (one a guide dog user and one a long-cane user), one was a wheelchair user, and one was an amputee who uses a cycle as a mobility aid.

An anonymised summary of the key points made by groups members is as follows.

- General concern that those who install tactile paving (practitioners involved in design and construction) seem not to know what the Guidance says and/or how to install it correctly.
- Key issue for users is the high degree of inconsistency from street to street and place to place.
- Some feel that 'Guidance' is too weak, and that 'Regulations' might help ensure higher standards.
- Concern that practitioners apply tactile paving as an afterthought. Better if the needs of visually impaired (and other disabled) users were considered from the outset in developing designs layouts (e.g. eliminating constrained junction corners would remove the need to 'dress' them in awkward tactile patterns). "If streets were actually simple, logical and consistent, there'd be less of a need for tactile paving. Designers need to produce inherently safe/accessible streets."
- Concern that aesthetic considerations too often take primacy in design.
- Choice of materials sometimes fails to ensure adequate tonal contrast (in all weather conditions) and may mean surfaces are slippery when wet.
- Concern about 'ownership': designs may be correct on paper but sharp and/or incompetent contractor practice, allied to inadequate site supervision, can lead to poor provision.
- Suggestion that revised Guidance should stress the Public Sector Equality Duty (in 2010 Equality Act) by way of ensuring good tactile provision is understood to be essential, not optional.
- Guidance should emphasise the safety aspects of tactile provision. Concern that practitioners focus on the navigational aspects. "Wrongly-placed tactiles can be worse than none".

- Adequate depth of tactile layouts raised as a key issue (one line of 400m slabs is inadequate, as it may easily be stepped over).
- The Guidance itself needs to be screen-readable or otherwise made accessible to visually impaired people. Its language should be non-technical and its meaning intuitive. ("I don't want to have to go to College to understand it.")
- Stems/tails, though useful in principle, are often confusing: some overlap; some don't extend far enough back; use of the same surface (blister) for stems as well as the crossing edge.
- General recognition of the need to consider the concerns of other disabled people, especially those likely to experience discomfort or a trip hazard. Some blister dimensions reported as especially uncomfortable (too high), affecting buggy and wheelchairs users, etc.
- Suggestion of possible flat sections at crossings alongside blister sections (Swedish examples cited), with stems to ensure visually impaired people don't miss the blister section.
- Tonal contrast ('black and white test') generally agreed as more important than specific colours. Though concern raised that people with cognitive impairments associate red with 'safe place to cross'.
- Suggestion that guidance path surface could be more logical for stems. Related suggestion that guidance path may be more comfortable for wheelchair/buggy/pram users to cross than blister.
- Group members generally unfamiliar with platform edge tactiles (both types) and questioning if these situations need their own distinct surfaces. Would standard blister or corduroy suffice?
- Group members keen to understand what would follow from the end of this research study. General agreement that further engagement with users – and possibly more detailed user research on different surfaces – will be necessary before new Guidance is issued.
- General issue raised that, even if a better (different) way of deploying tactile paving were agreed, transitional issues may lead to cost and confusion that would militate against the effectiveness/value of change in practice.
- General agreement that, although technological developments may make physical tactile paving obsolete one day, that day is too far off to materially influence this iteration of updated Guidance.
- General concern about how best to deploy tactile surfaces in especially (and increasingly) complex situations, such as in relation to innovative (for the UK) cycling infrastructure.
- ("Historically, we've only thought about how to cross between footway and carriageway. Now we need to cross cycle tracks, but don't really have a way of doing

this other than mimicking a general carriageway crossing. Which adds complexity and is very costly.")

- Key issue raised about training for users: how there is very little of this; and how the existing Guidance (range of surfaces, different meanings/uses, numerous diagrams for different types of location) is not easy-to-grasp. Good knowledge by users is essential: "tactile paving can only be useful if people know what it means".
- Suggestion that the complexity of the Guidance itself may partly be responsible for the apparent 'marketplace of competitive alternatives' (i.e. that clear, simple rules relating to a smaller number of surfaces would make it easier to identify and challenge non-compliant layouts, colours, etc.)
- Concern that the urban street environment has become more complex/contested in recent years. So tactile provision is even more important – but must aid clarity, not add confusion.
- Issue raised that, for many amputees, steps are preferable to slopes. Steeper than 5 degrees is a real issue.
- Issue raised that tramline paving can unsettle people on cycles if not approached exactly in line; especially cycles with thinner wheels, and especially in the wet.
- General agreement that the requirement for 2400mm depth of ladder/tramline is excessive.
- Suggestion that new Guidance should be more user-friendly (less wordy/technical), with the more technical diagrams placed in an appendix.

Appendix C User survey

C.1 User Questionnaire

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.

UK Guidance on the Use of Tactile Paving Surfaces is now over 20 years old and the Department for Transport is seeking to understand how it might be most helpfully updated.

Please complete this survey if you are blind or partially sighted, are in a wheelchair, or are disabled in any other way, as this can better improve future guidance.

Your responses to this survey will be kept confidential and anonymous as per our privacy notice.

Should you be unable to complete this survey online, please call during office hours on 01344 770098 or 01344 770831 and ask to complete the Tactile Paving User Questionnaire. The questionnaire closes for responses on 24th July 2019.

1. Personal Information

Home city/town/village:						
Age (please select):	<18	19-34	35-49	50-64	65-79	80+
Sex (please select):	M	F	N	No answer		
Please tell us about your mobility characteristics (tick all which apply).	Blind or partially sighted					
	Please describe what mobility aids you use (e.g. long cane, guide dog) *(free text)*					
	Wheelchair user					
	Please describe the type(s) of wheelchair you use (e.g. manual, powered) *(free text)*					
	Other					
	Please describe how this affects your mobility *(free text)*					
Description of disability *(free text)*						

2. Where and how frequently do you encounter tactile paving? *(tick all which apply)*				
	At least weekly	1-3 times a month	Less than once a month	Never
Streets				
Traffic-free squares/plazas				
Railway or underground stations				
Bus stations				
Trams stops or tracks				
Shopping centres				
Elsewhere (please state)				

3. Blister paving comprises rows of flat-topped domes around 5mm high (picture alongside).	
3a: What do you think this blister paving means? *(free text)*	
3b: What do you do when you encounter this blister paving? *(free text)*	
3c: Blister paving may be red, buff or other colours. Please describe what you think each of the colours mean. *(free text)*	
Red meaning	
Buff meaning	
Other colour meaning	
4. Corduroy paving comprises rounded bars running transversely across the direction of pedestrian travel. The bars are around 6mm high and 20mm wide, with centres spaced at 50mm.	

4a: What do you think this corduroy paving means? *(free text)*	
4b: What do you do when you encounter this corduroy paving? *(free text)*	
5. There are five other types of tactile paving. Are you aware of these other forms of tactile paving? If so, please describe what they are and what they mean to you. *(free text)*	
6. Do you have any problems distinguishing between different types of tactile paving? If so, please give details. *(free text)*	
7. Is there anything apart from feeling that helps you distinguish tactile paving from the neighboring footway or carriageway surfaces? *(free text)*	

8. Where do you have issues in navigating safely around streets, and does tactile paving assist with this? Please describe each in detail.		
Type of area	**I do/do not have issues navigating this type of space** *(radio button select which applies)*	**How tactile paving helps or hinders you** *(free text)*
Controlled crossings (i.e. zebras or crossings with signals)	do / do not	
Uncontrolled crossings (i.e. crossings without signals)	do / do not	
Steps	do / do not	
Railway or underground platforms	do / do not	
Level/single surface streets	do / do not	
Large open spaces	do / do not	
Areas around amenities (telephone boxes etc)	do / do not	
Other (please describe)	do / do not	

9. Are there any common problems you encounter with tactile paving arrangements in the UK? If so, please describe the problem(s) and what you think the cause(s) may be. *(free text)*

10. Have you ever received training in the understanding and use of tactile paving?	yes/no	If yes, please describe *(free text)*

11. Are there any tactile paving surfaces that you do <u>not</u> consider important or useful? *(free text)*
12. Do you have experience of tactile paving in countries outside the UK? If so, please comment on whether you find any differences more or less helpful. *(free text)*

C.2 Survey responses

A total of 256 responses to the questionnaire was received. The answers respondents gave concerning their personal details are as follows in the tables below.

Q2 – Home location

England	173
Scotland	64
Wales	13
Northern Ireland	1
Not specified	5

Q3 - Age

<18	2
19-34	34
35-49	60
50-64	104
65-79	51
80+	4
-	1

Q4 - Gender

Female	142
Male	107
No Answer	7

Q5 – Mobility aids used by blind or partially sighted people (may be >1/person)

Guide dog	66
Long cane	115
(Quad/Walking) Stick/Crutches	5
Partner/Carer/Sighted Assistant	9
Wheelchair	3
Not blind / Not specified / None	*83*

Q6 – Wheelchair users: type(s) of wheelchair

Power	24
Manual	30
Scooter	7
Not wheelchair user / Not specified	*209*

Q8 – Further detail regarding disability or long-term condition

Blind/visually impaired	136*
Reduced mobility	58
Both	18
None	11

* Note that not all respondents completed this question. In response to Q5, 150 separate respondents identified as either or both of guide dog and long cane users and are therefore assumed to be blind/visually impaired.

Q9.1 - Frequency of encounters with tactile paving

At least weekly	227
1-3 times a month	8
Less than once a month	8
Never	7
-	6

Q10-Q12 – Understanding of different surfaces

Questions 10, 11 and 12 concerned users' understanding of what meaning the different tactile paving surfaces convey to them. Answers were given in free text, and these were then assigned to different categories by the research team.

For Question 10, concerning blister paving, respondents were deemed to have a reasonable understanding of the purpose of the surface if their answer was categorised into one or more of the following descriptions:

- Kerb/edge
- Pedestrian crossing

- Road approaching

For Question 11, concerning corduroy/hazard paving, respondents were deemed to have a reasonable understanding of the purpose of the surface if their answer was categorised into one or more of the following descriptions:

- Hazard (general)
- Steps (top/bottom)
- Transition to/from shared walk/cycle area

Question 12 concerned awareness of the other types of tactile paving surface. Just 66 of the 256 respondents (26%) said they were aware of any, though not all gave a specific answer. The number of people identifying and correctly describing the purpose of each surface was:

- Platform edge, off-street (offset blister) 20
- Platform edge, on-street (lozenge) 14
- Segregated shared cycle track/footway (ladder/tramline 10
    - Associated central delineator strip 2
- Guidance path 13
- Information 2

Summarising the findings of Questions 10-12 for the 172 respondents who described themselves as blind or visually impaired:

- 130 (76%) understand the meaning of blister paving
- 85 (49%) understand the meaning of corduroy paving
- 25 (15%) were able to correctly identify at least one other type of tactile paving

Q13 - Problems distinguishing between different types of tactile paving

Participants' answers often were dependent upon the types of tactile paving they had encountered. It's therefore important to consider that a high proportion of respondents were not aware of most of the seven types of surface.

The difference between blister paving (whether street edge or off-street platform edge) square or diamond) and other linear types of tactile paving (such as corduroy paving) was widely reported as distinguishable. However, some participants noted that it is difficult to distinguish the more subtle differences between, for example, the street edge blister surface and the platform-edge blister surface; or between the corduroy surface and the ladder/tramline surface. It may be, therefore, that some people may simply not be aware of the differences between some surfaces and haven't commented.

Q14 - Distinguishing tactile paving from the neighbouring footway or carriageway

Of the 131 blind or visually impaired people who answered this question, 57 (44%) said there were other factors that helped them to distinguish tactile paving; and 74 people (56%) said there were not any other factors. Colour and (tonal) contrast were the most used ways of identifying tactile paving, as well as the presence of a kerb. Some also rely on sound (such as traffic noise) or their own local knowledge to help identify the transition between footway and carriageway.

Q17 - Training in the understanding and use of tactile paving

Out of 172 blind or visually impaired respondents, 58 (34%) said they had received some training in understanding and using tactile paving. 105 people (61%) said they had not received any training and 9 people (5%) did not answer this question.

The survey did not delve into the reasons why most blind and partially sighted people have not received training, and it is therefore unclear what the reasons are (e.g. lack of training being offered, or poor take-up of training offers).

These findings tend to suggest that users could benefit from tactile paving provision and guidance being more simple, logical and consistent.

Q18 - Are there any tactile paving surfaces that you do not consider important or useful?

A total of 21 blind or partially sighted respondents stated that there were some tactile paving surfaces that they did not consider to be useful; while 64 said they found all tactile paving surfaces useful.

Some people responded that they could not answer, as they were not aware of all types of tactile paving. *Several* people stated that the commonly used blister paving and hazard paving surfaces were useful, but that others were not.

One blind or partially sighted respondent wrote, *"Well there are 7 in use, apparently, I and everyone I know who is blind can only recognise 2 or 3 at most. The other 4 or 5 are both largely unknown and unrecognisable. That makes them redundant."* This statement seems to capture the thoughts and experience or many blind and partially sighted respondents.

It was clear that blind and partially sighted people generally find the tactile paving surfaces that they recognise and encounter both useful and important. However, the practical utility of surfaces they do not recognise or cannot distinguish is very limited.

Appendix D Summary of key walk/wheel-about findings

There were five walk/wheel-abouts with users having a range of different disabilities, as follows:

1. Edinburgh (12th August) with four disabled people: two with guide dogs, one a powered wheelchair user and one ambulant disabled person.
2. Glasgow (13th August) with five disabled people: two long-cane users, one person with a guide dog, one manual wheelchair user and one ambulant disabled person.
3. Manchester (23rd September) with three disabled people: one person with a guide dog, one partially sighted person with no mobility aid, and one manual wheelchair user.
4. London (4th October) with seven disabled people: two with guide dogs, one blind long-cane users, three partially sighted people with no mobility aid, and one mobility scooter user.
5. Bristol (14th October) with five disabled people: two manual wheelchair-users, two powered wheelchair users, and one deafblind manual wheelchair user.

Of the total 24 participants, 10 were women and 14 were men.

Tactile paving surface type	Encountered in Edinburgh?	Encountered in Glasgow?	Encountered in Manchester?	Encountered in London?	Encountered in Bristol?
Blister surface for crossings	Yes	Yes	Yes	Yes	Yes
Corduroy hazard warning surface	Yes	Yes	Yes	Yes	Yes
Platform edge (off-street) surface	No	Yes	No	Yes	No
Platform edge (on-street) surface	Yes	No	Yes	No	No
Segregated shared cycle track/footway surface and central delineator strip	Yes	Yes	Yes	No	Yes
Guidance path surface	Yes	No	No	No	Yes
Information surface	No	No	No	No	No

An anonymised summary of the key points arising from the events, including observations, answers to questions from the consultancy team and comments made by participants is as follows.

- Two key concerns were established:
    - Can users reliably detect/distinguish different surfaces?
    - When detected, is the meaning of the surface clear to users?
- Almost all participants considered that simplicity was a key consideration in tactile paving provision, and that 'less is more' would be a good principle to observe.
- Generally, participants' knowledge of different surfaces was partial. All were aware of the meaning of blister paving at carriageway edges, though some were confused by the same surface being used for stems. The meaning of the corduroy surface was next best-known, though often thought just to denote steps. There was very limited knowledge of other surfaces. Where ladder/tramline was encountered, there seemed generally to be confusion as to its meaning.
- When asked, participants stated that they do not expect tactile paving provision alone to enable them safely to navigate along unfamiliar streets. Tactile paving is most commonly used as a reminder/prompt of where the person is in familiar locations of which they have good mental maps.
- Tonal contrast of tactile paving is a very useful additional aid for partially sighted people, enabling them to identify where tactile paving is present, and giving some a measure of advance warning.
- The configuration of blister stems at corners where there are controlled crossings in two perpendicular directions can be confusing when the tails clash and/or form large wedges of blisters. These make it difficult for people to identify where the desired signal pole might be, or what direction to take.
- Although blind and partially sighted people rely on tactile paving, they can suffer from cognitive overload where layouts are complex or tactile paving patterns are encountered too frequently or repetitively.
- Tactile paving can cause discomfort to wheelchair users, ambulant disabled people, and others; and is difficult to avoid. Blister paving stems, because of their intended purpose, are particularly difficult to avoid, as well as relatively frequently found.
- Some wheelchair users referred favourably to dual crossing arrangements they had encountered in continental Europe (e.g. Sweden and Germany) where there is a flush crossing section (raised carriageway or dropped kerb) with no tactile surface parallel and immediately adjacent to a section with both blister paving and a detectable kerb at the footway/carriageway interface. Guidance path leads to the blister surface.
- Wheelchair users can find corduroy paving (encountered in 'ladder' orientation) more difficult and uncomfortable to cross than blister surfaces. The level of discomfort can depend on the specific form of corduroy paving (not all are alike) and the size of wheelchair wheels.

- Wheelchair users can also find the ladder surface difficult to cross, and it can cause discomfort. Some wheelchair users therefore prefer to travel on the 'cycling' side of a parallel path arrangement direction.
- Slip resistance is a concern for most users when tactile surfaces are wet.
- Guide dog users generally defer to the dog when encountering tactile paving and will therefore largely ignore the surfaces they detect when the dog is working.
- Long cane users, by contrast, rely much more heavily on being able to detect surfaces themselves. They are also more reliant on tactile surfaces to lead them to the button boxes at signalised crossings.
- Some blind and partially sighted people are happier to seek and/or receive the help of strangers than others.
- Blister paving is generally readily detectable by visually impaired people.
- Visually impaired people find it much more difficult to detect and distinguish between the linear forms of tactile surface (corduroy, ladder/tramline, and guidance path).
- Some users seemed to find the corduroy surface easier to detect when encountered in the 'tramline' direction rather than 'ladder' direction. It is normally intended to be encountered in the 'ladder' direction.
- The platform-edge (on-street) surface (lozenge) seemed easy for all users to detect and to distinguish from other surfaces.
- Metal blisters inset into slabs were considered generally to be both more uncomfortable than stone/concrete blister surfaces, and more slippery when wet.
- Long cane users often use the building edge to navigate along a street, but street clutter can make this difficult.
- Long cane users sometimes use drainage channels or dips in the street to follow along the street; as if it were an informal line of the guidance path surface.
- Stems are key features for blind and partially sighted people to navigate to crossing points. Users can therefore struggle when stems do not reach the back of footway and do not lead close enough to the button box. Although most participants are now familiar with the use of blister paving for stems, there were concerns about potential confusion with edges, and questions about why stems are supposed to be deeper (1200mm) than edges (800mm) when the latter are the more important from a safety perspective.
- Corduroy paving was generally understood to be most likely to indicate the presence of steps, though also recognised as possibly indicating other hazards, such as shared areas.
- Most blind and partially sighted users reported not generally trusting their ability to use their feet to sense the alignment of blisters to give them directional information. Some stated they generally rely on the alignment of stems to more reliably point them to the far side of a crossing.

- Because the alignment of blisters cannot be reliably detected by many users, the street edge blister surface is not readily distinguishable from the platform edge (off-street) surface.
- Some guide dogs can detect blister paving at some crossings, seemingly dependent on training and the extent of colour/tonal contrast.
- Worn blister paving, especially at the kerb edge, presents a real hazard if it can no longer be reliably detected. This highlights the initial choice of materials and the level of ongoing maintenance as key issues concerning tactile paving provision.
- Several blind and partially sighted participants stated that, at uncontrolled crossings, they generally use their sense of hearing to judge when no vehicles are not crossing and when it is likely to be safe to cross. The lack of ability to detect the noise of approach cycles was stated as a reason for concern about informal crossings of cycle tracks, e.g. to get to the bus stop 'island'.

Appendix E Summary of user and practitioner feedback on each tactile surface type

Surface	Users: Level of understanding of meaning	Users: Detection and distinction	Practitioners: Comments & Issues	Additional Comments from walk/wheel-abouts
Blister	Very wide understanding that this indicates where there's a crossing point where there's no kerb upstand. Limited knowledge of directional purpose of alignment of blisters. Some confusion with use as stems, though this seems to have limited practical implications as many (most?) users already know their routes and use stems as reminders for anticipated crossings.	Readily detected by most people, though many struggle to detect directionality of alignment. Some confusion over its key use as a carriageway edge marker and its use as stems. Most users are unaware of and/or fail to distinguish 800mm/1200mm depths.	By far the most commonly used and well understood surface. Key problems are in relation to trying to achieve standard layouts in constrained locations (e.g. junction corners), which often lead to clashes or large wedges. Related queries about use for both edges and stems; the prescribed width of stems (1200mm) compared to edges (800mm) as the latter would seem more critical not to miss; the possibility of doing away with the minimum 800mm (leads to wedges) or of allowing the 'Westminster curve'.	Metal studs generally disliked: widely regarded as being slippery when wet; generally more painful for people with sensitive feet; too hot for guide dogs' feet in summer; and more uncomfortable – even an obstacle – for wheelchair users. Numerous examples of over-worn natural stone blisters, showing the importance of good maintenance/ replacement regimes.
Corduroy	Commonly, but not universally understood as meaning 'hazard'. Most often expected to mean, in practice, 'watch out for steps'. Because of multiple meanings, also reasonably well understood as a general 'watch out'.	Seems to be readily recognised as 'different' to surrounding flat surface, but individual ribs or alignment not easily detected (not that this is necessarily intended).	Most commonly used/intended for use as a warning for steps or at the transition of shared areas. In the real world, often mistakenly used as ladder; issues of lack of contractor awareness and/or of site supervision.	Where present (e.g. top and bottom of steps) commonly found to be laid just 400mm deep. Steps often link public to private realm and notable that steps with corduroy at one end didn't have any at other. Some corduroy units especially difficult or uncomfortable to

Surface	Users: Level of understanding of meaning	Users: Detection and distinction	Practitioners: Comments & Issues	Additional Comments from walk/wheel-abouts
				negotiate for users with small-wheeled wheelchairs.
Platform/ off-street	Commonly understood as meaning 'platform edge' when in a railway station. Not widely understood as being different from regular blister, but station context means this is unimportant in practice.	Not readily distinguished from regular blister; but unimportant in practice.	Known of by some practitioners, but rarely used in practice as few LA officers work in railway station contexts.	One very busy mainline station visited had no tactile paving on any of its platforms. Most users could not readily detect difference in blister alignment from standard on-street blister paving.
Platform/ on-street (lozenge)	Relatively low levels of understanding of meaning at the population level; likely because it's relatively uncommon in the real world.	Readily detected and distinguished, especially when expected.	Greater LA practitioner awareness, especially in cities with trams (Edinburgh, Manchester), but issue that tram schemes tend to be the province of consultants/contractors, not LA officers. Some LAs (e.g. in South Yorkshire) use for raised bus stop platforms. This may seem logical but is strictly non-compliant.	Where encountered (Edinburgh and Manchester) lozenge paving was readily detected as being quite different from all other tactile paving surfaces. Some queries, however, as to whether it is as immediately detectable at blisters in good condition.
Ladder/ Tramline with delineator strip	General meaning is commonly confused with corduroy (assumed to be marking shared area transition). The meaning of the orientation is also poorly understood by many. Both types of	Ladder/tramline relatively readily detected, including directionality. Some users cannot easily distinguish it from guidance path; although this may be	Next best-known after blister and corduroy, but many questions. Hard to achieve compliant layouts in some contemporary walk/cycle arrangements (*Guidance on the Use of Tactile Paving Surfaces* diagrams reflect the inherent complexity and risk of confusion). Consistency of	Where encountered (Edinburgh, Manchester, Bristol) was the source of much discussion and confusion, sometimes because corduroy had been used as 'ladder' alongside standard tramline. Wheelchair users

Surface	Users: Level of understanding of meaning	Users: Detection and distinction	Practitioners: Comments & Issues	Additional Comments from walk/wheel-abouts
	confusion may relate to lack of training and/or inconsistency of deployment (e.g. ladder/tramline sometimes reversed; corduroy fairly regularly used instead of ladder).	due to limited experience of the latter. The delineator strip seems to be readily detected by visually impaired people walking alongside, but easier to miss if approached from a more perpendicular angle.	installation hampered by confusion with corduroy and lack of clarity/perceived illogicality of ladder/tramline walk/cycle set-up. Cycle campaigners report common concern over tramline, especially in wet, such that many cyclists prefer ladder. Consistent queries about need for 2400mm depth.	prefer the tramline orientation but don't generally want to be on the cycling side. Recognition that some cyclists prefer ladder ('rumble strip') to tramline, especially in wet. Several instances of ladder being used instead of corduroy at thresholds of shared areas.
Guidance	Not widely understood. Where the meaning is known, most commonly association with use in train/bus stations, shopping centres, open spaces (on the continent).	Directionality is readily detected; but not easily distinguished from ladder/tramline.	Purpose well understood, but relatively little experience (not least because its prescribed use covers a narrow range of situations). Considered an obvious replacement for blister for stems but concerns about user confusion if this were done in practice.	Only encountered in two locations, where it was not deployed as prescribed. Generally good understanding of its intended purpose. Several positive anecdotes of experience in European cities. Generally positive response in discussions to idea that it could be used for stems at crossings.
Information	Very little understanding of meaning, and where known almost always a matter of theory, not practice.	So little-known as to be a surface that no-one thinks to detect.	Limited awareness, and no practical experience.	Not encountered.

Appendix F Recommendations and propositions for revised guidance on tactile surfaces

The notes and recommendations in the following table are a synthesis of the many and varied inputs to the *Guidance on the Use of Tactile Paving Surfaces* update received through the RQ1 and RQ4 workstreams.

In overview, the proposals below are an attempt to provide a picture of what would be better for users (and practitioners) if the provision of tactile paving surfaces in the real world was:

(a) simplified;

(b) considered much earlier as an integrated part of a properly inclusive design process; and

(c) understood as a vital safety feature to be provided in the context of the relevant provisions of the Equality Act 2010, including the Public Sector Equality Duty.

Generally, revised guidance could be provided in a simple three-section format, as follows:

1. Introduction – overview, context, etc. As concise as possible. Key points of focus should be on achieving layouts that are Simple, Logical and Consistent; ensuring tactile paving provision is practiced as an integral part of genuinely inclusive processes of street/highway design and maintenance; and stressing the safety aspects of tactile paving in the context of the Equality Act 2010.
2. Description – of the basics for each surface. This should be user-focused, simple & punchy. Suggest the objective is that each surface should be presented in the form of an easy-to-understand factsheet, that is suitable for use in training users. The only graphic in each should be the standard plan/profile figure. Illustrative photos or sketches can be provided. Aim for 2-4 pages each.
3. Technical drawings – user representative organisations and many practitioners value these as clear 'how to do it' guides. For different reasons, both groups are keen to limit the discretion that practitioners must depart from the guidance, intentionally or otherwise. These drawings will need a comprehensive review once changes to overall guidance are agreed; and should actively address typical 'tricky situations' showing how standard approaches can reasonably be varied (e.g. stems to reach the nearest shoreline if possible, so non-perpendicular arrangements allowed to achieve this).

Detailed recommendations and propositions for updating *Guidance on the Use of Tactile Paving Surfaces* are presented below, structured according to the structure of the current document.

1. INTRODUCTION

Emphasise the Simple-Logical-Consistent (SLC) principle. In keeping with this, the recommendations and propositions concerning the seven surfaces within the existing *Guidance on the Use of Tactile Paving Surfaces* are as follows:

1. **Blister**. Proposition that this should only be used in accordance with the stated core purpose to warn of a crossing point where there's no detectable kerb, and not for stems leading to the crossing points.
2. **Hazard/corduroy**. Proposition that the use of this surface should be extended to cover situations for which ladder/tramline are currently specified
3. **Platform edge (off-street).** Recommendation that this is considered is a separate section as not being appropriate for the public highway.
4. **Platform edge (on-street)/lozenge**. Proposition that this should be used for all tram/LRT platforms (even when these are off-street for consistency) and to warn of the edge of raised bus stop platforms.
5. **Ladder/tramline**. Proposition that this should be deleted, with the corduroy surface used instead.
6. **Guidance path.** Proposition that this should be used as currently specified and for stems leading to crossing points.
7. **Information**. Recommendation that this be deleted.

- Stress critical safety aspects, in addition to navigation/information functions
- No-one wants more than is necessary: cognitive load for VIPs; discomfort for some others
- Underline Equality Act considerations, including PSED
- The need to consult/engage effectively with users affected, both directly and indirectly, and with other stakeholders
- The need for trade-offs because of different user requirements
- Design: promote the need to consider access for blind and partially sighted people from the outset of scheme design, so that tactile layouts can be as SLC as possible. Tactiles are not a sticking plaster to make inherently awkward layouts better.
- Design: note on dropped kerb design here, not overloading the text of the blister section
- Design: note on depths of arrangements (400mm-800mm-1200mm); and safety aspects of these, here rather than spread across individual sections; and where variations may be allowable
- Maintenance: importance of maintaining feature height/distinctiveness over time
- Maintenance: where and why using smaller blocks may be preferable to 400mm x 400mm slabs

2. TACTILE PAVING SURFACES	
2.1 – Blister surface for pedestrian crossing points There is a lot of text in the existing guidance about crossings themselves and the need to consult, etc. Some of this is no longer needed, and much of what is still needed would sit better in the Introduction.	
Retain. But use to indicate/warn of crossings only; in keeping with existing core statement of purpose.	
a. Purpose	Proposed revised core statement: *"The purpose of the blister surface is to indicate and provide a warning of the presence of a crossing point to visually impaired people who would otherwise, in the absence of a kerb upstand >25mm high*, find it difficult to differentiate between where the footway ends and the carriageway begins. The surface is therefore an essential safety feature for this group of road users where the footway is flush with the carriageway to enable crossing by wheelchair users and others to cross unimpeded."* * The question of whether 25mm remains an appropriate boundary between what is/is not 'flush' should be subject to further consideration.
b. Definition	As existing, with simple diagram (Figure 2). Could add one or two non-technical graphics (e.g. colour drawing) to illustrate typical circumstances where blister paving will be deployed (e.g. zebra, signalised junction, simple side street crossing).
c. Application	*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.* Stick to core statement of purpose. Consider no longer using for stems, as this is (a) inherently at odds with the basic purpose and (b) leads to unnecessarily confusing layouts, especially at junction corners with two crossings perpendicular to one another. Review guidance on colour and tonal contrast. These do not help blind people but can give additional assistance to some partially sighted people. This implies they're not safety critical and so relaxation can be considered where the case is made (e.g. sensitive built environments or at 'continuous footway' treatments).
d. Maintenance	Delete this section. The guidance in this sub-section is essentially generic and common to all surfaces. To enable the chapters on surfaces to be as clear and concise as possible, Maintenance would be best covered in a short, distinct section that applies to all surfaces (e.g. within the Introduction chapter).
e. Layout	This section should be greatly reduced in size – it currently runs to 25 pages and 16 figures. Almost all of this, including the technical drawings, could/should be placed in Section 3.
2.2 – Corduroy hazard warning surface	

Retain. But broaden application to act as a warning for all circumstances where a warning is necessary but neither blister nor lozenge is appropriate. Low levels of user recognition/understanding and high levels of confusion concerning ladder/tramline suggest a less-is-more approach will enable better application of the simple-logical-consistent principle.	
a. Purpose	Proposed revised core statement: *"The corduroy surface conveys the message 'hazard, proceed with caution'. Its purpose is to warn visually impaired people of the presence of hazards not indicated by the blister or lozenge surfaces (which have a specific meaning), including steps, the approach to on-street tram or raised bus platforms, and level crossings. It is also used to mark the transition between a footway and an area/path that can be shared with people on cycles. The surface should be used to warn of flush transitions between footway and carriageway away from designated crossing points (where the blister surface is used)."* (This core statement of purpose – and those for other surfaces – could be shortened by leaving the descriptive second half to the 'Application' section.)
b. Definition	As existing, with simple diagram (Figure 19). Could add one or two non-technical graphics (e.g. colour drawing) to illustrate typical circumstances where blister paving will be deployed (e.g. steps, shared paths – both 956 & 957 arrangements).
c. Application	*The corduroy surface can be used for any situation (except at pedestrian crossing points - see 2.1) where visually impaired people need to be warned of a hazard and advised to proceed with caution, for example:* • *the top and bottom of steps;* • *the foot of a ramp to on-street tram or raised bus platforms (but not other ramps);* • *a level crossing;* • *where people could inadvertently walk directly on to a platform at a railway station; and* • *where a footway/footpath joins a shared (walking/cycling) route or space.* *Stress the need for consistent 800mm depth (with an allowance of up to 1200mm where used in circumstances currently covered by ladder/tramline).* *The surface must not be used to warn of obstacles.* (Could add an explicit link to the use of Guidance Path to guide people around obstacles, which is part of the existing core statement of purpose for that surface.)
d. Maintenance	See note in 2.1 in this table.

e. Layout	This section could be much shorter, or placed entirely, along with the technical drawings, in Section 3.
Chapter 3 – Platform edge (off-street) warning surface	
Relocate this section. This surface is not for use on the public highway, and should be placed in a separate section, as being largely irrelevant to the use of tactile paving surfaces in the public realm.	
2.3 – Street platform edge warning surface	
Retain. But use at on- and off-street LRT/tram platforms; and at raised platforms at bus stops. This surface was developed because of the risk that the platform edge (off-street) warning surface could be confused in the street environment with the blister surface used at pedestrian crossing points (see 2.1). This concern remains valid. However, there is no danger of similar confusion if lozenge is used on off-street platforms. Blind and partially sighted users on walkabouts found it easy to detect and distinguish lozenge. The existing *Guidance on the Use of Tactile Paving Surfaces* states that "the surface is not recommended for use at raised bus stops", but no reason is given. Some authorities already do use it in this way (e.g. in South Yorkshire) and there do not seem to be any obvious safety or navigation issues were this practice to become commonplace.	
a. Purpose	Proposed revised core statement: *The purpose of the street platform edge warning surface is to warn visually impaired people that they are approaching the edge of a tram/LRT platform, or a raised bus platform.*
b. Definition	Essentially as existing, with simple diagram (Figure 26 in *Guidance on the Use of Tactile Paving Surfaces*). Could add one or two non-technical graphics (e.g. colour drawing) to illustrate typical circumstances where blister paving will be deployed (e.g. on-street tram and bus, and off-street train).
c. Application	*The lozenge surface is recommended for use at all tram/LRT platform edges. It is also recommended for use at the edge of raised bus stop platforms.*
d. Maintenance	See note in 2.1 in this table.
e. Layout	There is only one technical drawing in *Guidance on the Use of Tactile Paving Surfaces* (Figure 27) but, even so, this should be placed in Section 3.
Chapter 5 – Segregated shared cycle track/footway surface and central delineator strip	
Delete this section. The existing 'Purpose' section notes that these surfaces should only be used "where it is not possible to achieve segregation (between people walking and cycling) by a level difference". The arrangements covered by this chapter are therefore essentially a concession. In addition, there are several indications that the disbenefits of permitting these arrangements outweigh any benefits. • Many users do not know what the surface means in general or what the different orientations signify	

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- A third ‘linear’ surface increases the chance of user confusion. Corduroy needs to be retained, while guidance path has a clear and defined purpose; and although it is comparatively rare at present, it has the potential to be used for stems leading to blister surface crossing points (see 2.1 and 2.4 in this table)
- Non-compliant layouts are common, e.g. corduroy used instead of ladder or ladder/tramline being swapped
- Figures 30 to 35 of *Guidance on the Use of Tactile Paving Surfaces* help to show how inherently complex and hard-to-interpret the arrangements might be, even in ‘perfect’ circumstances. This points towards the potential for a much simpler arrangement to be preferable in practice.
- Cycling campaigners report numerous incidents of people on bicycles crashing while traversing sections of ladder, especially when wet. (The prescribed depth of 2400mm may also be an issue.) Such concerns mean that some people prefer to cycle over the ladder (rumble strip) surface, which negates the purpose of the arrangement.

The recommendation is therefore that the delineator strip is retained, but both ladder and tramline at the thresholds are replaced by corduroy across both sides. The message communicated may be less sophisticated, but clarity and simplicity will be enhanced.
</td></tr>
<tr><td colspan="2">2.4 – Guidance path surface</td></tr>
<tr><td colspan="2">Retain; and consider use for stems leading to blister paving at controlled pedestrian crossing points.</td></tr>
<tr><td>a. Purpose</td><td>Proposed revised core statement:

“The guidance path surface has been 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. Its core purpose is twofold: to act as a ‘stem’ guiding visually people to an adjacent controlled crossing point where the blister surface has been provided; and to guide visually impaired people along a route when the traditional cues, such as a property line or kerb edge, are not available. It can also be used to guide people around obstacles, for example street furniture in a pedestrianised area.”</td></tr>
<tr><td>b. Definition</td><td>As existing, with simple diagram (Figure 36 in Guidance on the Use of Tactile Paving Surfaces). Could add one or two non-technical graphics (e.g. colour drawing) to illustrate typical circumstances where blister paving will be deployed (e.g. as a stem to a controlled crossing; in a large public space).</td></tr>
<tr><td>c. Application</td><td>The guidance path is recommended for use in the following circumstances:

• as a ‘stem’ leading to the blister surface at adjacent controlled crossing points
• where the traditional guidance given by a standard footway between the property line and carriageway does not exist (for example, in a pedestrian precinct);</td></tr>
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	• *where pedestrians need to be guided around obstacles (for example, in a pedestrian precinct): although care should be taken in siting street furniture to ensure that such problems are not created;* • *where visually impaired people need to find a specific location; and* b. *in transport terminals to guide people between facilities.*
d. Maintenance	See note in 2.1 in this table.
e. Layout	Technical drawings to be placed in Section 3. Consider using ISO model of blister paving squares at guidance path crossings.
Chapter 7 – Information surface	
Delete this section. Remove this surface from the list. It is extremely rare in practice; almost no-one knows what it means; and its purpose is not considered necessary or even beneficial in terms of either navigation or safety.	
PRACTICAL IMPLICATIONS OF RECOMMENDED CHANGES	
Blister surface. No change is proposed to the use of this surface as per its core statement of purpose as a warning of the transition between footway and carriageway. As to the recommendation that it no longer be used for stems (guidance path to be used instead), it is not considered that there is a pressing need for existing blister stems (which are commonplace) to be immediately replaced, though a programme of gradual replacement as part of maintenance and capital works is recommended. Priority for replacement should be targeted on locations (e.g. physically constrained junction corners with two perpendicular crossings) where blister stems overlap or form wedges, both of which arrangements are confusing. **Corduroy surface.** Its generic function (Hazard: proceed with caution) should be stressed. Its use to replace ladder/tramline – in 'ladder' orientation across the whole threshold (and to a depth of no more than 1200mm) – should be expedited wherever possible, due to the high levels of confusion (both for users and practitioners) and generally low levels of user satisfaction (shared across visually impaired people, wheelchair users and people on cycles). **Platform edge (off-street) surface.** It is recommended that this surface is retained but discussed in a separate section, to avoid confusion with the surfaces used on the public highway. **Platform edge (on-street) surface.** No change is proposed concerning its current use. As for the recommendation it should be used as a raised bus stop platform edge warning, this is considered unlikely to cause user confusion, and indeed its use for this purpose is already commonplace in some local authority areas (though none visited specifically for this study.) **Ladder/tramline surface and delineator strip.** It is proposed that the use of ladder/tramline is discontinued and that existing installations are replaced as soon as	

practicable with corduroy surface in the standard 'ladder' orientation across the whole threshold (see under corduroy above). The use of the delineator strip should be retained.

Guidance path surface. The use of guidance path for stems leading to blister surface at crossings – replacing the use of the blister surface for that purpose – is proposed for immediate adoption. While there is no general pressing need to replace existing blister stems, replacement should be expedited in locations where the used of blister stems currently causes confusion (see under blister above).

Information surface. The discontinuation of the use of this surface will cause no problems in practice due to it being almost never used or encountered and being almost entirely unknown by users.

3. SAMPLE LAYOUTS + TECHNICAL DRAWINGS
Updated versions of the still-relevant technical drawings from *Guidance on the Use of Tactile Paving Surfaces*, with some deletions and additions. Plans could be accompanied by photos and/or 3D visualisations where these are helpful in illustrating the context, especially where achieving the standard layouts is tricky. This Section should also cover 'permitted departures' from standard layouts: such as (for discussion) stems at non-perpendicular angles to enable them to reach the back of footway.

Accessible Public Realm: Updating Guidance and Further Research

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