TYPE OF INFRASTRUCTURES	REFERENCE	ORIGIN/CITY	TARGETED INDIVIDUALS	AIM / OBJECTIVES / HYPOTHESES	JUSTIFICATION	PARTICIPANTS	METHODOLOGY / SET UP	RESEARCH TOOLS	VARIABLES / INDICATORS STUDIED	ANALYSIS / INTERPRETATION	RESULTS	STATED LIMITS	CONCLUSION (THE BEST INFRASTRUCTURE/PRACTICE)	QUALITY
Shared spaces and sidewalk pavement treatment	**Imrie**, R. (2012). Auto-disabilities: the case of shared space environments. *Environment and Planning Architecture* . 44: 2260-2277.	**United Kingdom**	**Visually impaired**	1) Generate information about why local authorities adopt shared space, and the understanding that policy officers, and other key actors, have of the concept, 2) Investigate the extent to which shared space policy is shaped by knowledge of particular types of users, with a focus on vision-impaired people.	[...] the functioning of shared space is predicated on sensory interactions, including visual interchanges, between pedestrians and motor vehicle drivers. [...] it may render vision-impaired people as bodies out of context in shared space environments, uncertain of how to navigate around them, and placed into danger by the omnipresence of motor vehicles	n = 37 Individuals (24 men, 13 women) in the Department of Transport, the Disabled Persons Transport Advisory Committee, Guide dogs for the Blind, Mencap, and the Royal National Institute for the Blind	**Qualitative mixed methods: Location:** ten English local authorities based in and around London. **Investigator** : Thomas Pocklington Trust, a registered charity providing housing, care and support for people with sight loss in UK. **Methodology: Scoping interviews. Investigation of shared space policy**. **Site visits** to shared spaces, **collection of key documents and plans** relating to shared spaces schemes, **interviews** with key actors in central government and national organizations, local councilors, vision-impaired people, employees of disabled people's organizations and policy officers usually based in planning and transport.	**Questionnaire :** open-ended questions varying from one interview to the next, depending on the interviewee.	Origins of shared space, the reasons for their adoption, how their design was developed, who was involved, how they were involved, how far vision-impaired people were consulted, and with that outcomes, etc. Information on the accessibility of shared spaces, tactile paving, corduroy paving and width of passageways.	Qualitative analysis	Shared spaces are seen as disembodied urban design; that is, based upon a conception of the body in abstraction from the complexity of corporeal form and the manifold interactions of bodies-in-space. Their functioning is predicated on sensory interactions, including visual interchanges, between pedestrians and motor vehicle drivers. The elimination of kerbs which orientate guide dogs and of change in surface by color schemes or other forms of contrast could not be enough for a guide dog. 1) Tactile paving (Blister pavements and metal studded paving): too often it is installed incorrectly and not maintained (confusion about how to install them). Tactile is not efficient as a deliverator, people can miss it and its use is unpredictable. 2) Corduroy paving: need long term monitoring, lack of information about how warning these strips should be used. Width of passageways: 1100mm and 1200mm for a visually impaired person who is being guided.		Shared spaces are popular in many municipalities in different countries including Japan, USA, Canada and Norway. As the basis for redesigning urban streets, they have become "the best practice" urban design in relation to street environments. However; redesigning streets should be done in a way that does not prioritize the needs of any one user over another, DfT (2002) Inclusive Mobility. Demonstrate the absence of embedded knowledge ofiabout (the complexities of) vision-impaired people's corporeal interactions with the designed environment. There is a lack of quantifiable evidence from the UK; most data come from the Netherlands, Germany and Belgium and might not be applicable elsewhere.	30
Shared spaces	**Parkin**, J. & Smithies, N. (2012). Accounting for the needs of blind and visually impaired people in public realm design. *Journal of Urban Design*. 17(1), 135-149.	**Bolton, United Kingdom**	**Visually impaired**	Determine the specific difficulties of blind and visually impaired people in the public realm, particularly when in Shared Spaces, and to understand the capabilities that blind and partially sighted people develop in guiding themselves through the urban environment.	The primacy of design linked with movement has recently been challenged in a range of urban design thinking (e.g. CABE 2006 and 2007) and a more balanced approach is being pursued in some inner urban and residential areas where there is a high demand for space for interaction. A common method of providing such interaction space has been to 'share' space between people and vehicles. Such 'Shared Space' is increasingly frequently being designed without a kerb edge between what would otherwise be a carriageway (primarily for vehicles) and a footway (for people). Such 'Shared Surfaces' are contentious, particularly for groups which represent those with disabilities, including in particular blind people and people with visual impairment, and the contention is caused by the lack of segregation, limited navigation aids and street furniture which creates obstacles. The concept of Shared Space replaces the 'predictability and certainty', as Hamilton-Baillie (2008) describes it, of the segregation of carriageway from footway with integration which relies on 'cultural signals and informal social protocols', most of which rely on eye contact. Commenting on three showcase schemes in The Netherlands, arguably the progenitor of the modern Shared Space 'movement', they challenge three underlying assumptions of movement in Shared Space: not all users are able to detect and recognize danger; not all users may respond appropriately; and motor vehicles are no longer the dominating influence in such areas.	n=19 from the Bolton members of The Action for Blind group. 2 respondents were blind, with one using a cane to navigate, and the other a guide dog. 17 were visually impaired. 15 used a cane to navigate. 1 used either a guide dog or a cane, and 1 used an indicator light, but in bad weather only. n=4. 2 interviewees used guide dogs to navigate, and 2 were able to use either a guide cane or a dog. Participants who used a guide dog walked in the centre of the footway, while cane users walked near the building shore line as this provided a tapping point for the cane. All participants commented on the use of hearing to identify gaps between the shore lines, that is where a side street may be present. n=5. **Person A** is blind, uses a long cane to navigate and was observed in dry weather. When crossing the street, a rumble strip constructed from setts not only alerted him to passing traffic (due to the different noise), but also allowed him to identify his position in the road using his cane. **Person B** is visually impaired, uses neither a cane nor a dog to navigate, and was observed in light rain. **Person C** is visually impaired, uses neither a cane nor a dog to navigate, and was observed in dry weather. **Person D** is visually impaired, uses a long cane as a navigation aid, and was observed during dry weather. **Person E** is visually impaired, uses a small white cane held at chest height, and was observed in dry weather.	A tri-partite survey methodology was developed including a questionnaire, in-depth interviews, and observational studies. Data were collected from blind and visually impaired people using a questionnaire, interviews and observations of participants. The questionnaire provided an initial overview of the nature and scope of participant's views and concerns, while the interviews allowed for greater exploration of the questionnaire responses. The observations provided a rich source of data on use of facilities in vivo. The tri-partite methodology was preceded by an initial fact-finding observation of a blind person being instructed by a trainer on how to navigate the route from her workplace to her new home. The observation enabled more relevant questions to be developed for the questionnaire. Problems identified with prior observations: 1. Gullies place in the centre of dropped crossings; 2. Tactile paving incorrectly located on the footway; 3. Narrow footways or footpaths (less than 1 metre in places); 4. Sudden ending of footways; 5. Poles for street signs and street furniture not being aligned consistently at a certain distance from either the kerb line or the back of footway, i.e. being apparently randomly located; 6. Poles for pedestrian push button units at pedestrian crossings being located on both sides a crossing point, rather than the usual one side; 7. A Closed Circuit Television column located inappropriately on a pedestrian refuge island; 8. Damaged statutory undertakers equipment boxes in the footway; 9. Overhanging trees; 10. 'Oversplits' from shop frontages (signs, equipment or items for sale which shop keepers place in the footway).	**E-mail questionnaire:** Comprised 10 questions, which covered issues of longevity of blindness, whether a cane or a dog is used for navigation; whether the footway median line or a building 'shore line' is usually used as a reference; particular difficulties of navigating in shared use areas and possible demarcation options and other means for effective navigation in such spaces; interpretation of tactile paving; and the types of surfaces which are found to be difficult to identify. 6 of the visually impaired people navigated down the centre of a footpath or pedestrian area with 6 staying close to buildings when walking. They use their canes or guide dogs to locate and follow demarcation lines such as buildings or other 'shore lines' to identify their location. Only 1/15 responses mentioned kerb lines as his demarcation aid. **One-to-one home based hour long interviews:** Detailed discussions ensued regarding beneficial and difficult issues linked to shared use areas, and general difficulties faced by blind and visually impaired people in urban environments. Interviewees kept to the building line or a channel line (such as a drainage feature or other linear feature within the area) if one was present. Contrasts in texture between different surface types were also used for navigation purposes. Unlike those who are visually impaired, who can distinguish to some extent between red and buff tactile paving, blind people noted that its presence may cause them to attempt to find a controlled crossing push button unit, only for one not to be there. Respondents suggested that tactile paving is not necessary at side roads because listening can allow for the sense that there is less traffic noise, providing the clue as to it being a side road. It was also noted that no identification method exists that allows a blind person to know whether a crossing point has a refuge island in the middle of the carriageway. When they reach a refuge island they do not instantly know whether or not they are in the middle of the carriageway or safely across the whole carriageway. Blind participants were unaware that different layouts of tactile paving denoted different situations such as a controlled or uncontrolled crossing. **Observations,** where participants were asked if they would be willing to be observed in a Shared Space and if they were unwilling, they were observed using a familiar route. With the participants' approval, photographs were taken during the observation. Once the observation was complete the observer produced a written account of the event detailing the general facts concerning the observation. It also estimated the walking speed and described problems encountered and suggestions for improvements by the participant.	Paving surface characteristics Pavement color Obstacles Paving surface characteristics Obstacles and difficulties Effective ways of navigating Shared Spaces Navigation in space (alignment) Pedestrian crossing characteristics Paving surface characteristics Pavement color	The majority of data obtained from the questionnaire survey were qualitative in nature. Interview responses were recorded in narrative form and detailed accounts of the observations were written by the observer. The analysis of this qualitative data was accomplished with the assistance of MAXQDA software which allows for a rigorous and exhaustive analysis of textual data based on a coding system linked to the occurrences of words and phrases. The analysis aimed to identify commonalities and patterns in the responses and accounts in order to provide a rich and deep understanding of the issues faced by blind and visually impaired people. Using a triangulation method, by gathering data through questionnaires, interviews and observations, enabled comparisons to be made within the data collection and allowed for a greater assurance that views and suggestions expressed were corroborated by observational evidence.	Only 3 of the responses highlighted tactile paving as helpful, with the suggestion that they present a safe place to cross the road. 4 of the participants did not like tactile paving, commenting on its discomfort underfoot. 1 respondent had never come across a tactile surface, and another had no training on what a tactile surface represented. Both blind participants suggested that tactile paving denoted a controlled crossing point, but only 1 participant suggested it was useful. The remainder of answers suggested that tactile paving was installed to denote the presence of a signal-controlled crossing. Tarmac (actually, bitumen macadam) was identified as the easiest surface to identify by 5 respondents, with 4 highlighting paving flags as easily recognizable due to their unevenness. 3 of the responses were not able to tell the difference between surface material types. Tarmac was noted as being the smoothest surface and most comfortable to walk on. Participants who noted tarmac as being easily identifiable stated that paving flags were uncomfortable to walk on. Only 1 negative comment was received about tarmac from the visually impaired responses. Paving flags were identified as being easily identifiable, with one participant stating all surface types were acceptable. Block paving was suggested as posing problems while using a guide cane. A number of participants commented both negatively and positively about trench reinstatements, that is locations where statutory undertakers have replaced a surface after having undertaken work in the ground. Some suggested that these reinstatements provided a useful navigation aid for the visually impaired person, as they often run in straight lines along the centre of the footway. Contrarwise, these reinstatements can often be uneven and prove confusing for some visually impaired people. Colour differences between the original footway surfacing and the any reinstatement were seen as potentially useful but also possibly confusing. Bollards and shop advertising boards are major concerns while navigating Shared Spaces. Black bollards are particularly difficult to identify due to the lack of colour contrast with the surrounding environment. The presence of cyclists and skate boarders was also noted as problematic. Inconsistent positioning of street furniture was highlighted as a difficulty, not only in Shared Spaces but for highway design in general. Cars parking on the footway and thereby restricting the footway width were noted as a hazard, particularly the propensity to walk into door mirrors. A number of participants regarded other pedestrians as a concern when within Shared Spaces due to their lack of awareness in a visually impaired person's presence. All interviewees thought tactile and guidance paving was easily identifiable. Participants confirmed questionnaire feedback that statutory undertakers' trench reinstatements provide useful lines to follow along a footway. Further discussion centred on strips of blocked paving or channel drains as useful delineators. Respondents suggested that tactile paving is not necessary on side roads because listening can allow for the sense that there is less traffic noise, providing the clue as to it being a side road. Absence of kerb line causes problems as guide dogs are taught to walk in a line parallel to the kerb; sharing with motor vehicles is frightening, especially When a car is heard approaching; direction of traffic is difficult to detect through hearing; dogs find it confusing when too many obstacles are in the way; the change in environment is difficult to adjust to; shop 'oversplits' and street furniture are in less predictable locations; cyclists are not easily able to identify a blind person. Street lighting columns and strategically placed bollards; surface material changes; changes in level, i.e. deliberate dips and kerbs; alleyways, as they create a different background acoustic; building shorelines; gullies or channel drains as these can be used as a demarcation aid; other senses, i.e. noise and smells; effective use of a guide dog. **Person A** kept to the back of the footway at all times, using his cane to tap against the change in surface. He said he felt safer knowing he was away from the carriageway, and not in the way of other pedestrians. On approaching pedestrian crossings, Person A used his cane to identify the tactile paving at the back of the footway, and then followed it to locate the push button unit. **Person B** chose not to use a particular pedestrian crossing, but felt safer crossing further along the road where visibility of oncoming traffic is better. **Person C** walked close, but not adjacent to the building line, he explained that this would avoid obstacles. **Person D** close to the shore lines of buildings. She keeps close to the shore lines, in order to use her cane against buildings and walls positioned at the back of the footway, which helps her define her location. **Person E** found it difficult to identify her location due to sunlight reflecting off the surface: contrast between surface types was hard to identify, as was the presence of street furniture, particularly as there was little or no colour variation within the surroundings. Other difficulties identified while observing Person E included black bollards situated throughout the Town Centre. She explained that the colour of the bollards does not stand out against its surroundings, and as a result she often walks into them. **Person A** used his cane to identify the tactile paving at the back of the footway, and then followed it to locate the push button unit. **Person B** chose not to use a particular pedestrian crossing, but felt safer crossing further along the road where visibility of oncoming traffic is better. **Person D** identified every controlled pedestrian crossing by locating the tactile paving at the back of the footway and following it to the push button unit. She used the rotating cones underneath the push button unit to tell her when the invitation to cross period had begun (i.e. when the 'green man' was being displayed). **Person D** made use of pavement surface variations, such as the up-lighting installed within a block paving strip, or drains situated in a straight line. **Person C** noted the useful colour contrast between setts in the carriageway and sandstone paving flags in the footway. For person E, contrast between surface types was hard to identify, as was the presence of street furniture.	The study was based in a single town and hence the pool of potential respondents was limited. In addition, the nature of the features in the town will not be as varied as may occur across a sample of towns.	Suggested accessibility improvements following the questionnaire within Shared Spaces included a walkway specifically for pedestrians, installing street furniture closer to the shops, and the fitting of street lighting brackets to buildings. Suggestions made by participants following the interviews to improve accessibility in Shared Spaces included enforcement where vehicles park on the footway and a reduction in the number of obstacles, i.e. street furniture, within the Shared Space. Blind participants emphasised the use of their other senses to help locate demarcation aids, for example their hearing for locating the direction of traffic. A particularly significant and recurring issue is the use and understanding of tactile paving. Highway designers generally place tactile paving at the junction of side roads. Trainers, however, instruct a blind or visually impaired person to walk some way along a side road away from the main road before crossing. This provides a better chance of hearing turning vehicles, and improves driver visibility when turning into a side road if a blind or visually impaired person is waiting to cross. Visually impaired people observed in shared use areas walked close to the buildings or other shore lines. These areas provide some degree of safety from vehicles which may enter the area. These areas provide some degree of safety from vehicles which may enter the area, and provide a means of navigating through the area. By contrast, guide dogs are taught to walk in a central position, avoiding obstacles. Very frequently, participants made good use of channel drains, block paving features and other strips of surface materials as demarcation aids. These provided a different surface texture and a path the cane could follow. These demarcation aids appear to be highlighted to visually impaired people by their trainers. Data collected from the 3 types of survey did not identify any distinctly negative views from blind and visually impaired participants with respect to Shared Space. This is unexpected as the view of user representatives clearly and consistently highlights objections to the concept of Shared Space. It may reflect the fact that there are a limited number of Shared Spaces in the centre of Bolton carry higher volumes of pedestrian than vehicle traffic. Navigation techniques and interpretations of shared use public realm areas differ depending on the sociability of the participants. Many members of the Guide Dogs for the Blind Association have a more negative view on shared areas than other participants. Participants who were blind did not complain about certain surface types, such as cobbles or tactile paving as being uncomfortable to walk on. Blind participants saw benefit in having this distinct surface underfoot as it aided them in identifying their location and reassured them they were safe. However, visually impaired participants, who could see the uncomfortable surface type, were more predisposed to complain about its lack of comfort. Discrete features, such as gaps in the frontage to a road and countable objects such as street lighting columns, and also linear features, including serendipitously located features not specifically designed for navigation purposes, are essential requirements for blind and visually impaired people. Shared Spaces should not be a uniform material but there should be distinct areas and boundaries within the space to create a physical geography easily identifiable and understandable to blind and visually impaired people. In addition, colour contrast, accentuation of clues based on sound, and an absence of obstacles is desirable. The space needs therefore to be interesting not just to look at, but also to navigate through. Demarcations for safe areas must be identifiable by means of a cane and change in feeling underfoot. To a designer, tactile paving alerts and directs a person to a crossing point, with red tactile paving being generally used at controlled crossings and buff coloured paving at uncontrolled crossings. A blind person is taught that tactile paving may indicate the presence of a gap in the footway for a side road and that it does not necessarily indicate the safest place for a blind person to cross a road.	38
	Thomas, C. (2011). Briefing: Minimum effective kerb height for blind and partially sighted people. *Proceedings of the Institution of Civil Engineers: Municipal Engineer.* 164(1), 11-13.	**Reading, United Kingdom**	**Visually impaired**	Present a research report commissioned from University College London (UCL), which involved trials with a range of potential delineators as possible replacements for the traditional kerb.	The concept of 'shared space' is based on the observation that an individual's behaviour in traffic is more positively affected by the built environment of the public space than it is by conventional traffic control devices and regulations. Several local authorities in the UK have redesigned town centres and high streets using the concept of shared space, and this trend looks set to continue as the goal for safer, more accessible streets for all is pursued. Keith Bright, Emeritus Professor of Inclusive Environment at The University of Reading, highlights that in order for shared space schemes to be fully and safely achieved two factors are critical (a) the needs of all those who use shared spaces must be fully addressed, including blind and partially sighted people, other disabled people, older people and children; (b) the way in which people use the space must be fully understood, both in terms of their own actions and how they react to those of others, which will be influenced by their own individual abilities and how they see or interpret the activities taking place within the space. The key issue lies in the fact that shared space is often delivered by means of a 'shared surface design'. Shared surface schemes require the removal of the traditional (120–150 mm) kerb because it makes too distinct a separation for proponents of shared space schemes. The removal of the kerb takes away the vital clue used by blind and partially sighted people to help them navigate the pedestrian environment and to identify when they have reached the edge of the footway.	n=36 blind and partially sighted individuals	The experiments took place in May and June 2009 at the UCL's Pedestrian Accessibility Movement and Environment Laboratory (Pamela). Pamela is a project funded by the Engineering and Physical Sciences Research Council UCL to provide the world's most comprehensive pedestrian environment laboratory in order to undertake research into pedestrians' interactions with their environments. Participants were positioned at set points in the laboratory and asked to walk, following the experimenter's voice to help with orientation, as if they were in an unfamiliar street, for example heading towards the library, or a cafe', only stopping if they detect what they thought could be a kerb. Afterwards, participants were asked questions about the level of confidence they had that what they had encountered was a kerb. If the participant did not detect a kerb where there was one, the experimenter would class the trial as a fail. If a kerb was encountered, the participant was asked to give a score relating to the confidence they had that what had been encountered was a kerb. Kerbs were tested at heights from 20 mm up to 120 mm and in two profiles: bullnose and chamfer.	Observation and questionnaire	Detection of kerbs Level of confidence		No one failed to detect a kerb height of 60 mm or greater and there was a high level of confidence that what had been encountered was a kerb. This detection confidence is reflected in the reduced perceived anxiety response in the higher kerb heights where there was a relationship between height and anxiety score. There was no systematic increase in perceived anxiety for kerb heights of 60 mm and greater.	While the laboratory provides a safe and convenient way to conduct such trials, it remains a simulation. However, a realworld application brings with it even greater challenges so it is considered that if a kerb height is not detected in lab trials where participants are focused on the task, it would be even less likely to be detected in external environment conditions.	Designers have been reluctant to introduce traditional kerbs as part of shared space designs because they consider them to provide too distinct a separation between the footway and carriageway and so would dissuade drivers from modifying their behaviour. A kerb of 60 mm, together with dropped kerb crossings and tactile paving, could be used to delineate the footway for vulnerable pedestrians from the area used by traffic or the shared area. In a shared space development this could be used together with other design elements such as wider footways, narrower nonlinear carriageways, and the use of paving materials, lighting and features such as trees and street furniture visually to break up a carriageway for drivers.	25