Figure 97: Kerb type options plan and section views

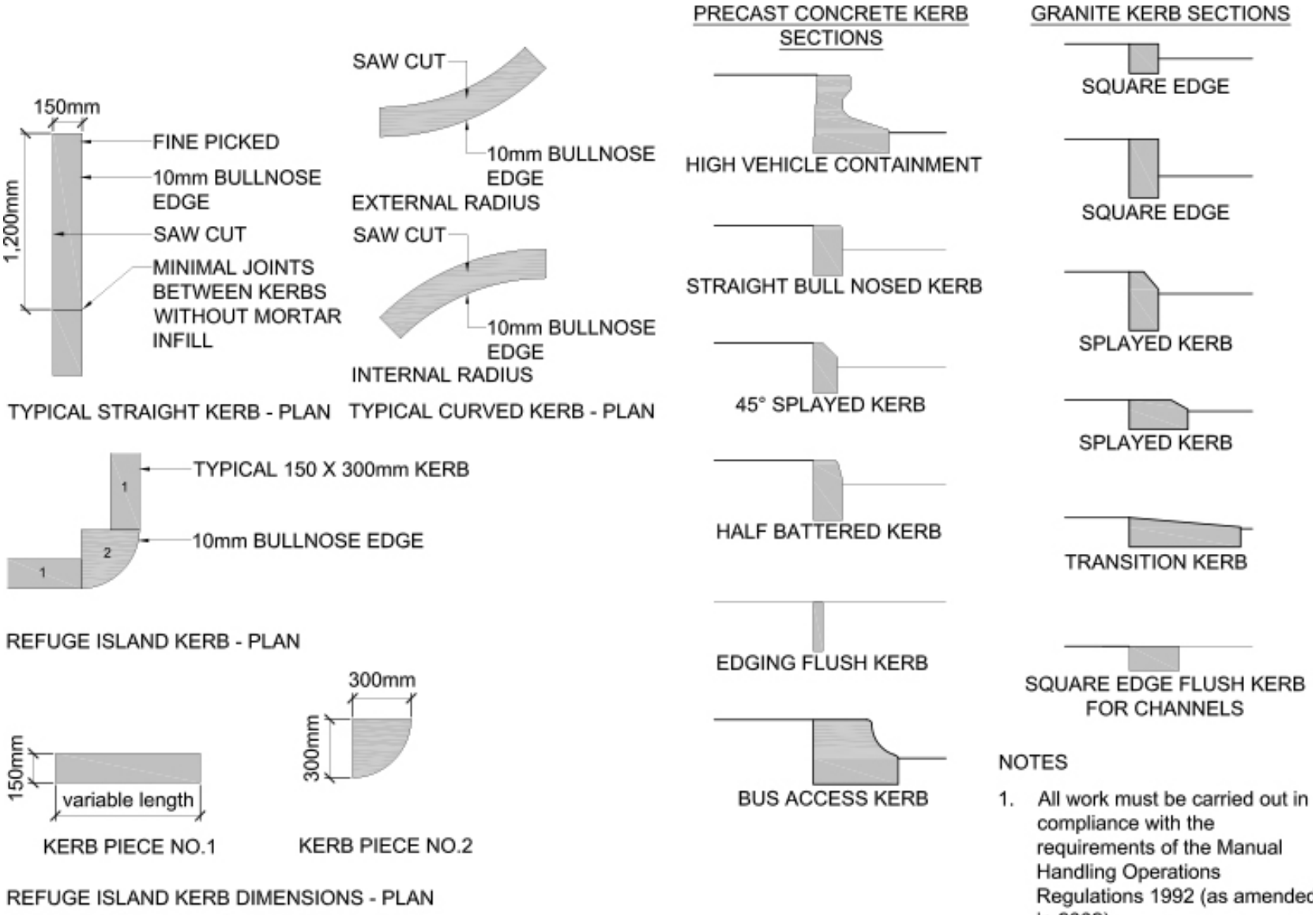
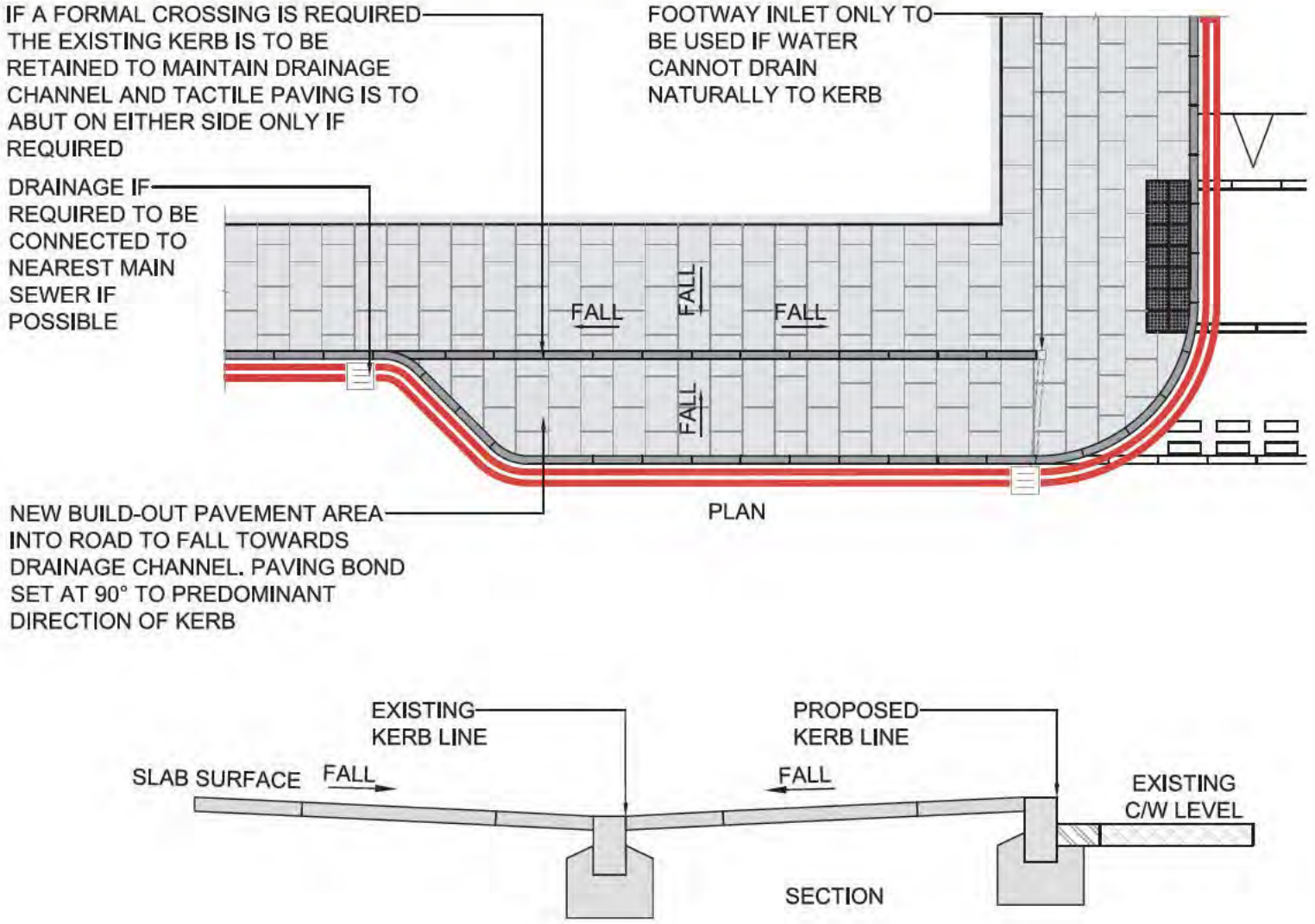


Figure 98: Footway build-out with flush kerb to facilitate drainage



## Kerb construction

Kerbs should be:

- Dry jointed and closely butted where possible
- Sawn on the rear face to avoid the need for mortar infill between paving
- Set on a concrete subbase of minimum 150mm depth as standard

## Additional information

### British Standards:

BS EN 1340:2003 Concrete kerbs

BS EN 1343:2012 Kerbs of natural stone for external paving. Requirements and test methods

BS 7533-6:1999

### University College London:

Effective Kerb Heights for Blind and Partially Sighted People (Accessibility Research Group, UCL, 2009)

### Transport for London:

Accessible Bus Stop Design Guidance, 2015

# Part E Carriageways



## 8.1 Vision

If we are to achieve world-class roads and streets appropriate surfacing specification is essential for providing durable, safe, comfortable and legible road layouts. Selecting the right materials is key to creating a backdrop that will sustain all the activities within the streetscape. Materials should be selected based on their:

- Long-term durability
- Safety performance
- Legibility
- Relationship to the surrounding urban character and overall appearance of the streetscape
- Visual performance characteristics
- Cost to implement
- Whole life cost (maintenance)
- Asset accessibility

Asphalt, and in special circumstances, coloured surfacing and natural stone setts are recommended for carriageway surfaces.

Surface construction must be detailed to accommodate the loads and foreseeable uses acting upon it, and to ensure long-term durability and maintenance of the materials. Surfaces should be smooth, firm and non-slip in all weather conditions with gradients that are both comfortable to walk on and sufficient for free draining of surface water.

We have an internal procedure to review new products proposed for the TLRN and approval should be sought from the SDRG and TfL Engineering at the design stage.

Figure 99: Roundabout where Stamford street joins Waterloo Road

## 8.2 Carriageway materials

### Asphalt surfacing for carriageways

Asphalt is the standard surface material for all carriageways and should be applied in most cases. Asphalt has a high deformation resistance and can be repaired relatively quickly and inexpensively. It can be designed to meet the needs of the expected use. Variable aggregate gradings are acceptable. Aggregate properties such as shape and size, and resistance to crushing or polishing, should be selected based on site conditions. All asphalt surfacing should comply with BS EN 13108 Bituminous mixtures standards.

Figure 100: Cheyne Walk and Battersea Bridge

### Maintenance

Resurfacing regimes should be based on an understanding of the existing surface composition and condition of the carriageway. Contractors are encouraged to recycle materials where practicable

### Innovative surface materials

There is continual innovation within the industry of materials science, improving the performance and cost effectiveness of surfacing through more efficient laying techniques and new technologies. While the materials palette is strictly defined on the TLRN to ensure quality and consistency, advances in material technologies will be considered on an ad hoc basis to trial new finishes and test the resilience of the product on a limited stretch of road.

### Additional information

**British Standard:**

BS 594987:2015 Asphalt for roads and other paved areas. Specification for transport, laying, compaction and product-type testing protocols

## Granite setts for carriageways

A sett is a dressed block or stone, 50-300mm in length and 75mm or more in depth. Setts are used to aid the creation of a high quality surface finish to help emphasise greater pedestrian priority. Setts may be considered in exceptional circumstances where looking to:

- Provide a high quality low speed environment, for example, for shared space schemes, where vehicle traffic is especially low
- Communicate a traffic calmed space with visually related carriageway and footway surfaces
- Improve material durability for footway surfaces which are subject to regular vehicle overrun
- Reflect the historic character of an area

Figure 101: Granite setts used on a carriageway to slow vehicles and create a more pedestrian friendly setting

### Design considerations

The installation of setts should be considered for:

- Inset on-carriageway bays and on-footway loading or parking bays and in front of pubs
- The flat surface of raised tables on side road entry treatments, but not on the ramp
- Footway crossovers
- Traffic islands, central median strips or within central reservations that are not flush and do not have regular vehicle overrun

Only in exceptional locations where vehicles are known to mount the kerb, can a band of five 100x100mm setts be installed on the footway, running parallel to the kerb.

Figure 102: Granite setts on a raised table at Goswell Triangle

These may be considered where:

- The area has special historic or civic significance and requires a high quality surface finish
- There is no capacity to provide designated loading bays, but where informal loading is known to take place with a high number of retail units fronting on to the street
- Footways are narrow such that installing bollards would overly impinge on footway space
- There is insufficient depth to structurally reinforce paving slabs

When considering the use of setts it is important to anticipate loading requirements. The specified material and subbase must be designed to withstand expected loading, traffic volume and ground conditions. Where setts terminate and meet tarmac, it is important to specify a robust edge containment detail.

### Materials

Setts should be composed of natural stone: granite or Yorkstone, to match the surrounding footways and complement the character of the built environment.

Granite setts are recommended for footways and low speed carriageway settings on side roads or minor roads which do not serve as a bus route.

Yorkstone setts are permitted where vehicle overrun is infrequent, such as adjacent to the kerb edge or on footway crossovers.

### Preferred sizes

Generally 200x100mm units are preferred on the TLRN, with depths selected based on the load bearing requirements – please refer to BS7533-12 for further information. Other bespoke dimensions may be permitted upon approval by the SDRG.

Herringbone pattern is the preferred way to lay block paving as the interlocking pattern makes it more resilient to turning movements.

### Maintenance

Maintenance of setts is more costly and time consuming than asphalt. Using a mixed palette of colours can help mask dirt, discolouration and marks.

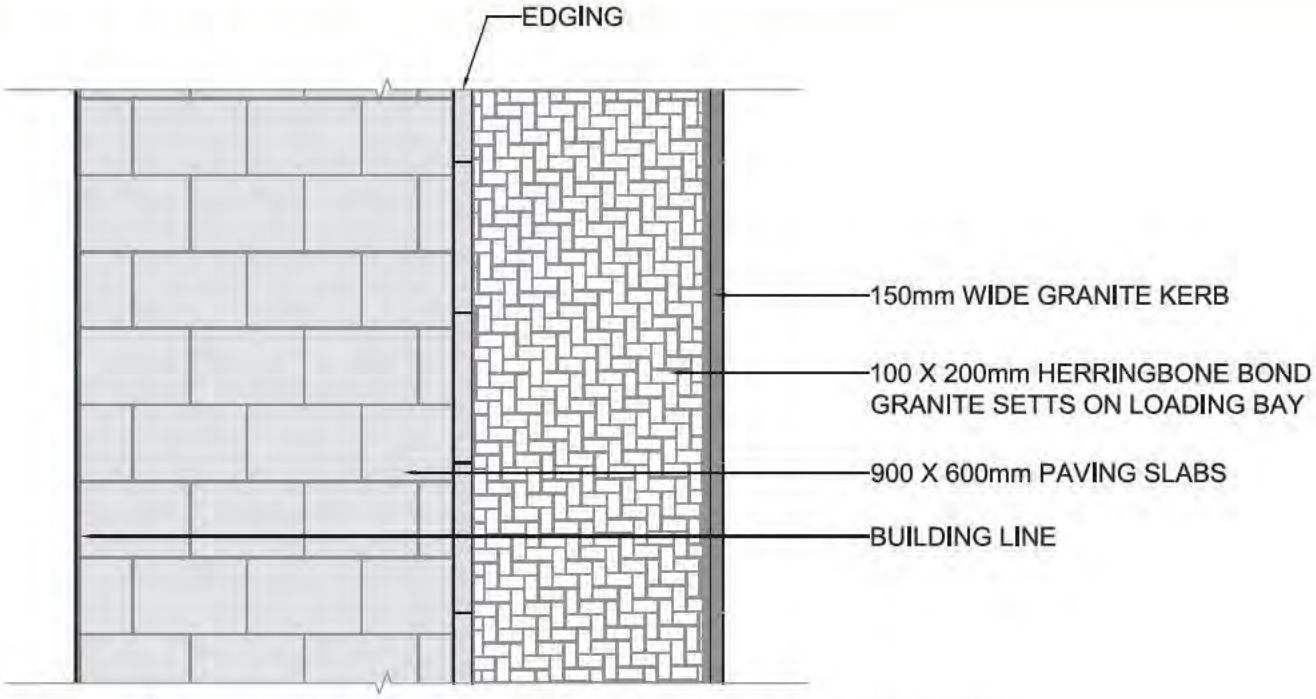
### Additional information

**British Standards:**

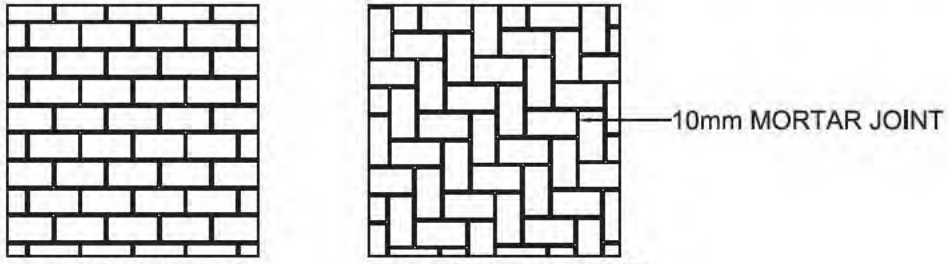
BS EN 1341: Provides guidance on the breaking load for setts

BS 7533: Part 12 provides sub-structure advice for pedestrian areas

Figure 103: Sett paving patterns on footway loading bay




EXAMPLE PLAN - HERRINGBONE JETS IN WADING BAY FLUSH WITH FOOTWAY




TYPES OF BONDS - ELEVATION

## Coloured surfacing

Coloured surfacing includes any surfacing that changes the appearance of the conventional asphalt wearing course. The use of coloured surfacing should be justified on a site-by-site basis and approved by the SDRG.

Coloured surfacing may be considered where there is a safety or operational benefit to specified users in making a facility more conspicuous and should only be implemented when other remedial measures have been deemed inappropriate. Coloured surfacing should be used sparingly and selectively to minimise capital and maintenance costs and improve the appearance outcome where surface repairs are required.

Figure 104: Colour used to emphasise a crossing and used to delineate a cycle track

### Use across London

There is variable support for use of coloured surfacing across the London boroughs. The use of conspicuous colours, especially in areas with high heritage and conservation value has been challenged based on concerns about their visual impact. However, some partially sighted pedestrians use differences in colour and tone to help them identify the interface between footway and cycle tracks or carriageways. Therefore where there is an identified risk of conflict between various users, the use of coloured surfacing may be recommended to support legibility and road user recognition.

### Design considerations

Design teams are encouraged to carefully consider the use of coloured surfacing treatments as they should only be applied to highlight areas of conflict by emphasising the existence of certain facilities.

Coloured surfaces have no legal status as they do not constitute a formal road marking or sign, however, they can be used to supplement road signs and markings and discourage vehicle encroachment.

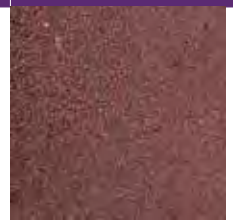
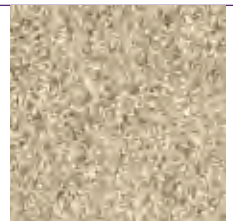
Coloured surfacing should not be applied at locations with a high density of utilities or where one or several utility companies have a high rate of attendance and trenching as the reinstatement of this type of surface still shows as a trench. Colour does not show up well at night under headlights or in wet conditions.

### Application

There are several materials that can be used to achieve a coloured surface on the carriageway including: coloured asphalt, resin-bound aggregate and a surface dressing. The specification of coloured surface, skid resistance and method of application is to be in accordance with Clause 924 of the Highways Agency's Specification for Highway Works.

Please speak to one of our technical specialists when considering the use of a coloured surface on the TLRN. The table on the following page provides a range of colours commonly used on the road network.

Figure 105: Coloured surface on the carriageway is used to suggest pedestrian priority

| Colour | Example | Purpose |
|---|---|---|
| 'Venetian' red BS381C – colour 445 |  | To supplement road markings and aid bus lane compliance. We no longer apply red surfacing to bus lanes, however, some boroughs still do require this. |
| 'Deep chrome' green BS381C – colour 267 |  | To highlight cycle facilities that do not have physical segregation. |
| 'Sky blue' RAL5015 |  | To highlight cycle facilities that do not have physical segregation. |
| Natural buff – to match Yorkstone paving |  | To visually reinforce crossing locations, a change in traffic management, or align the colour of an off-carriageway facility to other elements in the streetscape for aesthetic reasons. |
| Grey – to match granite or concrete streetscape elements |  | To visually reinforce crossing locations, a change in traffic management, or align the colour of an off-carriageway facility to other elements in the streetscape for aesthetic reasons. |

### Maintenance

Some types of coloured surfacing fade rapidly in heavily trafficked locations (after 6-12 months) and may need to be reapplied regularly. Maintenance regimes should match the original colour pigmentation by selecting the same coloured product and binder. Bespoke treatments are more difficult to maintain, especially where underground servicing is required.

Where maintenance or highway works are required, the colour surface should be laid to provide a consistent finish across the carriageway and should not be applied as a patchwork. Good quality repair work requires the whole surface to be relaid as patchwork repairs are unsightly.

## 8.3 Road markings

Road markings provide traffic signing information and look to enhance the safety and legibility of the road space for all road users. Road markings are applied to the carriageway surface as lines, symbols or words, and in some instances will be marked on the kerb and footway, or temporarily at roadworks.

Road markings are classified as:

- Regulatory – enforceable traffic management markings
- Warning and information – road markings that increase awareness of likely hazards
- Directional – location and route guidance

Statutory requirements and detailed information on the design and placement of road markings for the public highway are provided in the TSRGD.

### Design approach

Design teams should adopt a consistent approach across the network to:

- Ensure safety
- Provide sufficient information to promote good lane discipline
- Encourage traffic regulation compliance and enable efficient enforcement

### Minimising visual clutter

Design teams should adopt an approach of minimising road markings to ensure they are carefully considered in conjunction with the character and function of the street, as well as the placement of adjacent traffic signs. The removal of any unnecessary road markings will help to reduce visual clutter and maintenance costs, and in most cases contribute to improved legibility. The following considerations should be made to rationalise road markings:

- Road markings which include words (for example, 'keep clear'/'look left') should be assessed to see if they are needed
- Yellow boxed areas can look unsightly and consideration should be given to removal where legal enforcement is not necessary
- To help facilitate a traffic calming effect, reduced road markings can help in some locations, such as the removal of carriageway centrelines (Centreline removal trial, TfL, 2014)

Figure 106: Victoria Embankment: 'Keep clear' markings have been used instead of a yellow box


Figure 107: Carefully considered road markings will improve legibility and reduce visual clutter

Figure 108: Renewed red line markings

### Marking dimensions

Many markings are fully dimensioned in the TSRGD and Traffic Signs Manual (TSM). These documents are the main resource for prescribing standard road markings.

Markings should be provided to a maximum thickness of six millimetres where pedestrian activity might be expected. Any higher and the marking could pose a trip hazard or adversely impact on drainage.

Red route road markings to diagrams 1018.1 and 1017 (TSRGD) should not be thinner than 100mm as this would pose an issue for enforcement cameras.

### Materials

Expert advice should always be sought before prescribing the road marking material as a range of products are available with widely differing performance characteristics.

Road markings are available as:

- **Water based paint** – best restricted to roads with lower traffic flows as the markings are more prone to wear
- **Thermoplastics** – standard paint system and should be avoided on concrete and natural stone
- **Preformed markings** – preferred where complex shapes and symbols are required
- **Cold plastic** – can be used to mark pedestrian crossings, yellow boxes, bus lanes and other common road markings. If applied well it can last between four to eight years
- **Setts** – where setts are used on a side road entry treatment, red setts are permitted to designate the red route but are not a requirement; conventional markings may be used

## Performance

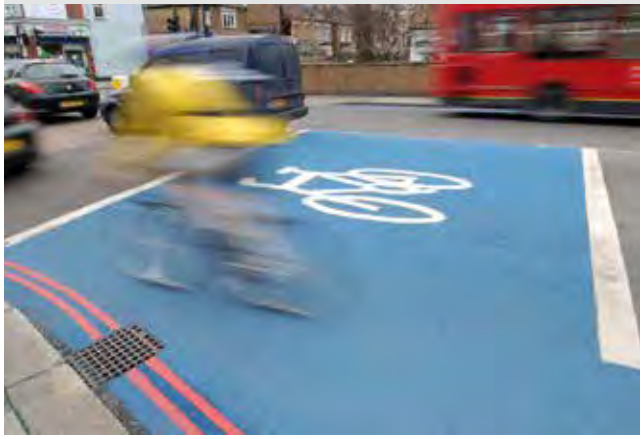
Most road markings that have a regulatory function are required to incorporate a retroreflecting material such as glass beads that better reflect vehicle headlights (TSM chapter 5, table 23-1 and TSRGD).

## Line colours

All markings and colours should be in accordance with the TSRGD, British Standards (BS EN 1790 and BS EN 1871) and our Design Standards for Signal Schemes in London.

The colours white, red and yellow are prescribed for road marking materials on the TLRN. Black road marking materials may also be introduced where existing markings need to be temporarily obscured. Black road markings have been used to change an advisory cycle lane as a temporary measure.

Figure 109: An advanced stop line coloured in sky blue on a Cycle Superhighway



Coloured resin aggregates for larger areas of carriageway such as bus lanes or for demarcating cycle infrastructure are not formal road markings, but aim to improve the compliance of regulatory road marking signage.

## Road studs

Retro-reflective road studs may be used to supplement longitudinal road markings, and are particularly effective for areas with low lighting levels. Metal road studs should be avoided as they can cause problems for two-wheeled vehicles.

## Removal

It is important that all the material used to define the road marking is removed where new marking arrangements are proposed. Ghost images of old markings are unsightly, detract from the streetscape and can have an impact upon legibility and road safety.

## Trials – centreline removal

Our aspiration for a safer network, reinforced through good design, has been put forward in a recent study which challenges conventional assumptions into the application of centrelines (Centreline removal trial, 2014). The study looks at the impact of removing centrelines on traffic speeds, across three outer London routes scheduled for resurfacing. Initial results suggest a consistent decrease in vehicle speeds as a result of the interventions. We will continue to monitor collision data at these sites and use this evidence to determine the long-term applicability of centreline removal for encouraging lower speed driving environments. Any centreline removal trial should be subject to a pre and post-construction road safety audit.

## Maintenance

Regulatory markings must be maintained adequately to provide good visual contrast and ensure good effective enforcement. To ensure this:

- Road markings should be regularly reviewed to ensure good legibility and definition
- Maintenance requirements are dependent on traffic flows, the material used and the position of the marking on the road surface, and so will not be the same for all types of street
- During routine maintenance when road markings are often re-marked it is important to ensure the new surface is accurately applied over the old material so that the edges of the markings remain crisp and of the desired width
- The excessive build up of thermoplastic can lead to the ponding of surface water and should be avoided

## Centreline removal trial London, UK

Investigating the impact of centreline removal on traffic speeds across three sites in London

### Key functions

### Opportunity

The Mayor's Better Streets initiative challenged TfL to justify any road marking.

### Benefits

The investigation showed that at all three sites there was a statistically significant reduction in traffic speed. Collision data will be tracked at these sites for the next three years to ascertain the long-term effects of centreline removal.

### Implementation

A study was conducted at three sites across London to judge the effect of removing centrelines on traffic speeds and accidents.

### Applying in London

While it is not suitable to remove markings at all locations, it is desirable to remove clutter where possible.

### Additional information

**Statutory instruments:**

Traffic Signs Regulations and General Directions (TSRGD)

**British Standards:**

BS EN 1790: For preformed markings

BS EN 1871: For directly laid materials

**Department for Transport:**

Traffic Signs Manual, 2003

Traffic Advisory Leaflet 01/13: Reducing Sign Clutter, 2013

**Transport for London:**

Design Standards for Signal Schemes in London, 2011

Centreline removal trial, 2014

## 8.4 Cycle infrastructure

The London Cycling Design Standards (2014) (LCDS) provides comprehensive advice that all designers of cycling infrastructure should refer to. It uses the Cycling Level of Service (CLoS) methodology as a measure for the quality of provision for cycling on any street or route.

Streetscape Guidance identifies the palette of materials appropriate for the different types of cycling infrastructure identified in the LCDS. It also reinforces the importance of a holistic approach to street design, to maintain the quality and continuity of the streetscape character.

### Design considerations

#### Network planning

The network for cycling comprises signed cycle routes and any other street or space that cyclists may legally use. In general, a higher level of service for cycling can be achieved on branded routes and on any street where motor traffic speeds and volumes have been calmed, such as where 20mph limits apply.

New and improved cycling facilities should be planned coherently to encourage more cycling, to address risks to cycle safety and allow coherent, direct and comfortable access to local destinations. All route proposals should include a maintenance plan to ensure cycle routes remain free of debris and in a good riding condition.

We acknowledge the significance of 20mph speed limits for enhancing the quality of the cycling environment and will continue to review sections of the road network with a view to broadening the 20mph designation.

Figure 110: Blackfriars bridge mandatory cycle lane

## Cycling interventions

Proposals for cycling should reflect the place function of a street within a wider area – the street's character and the uses and activities that take place within it – rather than be determined solely by the movement of other vehicles.

Cycling facilities should enhance the area through which a route passes and design teams should consider the cycling experience along the full length of the route to provide a consistently attractive setting for cycling and walking. Good design should provide cycle routes which are safe, continuous, clear, coherent and attractive. They should complement the existing streetscape quality and avoid additional unnecessary clutter.

The degree of separation required for cycling should be based on an assessment of the existing conditions, on proposals for improvement of the area and on addressing key safety, capacity and accessibility issues. Higher levels of service for cycling can be achieved through designing for lower speeds, lower motor traffic volumes and through greater separation from motor vehicles, while avoiding conflict with pedestrians.

A street may be part of a proposed new or improved cycle route, or may have existing or proposed cycle routes crossing it. In both cases, the level of service offered at junctions and crossing points is a key determinant of the overall quality of provision for cyclists.

- Cycle infrastructure need not be heavily engineered or costly but should be consistent and aligned to the uses and dimensions of the street environment
- Streetscape Guidance encourages designers to consider the impact of cycle infrastructure on the pedestrian environment as well as the visual quality of the streetscape. This includes being mindful of any facility that proposes additional street clutter, the creation of small fragmented areas of space, or overly complicated arrangements to the detriment of other users
- Designs should avoid making cosmetic alterations for the sake of change and should be rooted in an evidence-based design approach
- Trials of temporary layouts to assess impacts of changes to road space allocation should be considered as a step-change towards long-term infrastructure provision

## Designating space for cycling

Formal cycle infrastructure on the highway consists of: cycle lanes (regulatory road markings on carriageway), cycle tracks (generally, provision dedicated to cycling off the carriageway) or areas shared with pedestrians.

Cycle tracks are usually away from the carriageway or separated from it by a verge or height difference. A Section 65 Notice (Highways Act, 1980) can be used to convert a footway into a cycle track and prioritise cycling. Appropriate signing should be incorporated including TSRGD diagram 955 and associated cycle symbol marking (diagram 1057).

LCDS describes different kinds of provision for cycling in terms of the 'degree of separation' they offer from motor vehicles on-carriageway or from pedestrians off-carriageway. With the highest degree of separation first, the on-carriageway options are:

## Full separation on links

### Segregated lane/track:
Cycle lane or track separated by a continuous or near-continuous physical upstand along links (usually verges or kerbed segregating islands).

### Stepped tracks:
Vertically separated cycle tracks at an intermediate level between the footway and main carriageway, with or without a buffer zone.

## Dedicated cycle lanes

### Light segregated lane:
A facility separated and protected by intermittently placed objects generally alongside formal, mandatory cycle lane markings. (Note that no light segregation product has been approved for use across the TLRN, so any proposal should be brought to the attention of the SDRG to ensure that the product satisfies streetscape requirements and does not pose a maintenance and safety liability).

### Mandatory cycle lane:
A marked lane for exclusive use of cyclists during the advertised hours of operation. It is an offence for other vehicles to enter, unless they are exempted. Separate parking restrictions are needed to be fully effective.

## Shared lanes

### Shared bus lane:
Cyclists may use the full width of the bus lane during and beyond its hours of operation. Applies to all nearside, with-flow bus lanes, and should extend to contraflow and offside types.

### Advisory cycle lane:
An area intended for, but not legally restricted to, cyclists' use. Other vehicles are permitted to enter or cross it.

Integrated with other users

**Cycle street:**
A street where cyclists have assumed priority in a speed restricted area, variously marked with or without formal cycle lanes or indicative areas for cycling.

**Mixed traffic:**
A street or space without cycle lanes or tracks, often including cycle symbols on carriageway. Motorised traffic is either absent or at low volumes and speeds. May include space shared between all road users.

**Footways and footpaths may be designated as shared between pedestrians and cyclists. Degrees of separation between cyclists and pedestrians by the carriageway are:**

**Separated footway ('segregated shared use'):**
A footway divided between users usually with a low, raised delineator, often punctuated by fully shared areas. Marked with a sign to diagram 957 of TSRGD.

**Shared use footway or area ('unsegregated shared use'):**
A footway fully shared between users and marked with sign to diagram 956 of TSRGD. May exist in a limited area, usually to allow cyclists to make a crossing movement and/or transfer from on- to off-carriageway provision.

However, as a general principle, there is a presumption that footways are to be used only by pedestrians. These two options should therefore only be used in exceptional circumstances – for example, where the footway is wide and pedestrian flows sufficiently low, or where motor traffic conditions justify off-carriageway provision and cycle tracks are not suitable or viable.

See LCDS for further description and guidance on the application of each of these cycle infrastructure types.

## Materials

### Surface materials

The visual impact of materials associated with cycle infrastructure should be carefully considered. Layouts which are overly complex will not only impact on the visual quality of the streetscape, but will likely lead to ambiguous layouts which reduce the legibility of the scheme design for all road users.

Where there is a requirement for kerbside access an adequate dropped kerb access across the cycle track must be provided.

Where there is a requirement for vehicles to access equipment for maintenance purposes on the footway including lighting columns, utilities, etc., any adjacent cycle facilities must be constructed to withstand the weight of vehicles. The material palette should be simple to minimise issues of maintenance and ensure consistency across the network. Mechanically laid asphalt, where possible, is the standard surfacing material for cycle infrastructure on the TLRN and may take the form of either:

- **Asphalt concrete** – typically a six millimetre aggregate is recommended to provide a smooth finish
- **Proprietary asphalt** – thin surface course systems (TSCS) may be considered in special areas
- **High stone content hot**-rolled asphalt – typically HRA55/10

In selecting a type of asphalt, consideration should be given to the permeability of the surface and the extent to which more porous open-graded mixes are incorporated as part of a sustainable drainage strategy.

Natural stone for prolonged stretches of cycle routes should be avoided as skid resistance can be low. Anti-skid surfacing for cycle routes is acceptable for use on the TLRN but should be laid longitudinally to avoid ridges. Resin-bound aggregate may be considered for footway areas which operate as a shared use area. Unbound surfaces such as gravel or hoggin are not recommended for major cycle routes as they can deteriorate quickly and provide a low quality of riding surface.

### Signage

Signage should be designed to minimise visual clutter and be combined with existing street furniture, such as lamp columns, and only used at decision points and sparingly as route repeater signs. The sign reverse should match the surrounding street furniture colour: black-backed in central London and town centres, grey on arterial routes.

The height of the signage should provide adequate head clearance: 2400mm as a minimum. Where cycle tracks or shared use areas are provided the appropriate signing must be erected with consideration to minimising clutter.

### Road markings

TSRGD standards should be applied to ensure consistency for all road markings across the road network. Consult LCDS for guidance on how to use road markings for cycling.

Bespoke cycle symbol treatments such as engraved or inlayed natural stone may be appropriate in conservation areas; approval should be sought from the SDRG for TLRN cycle routes.

## Coloured surfacing and cycling

Coloured surfacing is not a formal traffic sign and should be kept to a minimum for aesthetic and maintenance reasons. Please refer to LCDS for further information on applying colour to cycle infrastructure.

The provision of highly conspicuous surfacing can detract from the aesthetics of the streetscape and may not be appropriate in conservation areas.

Where coloured surfacing is to be applied, a veneer coat should be laid on to the wearing course.

Figure 111: Cycle track demarcated with lines and colour

Figure 112: Cycle lane delineator strip

### Kerbs

- Low kerbs of between 50-100mm may be considered for the cycling and footway surface interface however a 125mm kerb must be provided between the cycle facility and carriageway
- Kerb heights should be carefully detailed to maximise the effective width of the cycle facility by allowing cyclists to travel closer to the kerb, reducing the likelihood of a cyclist catching their pedals on the upstand
- Bull-nose, battered (45 degree) or half-battered kerbs may be used adjacent to any cycle facility
- Where cycle provision is next to the footway and at footway level, a raised delineator strip (diagram 1049.1 of TSRGD) must be used
- The delineation for segregated cycle lanes needs to be carefully detailed to provide good visual definition between carriageways and footways
- Where cycle tracks or shared use areas are provided, flush dropped kerbs must be provided at entry and exit points from the carriageway

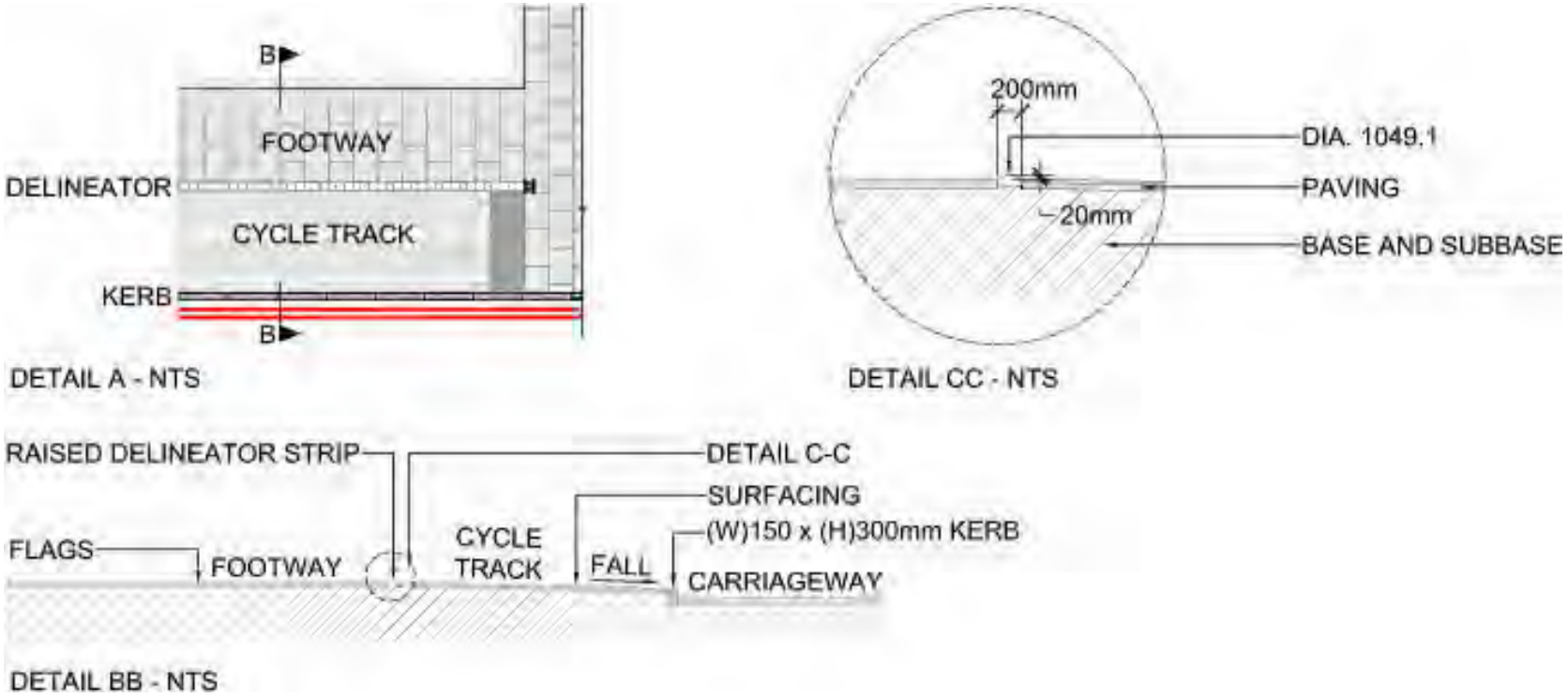
### Drainage

- Cycle infrastructure should be free-draining to ensure effective widths for cycling and skid resistance properties are maintained across the facility
- Gully locations and levels need to be carefully detailed and the type of grating needs to be considered to best provide for cycling, refer to 'Keeping London dry' in this guidance for further information
- Gully gratings should be perpendicular to the direction of cyclists' travel to avoid wheels becoming caught in the grating

### Maintenance

- All signing should be regularly monitored to ensure that surface markings are maintained and signs appropriately positioned
- Planting adjacent to cycle lanes and tracks should be maintained regularly to ensure cyclists do not have to leave the facility to avoid overhanging vegetation
- Surface defects can cause significant risks for cyclists and a regime to maintain high quality surfacing is essential for all designated routes
- Maintenance regimes should be aligned to our hierarchy of designated cycle routes, to ensure that the level of maintenance matches the extent of use

Figure 113: Segregated route on footway



## Protected junction temporary trial Portland, USA

A 'protected intersection' designed to eliminate cycle-car conflicts

### Key functions

### Opportunity

Right turns at junctions can put cyclists into conflict with motor vehicles. A redesigned junction can remove this conflict.

### Benefits

This reinterpretation of a Dutch cycle-friendly junction provides a phased and safe way to make a right turn. The introduction of kerbs within the junction reduces the crossing distance and offers a refuge to cyclists while they wait to complete their turn.

### Implementation

Junctions that avoid merging cyclists and drivers have proven safer for both. This is a trial aimed at making junctions more comfortable for cyclists to use. Cycle friendly junctions take many forms and need to be adapted to their context.

The image shows a trial example of a cycle friendly junction in Portland, Oregon, USA (Image courtesy of Nick Falbo)

### Applying in London

This Dutch inspired concept is being studied to determine its suitability for the London context. The hope is that the design will provide an increased sense and level of safety and comfort for cyclists, especially at busy junctions. At the moment this is a concept design which will require further design development and trialling prior to implementation.

### Additional information

**British Standards:**

BS 594987:2010 Asphalt for roads and other paved areas

BS EN 13108: Bituminous mixtures. Material specifications (BSI, 2010)

**Transport for London:**

London Cycling Design Standards, 2014

Figure 114: Bus lane and advisory cycle lane on Westminster Bridge


## 8.5 Bus lanes

Bus lanes are provided on many red routes to increase journey time reliability for certain types of vehicles and encourage the use of sustainable transport modes. They are usually located at the kerbside to serve bus stops. However, they can also be located in the centre or offside of the lane. Other bus priority features on the carriageway can also include bus gates and access to bus station.

Other vehicles that may be permitted in bus lanes during designated times include coaches, taxis, motorcycles and cycles. In some limited locations, heavy goods vehicles may also use the bus lane and this will be indicated accordingly.

### Design considerations

In determining the feasibility of implementing a bus lane within the existing built environment, consideration should be given to:

- The volume of potential bus users
- The carriageway width
- The overall capacity of the carriageway
- The proximity of street trees to the carriageway
- Delays to buses and impacts on general traffic

### Start and end points of bus lanes

When determining the precise position of the start and end points of bus lanes, coordination of regulatory signs with other street furniture should be considered. Minor bus lane amendments may involve moving the start and finish by a few metres to enable existing street furniture to be used to locate regulatory signing, and minimise clutter. Any amendment to a bus lane requires a Traffic Regulation Order (TRO).

### Designing for cyclists

There should be a general presumption that cycles are allowed to use bus lanes, however there are exceptions. For further information on bus lanes and cycling please see LCDS.

### Road markings and signage

Signs and markings are a powerful way of representing legally enforceable bus lanes. Their format and use are controlled by the DfT, and they are disseminated via TSRGD, Traffic Signs Manual and TfL's Red Route Signing Manual.

Design teams should consider how to minimise the physical and visual impact by avoiding the unnecessary introduction of additional signposts.

## Contact

Advice on the design and layout of bus lanes should be sought from our buses team, please contact the streetscape manager to determine the appropriate contact by emailing: **StreetscapeGuidance@tfl.gov.uk**

## Authorisation

Any changes to a bus lane length or location requires a Traffic Regulation Order from the relevant regulatory authority, in the case of the TLRN the authority would be TfL. The installation or removal of a bus lane also requires a TRO.

## Additional information

**Statutory instruments:**

Traffic Signs Regulations and General Directions (TSRGD)

**Department for Transport:**

Design Manual for Roads and Bridges

Local Transport Note 1/97: Keeping Buses Moving

Traffic Signs Manual, Chapter 3: Regulatory Signs

Traffic Signs Manual, Chapter 5: Road Markings

Figure 115: Waterloo Bridge Roundabout

## 8.6 Median strips/central reservations

Median strips have traditionally been used on high speed arterial routes to separate traffic flows and provide safety and operational benefits on the approach to junctions. These centrally located islands, usually consisting of a raised kerb edge and paved surface, are also found on numerous inner city roads with four lanes or more.

The use of median strips within urban street environments is becoming an increasingly attractive design option to provide an informal crossing point thereby reducing severance created by a wide carriageway or heavy volumes of traffic.

Figure 116: Upper Street in Angel with a wide central median used by pedestrians for informal crossings

### Benefits

Median strips offer several benefits including:

- Facilitating safer and more convenient informal pedestrian crossing movements by effectively acting as an extended pedestrian refuge
- Reducing the carriageway width can help to reduce vehicle speeds, reduce crossing distances and create an environment more conducive to informal pedestrian crossing and social vibrancy
- Providing an opportunity to declutter the footway by locating street furniture on the median itself
- Kerbside activities such as loading or parking can also be integrated within wider median strips, while ensuring sightlines are maintained

### Layout

#### Median strip design standards

There is no prescribed minimum width for a median strip, however, where the median is intended to also act as a central refuge for pedestrians, the following dimensions should be applied:

| Median strip width | Suitable functions |
|---|---|
| 1200mm – absolute minimum | Pedestrian refuge space for a straight across single phase formal crossing or informal crossing |
| 1500mm – preferred minimum | More comfortable pedestrian refuge space for a straight across single phase crossing |
| 3000mm | Sufficient space to accommodate a staggered crossing facility<br>Minimum width to consider cycle parking<br>Minimum width to consider tree planting<br>Minimum width to consider central loading or parking bay |
| 4000mm | Minimum width to consider a pedestrian refuge space for a straight across two phase crossing |

## Design considerations

Designs which have numerous short sections of median strip and open carriageway can detract from the quality and legibility of the street environment, and reduce the visual coherence of the median as a whole.

Layouts which significantly vary the width of the median strip should be avoided as this can create pinch points on the carriageway, pockets of ineffective space and visual clutter.

Medians may be introduced asymmetrically within the overall street layout, such that a single lane in one direction may be separated from two lanes in another direction, for example. This can be used to help support contraflow bus lane and contraflow cycle lane designs.

Figure 117: Brixton Road where a narrow median (less than 1,200mm) is widened at a controlled crossing to provide an acceptable refuge width

Road hatching is not always required therefore road geometry on the approach to the medians should be detailed so that minimal use of road hatching markings are required to reduce visual clutter and maximise useable road space.

The decision to include a median strip should consider the impact on cyclist comfort, as narrowing of the carriageway will likely be required. Poorly positioned or overly wide median strips can create pinch points on the carriageway which impact on cycle comfort and safety.

### Street furniture

Care should be taken when locating furniture on the central median as it can impede informal crossing movements and reduce visibility of oncoming traffic.

Standard streetscape principles apply so that the median strip does not become overly cluttered and detract from the view of the other side of the street and the surrounding architecture.

- Street furniture on a median strip should be located a minimum 600mm from either kerb edge
- Street furniture should be located a minimum 1,000mm away from adjacent objects in long profile along the length of the median strip; 1,200mm for cycle parking stands, to allow for adequate pedestrian permeability across the median
- For speed limits of 40mph or more, the type of street furniture used on the median should be carefully considered. Furniture such as cycle parking will likely not be appropriate
- Low-level 'keep left' bollards can be used at the start of the median strip and should be clearly positioned 450mm from the kerb edge

Relocating lighting columns on the median strip can help to reduce clutter on the footway; however, this is a non-standard arrangement on the TLRN and requires SDRG approval. Designers should recognise the aesthetic impact of locating light columns in the centre of the road, and the safety implications in terms of lighting distribution, glare and providing sufficient footway lighting.

Figure 118: The central median on A40 Holborn Circus utilised for highway lighting and cycle parking

Planting on median strips can have maintenance implications which may require lane closures. Consult an arboriculturist to discuss viable planting options.

Cycle parking placed on the median strip can help to reduce clutter on the footways, but care should be taken as traffic conditions may make it difficult for cyclists to cross to the parking and rejoin the carriageway afterwards. It may also increase the distance to their destination such that they choose to 'fly park' on the footway instead.

Seating is rarely a practical solution on a central median and unlikely to provide a comfortable resting environment unless the median strip is sufficiently wide.

Figure 119: The central median on Kensington High Street utilised for cycle parking and tree planting

## Construction

### Surface materials

Surface materials for the median strip should be consistently applied along the length of the median and the tone and colour should resemble the surrounding footways.

The median strip surface materials do not need to match the actual materials used for the footway, however, a higher quality of finish and consistent aesthetic can be achieved when the materials do match.

Where a raised kerb is provided, no tactile paving delineation is required, except at designated formal crossing points with a dropped flush kerb.

Where vehicle overrun is anticipated or parking and loading bays incorporated as part of the median, small unit paving should be applied in the form of setts. Alternatively, these areas may be surfaced in asphalt with a kerb edge to delineate the median strip and appropriate edge restraint construction detailing for either side of the kerb.

### Kerbs

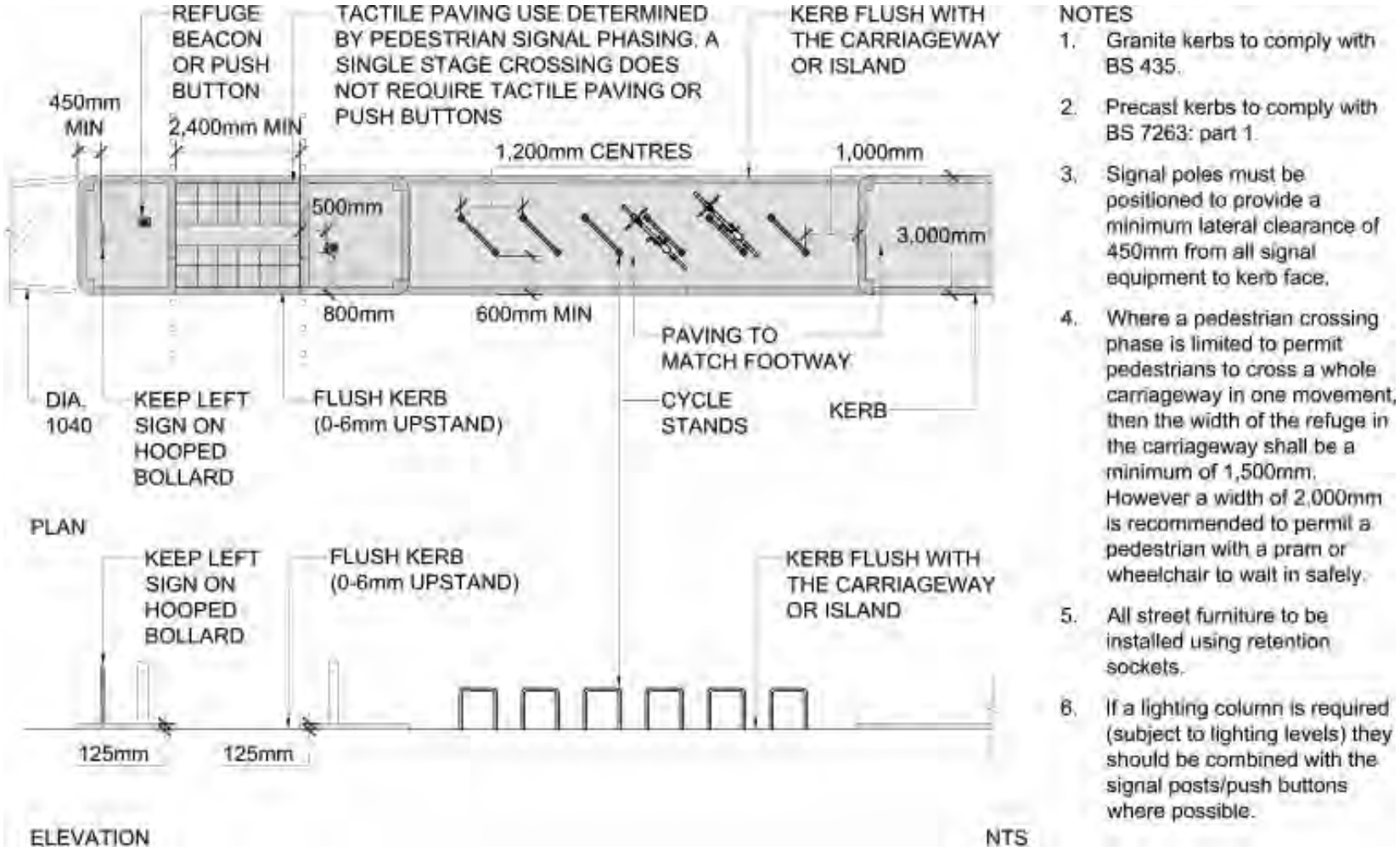
The kerb material and width should be consistent along the length of the median to provide clear delineation from the carriageway surface.

The kerb edge restraint detailing is vitally important and should be able to withstand impacts from vehicle overrun.

The kerb height for the median strip should be carefully considered and respond to the character and use of the street. The height is important to delineate the median from the carriageway and support the functional requirements of the median strip at specific locations.

Where inspection covers intersect the line of the median strip it may be necessary to detail the kerb edge around the cover. The preference, however, would be to accommodate the inspection cover on the median strip itself by moving the access point where practicable.

Figure 120: Median strip with street furniture




NOTES

1. Granite kerbs to comply with BS 435.
2. Precast kerbs to comply with BS 7263: part 1.
3. Signal poles must be positioned to provide a minimum lateral clearance of 450mm from all signal equipment to kerb face.
4. Where a pedestrian crossing phase is limited to permit pedestrians to cross a whole carriageway in one movement, then the width of the refuge in the carriageway shall be a minimum of 1,500mm. However a width of 2,000mm is recommended to permit a pedestrian with a pram or wheelchair to wait in safely.
5. All street furniture to be installed using retention sockets.
6. If a lighting column is required (subject to lighting levels) they should be combined with the signal posts/push buttons where possible.

## Technical detail

### Kerb cuts and paving layout for median strip

| Kerb height | Median strip application |
|---|---|
| 125mm-150mm | Standard upstand height where vehicle speeds are 40mph or greater |
| | Standard upstand height for central refuge at controlled crossing points and designated uncontrolled crossing points |
| 60mm-125mm | Standard kerb upstand range where vehicle speeds are 30mph or less |
| Flush-6mm | Adjacent to centrally located cycle parking provision to allow convenient access for cyclists |
| **Dropped kerb at formal crossings** | |
| 60mm | For shared surface schemes |
| | For centrally located parking and loading bay access |

### Additional information

**The Highways Agency:**
Design Manual for Roads and Bridges, Volume 6, Section 2: TD 42/95 Geometric Design of Major/ Minor Priority Junctions, 1995

**Department for Transport:**
Traffic Signs Manual (2003), Chapter 5: Road Markings

Figure 121: The central median should be paved in the same material as the footway

Figure 122: Oxford street's central median is paved in granite setts to match the concrete paving on the footways

# Part E Crossings



Figure 123: Tactile paving is used to communicate important information to the visually impaired

## 9.1 Introduction

Walking is a great way of getting around London. It's free, healthy, environmentally friendly, and often the quickest option for short journeys. The provision of safe, inclusive and well-designed crossings is key to ensuring a quick and pleasant journey. Crossings can take on several forms including controlled, uncontrolled and grade-separated which are detailed here.

Figure 124: A crossing on Bishopsgate


## 9.2 Tactile paving

The consistent application of tactile paving is crucial for ensuring that pedestrians with visual impairments are supported in navigating the street environment safely and confidently.

A range of tactile paving types are used to help people identify particular hazards in the street and/or orientate towards a crossing. Generally these are units of paving that are specially designed to differ from the surrounding footway material, providing a detectable change in texture underfoot and a visual tonal contrast.

Figure 125: A busy crossing

There are four types of tactile paving used in London:

Blister

Corduroy

Ladder and tramline

Lozenge

Those involved in the design of tactile paving layouts should familiarise themselves with the design principles outlined in DfT's Guidance on the use of Tactile Paving Surfaces (2021), acting as the current national guidance. Designers should also acknowledge that ongoing research and experience in delivery has shaped what we consider to be best practice.

## Common issues in application

Along with other local authorities in London, we have become increasingly aware that rigid application of the national guidance can have a detrimental impact on the legibility of tactile provision and negatively impact on the visual quality of the footway.

The complexity of London's street network, with irregular kerb geometries and angles of crossings, creates challenges for designers to comply with national guidance while providing a visually clean layout which is easily understood by people with visual impairments.

Common issues with layouts have emerged since the national guidance was produced and Streetscape Guidance recommends a number of departures from national guidance to overcome these challenges.

## Ongoing research

We are undertaking ongoing research to conclude best practice designs for tactile paving to ensure the materials are effective. Streetscape Guidance will be reviewed and updated as research is completed to reflect best practice. TfL are in discussion with DfT to understand the latest research and will review any departures from National Guidance considering the latest research.

## Good practice

Tactile paving should be carefully detailed to ensure consistency and quality in application so that it does not adversely affect the overall aesthetic of the streetscape. This extends to the workmanship and neatness of finish, with good planning and detailing required for overcoming any potential construction issue.

### Detailing

- Inset covers should always be used where tactile paving meets an inspection cover and the careful design of fold and cut lines should be detailed to ensure the blister texture is consistently aligned across the cut
- Borders, such as the use of paint or setts, should not be provided around tactile paving
- The gradient of dropped kerbs should be carefully designed so as to maintain a constant gradient across the tactile surface
- Quadrant kerbs can be useful to ensure a neat finish at tight corners, ensuring vertical alignments are well integrated to avoid trip hazards
- Minimise the amount of tactile surfaces used to provide adequate support for visually impaired people while reducing the discomfort for those with walking difficulties and users of buggies or large bags

### Materials

Concrete and natural stone are the most suitable materials for tactile paving as they are readily available in a range of appropriate colours, can be precast or cut into the required shape and have good slip resistance properties.

Yorkstone and granite may be considered at the request of the borough or where there is an urban design or heritage justification. It is prone to wear and does not generally comply with colour guidance. Use of Yorkstone or granite for tactile paving is subject to SDRG approval.

Metal studs are not generally recommended for use on the TLRN but may be considered by the SDRG in exceptional circumstances.

## Detailed application

### Blister paving

Application: Blister paving is used for two different purposes, functioning as a navigational guide for visually impaired pedestrians to help users locate, operate and cross at:

- Controlled crossings
- Uncontrolled crossings


Red concrete


Grey concrete


Yorkstone


Granite


Metal studs

The design and layout differs for these two applications, enabling this variation in crossing type to be communicated to users.

## Layout

### Blister paving at signal controlled crossings

- Should be provided at the kerb of the designated crossing point, as well as across the footway itself as a 'tactile tail'.

Figure 126: Blister paving at a crossing

## Layout criteria

### Dimensions

- 400x400mm paving unit with series of regular flat-topped blisters (5mm high, 25mm diameter) regularly spaced at 64-67mm across the unit.

### Placement

- Two rows of 400x400mm tactile, for a total of 800mm wide at the narrowest point across the full width of the flush crossing. Tactile tails will form an 'L' shape at the crossing and are to be 800mm wide
- Blister paving should be oriented to align with the direction of the crossing
- Only full tactile slabs should be installed
- The maximum gradient should be of eight per cent (1 in 12) on the direct approach to a crossing and nine per cent (1 in 11) on the flared sides

### Colour

- Red is standard on the TLRN for controlled crossings
- Contrasting grey for controlled crossings will be considered in conservation areas, or where red paving does not provide suitable contrast with surrounding paving
- Natural stone tactile paving may be produced using milled Yorkstone or granite but must have SDRG approval
- Metal paving studs are generally not recommended but may be adopted as an exception with SDRG approval

## TLRN departures from national guidance

The following departures from national guidance should be used by designers working on TLRN schemes when designing tactile paving at controlled crossings:

- Exceptionally, where the area covered in tactile paving will be unnecessarily extensive or illegible due to a high radii kerb line combined with an abnormally wide crossing, consideration should be given to cutting the area of tactile paving to be consistently 800mm from the kerb edge. Each location is to be assessed and approved by TfL Engineering individually at the detailed level
- Research shows that partially visually impaired people often use the contrasting colour of tactile paving to guide them through the streetscape. However, there is less evidence that the specific colour used makes the space more legible. As such, the use of alternative contrasting coloured tactile paving will be considered on a case-by-case basis, for instance, in conservation areas or where the 'standard coloured' tactile paving does not contrast with the surrounding paving
- The use of reduced width tactile tails and tactile paving at the kerb edge (800mm instead of 1,200mm). Research undertaken in 2010 by University College London concluded that 'the blister profile is readily detectable when it is 800mm wide' as it will always capture a person's stride. We have therefore reduced the width used for all tactile paving surfaces from 1,200mm to 800mm; two rows of 400x400mm flags (reduced from three)
- The crossing of tactile tails can cause confusion for visually impaired users, and should be avoided. To avoid tails crossing, the tail associated with the crossing with lower pedestrian demand should be terminated at least 800mm from the other tail

## Recording departures from national guidance

Consistency in application is of fundamental importance for legibility and so any deviations from national guidance and the national approach to tactile provision should be carefully justified.

Project files must record the reason for not following the national guidance. This includes recording how Streetscape Guidance has been followed in respect of the aforementioned departures from national guidance.

Figure 127: Blister tactile paving at controlled and uncontrolled crossings

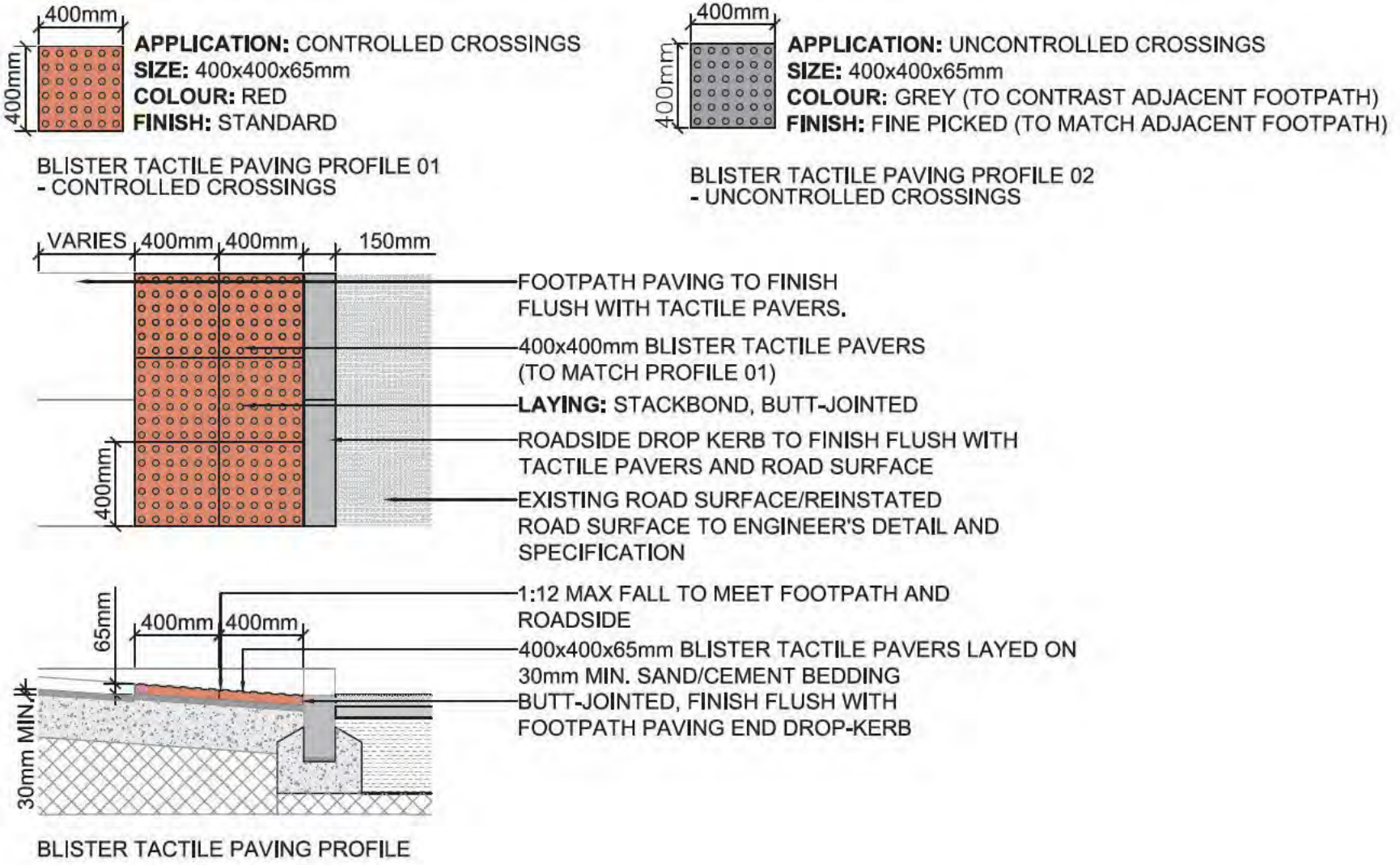


Figure 128: Controlled and uncontrolled crossing tactile layout

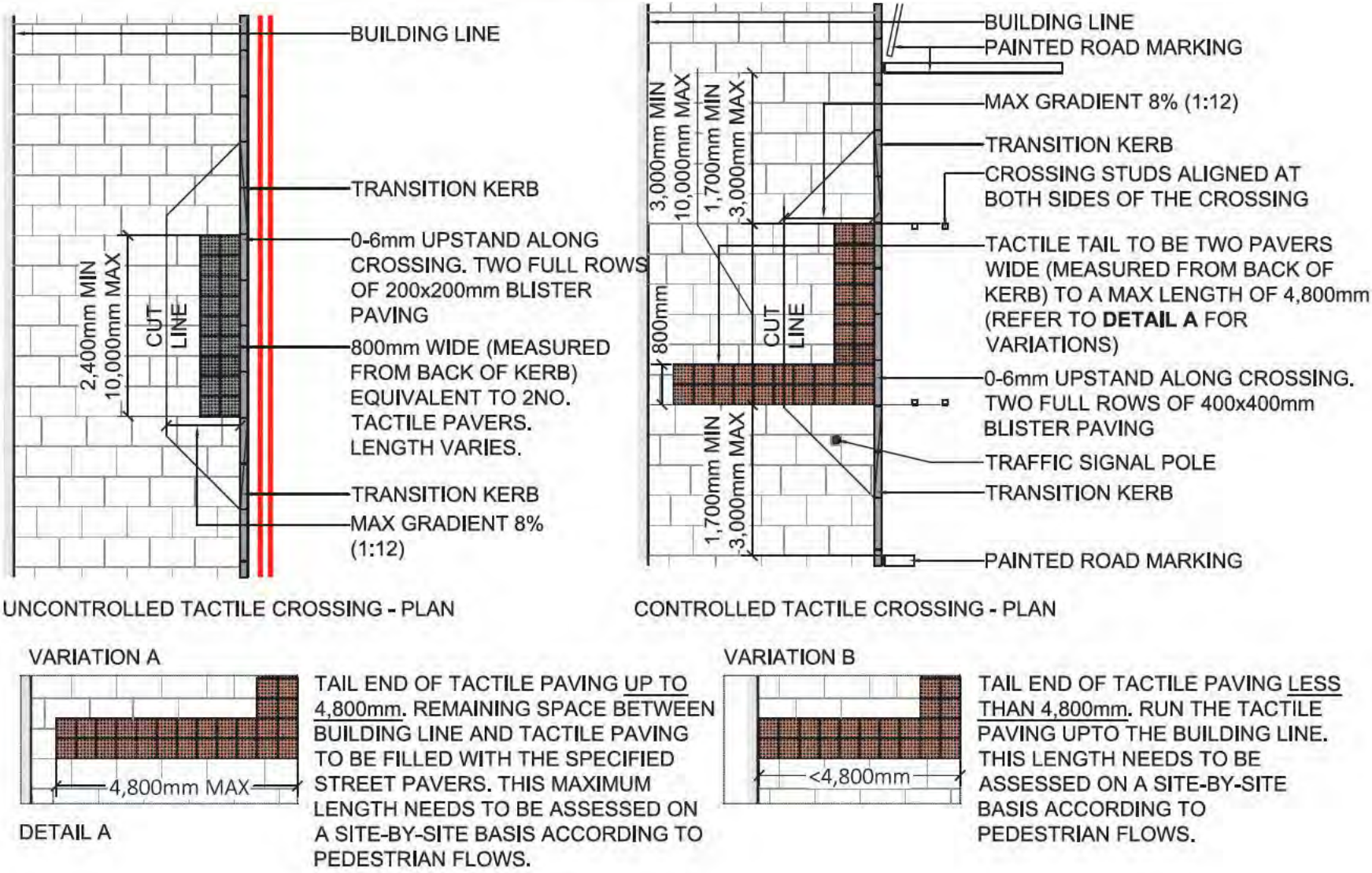
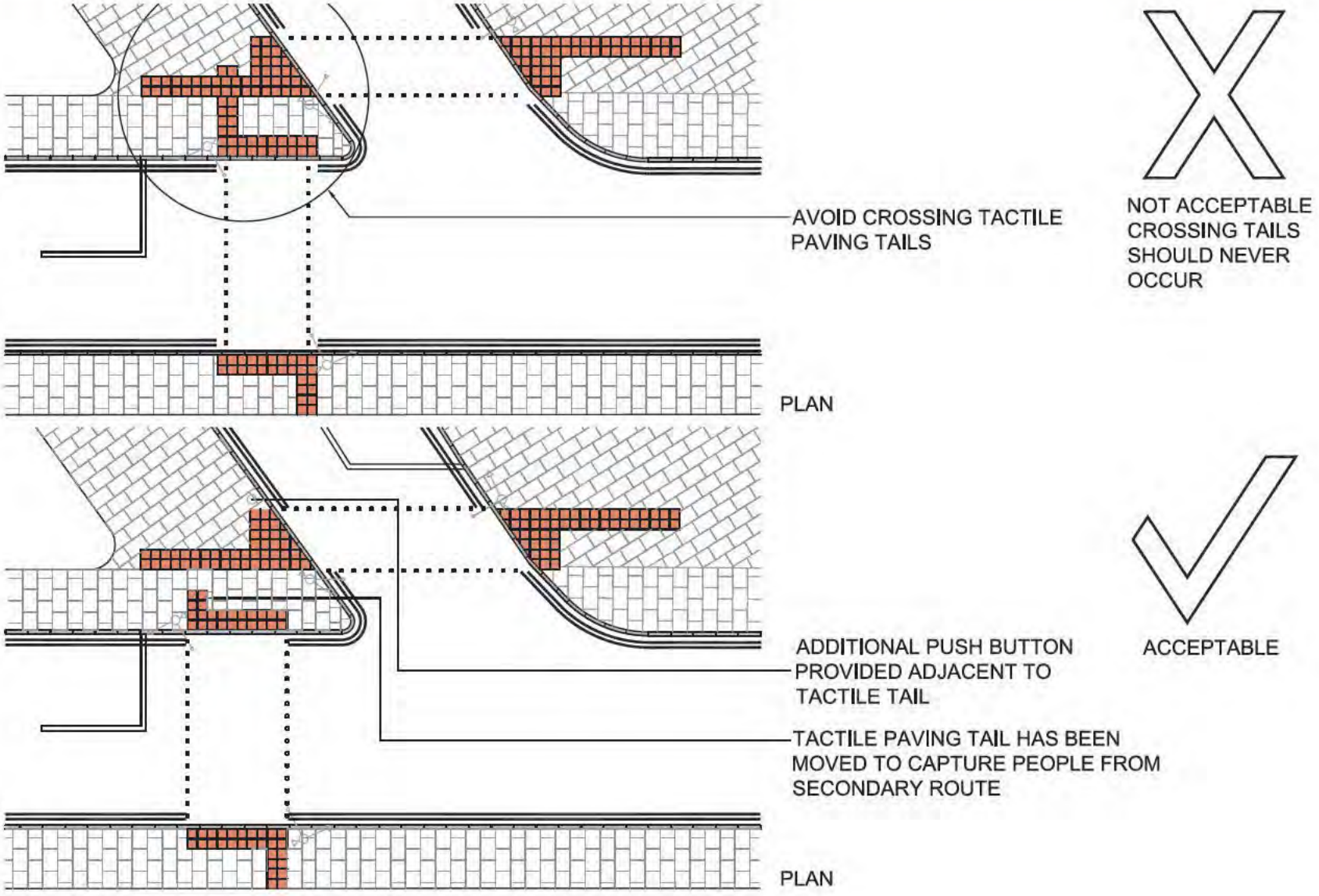


Figure 129: How to resolve a difficult tactile layout



**Blister paving at uncontrolled crossings** – uncontrolled crossings are used where vehicle flows and speeds allow pedestrians safe opportunities to cross a street without the need for a formal facility such as a signal crossing or zebra.

### Layout criteria

#### Dimensions

- 400x400mm paving unit with series of regular flat-topped blisters (5mm high, 25mm diameter) regularly spaced at 64-67mm across the unit

#### Placement

- Two rows, 800mm wide at the narrowest point across the full width of the flush crossing
- Blister paving should be oriented to align with the direction of the crossing

Figure 130: Tactile paving should contrast with the surrounding footway material

- Exceptionally, the back of the crossing tactile paving may not need to be oriented at right angles to the crossing, and may be cut to be consistently 800mm from the kerb edge. This must be reviewed and approved by TfL Engineering on a case-by-case basis
- Tactile tails should not be provided
- Tactile paving associated with separate crossings should not join as this impacts on legibility
- Only full tactile slabs should be installed
- The maximum gradient should be of eight per cent (1 in 12) on the direct approach to a crossing and nine per cent (1 in 11) on the flared sides

#### Colour

- Contrasting grey – charcoal grey is standard on the TLRN for uncontrolled crossings
- Natural stone if tactile paving produced with milled granite/Yorkstone and as approved by SDRG

### TLRN departures from national guidance

The following departures from national guidance should be used by designers working on TLRN schemes when designing tactile paving at uncontrolled crossings:

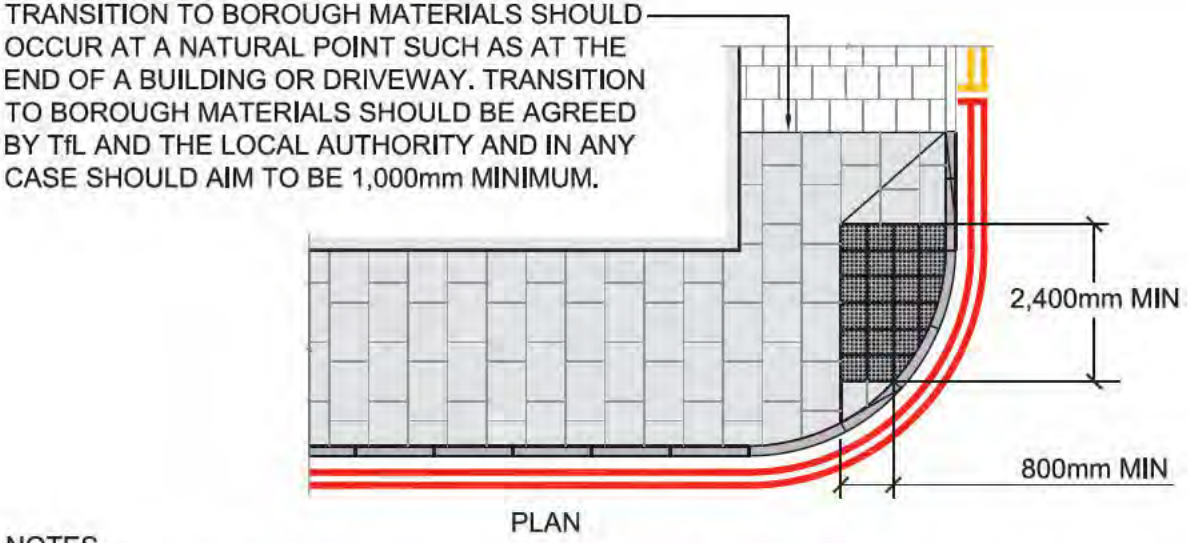
- Exceptionally, where the area covered in tactile paving will be unnecessarily extensive or illegible due to a high radii kerb line combined with an abnormally wide crossing, tactile paving should be cut to be consistently 800mm from the kerb edge. Each location is to be assessed and approved by TfL Engineering individually at the detailed level
- Research shows that partially visually impaired people often use the contrasting colour of tactile paving to guide them through the streetscape. However, there is less evidence that the specific colour used makes the space more legible. As such, the use of alternative contrasting coloured tactile paving will be considered on a case-by-case basis, for instance, in conservation areas or where the 'standard coloured' tactile paving does not contrast with the surrounding paving
- The use of reduced width tactile paving at the kerb edge in all cases (800mm instead of 1,200mm). Research undertaken in 2010 by University College London concluded that 'the blister profile is readily detectable when it is 800mm wide' as it will always capture a person's stride. We have therefore reduced the width used for all tactile paving surfaces from 1,200mm to 800mm; two rows of 400x400mm flags (reduced from three in certain circumstances)

## Recording departures from national guidance

Consistency in application is of fundamental importance for legibility and so any deviations from national guidance and the national approach to tactile provision should be carefully justified.

Project files must record the reason for not following the national guidance. This includes recording how Streetscape Guidance has been followed in respect of the aforementioned departures from national guidance.

Figure 131: Uncontrolled pedestrian crossing at a side road




PLAN

NOTES

1. Flags to be laid with courses set at 90 degrees to kerb and a minimum overlap bond of 150mm.
2. The bonding of paving to be cut around utility service covers unless directed by the resident engineer.
3. Flags should not be cut so that a width less than 300mm remains. Previous courses should be cut to distribute evenly over width.
4. Kerb dropped over approximately 1,800mm to provide a flush kerb (0-6mm upstand) over crossing width.
5. All work to be carried out in compliance with the requirements of the Manual Handling Operations Regulations 1992 (as amended in 2002).
6. All covers within the tactile areas have to be recessed and in-filled with blister paving. It would be desirable for the rest of the covers to be recessed in order to match the footway surface but this needs to be agreed with TfL and the utility companies need to be contacted in order to get an agreement and request appropriate labeled assets.

## Corduroy paving

**Application** – corduroy should be used to identify specific hazardous situations for pedestrians including:

- The top and bottom of steps
- The foot of a ramp to an on-street light rapid transit platform, but not any other ramps
- While national guidance illustrates where the footway is to be shared-use with a segregated path for cyclists, the results of future research should conclude appropriate use
- On the approach to level crossings

**Application** – corduroy should not be used to:

- Identify segregated routes for pedestrians and cyclists where ladder and tramline paving should be used
- Provide a defined edge of kerb instead of a kerb upstand

### Layout criteria

#### Dimensions

- 400x400mm paving unit with rounded raised ridges 6mm high, 20mm in diameter and equally spaced at 50mm

#### Placement

- The placement should comply with the DfT's Guidance on the use of Tactile Paving Surfaces (2021); generally 800mm (two paving units) wide, except for the approach to a level crossing and should extend the full width of the steps, ramp or footway

#### Colour

- Contrasting grey – charcoal grey is standard on the TLRN unless this provides insufficient contrast with surrounding footways

### TLRN departures from national guidance

The following departures from national guidance should be used by designers working on TLRN schemes when designing corduroy paving:

- Research shows that partially visually impaired people often use the contrasting colour of tactile paving to guide them through the streetscape. However, there is less evidence that the specific colour used makes the space more legible. As such, the use of alternative contrasting coloured tactile paving will be considered on a case-by-case basis, for instance, in conservation areas or where the 'standard coloured' tactile paving does not contrast with the surrounding paving

### Recording departures from national guidance

Consistency in application is of fundamental importance for legibility and so any deviations from national guidance and the national approach to tactile provision should be carefully justified.

Project files must record the reason for not following the national guidance. This includes recording how Streetscape Guidance has been followed in respect of the aforementioned departures from national guidance.

Figure 132: Corduroy paving

Figure 133: Corduroy paving used at stairs to indicate a level change

## Ladder and tramline paving

**Application** – ladder and tramline paving should be used to delineate between segregated cycle and pedestrian surfaces on a shared use route. It should be used at the start and end of a cycle route on and level with the footway, as well as at any junction where pedestrians with visual impairments may unknowingly walk on to the cycle track, and as a repeater marking as required.

### Layout criteria

#### Dimensions

- 400x400mm paving unit with flat-topped bars 5mm high, 30mm wide and spaced 70mm apart

#### Placement

- Consideration should be given to omitting the ladder (pedestrian) side of ladder and tramline paving, in order to enhance the simplicity and legibility of the pedestrian environment. In all such cases, an Equality Impact Assessment should be completed to ensure this approach is appropriate, and the results clearly highlighted and justified in consultation materials. Where this approach is not appropriate national guidance should be followed and designs brought to SDRG for approval.

#### Colour

- Contrasting grey or to contrast the surrounding footway material

Figure 134: Ladder and tramline paving 800mm width on Borough Road

### TLRN departures from national guidance

The following departures from national guidance should be used by designers working on TLRN schemes when providing ladder and tramline paving:

- Customer research by TfL (2015) has demonstrated that ladder and tramline paving is poorly understood, serves a limited function in informing visually impaired people where they should or should not walk and is difficult to traverse by people who are mobility impaired. The cycle facility should be properly delineated so that all users know if they are walking into it. Consideration should therefore be given to omitting ladder paving (pedestrian side) on segregated footways and only provide tramline paving (cycling side), to enhance the simplicity and legibility of the pedestrian environment. In all such cases, an Equality Impact Assessment should be completed to ensure this approach is appropriate, and the results clearly highlighted and justified in consultation materials. Where this approach is not appropriate national guidance should be followed and designs brought to SDRG for approval.
- While national guidance for ladder and tramline recommends an application 2,400mm depth, 800mm will be accepted based on the findings of UCL's (2010) research which revealed an 800mm depth for blister paving will capture a person's stride.

### Recording departures from national guidance

Consistency in application is of fundamental importance for legibility and so any deviations from national guidance and the national approach to tactile provision should be carefully justified.

Project files must record the reason for not following the national guidance. This includes recording how Streetscape Guidance has been followed in respect of the aforementioned departures from national guidance.

## Lozenge paving

**Application** – lozenge paving should be used at tram stops on the open street.

Figure 135: Lozenge paving at a tram stop


## Layout criteria

### Dimensions

- 400x400mm paving unit, with rows of lozenge shaped rounded raised ridges 6mm high, 150mm in length and 83mm in width and equally spaced at 50mm

### Placement

- The placement should comply with the DfT's Guidance on the use of Tactile Paving Surfaces; generally 400mm (one paving unit) wide parallel to the platform edge and a minimum of 500mm back from the edge

### Colour

- Buff

## Additional information

### Department for Transport:

Inclusive mobility – A guide to best practice on access to pedestrian and transport infrastructure, 2021

Guidance on the use of Tactile Paving Surfaces, 2021

Inclusive Design for Getting Outdoors (I'DGO): Design Guide 003 Note: Tactile Paving

## 9.3 Controlled crossings

To create a high quality walking environment it is essential that where the pedestrian desire lines, pedestrian demand and vehicular flow justify, controlled crossing points are provided to cross the carriageway, typically but not necessarily at junctions.

Provision of formal crossings can partially change desire lines but they will not prove successful if they require a significant deviation in natural pedestrian flow.

On the TLRN several different controlled crossing types are used to provide fit for purpose crossing facilities appropriate to the urban context, including:

- **Signal controlled crossings** – located on busy routes where pedestrians need a formal pedestrian phase
- **Non-signal controlled crossings** ('protected crossings') – the zebra family of crossings are non-signal controlled crossings

The design team should consider the relationship of the crossing to adjacent building entrances and side roads, and coordinate the design with surrounding street furniture and tree planting.

| Crossing category | Permitted crossing type |
|---|---|
| **Signal controlled crossing** | Ped-X<br>Toucan<br>Pegasus |
| **Non-signal controlled crossing** | Zebra<br>Zebra with parallel cycle crossing |

Controlled crossings can be further split into:

- Straight-across single stage
- Straight-across two stage
- Staggered two (or more) stage

Figure 136: Controlled crossing on Upper Street, Angel


### General crossing considerations

For all types of crossing, the following general design guidance should be followed.

#### Design

The effective design and layout of crossings requires an understanding of a number of interrelated factors including the road context and proximity to any junctions, traffic and pedestrian flows, existing desire lines, traffic speeds and road safety issues.

#### Materials

Anti-skid surfacing should not be used on the carriageway surface between the crossing studs as pedestrians with mobility impairments can experience discomfort or difficulty in crossing these surfaces.

Coloured surfacing should not be applied unless approved by the SDRG.

It may be appropriate to continue footway materials across the carriageway where pedestrian priority or a unified space is being promoted.

#### Drainage

- Ensure drainage gullies are not located within the crossing
- Levels must enable surface water to drain away from the crossing

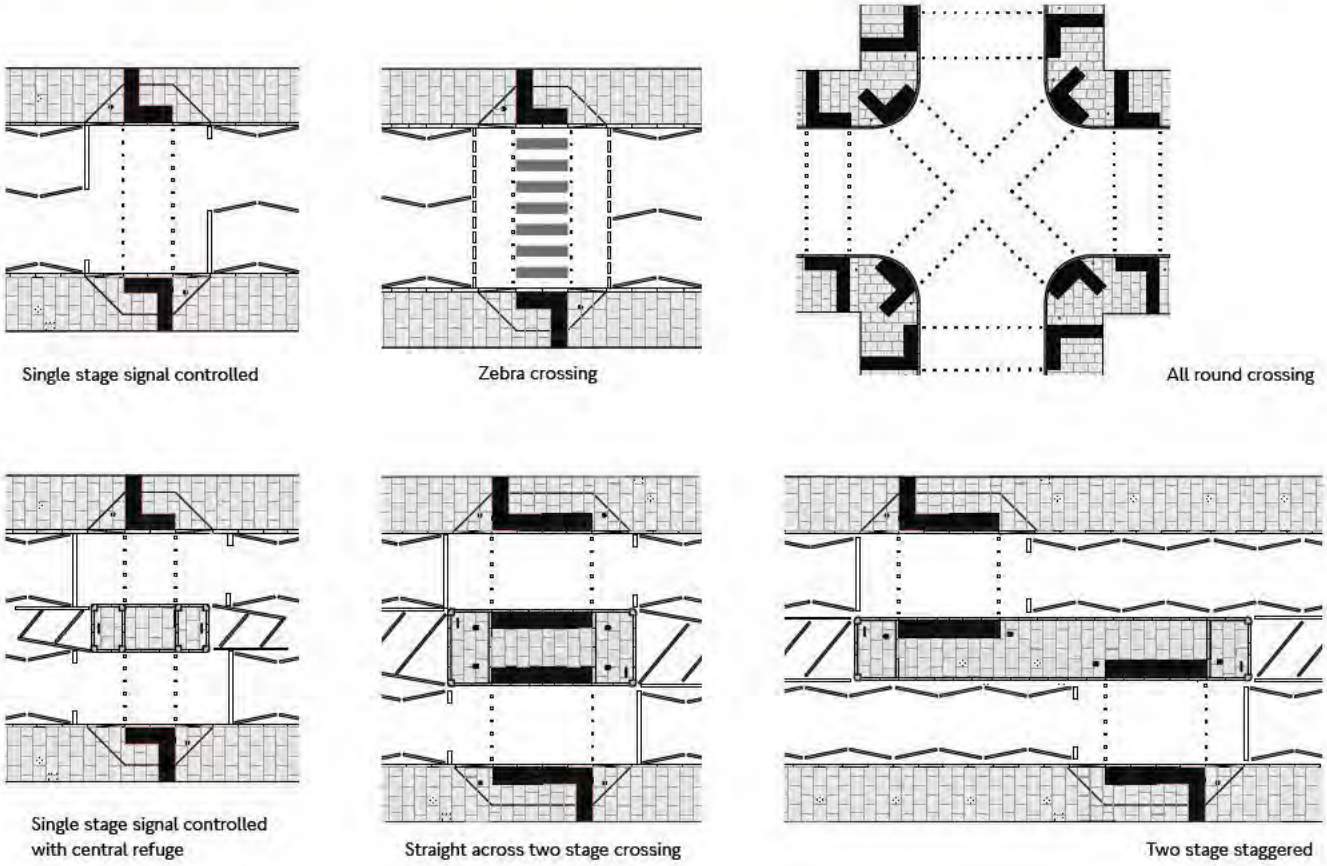
## Safety

- Guardrailing should not be used unless there is evidence that pedestrian safety would otherwise be compromised. Please refer to 'Barrier free footways' for further information
- Sightlines at crossings should not be obstructed by street furniture, plantings or parked/stopped vehicles
- Crossings should not be located where sharp bends in the road occur as this may create blind corners and reduce driver awareness to stop within a safe distance

## Pedestrian comfort

- Both the footway and the crossing should be fit for purpose such that pedestrians are not overly constrained on the crossing or in the waiting area. Refer to our Pedestrian Comfort Guidance for London (2010) to determine the required levels of service
- A 5,000mm wide crossing or similar is recommended where footways are narrow (less than 3,000mm) to increase waiting space and minimise obstructing pedestrian flows on the footway
- At-grade crossings are preferred to subways and footbridges, to better serve pedestrian desire lines and facilitate greater priority for pedestrians

Figure 137: Controlled crossing types




- At especially busy crossings, for example outside stations, the designer should review the potential for footway widening and the provision of crossings wider than 5,000mm
- Single stage crossings are preferred to staggered arrangements, to better serve pedestrian desire lines and facilitate greater priority for pedestrians

## Signal controlled crossings

Pedestrians establish priority over vehicles at signal controlled crossings through the use of signal controlled pedestrian phases. Selection should be based on traffic volumes, speed and pedestrian flows, as well as whether the crossing is at a junction or standalone.

### Pedestrian crossing facility (Ped-X)

This is the preferred crossing for all new, modified and modernised signal layouts. The layout appears similar to a pelican crossing with far-sided pedestrian aspects, but the traffic light sequence is as a signalised junction, has no flashing amber vehicle signal and usually includes a countdown timer.

Figure 138: A Ped-X crossing on Harrow Station Road with no pedestrain countdown timer

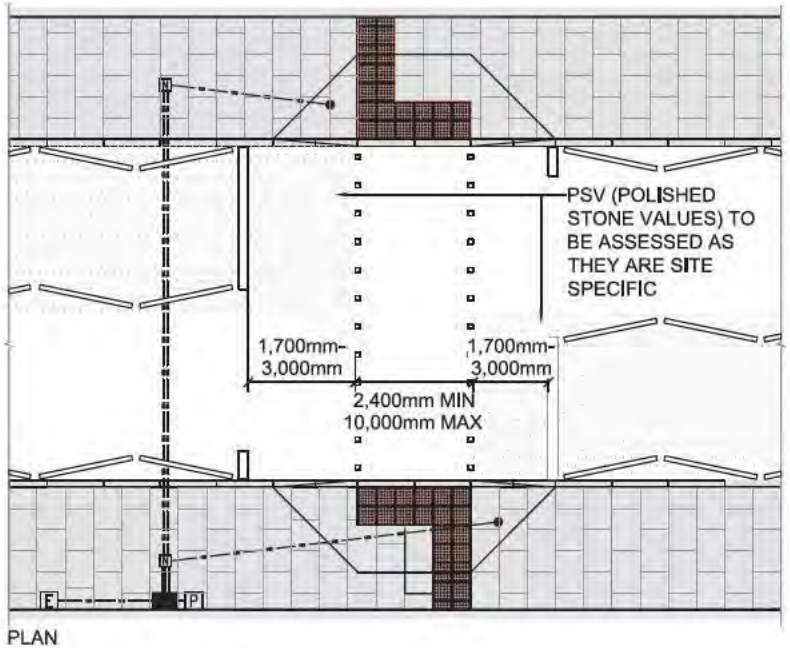
### Layout criteria

| | |
|---|---|
| **Straight-across Ped-X crossings** | |
| Preferred minimum crossing width | 3,200mm |
| Maximum crossing width | 10.0 metres |
| Dropped kerbs | 1:20 preferred to 1:12 (maximum) |
| **Additional requirements where a central refuge is provided** | |
| Recommended minimum central refuge depth | 2,000mm |
| Recommended minimum central refuge length | 7,200mm |
| Kerb upstand around central refuge | 125mm |
| **Additional requirements for staggered Ped-X crossings** | |
| Preferred minimum central refuge kerb to kerb | 3,000mm |
| Minimum stagger distance between crossing points on central refuge | 4,000mm recommended. Relaxations may be permitted with SDRG approval |
| Stagger for all two-way roads | Left stagger to face oncoming traffic, unless otherwise agreed with SDRG |
| Recommended minimum distance from uncontrolled junctions to primary signal pole | 20.0 metres |

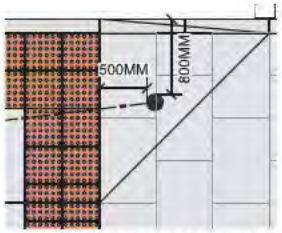
### Good practice

- Countdown timers should be considered for all Ped-X crossings
- Signal timings should be appropriate to pedestrian flows and traffic volumes
- All signal schemes are required to have a design and safety check in line with the Design Standards for Signal Schemes in London
- Tactile rotating cones should be fitted to all controlled crossings
- Audible bleepers should be fitted to standalone signal controlled crossings and 'all round' crossings at junctions as detailed in DfT Traffic Advisory Leaflets 4/91 and 5/91

## Figure 139: Ped-X crossing




PLAN

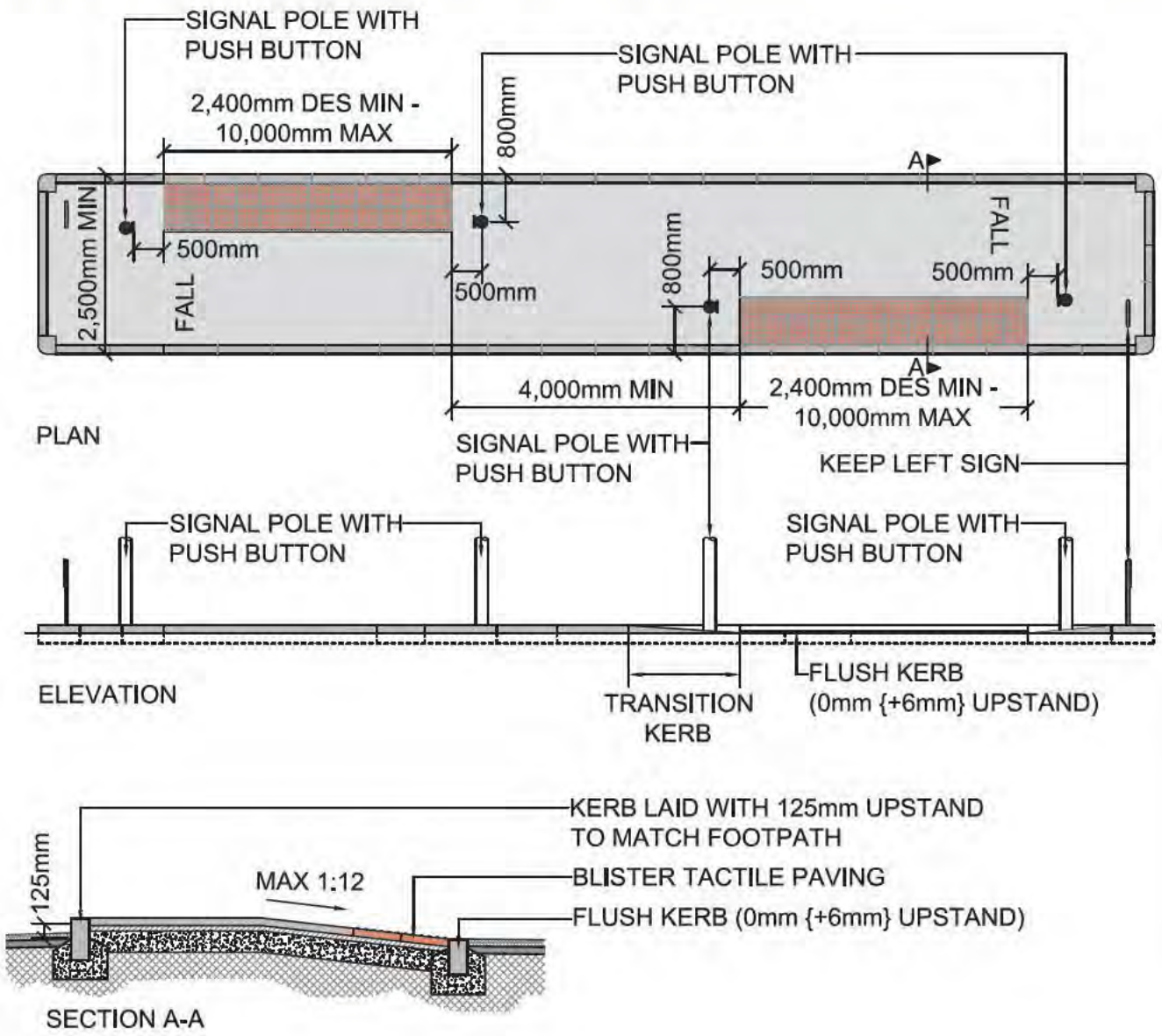



PED-X SIGNAL SCALE 1:50

Notes:

1. All works to be carried out to the relevant tfl specification.
2. Duct layout is indicative only and subject to site conditions.
3. Traffic signal poles must be positioned to provide a minimum lateral clearance of 450mm from all signal equipment to kerb face.
4. All poles to be installed on retention sockets.
5. Pushbuttons to be mounted at 45° to kerb on all poles.
6. Engineer to specify width of crossing (between stud lines). Width should be in increments of 400mm to accommodate exact number of standard 400x400mm blister paving slabs.
7. Ideal tactile arrangement as shown with two rows of blister for the width of the crossing and a tail of three blister slabs wide from the right hand side of the crossing extending to back of footway or to 5,000mm maximum.

Figure 140: Pedestrian refuge islands – staggered crossing




Notes

1. All street furniture must be positioned to provide a minimum lateral clearance of 450mm to kerb face.
2. If a lighting column is required (subject to lighting levels) they should be combined with the signal posts/push buttons where possible.
3. Material in central refuge island to match material on footway.

### Toucan crossing facility

Toucan crossings allow both pedestrians and cyclists to cross without segregation. These crossings are typically used in conjunction with shared use footways. Far-sided signals have a green cycle symbol alongside a green/red man.

If a two-stage toucan crossing is required in exceptional circumstances its design should be carefully considered as cyclists may not stop on the refuge.

Figure 141: A busy toucan crossing at Hyde Park Corner

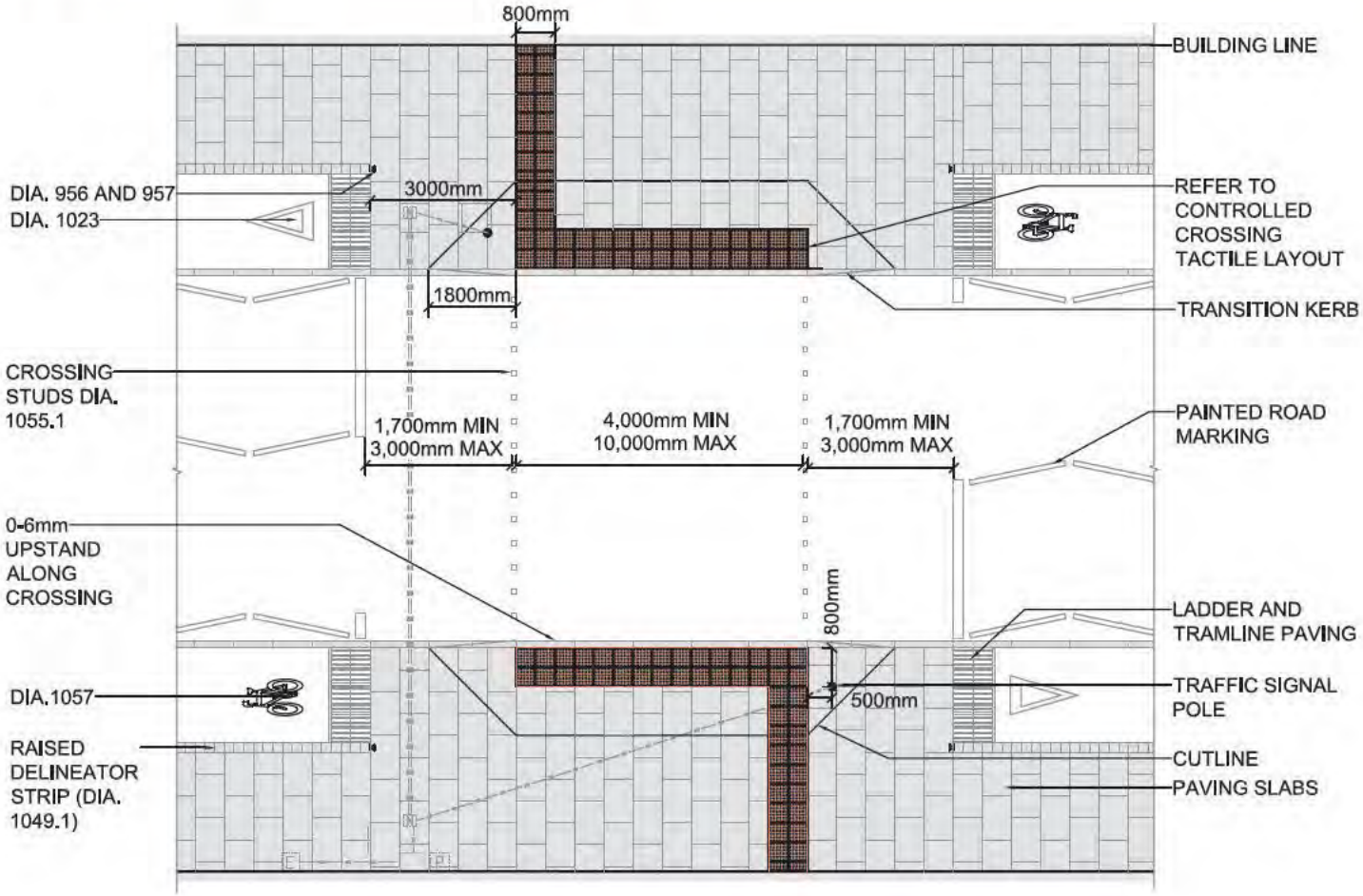
### Layout criteria

| Straight-across toucan crossings | |
|---|---|
| Preferred minimum crossing width | 4,000mm |
| Maximum crossing width | 10.0 metres |
| Dropped kerbs | 1:20 preferred to 1:12 (maximum) |
| **Additional requirements where a central refuge is provided** | |
| Recommended minimum central refuge width | 3,000mm |
| Recommended minimum central refuge length | 8,000mm |
| Kerb upstand around central refuge | 125mm |
| **Additional requirements for staggered toucan crossings** | |
| Central refuge width kerb to kerb | 7,000mm recommended<br>4,000mm preferred minimum |
| Minimum stagger distance between crossing points on central refuge | 4,000mm recommended. Relaxations may be permitted with SDRG approval |
| Stagger for all two-way roads | Left stagger to face oncoming traffic, unless otherwise agreed with SDRG |
| Recommended minimum distance from uncontrolled junctions to primary signal pole | 20.0 metres |

### Good practice

- Far-sided toucan crossings are preferred. This permits the addition of countdown signals
- Signal timings should be appropriate to pedestrian and cycle flows and traffic volumes
- All signal schemes are required to have a design and safety check in line with the Design Standards for Signal Schemes in London
- Tactile rotating cones should be fitted to all controlled crossings
- Audible bleepers should be fitted to standalone signal controlled crossings

Figure 142: Toucan crossings



## Other cycle facilities

Where safety considerations, traffic flow, speed or demand provide justification, signal controlled cycle facilities can be used to enable cyclists to cross. Cycle facilities can come in the form of a toucan or facilities that treat cyclist as a vehicular movement.

There are a range of cycle facilities available to allow cycle routes to cross a carriageway. Please refer to LCDS or speak to the Traffic Infrastructure team for further information.

Figure 143: A signalised cycle facility next to a pedestrian crossing

## Pegasus crossing

Pegasus crossings allow horses and their riders to cross. These crossings are similar to toucan crossings but have a red/green horse symbol and additional push buttons mounted at a greater height.

Figure 144: A parallel toucan and pegasus crossing at Constitution Hill and Duke of Wellington Place

### Layout criteria

| Pegasus crossing | |
|---|---|
| Preferred minimum crossing width | 4,000mm |
| Maximum crossing width | 10.0 metres |
| Dropped kerbs | 1:20 preferred to 1:12 (maximum) |
| **Additional requirements where a pegasus crossing is adjacent to a pedestrian/cycle crossing** | |
| Minimum separation between crossings | 3,000mm |
| Maximum separation between crossings | 5,000mm |
| Other standards apply as per the relevant pedestrian/cycle crossing type | |

### Good practice

- For specific design guidance consult with TfL's Traffic Infrastructure team
- All signal schemes are required to have a design and safety check in line with the Design Standards for Signal Schemes in London
- Tactile rotating cones should be fitted to all controlled crossings
- Audible bleepers should be fitted to the adjacent pedestrian/cycle crossing as detailed in DfT Traffic Advisory Leaflet 3/03

## Diagonal or 'all red signal' crossings

At a signal controlled junction, a diagonal or 'all red signal' crossing provides an exclusive pedestrian stage to enable pedestrians to use all crossing points simultaneously and enable diagonal crossing movements (which may be appropriate for crossings with high, consistent pedestrian flows across all arms).

Figure 145: Diagonal crossing in Wimbledon

### Layout criteria

| Diagonal or 'all red signal' crossings | |
|---|---|
| Preferred minimum crossing width | 3,200mm |
| Maximum crossing width | 10.0 metres |
| Dropped kerbs | 1:20 preferred to 1:12 (maximum) |
| **Additional requirements where central refuge is provided** | |
| Minimum central refuge depth | 2,000mm |
| Minimum central refuge length | 7,000mm |
| Kerb upstand around central refuge | 125mm |

### Good practice

- Signal timings should be appropriate to pedestrian and traffic volumes
- All signal schemes are required to have a design and safety check in line with the Design Standards for Signal Schemes in London
- Tactile rotating cones should be fitted to all controlled crossings
- Audible bleepers should be fitted as detailed in DfT Traffic Advisory Leaflets 4/91 and 5/91

## Controlled non-signalised crossings

### Zebra crossings

Zebra crossings are laid out with alternating black and white bands, marked by zigzag markings on the approach and flashing beacons. Pedestrians only have right of way once they have stepped on the markings designating the crossing. However, pedestrians should remain on the kerbside for safety until approaching vehicles have stopped.

Zebra crossings are therefore only recommended for low speed environments, 35mph or less, provided there are clear sightlines.

Cyclists do not have legal priority over motor vehicle traffic, however it is not illegal, depending on the provision from the footway, to cycle across a zebra crossing.

Zebra crossings are not generally permitted on routes under the Urban Traffic Control (UTC) system, and require SDRG approval.

### Zebra crossings with parallel cycle crossing

Unlike a conventional zebra crossing, this design requires motorists to give way to cyclists using the crossing.

- Belisha beacons are required at each end of the crossing
- Zigzag markings are required at each side of the crossing
- Care must be taken to design out conflict between road uses. The cycle crossing should connect at each end to provide clear coherent cycle routes
- This type of crossing can be used on roundabouts with a cycle lane, as shown below
- For detailed information please refer to London Cycling Design Standards (2014)
- Authorisation to use this type of crossing shall not be permitted until such time as it is approved for use within the TSRGD

Figure 146: Zebra crossing

Figure 147: A zebra crossing with a parallel cycle crossing in Milan

Figure 148: Zebra crossing

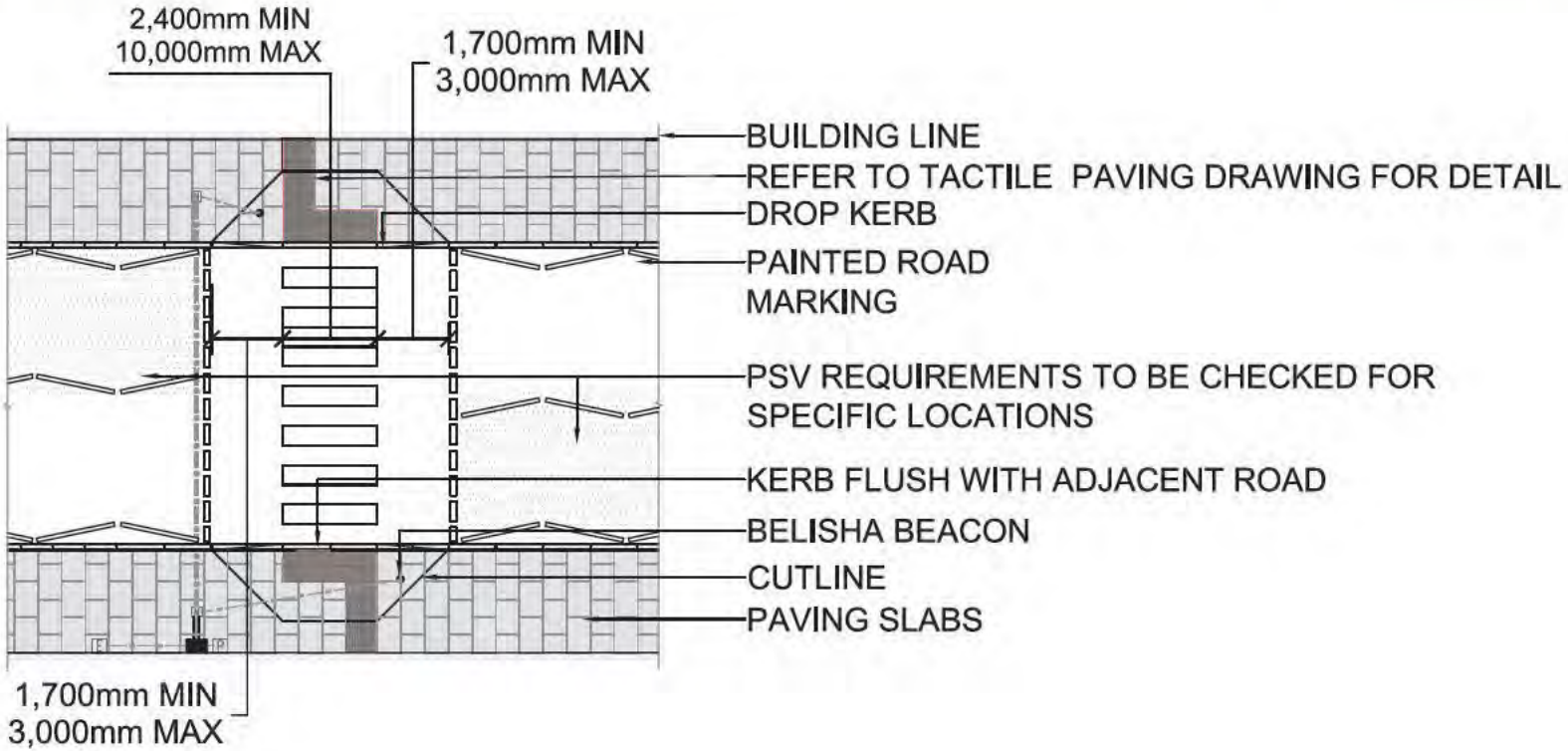
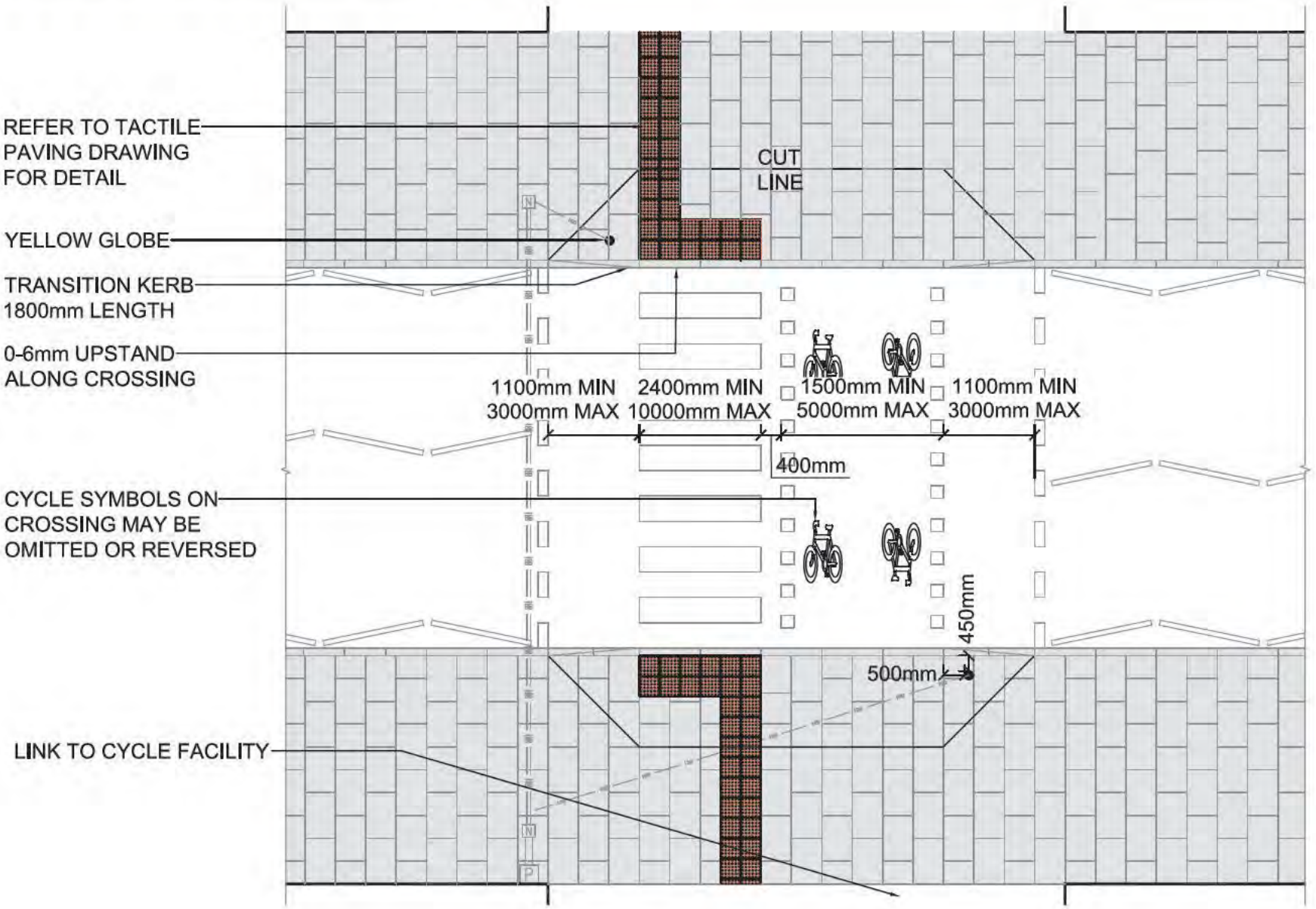


Figure 149: Parallel pedestrian and cycle crossing



**Additional information**

**Department for Transport:**

Guidance on the use of Tactile Paving Surfaces, 2021

Local Transport Note (LTN) 1/95: The Assessment of Pedestrian Crossings, 1995

LTN 2/95: The Design of Pedestrian Crossings, 1995

Traffic Advisory Leaflet 3/03: Equestrian Crossings, 2003

Traffic Advisory Leaflet 5/05: Pedestrian Facilities at Signal-Controlled Junctions, 2005

Traffic Advisory Leaflet 5/91: Audible and Tactile Signals at Signal-Controlled Junctions, 1991

Traffic Advisory Leaflet 1/06: General Principles of Traffic Control by Light Signals, 2006

**Transport for London:**

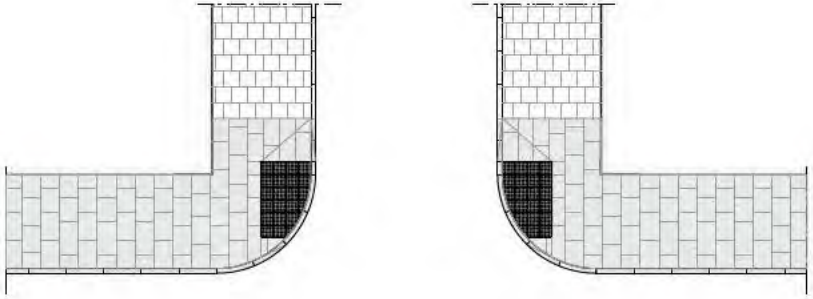
Design Standards for Signal Schemes in London

## 9.4 Uncontrolled crossings

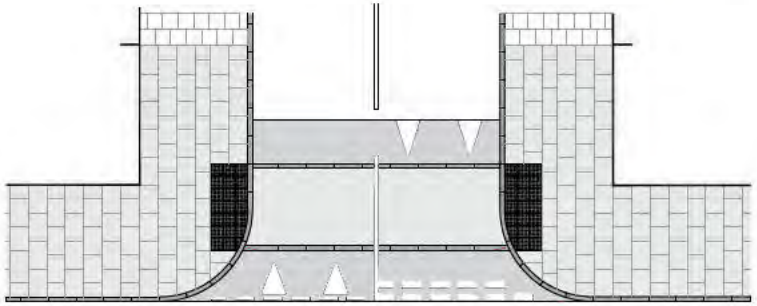
Uncontrolled pedestrian crossings should be located on pedestrian desire lines at side roads or at signalised junctions without pedestrian phases as a 'walk with traffic' facility. The pedestrian does not have priority over vehicles at these crossings and has to seek safe crossing opportunities when traffic is held on a red signal.

Figure 150: Uncontrolled crossing

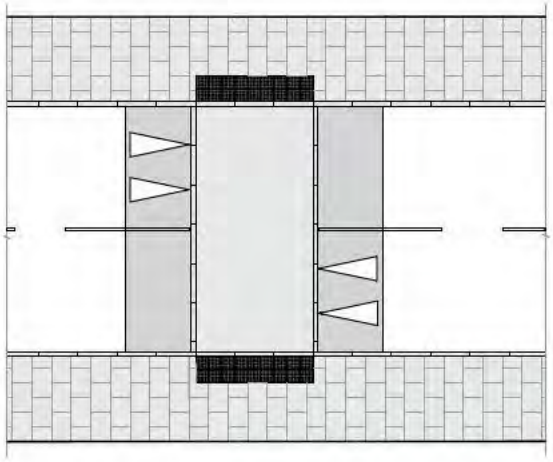
Figure 151: Uncontrolled crossing



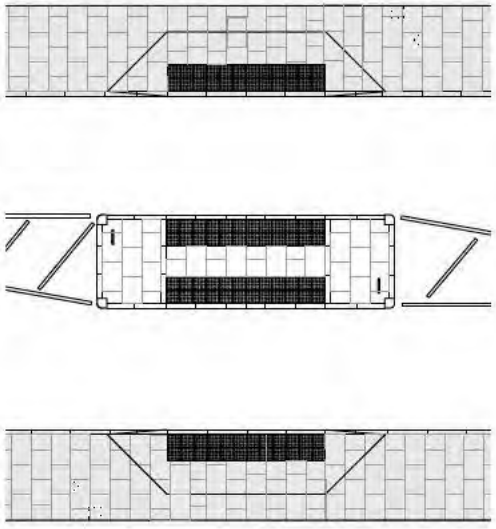
Side road uncontrolled crossing



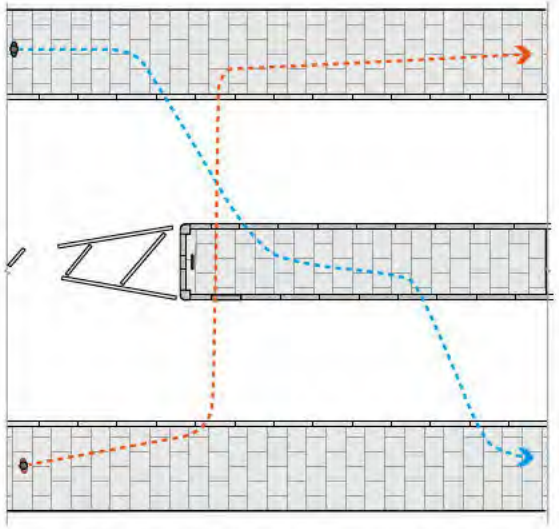
Side road uncontrolled crossing with raised entry treatment



Uncontrolled crossing with raised table



Uncontrolled crossing with refuge island



Typical informal crossing movements supported with central median

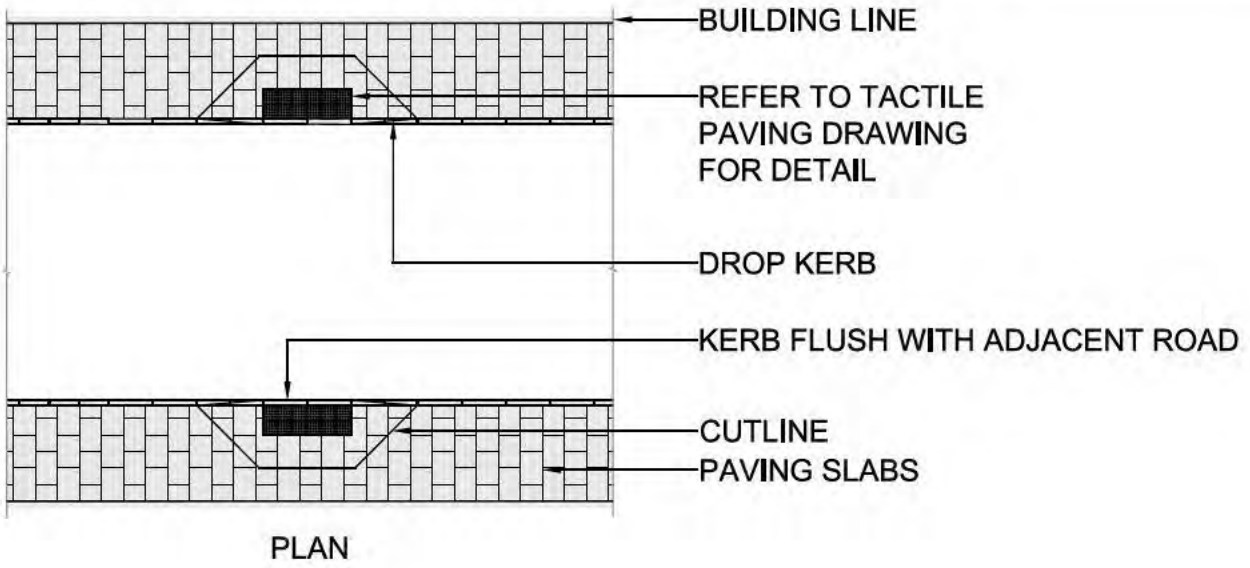
| Crossing category | Crossing type | Stages |
|---|---|---|
| Uncontrolled crossing types | Uncontrolled | 1 or 2 |
| | Traffic island | 2 |
| | Dropped kerb | 1 |
| | Side road entry treatment | 1 |
| | Courtesy crossing | 1 |
| | Informal island | 1 or 2 |

| Uncontrolled pedestrian crossing design standards | |
|---|---|
| Preferred minimum central refuge width | 2,000mm |
| Absolute minimum central refuge width | 1,500mm |
| Dropped kerbs | Flush with carriageway |
| | 1:20 optimum gradient to 1:12 maximum |
| | Provided at least every 100 metres on residential roads |
| Tactile paving | Contrasting grey/two rows deep/no tactile tail |

The provision of tactile paving and a dropped kerb on each side of the road helps to delineate the crossing point. Central refuges may be provided at uncontrolled crossings to facilitate crossing in two stages and protect pedestrians from traffic. Uncontrolled crossings are appropriate where there are moderate to low vehicle flows.

Where traffic capacity at a junction does not allow for a green pedestrian crossing phase in the signal timings, an uncontrolled crossing point may be provided. These arrangements are not recommended for locations where there are moderate to high pedestrian flows with evidence of a crossing desire line.

Figure 152: Uncontrolled crossings may or may not be combined with an island



## Side road entry treatments

Entry treatments should be used to emphasise pedestrian priority and as traffic calming devices. Generally they are placed across a minor road at, or within a short distance of a junction with a major road.

Side road entry treatments are generally only used in urban areas and may be implemented in isolation or as part of a series of traffic calming features. They should not be used adjacent to high speed road environments as vehicles turning on to the ramp and raised table are required to move at low speeds. A side road entry may be considered for an intersecting road which is of a lower movement order than the adjoining road.

Figure 153: A side road entry treatment at Windrush Square, Brixton

Entry treatments aim to achieve a combination of objectives relating to safety and user priority, through a series of physical interventions:

| Objective | Corresponding design intervention |
|---|---|
| Denote a change in street character where a side road intersects a major road type and signals to drivers that they are entering or leaving a different traffic condition and should act accordingly | Use materials to suggest greater pedestrian presence and priority on the side road |
| To emphasise pedestrian movements | Raise carriageway level to footway level<br>Reduce the carriageway crossing distance<br>Use materials to suggest greater pedestrian presence and priority |
| Reduce vehicle speeds on the approach | Provide a change in surface before the junction<br>Include vertical deflection |
| Reduce vehicle speeds through the turn | Tighten corner geometries |
| Improve junction visibility | Provide footway build-outs to deter parking near the junction |
| **Additional site specific objectives** | **Corresponding design intervention** |
| Identify the start of a 20mph zone or traffic calmed area | Use a combination of measures including signage, carriageway surface materials and build-outs |

## Design

Side road entry treatments should consist of:

- An uncontrolled crossing with appropriate tactile paving treatment
- A crossing width of minimum 2,400mm
- A flush crossing surface raised to footway level through vertical deflection
- Tight corner radii of 3,000mm or less to control vehicle entry speeds, with radius kerbs used
- Footway build-outs where appropriate to reduce carriageway width
- The extent of carriageway narrowing should be based on local traffic flows and classified turning movements.
- The highest point on a flat-topped road hump must be no more than 100mm above carriageway level. Where a standard 125mm kerb is provided, the surrounding carriageway needs to be built up, so that the side road entry does not exceed a 100mm rise above carriageway level
- One-way side roads should provide carriageway widths suitable for single vehicle access, usually in the range of 3,000mm to 6,000mm dependent upon the vehicles expected
- Two-way side roads should ideally be between 5,000mm and 6,500mm wide

## Good practice

- Entry treatments should not interfere with vehicle access to properties
- Street furniture may be introduced on widened footways as part of the entry treatment and should be selected in accordance with Streetscape Guidance
- Relocate drainage gullies where necessary and avoid locating within the uncontrolled crossing
- Designers should review the impact of carriageway narrowing on cycling

Figure 154: Uncontrolled raised crossing

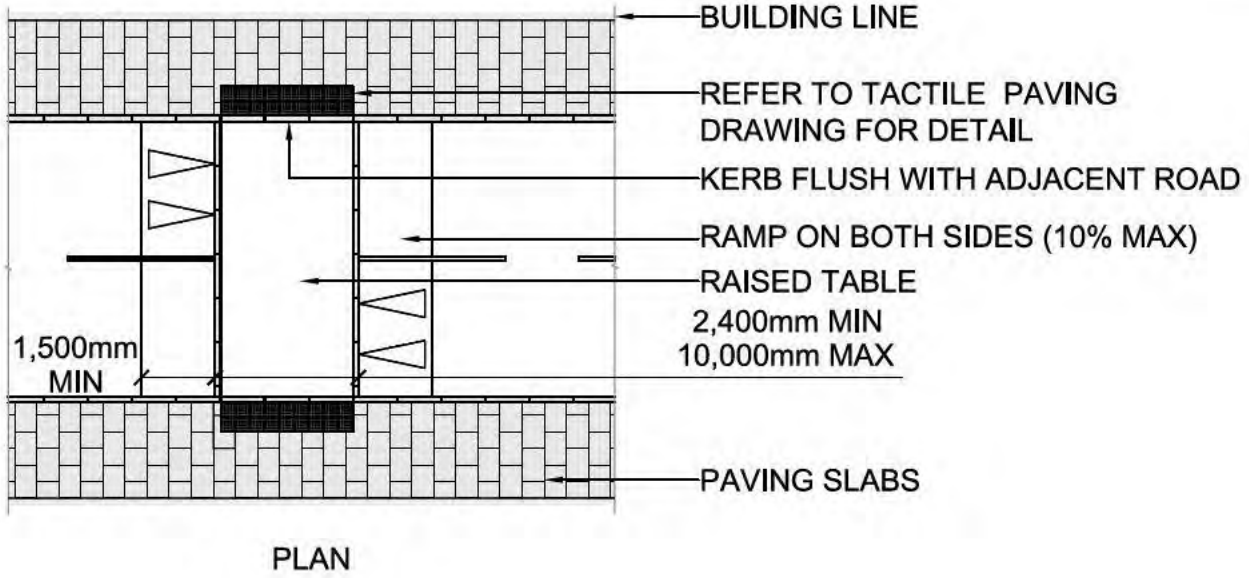
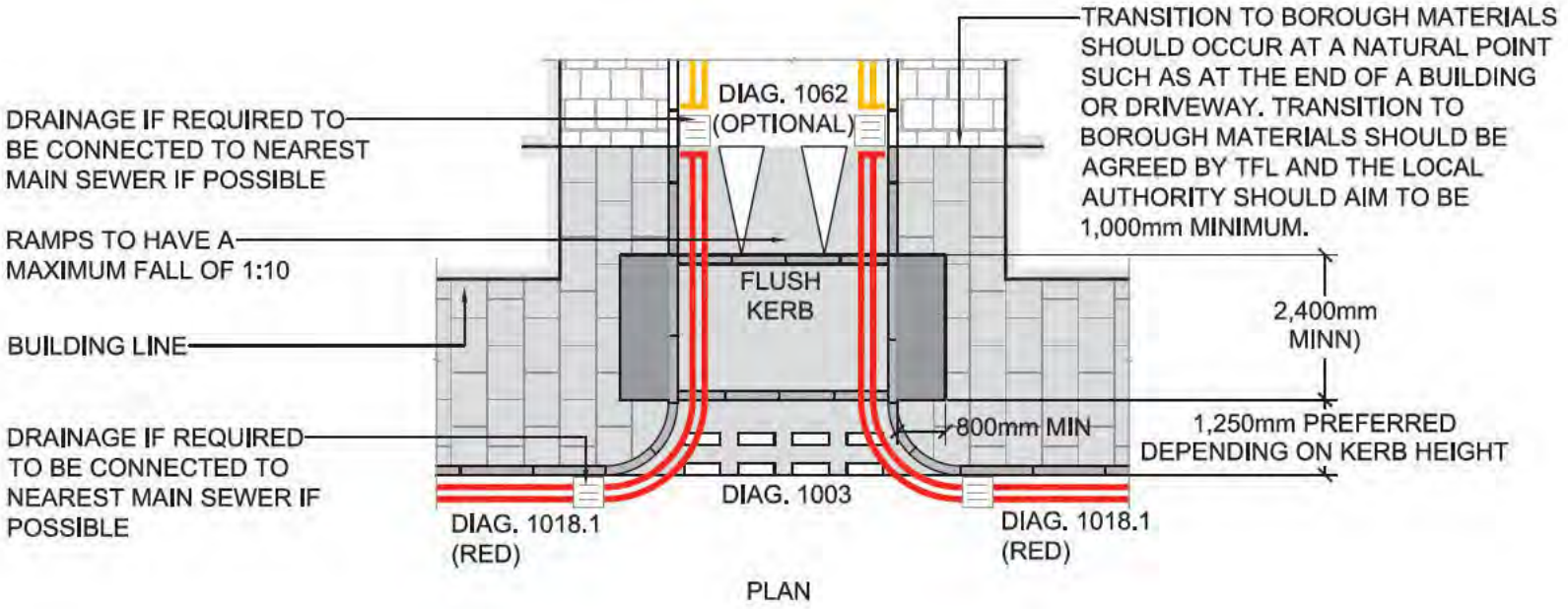
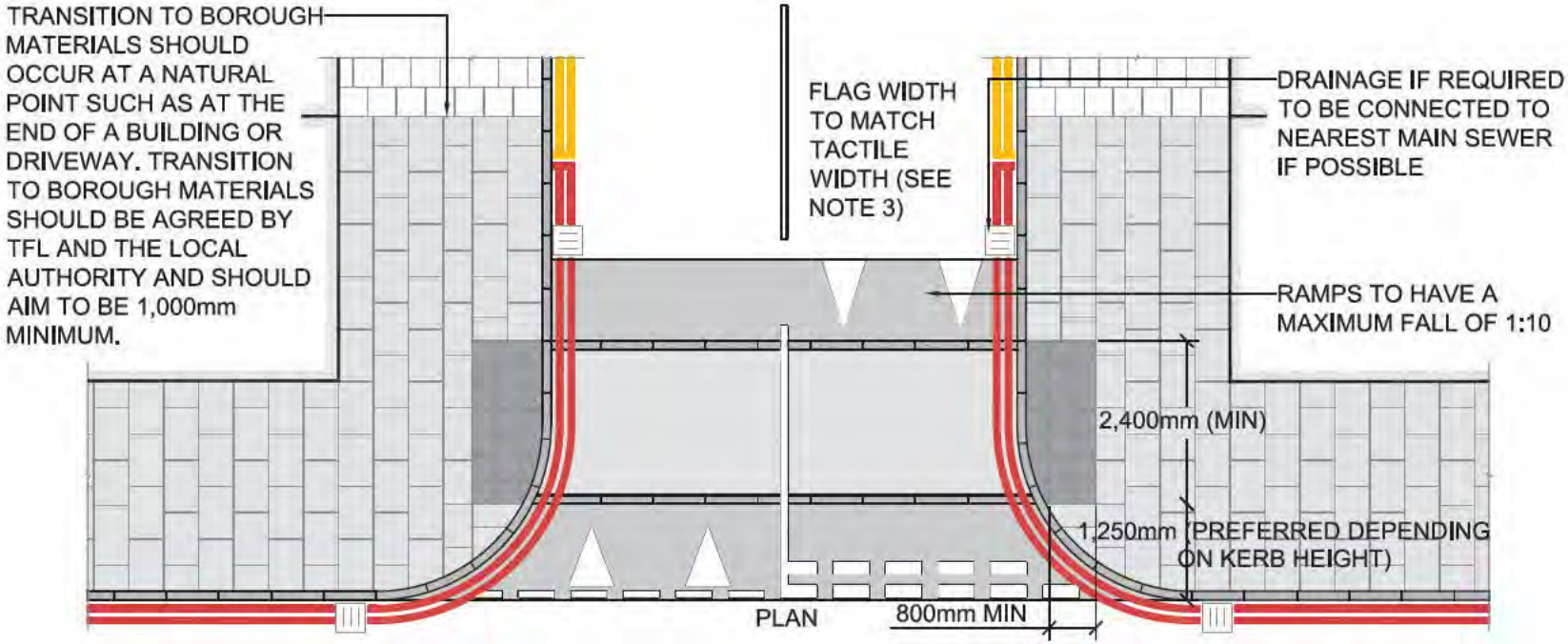


Figure 155: Side road (one-way) raised entry treatment




1. Entry treatments can be constructed using asphalt, setts or blocks. Material selection should be in keeping with the context.
2. The bonding of paving to be cut around utility service covers unless directed by the resident engineer.
3. Cutting materials should be kept to a minimum and should not be cut so that a width less than 300mm remains.
4. All covers within the tactile areas have to be recessed and in-filled with blister paving. It is desirable for the rest of the covers to be recessed in order to match the footway surface but this needs to be agreed with TfL and the utility companies need to be contacted in order to get an agreement and request appropriate labeled assets.
5. Where side road entry treatments are added, and surrounding asphalt is not replaced, kerbs are to be used on the bottom edge of the ramps in order to achieve a clean channel.
6. Drainage locations shown are indicative and should only be used if required.

Figure 156: Side road (two-way) raised entry treatment




1. Entry treatments can be constructed using asphalt, setts or blocks. Material selection should be in keeping with the context.
2. The bonding of paving to be cut around utility service covers unless directed by the resident engineer.
3. Cutting materials should be kept to a minimum and should not be cut so that a width less than 300mm remains.
4. All covers within the tactile areas have to be recessed and in-filled with blister paving. It is desirable for the rest of the covers to be recessed in order to match the footway surface but this needs to be agreed with TfL and the utility companies need to be contacted in order to get an agreement and request appropriate labeled assets.
5. Where side road entry treatments are added, and surrounding asphalt is not replaced, kerbs are to be used on the bottom edge of the ramps in order to achieve a clean channel.
6. Drainage locations shown are indicative and should only be used if required.

## Materials

Side road entry treatments are generally provided in one of two conditions:

- In asphalt to indicate traffic calming with continuous footway priority
- In setts to redefine the emphasis of the carriageway as footway (SDRG approval must be sought)

Flush granite edge constraints should be provided at the top of the ramp and at the bottom if the ramp is composed of a different material.

Where pedestrian flows are high relative to motor vehicle turning movements, design teams may consider continuing the footway surface material across the side road entry as a 'blended footway'. No kerb line delineation or tactile paving is required in this instance as pedestrians have priority.

Standard construction for a narrow side road entry treatment with asphalt across the carriageway.

## Additional information

### Legislation:

The Highways (Road Humps) Regulations 1999

## 'Continuous footway' treatment Clapham Old Town, London

Bespoke 'continuous footway' treatment, continuing the footway surface across a side road

### Key functions

### Opportunity

Clapham Old Town in southwest London is largely composed of attractive 18th century buildings. Despite being a conservation area, the surrounding streetscape was in poor condition. The pedestrian environment was unappealing because it was dominated by swathes of empty asphalt.

### Benefits

Continuous footways at side roads (previously unseen in the UK) provide a coherent pedestrian environment. Well-chosen materials enhance the historic buildings and sense of place.

### Implementation

A collaborative effort by TfL, London Borough of Lambeth, local residents and a specialist consultancy produced a series of design options. These were refined through extensive public consultations to produce an area-wide scheme.

The final result is a step change in the quality of the public realm.

### Applying in London

This method should be regarded as experimental in the UK. Further development and research is needed, in consultation with access groups, to determine acceptable approaches, given concerns over the lack of delineation between the footway and the area accessible to vehicles that runs over the entry treatment. Any proposals of this nature are subject to SDRG approval. Any proposal must be subject to an Equality Impact Assessment

## Informal crossings

Designers should also acknowledge the significance of informal pedestrian crossing movements as part of the streetscape. An informal crossing point can be any location where a pedestrian chooses to cross the carriageway and is the product of a pedestrian assessing the road conditions before following their desire line.

Although it may not have been explicitly designated as a crossing point in the scheme layout, designers should consider informal crossing demand and whether to provide additional design support to encourage or discourage informal movements. This will depend on the design context, the character of the road, traffic speeds, surrounding land uses and pedestrian flows.

## Central refuge islands

- Central refuge islands enable pedestrians to cross the road in two stages, providing a safe standing area to wait to cross. They can be introduced on controlled, uncontrolled and informal crossing types
- Where refuge islands are specified they need to provide a minimum depth of 1,200mm and 2,400mm crossing width. This should be increased for crossings with high pedestrian flows or for straight-across two stage crossings
- Refuge crossing provision should be consistent with the crossing detail on the footway
- Consider the needs of cyclists on the carriageway who require sufficient space adjacent to the central refuge pinch point. This should be either at least 4,000mm where the speed limit is 30mph or greater, or 3,200mm or less where the speed limit is 20mph or lower (subject to site conditions)

## Additional information

### Department for Transport:

Guidance on the use of Tactile Paving Surfaces, 2021

Local Transport Note (LTN 1/95): The Assessment of Pedestrian Crossings, 1995

Local Transport Note (LTN 2/95): The Design of Pedestrian Crossings, 1995

Traffic Advisory Leaflet 5/91: Audible and Tactile Signals at Signal-Controlled Junctions, 1991

### Transport for London:

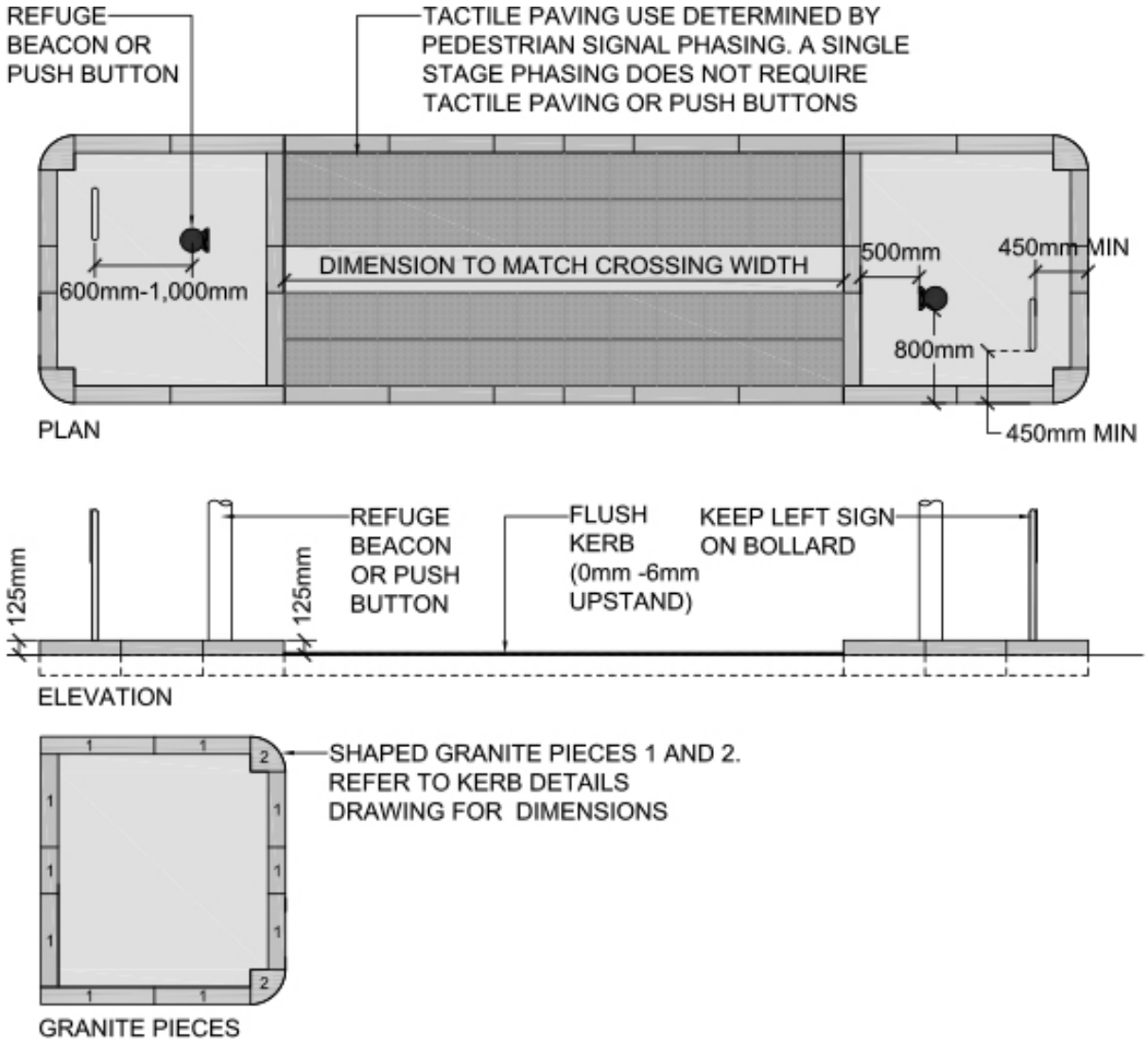
Bus pre-signal assessment and design guidance – Bus Priority Team technical note BP1/05, July 2005

Bus priority at traffic signals keeps London's buses moving – Selective Vehicle Detection (SVD), January 2006

Design Standards for Signal Schemes in London, 2011

Traffic calming measures for bus routes – Bus Priority Team technical note BP2/05, September 2005

Figure 157: Pedestrian refuge islands – straight-across crossing




Notes

1. Granite kerbs to comply with BS 435.
2. Precast kerbs to comply with BS 7263: Part 1.
3. Refer to hooped bollard drawin for keep left sign.
4. Signal poles must be positione to provide a minimum lateral clearance of 450mm from all signal equipment to kerb face.
5. Where a pedestrian crossing phase is limited to permit pedestrians to cross a whole carriageway in one movement, then the width of the refuge in the carriageway could be an absolute minimum of 1,500mm This width should be increased to at least 2,000mm at areas used for pedestrian refuge to permit a pedestrian with a pram or wheelchair to wait in safety.
6. All street furniture to be installe using retention sockets.
7. If a lighting column is required (subject to lighting levels) they should be combined with the signal posts/push buttons where possible.

## 9.5 Traffic signals and controller cabinets

### Streetscape issues

Traffic signals and poles can add unnecessary clutter to the streetscape. In addition, signal controller cabinets and associated equipment can create obstructions on the footway. Any redundant equipment must be removed and the footway reinstated to match the surrounding surfacing.

While ensuring any design is fully compliant with signal design standards, design teams should undertake a streetscape review to ensure that junctions and crossings also conform to current best practice in relation to urban design and accessibility. This should include a priority to reduce street clutter by minimising the number of poles used to deliver a signal scheme, for instance by mounting signal heads on street light columns or by combining multiple signal heads on one pole.

The design and placement of controller cabinets should be in accordance with section 12.7.

Figure 158: Traffic signal for toucan crossing

### Design

- Traffic signals must be designed in accordance with TSRGD
- Traffic control systems must be designed in accordance with the specification TR2500
- Design should consider good practice standards outlined in LTN 1/98 The Installation of Traffic Signals and Associated Equipment
- The effective design and layout of signals requires an understanding of a number of interrelated factors including the road context and proximity to any junctions, traffic and pedestrian flows, existing desire lines, traffic speeds and road safety issues

- TfL is the traffic authority for traffic signals across London, including the Strategic Road Network and roads which are managed by the local highway authority. The Traffic Infrastructure (TI) team within our Surface Asset Management is responsible for the design, installation, commissioning, maintenance and decommissioning of traffic signals and associated equipment
- Streetscape Guidance encourages design teams involved in any new or modification of existing signals, to work closely with the TI team to ensure that the scheme will function safely, while minimising the adverse visual and physical impact on the streetscape
- Backing boards are not normally fitted to signal heads in London, except on TLRN roads with speed limits greater than 30mph. They may also be considered in exceptional circumstances when a visibility issue has been raised, such as on east-west road alignments where the sun can impact on drivers' vision, or if surrounding street lighting creates additional glare or by an engineer's judgement
- High six metre poles with additional signal heads may be used where there is a clear design need or a safety issue

Figure 159: Trixi mirrors are used by motorists at junctions to detect cyclists in their blind spot

## Smart's 'For More Safety' campaign Lisbon, Portugal

Dancing red man keeps pedestrians safe

### Key functions

### Opportunity

In Lisbon, a campaign by Smart entitled 'For More Safety' uses the red phase of a pedestrian signal to entertain people while they wait to cross a busy junction.

### Benefits

The campaign is reported to have made 81 per cent more people stop at the junction.

### Implementation

A video booth near the junction transmits live volunteers who dance to music of their choosing while feeding back reactions of people.

### Applying in London

An entertaining pedestrian crossing such as this could be applied to one of London's many busy central junctions.

## Additional information

### Statutory instruments:

Traffic Signs Regulations and General Directions, 2002 and 2015

### Department for Transport, Highways Agency:

Design Manual for Roads and Bridges, Volume 8, Section 1, TA 84/06: Code of Practice for Traffic Control and Information Systems for All-Purpose Roads

### Department for Transport:

Local Transport Note (LTN 1/98): The Installation of Traffic Signals and Associated Equipment

### Transport for London:

Bus pre-signal assessment and design guidance – Bus Priority Team technical note BP1/05, July 2005

Bus priority at traffic signals keeps London's buses moving – Selective Vehicle Detection (SVD), January 2006

Design Standards for Signal Schemes in London, 2011

## 9.6 Grade-separated pedestrian crossings

### General principles

Where other design approaches are not possible, grade-separated crossings can reduce the severance effect of major highways and other barriers. They need to be designed very carefully, to make them easy to use, direct, safe and attractive. They should always cater for people on foot and on cycles.

Grade-separated crossings on the TLRN are most commonly found on high speed roads (40mph or greater) and at complex junctions. In London these often take the form of subways rather than footbridges to minimise the visual intrusion on the street environment.

Figure 160: This footbridge L01 crossing Ruckholt Road, becomes a landmark through use of bright colours and thoughtful design

Grade-separated crossings should only be considered in exceptional circumstances where high vehicle speeds and traffic capacity need to be maintained and where there is evidence that road safety risks would not support at-grade facilities. This should be prioritised where designated cycle routes meet a barrier in the form of a motorway or topographic constraint, such as a river, and the route needs to continue.

### Benefits

- Provides the opportunity for improved connectivity between neighbourhoods severed by a high speed road network
- Separated crossings are considered safer than at-grade facilities for high speed road types
- Enables continuity for cycle and pedestrian routes
- Does not impact on traffic capacity
- Wide land bridges can provide additional amenity and green infrastructure value

### Constraints

- Expensive to construct and maintain
- Will only be used by pedestrians if it is situated appropriately on a desire line and does not require negotiating a large number of steps or ramps
- Requires additional space for constructing a landing point and approach ramp
- May pose a personal security risk if not well-lit or with adequate surveillance

Figure 160: A footbridge in Queen Elizabeth Olympic Park in Stratford, London

| Grade-separated crossing design standards | |
|---|---|
| Minimum grade-separated crossing width for pedestrian only use | 2,000mm |
| Optimum grade-separated crossing width for shared use with cyclists | Minimum 4,000mm effective width |
| Minimum subway height for pedestrian only use | 2,300mm |
| Recommended subway height for shared use with cyclists | 2,300-3,000mm |
| Optimum ramp gradient | 1:20 |
| Optimum landing dimensions | 1,200-1,800mm in depth |
| Maximum number of steps in a flight | 12 steps |
| Corduroy paving | 800mm provided at the top and bottom of each flight of steps |
| Handrails | Provided on both sides of steps<br>Central handrail required for widths greater than 3,000mm |

## Melkwegbrug Purmerend, Netherlands

Distinctive, attractive and practical crossing for pedestrians and cycles

### Key functions

### Opportunity

Whether a bridge is needed to cross a river or a motorway, inspired designs act as icons within the community making it a place in its own right.

### Benefits

The creation of the Melkwegbrug in Purmerend, Netherlands was such a project as it connected two communities and reinforced the identity of the area.

### Implementation

This double bridge provides facilities for cyclists and pedestrians. The pedestrian arch rewards users with a panoramic view and the 'z' shaped bridge provides an accessible ramp for cyclists and wheelchair users.

### Applying in London

New infrastructure in London should seek to enhance or reflect local context while acting as a beacon thereby making it a destination in its own right.

## 9.7 Subways

Subways can provide high capacity pedestrian and cyclist crossing opportunities in relatively constrained urban environments where carriageway or architectural constraints limit other crossing options. They can, however, provide a low quality environment, lacking natural surveillance and forcing pedestrians to deviate from the surface. This can also cause difficulties for people with mobility impairments. These issues may result in people choosing to cross informally to avoid using the subway.

### Removal

Opportunities to provide at-grade pedestrian crossing facilities to replace subways should be explored.

Figure 162: Old Street subway entrance built in 1969 has been recently updated with brightly coloured graphic devices to aid in wayfinding


Where at-grade crossings are implementable, subways should be closed for access (see TfL Surface Transport Panel note on Subways). This may open up new potential uses for the subway space, such as storage, or could enable the creation of additional useable space where the access ramps are infilled.

Figure 163: Bricklayers Arms roundabout subway closure in Southwark, before and after

### New subways

New subway crossings should only be implemented in exceptional circumstances where high pedestrian demand cannot be provided for with an at-grade facility.

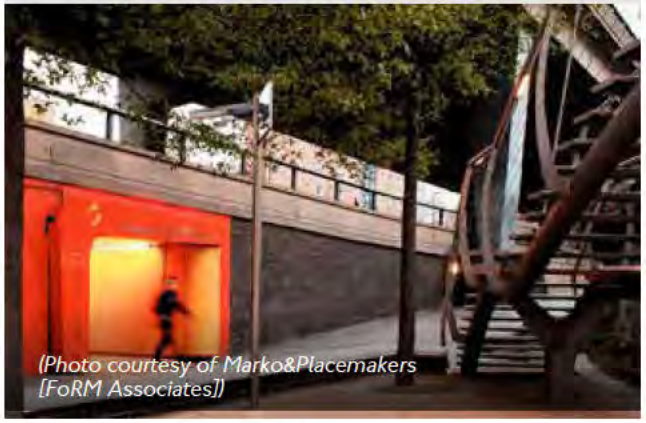
They need to be located as close as possible to existing pedestrian (and where appropriate, cyclist) desire lines and should be supported with a consistent wayfinding signage to support legibility.

To accommodate cyclists, subways require direct sightlines and avoid sharp corners at their entrances and exits.

### Security

- Lighting should be in accordance with BS 5489 (Code of practice for the design of road lighting) within the subway and on the approach, ramps and steps. Walls, floors and ceilings should be designed to reflect light
- Vandal-resistant and sound deadening materials should be used within the subway to minimise echo
- Tiling and artwork produced by the local community should be considered to deter vandalism
- CCTV may be used to promote a sense of personal security, and mirrors should be provided to enhance visibility

Figure 164: A subway entrance acts as a beacon in the streetscape



*(Photo courtesy of Marko&Placemakers [FoRM Associates])*

Figure 165: Artistic lighting used to illuminate a subway and enhance the character of the place

*(Photo courtesy of Raphael Daden)*

## Additional information

**Transport for London:**
Surface Transport Panel – Subways (2009)

**Department for Transport:**
Design Manual for Roads and Bridges, Volume 6, Section 3. TD36/93: Subways for Pedestrians and Pedal Cyclists. Layout and Dimensions

## Odenplan piano key staircase Stockholm, Sweden

Musical staircase encourages physical activity at subway entrance

### Key functions

### Opportunity
Odenplan is a station on Stockholm's T-Bana (metro system). It is a busy station, near the city centre.

### Benefits
Physical inactivity is a worldwide problem. On urban metro systems, most people will use an escalator in preference to an adjacent staircase

The piano key staircase led to 66 per cent more people choosing the stairs than had done so previously. By making them fun to use, the extra effort of climbing the stairs was offset by the pleasure of making music.

### Implementation
The station's staircase was converted into a large piano keyboard. Controlled by sensors, each stair would play a musical note when stepped on. It was therefore possible to play a musical scale by climbing or descending the stairs.

### Applying in London
Technology is relatively easy to transfer – potentially suitable for Tube stations that do not see huge tidal flows.

## 9.8 Pedestrian and cycle bridges

### Existing

Pedestrian and cycle bridges within central London cross railway lines, watercourses and roads and inherently form an important part of the streetscape by integrating routes within the walking and cycling networks.

The palette of materials on the bridge structure itself may differ from the standard palette set out by Streetscape Guidance, but should interface cleanly with the street. This can be achieved through high quality detailing at the transition point between the street and bridge structure.

Figure 166: Footway bridges, such as the Millennium Bridge in central London, provide important links and can also become landmarks in their own right if well designed

Figure 167: One of the Golden Jubilee footbridges

Approaches should be clearly signposted with consistent wayfinding support. Existing footbridges should be inspected regularly to identify surface defects and ensure structural integrity.

### Proposed

Proposals for major infrastructure should demonstrate a clear need for improving connectivity by identifying wider community, health and journey time saving benefits.

New layouts should look to support key walking routes and be sympathetic to the surrounding urban character in their architecture and material palette.

Where possible any new structure should use the existing topography to minimise visual intrusion on the landscape and avoid obstructing key views. Layouts should allow for step-free access and accommodate cyclists where appropriate with a coherent route.

Materials should satisfy the same design considerations as footway surfacing materials with good slip resistance qualities, visual contrast at steps and changes in gradient and high durability.

### Additional information

**Department for Transport:**
Design Manual for Roads and Bridges, Volume 2, Part 8

Figure 168: The bright colouring of this bridge acts as a beacon in the streetscape

Figure 169: Necessary structural elements can be designed to be beautiful elements in their own right

*Image courtesy of Mark Humphreys*

## 9.9 Road bridges

This section details streetscape design considerations for bridges which support motor vehicle traffic. In most inner city areas, bridges will also provide access for pedestrians on the footway (for pedestrian and cycle bridge design guidance, see 'Pedestrian and cycle bridges').

Figure 170: Tower Bridge is an international symbol of London

From a streetscape perspective, bridges are an extension of the street environment and should be considered a cohesive and integral part of the road network. Bridges differ from a standard street arrangement in that there will typically be no active frontages or intersecting side roads. Most bridges can therefore be considered a linear self-contained link; one where vehicles and pedestrians only enter from either end. For this reason it is important to ensure that a consistent approach is adopted across any bridge structure, in layout and materiality.

### Design considerations

- Bridge alignments should be selected to minimise the use of retaining structures, while making the crossing as square as practicable to the existing road geometry
- Footways, cycleways and road widths should be maintained across the full length of the bridge where practicable, with regular kerb alignments. Any change in alignment should consider the potential impact on cyclists
- A preferred minimum footway width of 2,000mm should be provided on both sides of the carriageway
- The needs of cyclists and other non-motorised vehicle traffic must be fully considered in any bridge design
- Street furniture on the bridge itself should be kept to a minimum to maximise footway capacity
- Parking bays should not be implemented within the bridge structure or on the approach
- For bridges located close to non-signalised junctions, any associated infrastructure such as guardrails should be positioned so as not to reduce visibility for motorists and pedestrians
- Designers should look to minimise the use of guardrails on bridges and only consider where there is a proven safety issue
- At-grade pedestrian crossings should be provided within close proximity to either end of the bridge structure
- Utility cabinets and access arrangements may become clustered at either end of the bridge. Design teams should look to ensure that the approach remains as unobstructed and free from clutter as possible
- All bridges in visually important locations shall be given appropriate aesthetic design considerations. This may include artwork and bespoke design treatments, upon approval by the SDRG
- Designers should consider all sides of the bridge aesthetics, particularly the underside and how it relates to other roads and the surrounding architecture

## Materials

- The bridge streetscape should be designed to provide a seamless transition from the surrounding street environment
- Surface paving should continue as it is found on the approach to the bridge structure. Paving units may require a consistent cut across the full length of the footway should a change in gradient be required
- Expansion joints should be carefully detailed with respect to any adjoining paving materials
- Trees on bridges should generally be avoided. Consult the Arboriculture and Landscape team for further information
- Lighting should be carefully considered so as to provide a symmetry and quality that enhances the architecture of the bridge structure. In exceptional circumstances, lighting may be incorporated within the bridge structure itself
- Signage should be used on the approach to the bridge but should be avoided on the bridge
- Acoustic protection for adjacent land uses may be required
- Materials for the actual bridge structure are to be selected on a basis of maximising durability, while minimising maintenance requirements
- Timber is only acceptable for use as cladding in exceptional circumstances, where the bridge has a significant role for pedestrians

## Additional information

**Department for Transport, Highways Agency:**

Design Manual for Roads and Bridges, Volume 2 – Highway Structures: Design (Substructures and Special Substructures), Materials

**Transport for London:**

London Cycling Design Standards (2014)

## 9.10 Road underpasses and bridges over roads

The density of London's road network frequently creates situations where underpasses and bridges over roads are necessary to provide convenient and direct routes.

Underpasses are a particularly challenging design context for upholding the values of Streetscape Guidance. Underpasses should be carefully considered so as to promote a greater sense of quality, especially for those routes which serve as pedestrian and cycle links alongside the carriageway.

Figure 171: Euston Circus underpass, clad in metal reflects light

Figure 172: Bridge creating a friendly urban environment under its structure

### Design

- Footways should preferably be provided on both sides of the underpass where there are local pedestrian links. An unobstructed width of minimum 2000mm should be provided
- For roads with speed limits of 50mph or more, footways alongside underpasses are not appropriate and road restraint systems should be considered on the approach to the underpass

Figure 173: Light installation in the railway bridge at Southwark Street and Redcross Way near London Bridge transforms a drab underpass into a dynamic environment

*(Image courtesy of www.piersvan.com/category/travel/)*

- Structural constraints may limit the capacity for adequate footway widths to be provided on both sides of the underpass. A wide footway on one side may be considered in these locations, assuming adequate crossing facilities are provided for pedestrians on the approach
- Underpasses should be designed to promote a sense of security. A well-lit and open aspect structure is important, to minimise opportunities for concealment
- The approach slopes to underpasses require special attention such that gradients remain in line with the Equality Act
- Designers should pay particular attention to the integration of utility access chambers, as these must be set flush with finished levels
- On long stretches of an underpass, in excess of 20 metres, the provision of an emergency telephone should be integrated within the wall structure. The telephone must be wheelchair accessible and fitted with an inductive coupler.
- Tiling, artistic lighting and other public realm treatments are encouraged in all underpasses to enhance the pedestrian environment, improve lighting and improve a sense of safety

## Materials

- Paving materials should be consistent with either side of the underpass
- Gabions for underpass walls on the TLRN require SDRG approval
- Consider acoustic measures within underpasses to reduce noise pollution and provide a better environment for pedestrians and cyclists
- Guardrailing may be required in exceptional circumstances where there are narrow sections of footway
- Safety containment kerbs should be considered where road speeds are 40mph or greater

## Additional resources

**Department for Transport:**

Design Manual for Roads and Bridges, Volume 2, Section 9

# Part E Kerbside activity



## 10.1 Vision

Kerbside activity seeks to address the allocation of space on carriageway and at the kerb edge on the footway to accommodate the needs of users without detracting from the quality of the environment. This section details how to achieve a high quality interface and serve the needs of various users.

Figure 174: A loading bay in use by a private vehicle and a lorry at one time

## 10.2 Parking and loading bays

Loading and, where appropriate parking, allocation is important for supporting local businesses and providing for a range of users' mobility needs. Parking and loading bays should be designed to ensure that their use, and turnover of use, best provides for surrounding buildings and the character of the street.

The distribution, placement and type of bay provided should correspond to the surrounding land uses and the dimensions of the street. The arrangement of parking and loading controls should not restrict the free and safe flow of traffic, particularly buses, nor should they adversely impact on pedestrian movement.

Our Kerbside loading guidance provides in-depth advice on loading requirements for the TLRN and should be referred to when designing loading bays. Street Audit: Freight Mode (also known as Freight Environment Review System) is a valuable tool to ensure appropriate delivery and servicing consideration.

This section covers a range of parking and loading bays including on-street and on-footway parking and loading by coaches, freight and private vehicles.

### Parking and loading activities

Parking and loading activities exhibit different vehicle use characteristics that will vary at different times of day. These characteristics should be considered when assessing whether to locate parking bays or loading bays, and how these should be managed:

- Parking typically involves the driver leaving the vehicle for any length of time within the defined parking limits
- Loading involves the collection or delivery of goods to a nearby property and is generally conducted over a short period. Loading bays usually have a greater turnover of vehicles, and may have periods where the bay is unoccupied

Figure 175: A parking bay paved in granite setts extends the footway when not in use

## Car clubs

Car clubs provide access to shared vehicles to members on a pay-as-you-drive basis, providing a cost-effective alternative to private car ownership. Car clubs are supported by TfL as a means to promoting sustainable travel choices, helping to reduce congestion, and bring about environmental benefits. London already has one of the largest car club markets in Europe and there is considerable potential for growth.

The main model of car club to date has been the round-trip scheme, where the member rents a vehicle from a designated bay (usually on-street and controlled by the host borough) and returns it to the same bay when the rental period finishes. New models are now emerging where the cars can be used for one-way journeys and either returned to one of a number of designated bays or parked within a defined area. Where dedicated bays are required, these should be visible and easily accessible to both private and business users.

Figure 176: Car Club space demarcated with road markings


All public highway car club bays in London are currently located on borough roads and must conform to the local authority's streetscape requirements. Car club bays may be located on the TLRN in future.

### Good practice

Parking and loading facilities should be located for the convenience and safety of all road users, not just motorists. Bays that permit people to stop should only be introduced where there is no viable alternative location to stop off the highway.

Figure 177: A sign used to demarcate a car club bay


When locating a loading bay, the designer needs to consider the vehicle type and frequency of use. The type of goods being transported may also influence the design of the bay and the surface materials used. For further information please refer to our Kerbside loading guidance.

Figure 178: Unloading activities occurring next to the delivery door

The distance that a load has to be moved can dictate the length of time that a vehicle will need to remain in the bay. Therefore calculating the time it takes for the driver to walk to deliver the goods must be considered to ensure that the loading bay can operate as intended and that users are able to operate legally.

The location of the bay and its signing should take account of, and coordinate with, other street furniture to avoid clutter (see 'Traffic signs'). Bays must be visible to motorists and pedestrians through the use of appropriate markings. Loading and parking bays should be marked using a contrasting paving where possible rather than paint.

## Operation and enforcement

### Operation

Restrictions on the permitted period of use can be defined by means of an appropriate Traffic Regulation Order, so that a bay can operate for all or part of the day. The control can additionally restrict the maximum duration of stay for a single vehicle within the bay.

### Usage

Changes in use may be required over time. Design and operation teams will need to react to patterns of use that may occur throughout the week as well as throughout the day.

Figure 179: Enforcement sign


### Enforcement

A sign detailing restrictions as to the nature of activity, duration and hours of operation must be erected next to the bay for the directions to be enforceable.

### Vehicle and user type

Parking and loading bays can be specifically allocated for use by a particular type of vehicle, for example, buses, coaches, lorries, vans or motorcycles will have different requirements (see sections on 'Motorcycle parking' and 'Coach facilities').

Parking bays can be reserved for particular types of user, for example, Blue Badge holders or doctors.

| Recommended street context | | Minimum bay dimensions |
|---|---|---|
| **Loading bays** | Provide adjacent to commercial or industrial premises which require regular deliveries and collections.<br><br>Minimise transfer distance by aligning delivery doors with destination doors wherever possible.<br><br>Minimise proximity to delivery point to minimise lorry dwell time. | No minimum length for standard vehicles but should be related to vehicle demand and manoeuvring requirements.<br><br>Please refer to Kerbside loading guidance, Appendix 2 for detailed information on loading bay dimensions. |
| **Parking bays (including car clubs)** | Can be provided in a wide range of circumstances including residential streets, commercial and industrial streets. | No minimum length for standard vehicles but should be related to vehicle demand and manoeuvring requirements.<br><br>Absolute minimum width: 1,800mm. |
| **Blue Badge bays** | Reserved for Blue Badge holders.<br><br>Should be located adjacent to local amenities.<br><br>Always consult a local representative group for people with mobility impairments when considering a Blue Badge bay. | Absolute minimum: 6,600mm<br><br>Preferred width: 2,700-3,600mm |

## Types of parking and loading bays

On-carriageway parking bay

### On-carriageway parking/loading bays

Parking should not be permitted within bus or mandatory cycle lanes during the hours in which the lanes operate. Loading may be permitted in certain circumstances, but must be carefully enforced to ensure that the facility is not compromised.

Designers must consider how permitting a vehicle to stop on the carriageway will affect the sightlines of pedestrian and motorists.

On-carriageway loading bay

Designers must allow for good access to the footway from the bay, especially when introducing loading or Blue Badge parking bays. The installation of a dropped kerb next to the bay should be provided, particularly where the delivery of wheeled goods or waste is expected.

Disabled parking combined with loading bays shall generally not be permitted.

Inset bay – flush with carriageway

### Inset parking/loading bays

Inset bays are on-carriageway facilities, fully recessed into the footway, offering additional protection for parked vehicles by being positioned out of the general flow of traffic.

Only in exceptional circumstances should the introduction of inset bays be considered. Such situations should already have a wide footway and a clear demand for loading.

Where designers are considering reducing footway space through the installation of loading bays, either inset or on-footway, we must be consulted and an agreement made.

On footway – flush kerb

On Footway – chamfered kerb

On-footway – dropped kerb

## On-footway parking/loading bays

On-footway loading involves a vehicle mounting the kerb and coming to rest on the footway. On-footway bays enable flexibility in the use of the footway and can be designed to remain clear during peak pedestrian periods.

On-footway bays should be considered as part of any scheme that involves footway widening, where loading, parking or servicing requirements need to be retained and traffic lanes kept unobstructed.

On-footway loading should never be at the expense of pedestrian safety or amenity. Pedestrian Comfort Level assessments should be based on the non-loading part of the footway to ensure it still meets minimum standards when a vehicle is present. Where there are heavy periods of peak pedestrian use it may be appropriate to restrict loading times outside of pedestrian peak flow hours.

Due regard should be given to the construction and material choice to ensure that the footway can support vehicular movement. Designers should ensure that any change in elevation is clearly delineated with a kerb edge detail, and trip hazards are minimised by providing a flush bay treatment where practicable.

Half-on, half-off

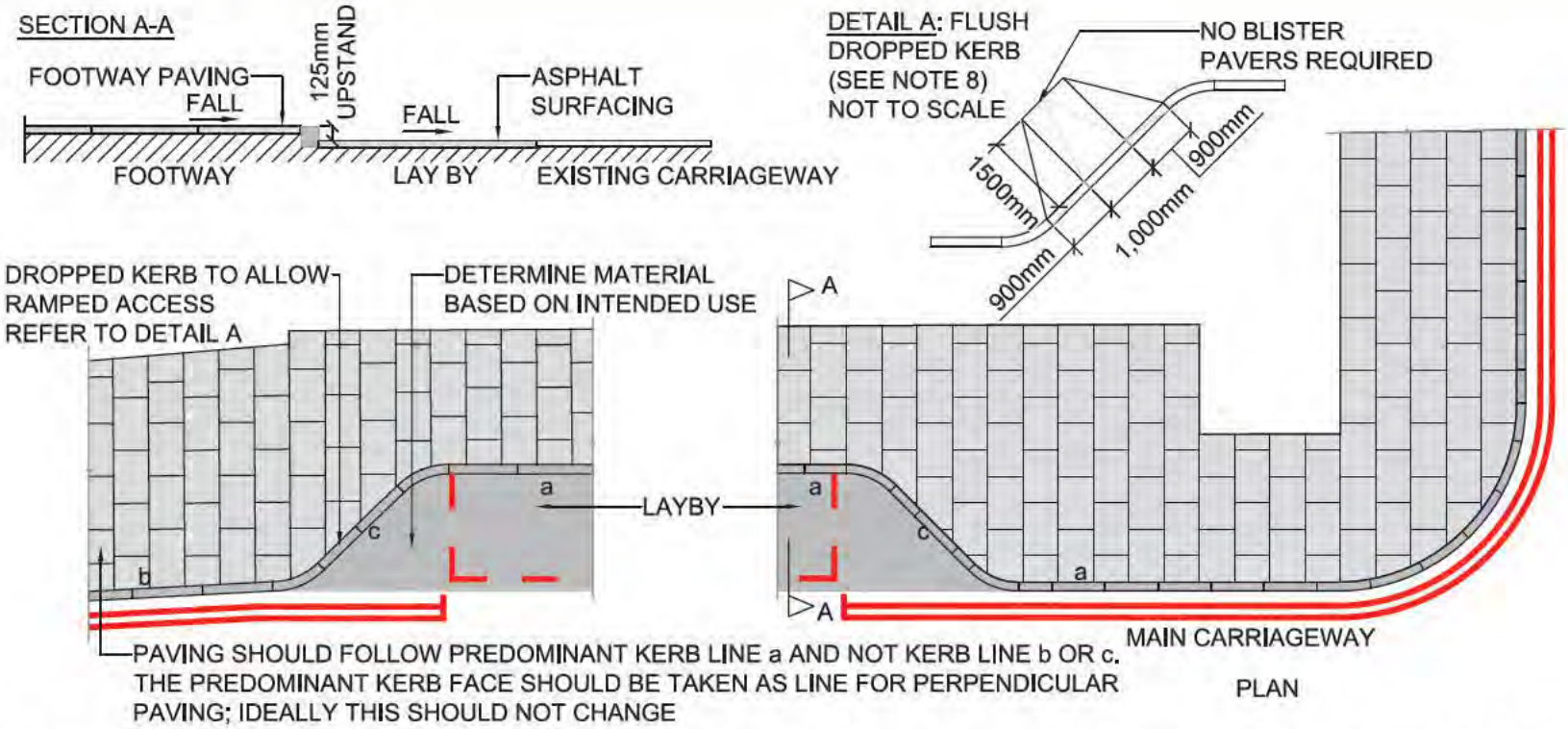
## Half-on, half-off loading bays

Some loading facilities are designed to allow vehicles to park with the nearside wheels on the raised footway and the offside wheels on the carriageway. Such facilities should use the same placement principles as inset bays regarding vehicle flows, pavement strength and remaining footway width.

Due to the restrictions this type of arrangement has on movement, this approach will only be considered as a last resort.

As width on-footway loading, half-on, half-off facilities are suitable in some circumstances but are not appropriate where pedestrians would be impeded or damage to infrastructure might result.

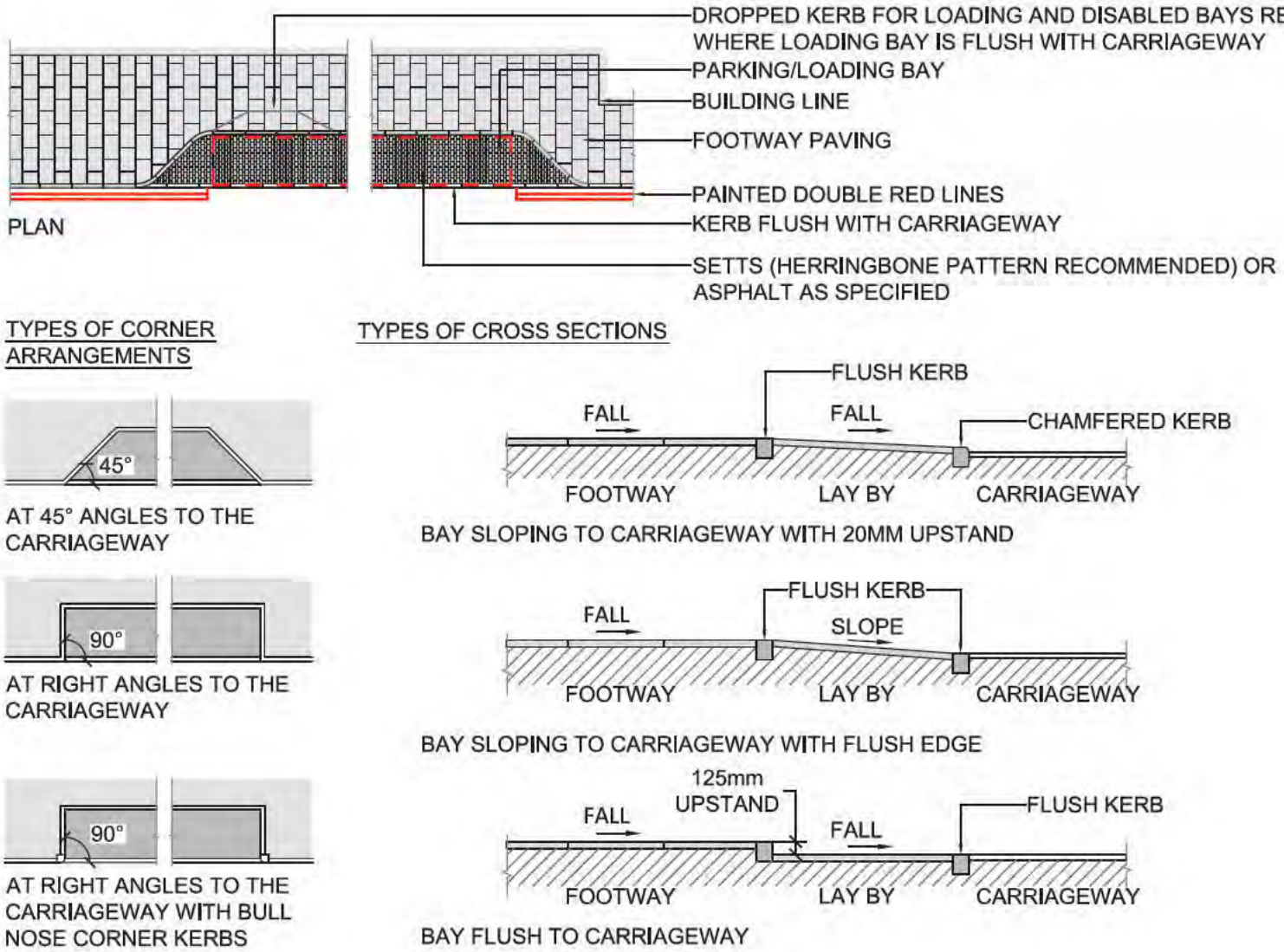
Figure 180: Loading bay




Notes

1. The resident engineer should be advised where the preferred depth of construction cannot be achieved on site.
2. Flags to be laid with courses set at 90° to kerb and a minimum overlap bond of 150mm.
3. The bonding of paving to be cut around utility service covers unless directed by the resident engineer.
4. Flags should not be cut so that a width less than 300mm remains. Previous courses should be cut to distribute evenly over width.
5. All covers within the tactile areas have to be recessed and infilled with blister paving. It would be desirable for the rest of the covers to be recessed in order to match the footway surface but this needs to be agreed with TfL and the utility companies need to be contacted in order to get an agreement and request appropriate labeled assets.
6. Lateral clearance to all street furniture to be 450mm minimum from face of kerb.
7. All work to be carried out in compliance with the requirements of the Manual Handling Operations Regulations 1992 (as amended in 2002).
8. Kerb dropped over approximately 900mm to provide flush kerb (0-6mm upstand) for good transportation and disabled access if applicable.

Figure 181: On-footway parking and loading bay



## Surface materials

### Material design standards

| Setting | Material |
|---|---|
| On-street bay | Asphalt |
| Inset bay | Asphalt or setts |
| Half-on half-off bay | Asphalt for carriageway area<br>Setts for footway level |
| On-footway bay | Continue surrounding footway material across the bay with a flush kerb delineation or provide setts across the full width of the bay |

- Inset parking and loading bays should be constructed using radius kerbs with an asphalt finished surface
- A flush kerb should be provided for half-on, half-off bays and on-footway bays
- Paving material choice and construction workmanship should consider the need for smooth and level surfaces to aid the safe movement of cages and palette trucks

## Road markings

Signs and markings are a powerful way of representing legally enforceable loading and parking restrictions. Their format and use are controlled by the DfT, and they are disseminated via TSRGD, Traffic Signs Manual and TfL's Red Routes Signing Manual.

## Signage

In most cases there will be an associated sign. Loading may also occur where there are no restrictions and it is safe to park.

- Parking/loading signs should be located a minimum of 450mm from the bay edge and should not obstruct the pedestrian clear zone
- The smallest allowable text size should be used to keep the size of the sign to a minimum

Figure 182: Enforcement sign


- Designers should orientate the signs as required by the Traffic Signs Manual
- The colour of the backs of signs and any dedicated poles supporting them should be consistent with other street furniture, ie black or grey in accordance with the palette

## Additional information

**Legislation:**

Traffic Signs Regulations and General Directions 2002: Section 4 and Schedule 6 (Road markings)

Traffic Signs Regulations and General Directions 2015

Highways (Road Humps) Regulations 1999

**Department for Transport:**

Delivering the goods: Guidance on delivery restrictions, 2006

Inclusive mobility – A guide to best practice on access to pedestrian and transport infrastructure, 2021

Traffic Signs Manual, Chapter 5: Road Markings

**Legislation:**

Highways Act 1980
Traffic Calming Act 1992

**Transport for London:**

Kerbside loading guidance, 2009
Parking and loading legally, 2014

## 10.3 Motorcycle parking

Although the motorcycle/moped mode share of trips by London residents is down since 2005 (TfL's London Travel Demand Survey, 2011), ownership of motorcycles and mopeds has increased. They have become particularly popular for business use in central London. This has increased pressure on ourselves and the boroughs to deliver more motorcycle parking facilities where they are most needed.

Parking reviews along the TLRN, including side roads adjoining the main road, will be used to assess demand and determine motorcycle parking allocations.

Figure 183: Motorcycle parking bay enforced through road markings


### Location

Parking facilities for motorcycles are generally provided on the carriageway, within designated bays. Motorcycle parking should be placed:

- As close as possible to trip attractors, such as shops, town centres and transport interchanges
- Where passive surveillance can take place
- Away from any overhanging trees and vegetation
- Away from pedestrian crossings where parked motorcycles may cause visibility problems for wheelchair users
- Where they can be well-lit

### Design

Motorcycle parking bays are marked with 100mm-wide broken white lines on the carriageway in accordance with the TSRGD and supported by means of a Traffic Regulation Order.

Parking bays should be sufficiently large to accommodate a number of motorcycles and allow adequate manoeuvring space.

A typical motorcycle parking space width is 1500mm.

Motorcycle parking facilities should offer:

- A well-drained, well-maintained site
- Shallow crossfalls
- Non-slip carriageway surfaces
- An especially rigid surface which does not deform in warm weather and resists point loadings from the stands attached to motorcycles
- Discrete anchor points for securing motorcycles where a need has been demonstrated

### Secure motorcycle parking facilities

Secure motorcycle parking facilities should not be provided unless survey data from the Metropolitan Police Service, illumination levels or other information suggests there is a need for a secure amenity.

Figure 184: Motorcycle parking bay

The anchor point must be easy to use and compatible with a wide range of motorcycles and locking devices. Anchor points should be discrete and should not add unnecessary clutter to the streetscape.

Facilities should be simple in design, require little maintenance and must not present a tripping or slipping hazard to pedestrians.

### Authorisation

- Section 63 of the Road Traffic Regulation Act 1984 as amended by the Transport Act 2000 (Section 75 [2]), sets out the powers of authorities
- Section 32 or 45 of the Road Traffic Regulation Act 1984, details on-street parking provision

### Additional information

**Statutory instruments:**
Traffic Signs Regulations and General Directions (TSRGD)

**Department for Transport:**
Traffic Advisory Leaflet 2/02: Motorcycle Parking, 2002

**Motorcycle Action Group:**
A Guide to the Design and Provision of Secure Parking for Motorcycles, 2002

**Transport for London:**
Motorcycle Safety Action Plan, 2014

Travel in London, Supplementary Report: London Travel Demand Survey, 2011

Figure 185: Ground level anchor points provide the least visual intrusion when secure parking facilities are required.

## 10.4 Parking control equipment

Parking controls are introduced to manage kerb space where demand for parking exceeds supply. TfL does not charge for any parking on the TLRN as the majority of carriageway space is dedicated to maximising capacity and enabling essential servicing, loading and maintenance.

Parking meters are being phased out across many parts of London in favour of pay by phone charges.

### Location

Payment equipment should be located a minimum 450mm from the kerb edge and within 10 metres of a parking bay to provide convenient access for motorists, without overly impinging on footway space. There should be sufficient footway space to manoeuvre a wheelchair to the machine (1,850mm x 2,100mm).

### Design

Paid parking equipment is available in a range of products which vary in size, colour and finish. A consistent application of pay and display machines should be used to ensure ease of operation and maintenance:

- The colour and style should match that of adjacent street furniture
- The mounting height of payment equipment should be readily accessible to wheelchair users, with any message display or instruction centred approximately 1,500mm above the footway
- Pay by phone parking is becoming an increasingly attractive option to minimise the need for on-street equipment. This will require the agreement of the relevant local authority

Figure 186: Parking control equipment


Figure 187: Parking control posted on a lighting column

### Signage

The number and size of signs used should seek to minimise clutter while ensuring an appropriate level and size of signs are provided as prescribed by TSRGD. Signs showing tariffs should not be visually dominant and fixed to other items of existing street furniture, such as lamp columns, or mounted on adjacent buildings subject to necessary consents.

Parking bays, single line controls and Blue Badge restrictions must be signed with clear communication of operating times and restrictions. Within controlled parking zones, waiting and loading signs only need to be erected where yellow line controls differ from the hours of operation for the parking zone.

### Enforcement

Paid parking is excluded from the red route controls and is enforced by the local authority.

Residential parking zones may extend on to parts of the TLRN and are enforced by the local authority.

### Additional information

**Legislation:**

Traffic Signs Regulations and General Directions (TSRGD)

## 10.5 Electric vehicle charging points

### Vision and purpose

The installation of electric vehicle charging points (EVCPs) is one of several strategies being promoted to reduce vehicle emissions, in order to improve the health of all Londoners and tackle climate change. We need to support the creation of a coherent and safe charging infrastructure for all types of electric vehicle.

We have been tasked with implementing a network of rapid charging points (RCPs) in London to help support the introduction of the Ultra Low Emission Zone (ULEZ) and the requirement for taxis and private hire vehicles (PHVs) to be zero-emission capable.

The rapid charging infrastructure will enable electric taxis, PHVs and commercial vehicles to charge in as little as 20-30 minutes. This will minimise operational downtime and help vehicles operate in zero-emission mode for as long as possible. Many of the RCPs will be available for public use, especially those outside of central London.

### Development planning

Planning permission is required for RCPs proposed on TfL highway land. The submission of a planning application means consideration is given to general street design principles – to minimise street clutter and mitigate any negative impact on road users.

Providing a safe environment that does not negatively impact on the street scene is a

Figure 188: Electric vehicle charging point

priority. The following activities can help to ensure we are considering all users in the installation and maintenance of new infrastructure:

- Fire risk assessment
- Environmental risk assessment
- Electrical risk assessment
- Road safety audit
- Equality impact assessment
- Crime and disorder impact assessment
- Heritage and archaeology assessments
- Tree impact assessments

### Street design principles

Please refer to our Pedestrian Comfort Guidance (2010) to determine pedestrian flows. The aim is for a level of service no less than B+ rating.

Ideally, footways should be at least two metres wide. Refer to section 11 'footway amenities' of this guidance for general principles and more detailed layout considerations – such as minimum space requirements, footway width and operational access.

All electric vehicle charging infrastructure should be at a minimum of 450mm from the kerb edge and maintain a 'pedestrian clear zone'. Charge points should be placed on footway build-outs where practicable.

All sites will be subject to a full Road Safety Audit and any materials should follow the TfL Highways Technical Approval Authority (TAA) process.

### Product specification

RCPs are produced by different manufacturers so designs can vary. However, each unit should have common TfL branding to be recognisable to users.

### Feeder pillars

Please refer to section 12 'safety and functionality' of this guidance. Always consult an electrical engineer when locating and specifying a feeder pillar unit.

### Additional information

**British Standards:**

BS 7671: Requirements for Electrical Installations.

BS EN 61851-1:2011: Electric vehicle conductive charging system.

More detailed guidance will be provided. We are currently updating our 'Guidance for implementation of electric vehicle charging infrastructure' (2010).

## 10.6 Bus stop environments

### Bus stops

Bus stops are an integral part of the streetscape and should be recognised as gateways to the wider public realm, not just a location where buses stop.

The provision of bus stops across the network should be consistent. Designers should consider the important role that bus stops play as the 'shop window' for our services and a key part of the journey experience for passengers. Refer to our Accessible Bus Stop Design Guidance (2015) for comprehensive advice.

Figure 189: A bus waiting at a bus stop

## Location

The location of bus stops should be based on operational considerations, policy and consultation, addressing passenger convenience, pedestrian and traffic safety, and bus service frequency, such as the following:

- Any new or amended bus stop and shelter layout must seek to design out crime, according to section 17 of the Crime and Disorder Act
- Generally stops should be provided at intervals of between 300-400 metres
- Where bus stop cycle by-pass lanes are planned or exist, specific attention must be paid to the width/adequacy of passenger waiting areas and safe walking routes to and from the bus stop
- Stops should ideally be located close to health centres, places of worship, leisure centres, hospitals and retail areas
- To comply with the duties under the Equality Act, a ramp should be able to be deployed on the kerb from the bus to enable wheelchair access. Further information is available in the Accessible Bus Stop Design Guidance
- Consideration should be given to the impact of the bus stop on commercial and residential land uses. This may include inconvenience to adjacent property users. It also includes the visual impact on sensitive landscape and townscape locations and listed buildings
- Cage lengths are an important factor in appropriately locating bus stops. Cage lengths are described in the Accessible Bus Stop Design Guidance
- In some circumstances it may be appropriate to combine the bus stop flag with street lighting
- Except on wider roads and dual carriageways, stops should be not be sited opposite each other. They should be staggered to allow traffic to pass comfortably and safely
- Stops should be sited clear of central refuges. If located near a pedestrian crossing they should be positioned after the facility, so as to give a clear view of the crossing for oncoming vehicles
- Where possible, stops should be sited back from the crest of hills and bridges, on the approach side. Stops should not be placed at or near sharp bends
- Placing bus stops near shops which stay open late can help to provide natural surveillance for passengers waiting at the stop. However, it may also be advisable to move bus stops away from pubs, clubs, and off-licences to help reduce the risk of passengers becoming targets for harassment and other crimes

## Public realm

- The bus stop, passenger shelter and surrounding footway should be well illuminated and maintained
- Street clutter in the boarding/alighting zones should be avoided to allow full accessibility. Litter bins should be placed well clear of the boarding and alighting zones (refer to Bins)
- Bus boarders are beneficial for reducing the amount of kerbside space needed for the bus stop
- Please refer to 'Kerbs' for further information on kerbs at bus stops

## Bus boarder design

For TLRN and borough roads subject to a 30mph speed limit or less, bus boarders should be considered at bus stops where:

- Parked or loading vehicles cause operational problems for buses
- Buses have difficulty rejoining the main traffic flow

Kerb heights greater than 140mm upstand should only be used where the bus will not overhang the kerb. Detailed guidance can be found in Accessible Bus Stop Design Guidance.

### Cycle lanes at bus stops

Options for cycle infrastructure at bus stops depend on the nature of the general provision for cycling on the corridor, and on bus infrastructure and operation. Factors to be taken into account include:

- Cycle flows, and flow variation during the day and week
- Degree of separation of cyclists
- General motorised traffic volumes
- Volume and frequency of buses stopping (including the frequency with which more than one bus is likely to use the stop at any one time)
- Access for wheelchair users
- The number of bus passengers using the stop at different times
- The pedestrian routes to and from the bus stop
- Pedestrian comfort in using the adjacent footway

Figure 190: A bus boarder used to raise the kerb height to 140mm

Figure 191: A bus stop by-pass for Cycle Super Highway 2 on Whitechapel Road

Our Accessible Bus Stop Design Guidance (2015) should be consulted for further guidance.

### Authorisation

The Highways Act 1980 allows local highway authorities to give consent for objects to be sited on the highway.

The safe operation of bus stops signs should be assessed via the Road Safety Audit process.

Section 55(i) of the DfT Road Traffic Regulation Act 1984 provides that a highway authority may cause or permit traffic signs, which includes bus stop signs, to be placed on or near any road in their area.

DfT Traffic Signs Regulations and General Directions 2002 Schedule 5, Signs for Bus, Tram and Pedal Cycle Facilities, diagrams 973.2 and 973.3: Stopping place for buses operated by or on behalf of or under agreement with Transport for London. This describes the TfL LBSL roundel bus stop flag graphics as a recognised road traffic sign; permitted variants enable the face of the sign to be curved, and the word 'STOP' may be varied as 'STAND'.

# Bus station Digital Sign London, UK

Providing customers with live bus arrival information in bus station and interchange environments

## Key functions

## Opportunity

Responding to demand for more live bus arrival information, TfL introduced the award winning Digital Sign in 2013.

## Benefits

The Digital Sign provides passengers with access to live bus arrival information away from the bus stops, helping them to make informed travel choices.

Digital Sign technology has been further enhanced for use in bus station and interchange environments where it is often more complex to display bus arrival information than at standard bus stops due to the number of routes and bus stops converging.

## Implementation

We have also developed a means of displaying the sign in a robust, secure and weatherproofed structure that is fit for purpose in exposed environments.


## Applying in London

The bus station Digital Sign is currently under trial at Vauxhall and Harrow.

## Bus flags

Every bus stop in London is equipped with a TfL bus stop flag. Bus flags provide passengers with service information and a location from which to queue, as well as a reference point for where buses will stop.

Figure 192: A coach stop on Buckingham Palace Road for Victoria Station

### Location

The post is generally positioned on the approach side of the passenger shelter, but may also be positioned towards the middle of a shelter for 'centre of path' and 'back of path' layouts. The flag should not compete for space or clear visibility of other road signs and equipment.

| TLRN bus flag location standards | |
|---|---|
| Minimum kerb setback | 550mm |
| Recommended distance from bus stop to shelter and existing posts | 2,000mm |
| Recommended minimum distance from adjacent street furniture | 2,000mm |
| Recommended minimum distance from street trees | 2,000mm |
| Recommended flag height | 3,500mm |

- Bus flags may be affixed to walls or lamp columns, if owner consent is given, to minimise the number of posts on the footway. Stop posts must be sited clear of inspection covers, pillar boxes, trees and similar obstructions
- A restricted foundation plate should be considered where underground obstructions such as drains or cable ducting are expected within one metre of the post

Figure 193: An example of a bus flag at a bus stop

- Overall post design should be provided in accordance with TSRGD, with the flag positioned at a height of 3500mm to ensure good visibility. Flags are fitted with additional timetable and route information to complement the poster publicity in shelters
- The finish should be silver grey in our standard approved palette

### Authorisation

Our bus stop flag is a traffic sign as defined by the Traffic Signs Regulations and General Directions 2002, and is erected only after consultation with the highway authority.

## Bus passenger shelters

The following should be read in conjunction with section 6.1.3 of the DfT's Inclusive mobility guide (2021) and our Accessible Bus Stop Design Guidance (2015).

### Location

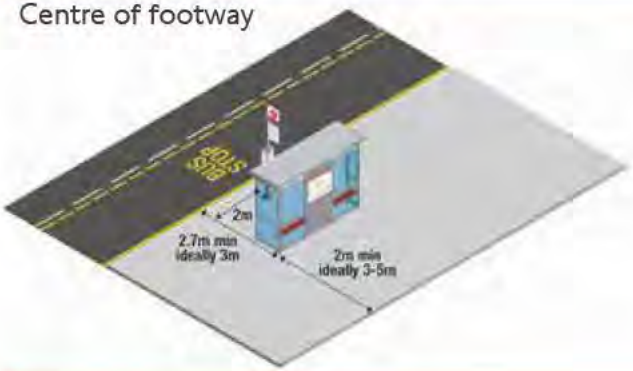
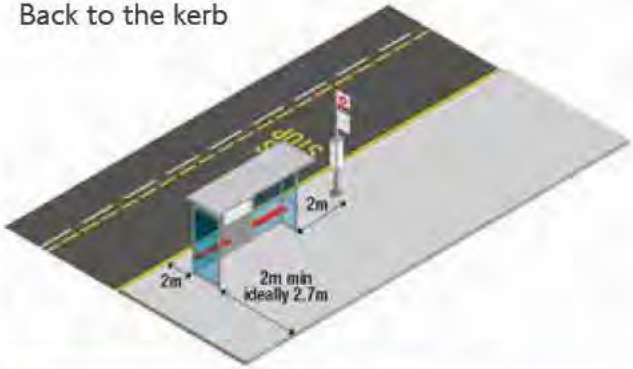
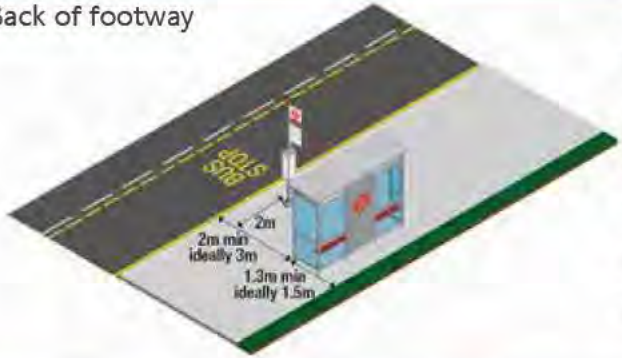
There are three general arrangement options for bus passenger shelter placement based on the footway width, pedestrian flows, required bus stop capacity and adjacent building entrance locations.

Shelters should ideally be positioned a minimum 2,000mm from any other street furniture. Where there is inadequate space for a shelter, a free-standing unit with integral flag, Realtime information (RTI) 'Countdown' and perch seat may be provided.

Figure 194: A new bus stop featuring an interactive touch screen on Westminster Bridge Road

Bins should be provided where space allows, although not sited within 2,000mm of the passenger waiting, boarding or alighting areas.

Figure 195: A bus stop on Oxford Street with the shelter orientated with the back to the kerb

| Position option | Application | Minimum setback from kerb | Recommended setback from kerb |
|---|---|---|---|
| Centre of footway   | Preference for wider footways (4,700mm or more) | 2,700mm | 3,000mm |
| Back to the kerb   | Preference for narrower footways (less than 4,700mm) | 550mm | 550mm |
| Back of footway   | Preference for footways between 3,300-4,500mm, with no adjacent active frontage and large volumes of pedestrians at peak periods (500mm clearance at back of shelter for maintenance; 450mm clearance of roof from kerb to avoid asset damage) | 2,000mm | 3,000mm |