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12. Crossings

12.1. Vision

12.1.1. 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 crossings which are detailed here.

12.2. Tactile paving

12.2.1. 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.

12.2.2. A range of tactile paving types have been developed to provide different kinds of warning 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.

12.2.3. This section should be read in conjunction with the London Pedestrian Design Guidance for information on the purpose and use of tactile paving. Streetscape Guidance provides information on the application of tactile paving.

General information

12.2.4. There are four types of tactile paving used in London including:

Blister  Corduroy  Ladder and tramline  Lozenge

National guidance and the TLRN approach

12.2.5. 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 (1998), acting as the current national guidance. Designers should also acknowledge that ongoing research and experience in delivery has shaped what we now consider to be best practice for the TLRN. These changes to the approach previously outlined in Streetscape Guidance 2009 respond to additional studies into the effectiveness of tactile paving and seek to resolve common issues in application.

**Common issues in application**

12.2.6. 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.

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

12.2.8. Common issues with layouts have emerged since the national guidance was produced and Streetscape Guidance recommends the following solutions to overcome these challenges:

<table>
<thead>
<tr>
<th>Common issues with tactile paving</th>
<th>Recommended solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large areas of tactile paving created by lining up the back of the tactile with the crossing direction</td>
<td>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 two units from the kerb edge. Each location is to be assessed and approved by the technical approvals manager individually at the detailed level on a site-by-site basis.</td>
</tr>
<tr>
<td>Tactile tails cross each other making them confusing for users</td>
<td>Avoid crossing tails by prioritising the main pedestrian desire line, stopping the secondary tail at least 600mm from the other tail (see TLRN departures from national guidance).</td>
</tr>
<tr>
<td>The red blister does not contrast with the surrounding footway</td>
<td>Use a contrasting grey tactile paving to better delineate the colour contrast (see TLRN departures from national guidance).</td>
</tr>
<tr>
<td>Inspection covers cut across areas of tactile paving</td>
<td>All inspection covers within areas of tactile paving should be inset with properly oriented blister paving. It is essential to liaise with all utility companies when designing crossings. Some companies refuse to locate the access to their plant at a pedestrian crossing, so they ask for their assets to be diverted.</td>
</tr>
<tr>
<td>Tails can be very long and not cross pedestrian desire lines</td>
<td>Construct to a maximum 5.0 metres length.</td>
</tr>
<tr>
<td>Inconsistency of application</td>
<td>Designers should ensure that the rationale for tactile paving design is aligned with Streetscape Guidance and carefully consider and note any departures from national guidance.</td>
</tr>
</tbody>
</table>
12.2.9. The following departures from national guidance should be used by designers working on TLRN schemes:

- The use of contrasting grey tactile paving at controlled crossings in conservation areas
- The use of reduced width of 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)
- Our approach is to prevent the joining of tactile tails by careful design. We require tails to be perpendicular to the main pedestrian flow and the length of the tail should be derived from understanding pedestrian movement at each crossing
- While national guidance for ladder and tramline recommends a 2,400mm wide application for this material, 800mm will be adopted once verified by specific research to align rationale based on the UCL research for blister paving

12.2.10. 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.

12.2.11. 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.

12.2.12. We are undertaking research to conclude best practice designs for tactile paving to ensure the materials are effective. Streetscape Guidance will be reviewed upon completion of this research to determine if a revision is needed.

12.2.13. 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:

**Materials**

12.2.14. 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.

12.2.15. 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 SRG approval.

12.2.16. Metal studs are not generally recommended for use on the TLRN but may be considered by the SRG in exceptional circumstances. We are currently developing an individual stud as a suitable alternative.
Detailed application

Blister paving

12.2.17. Application

12.2.18. 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

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

Paving dimensions

12.2.20. Blister paving consists of a 400x400mm paving unit with series of regular flat-topped blisters positioned regularly across the unit. Blisters should be dimensioned at 5mm high, 25mm in diameter, and spaced at 64-67mm from each other.

Layout

12.2.21. **Blister paving at signal controlled crossings** - For signal controlled crossings, blister paving should be provided at the kerb of the designated crossing point, as well as across the footway itself as a ‘tactile tail’.

http://www.pavingexpert.com/tactile01.htm
**Layout criteria**

<table>
<thead>
<tr>
<th>Placement</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Red is standard on the TLRN for controlled crossings. Contrasting grey for controlled crossings in conservation areas. Natural stone tactile paving may be produced using milled Yorkstone or granite. Metal paving studs are generally not recommended but may be adopted as an exception with SRG approval.</td>
</tr>
</tbody>
</table>

**Design considerations**

- Blister paving should be oriented to align with the direction of the crossing.
- The tactile tail should extend to the building line or to a detectable length derived from understanding pedestrian movement.
- Where a tactile paving tail does not adequately capture pedestrian desire lines within 5.0 metres of the crossing (such as on crossings adjacent to large corner geometries or wide footways) it is recommended that no tail is used. This should be decided by SRG on a case-by-case basis.
- Tactile tails should not join as this impacts on the legibility for users by not allowing for a clear distinction between two crossing points. A tactile tail should be positioned no closer than 800mm to an adjacent tail to avoid creating conflicting messages by being within one step of each other. Only full tactile slabs should be installed.
- The maximum gradient should be of 8 per cent (1 in 12) on the direct approach and 9 per cent (1 in 11) on the flared sides.
Figure 12.0: Blister tactile paving – controlled and uncontrolled crossings

**Blister Tactile Paving Profile 01** - Controlled Crossings

- **Application:** Controlled crossings
- **Size:** 400x400x65mm
- **Colour:** Red
- **Finish:** Standard

**Blister Tactile Paving Profile 02** - Uncontrolled Crossings

- **Application:** Uncontrolled crossings
- **Size:** 400x400x65mm
- **Colour:** Grey (to contrast adjacent footpath)
- **Finish:** Fine picked (to match adjacent footpath)

- **Footpath Paving to Finish Flush with Tactile Pavers.**
- **400x400mm Blister Tactile Pavers** (to match profile 01)
- **Laying:** Stack bonded, butt-jointed
- **Roadside Drop Kerb to Finish Flush with Tactile Pavers and Road Surface**
- **Existing Road Surface/Reinstituted Road Surface to Engineer's Detail and Specification**

- **1:12 Max Fall to Meet Footpath and Roadside**
- **400x400x65mm Blister Tactile Pavers Layed On 30mm Min. Sand/Cement Bedding**
- **Butt-jointed, Finish Flush With Footpath Paving End Drop-Kerb**

**Scale:** 1:25 @ A4
Figure 12.1: Controlled and uncontrolled crossing tactile layout

**CONTROLLED AND UNCONTROLLED TACTILE CROSSINGS**

**UNCONTROLLED TACTILE CROSSING - PLAN**

- **VARIATION A**
  - Tail end of tactile paving up to 4800mm. Remaining space between building line and tactile paving to be filled with the specified street pavers. This maximum length needs to be assessed on a site by site basis according to pedestrian flows.

- **DETAIL A**
  - 5000mm MAX

**CONTROLLED TACTILE CROSSING - PLAN**

- **VARIATION B**
  - Tail end of tactile paving less than 4800mm. Run the tactile paving up to the building line. This length needs to be assessed on a site by site basis according to pedestrian flows.

- **BUILDING LINE**
- **PAINTED ROAD MARKING**
- **MAX GRADIENT 8% (1:12)**
- **DROP KERB**
- **CROSSING STUDS AlIGNED AT BOTH SIDES OF THE CROSSING**
- **TACTILE TAIL TO BE TWO PAVERS WIDE (MEASURED FROM BACK OF KERB) TO A MAX LENGTH OF 4830mm**
  (REFER TO DETAIL A FOR VARIATIONS)
- **KERB FLUSH WITH ADJACENT ROAD 2 FULL ROWS OF 400mmx400mm BLISTER PAVING**
- **TRAFFIC SIGNAL POLE**
- **DROP KERB**
- **PAINTED ROAD MARKING**
Figure 12.2: Accepted controlled crossing tail layouts
12.2.22. **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

| Placement       | Two rows, 800mm wide at the narrowest point across the full width of the flush crossing.  
|                 | Tactile tails should not be provided. |
| Colour          | Contrasting grey – charcoal grey is standard on the TLRN for uncontrolled crossings.  
|                 | Buff beige – standard for uncontrolled crossings on other streets in London.  
|                 | Natural stone if tactile paving produced with milled granite/Yorkstone. |

### Design considerations

12.2.23. The back of the uncontrolled crossing tactile paving does not strictly need to be oriented at right angles to the crossing, as its purpose is to simply act as a warning, not to provide information on how to cross the road.
UNCONTROLLED PEDESTRIAN CROSSING AT SIDE ROAD

TRANSITION TO BOROUGH MATERIALS SHOULD OCCUR AT A NATURAL POINT SUCH AS AT THE END OF A BUILDING OR DRIVEWAY. TRANSITION TO BOROUGH MATERIALS SHOULD BE AGREED BY TFL AND THE LOCAL AUTHORITY AND IN ANY CASE SHOULD AIM TO BE 100mm MINIMUM.

NOTES

1. All paving to be laid on 30mm sand/cement mortar mix, butt jointed, with dry sand brushed into joints, on a minimum c7.5p concrete and type 1 sub-base, with a total thickness between 150mm and 250mm thick, depending on CBR values. Other materials such as cold recycled bound mixes and hot recycled bound mixes can be designed for use instead of concretes and type 1 sub-bases.

2. Flags to be aic with courses set at 90° to kerb and a minimum overlap bond of 150mm.

3. The bend ing 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. Kerb dropped over approximately 1800mm to provide a flush kerb (0mm upstand) over crossing width.

6. Signal heads must be positioned to provide a minimum lateral clearance of 450mm from all signal equipment to kerb face.

7. All work to be carried out in compliance with the requirements of the manual handling operations regulations 1992 (as amended in 2002).

8. 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.
12.2.24. Application - Corduroy should be used to identify specific hazardous situations for pedestrians including:

- The top and bottom of steps and 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

12.2.25. Note: Corduroy paving is sometimes wrongly used to demarcate segregated routes for pedestrians and cyclists where ladder and tramline paving pattern should be used. Incorrect use of corduroy paving can cause instability for cyclists and is misleading for visually impaired people. If corduroy is used correctly on a shared use route, cyclists should never have to cycle over it.

12.2.26. Corduroy paving should generally provide a colour contrast to the surrounding surface material, offering additional visual support.

12.2.27. Paving dimensions - Corduroy paving should be implemented as 400x400mm paving slabs, with rounded raised ridges 6mm high, 20mm in diameter and equally spaced at 50mm.

**Layout criteria**

<table>
<thead>
<tr>
<th>Placement</th>
<th>The placement should comply with the DfT’s Guidance on the use of Tactile Paving Surfaces; 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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Contrasting grey or to contrast surrounding footways.</td>
</tr>
</tbody>
</table>

**Ladder and tramline paving**

**Application**
12.2.28. Ladder and tramline paving use the same paving unit, orientated at right angles to each other to delineate between segregated cycle and pedestrian surfaces on a shared use route.

**Paving dimensions**

12.2.29. Units of 400x400mm with flat-topped bars 5mm high, 30mm wide and spaced 70mm apart.

**Layout**

12.2.30. The bars should be laid in the direction of travel on the cycle side and perpendicular to the direction of travel on the pedestrian side.

12.2.31. The paving 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. A delineator strip between the cycle track and footway should be used where surfaces are flush to ensure clear delineation between either side of the shared surface route (see London Cycling Design Standards, 2014).

**Layout criteria**

<table>
<thead>
<tr>
<th>Placement</th>
<th>While national guidance for ladder and tramline recommends 2,400mm depth for this material, 800mm will be adopted once verified by specific research to align rationale based on UCL research for blister paving.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Contrasting grey or to contrast the surrounding footway material.</td>
</tr>
</tbody>
</table>

Crossings 287
Figure 12.4: Segregated shared route at a toucan crossing

Lozenge paving

Application
12.2.32. Lozenge paving should be used at tram stops on the open street.

**Paving dimensions**

12.2.33. Lozenge paving should be implemented as 400x400mm paving slabs, with rows of lozenge shaped rounded raised ridges 6mm high, 150mm in length and 83mm in width and equally spaced at 50mm.

**Layout criteria**

<table>
<thead>
<tr>
<th>Placement</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Usually buff.</td>
</tr>
</tbody>
</table>

**Additional information**

Department for Transport:
- Inclusive mobility – a guide to best practice on access to pedestrian and transport infrastructure, 2002
- Guidance on the use of Tactile Paving Surfaces, 2007
- Inclusive Design for Getting Outdoors (I'DGO): Design Guide 003 Note: Tactile Paving

Transport for London:

12.3. **Controlled crossings**

12.3.1. To create a high quality walking environment it is essential that safe signal controlled crossing points are provided where people would like to cross the carriageway, typically, but not necessarily at junctions. Pedestrian desire lines should be assessed to inform the siting of controlled crossing points.

12.3.2. 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.

12.3.3. 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

12.3.4. 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.

<table>
<thead>
<tr>
<th>Crossing category</th>
<th>Crossing type</th>
<th>Possible stages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled signalised crossing</td>
<td>Ped-X</td>
<td>1, 2 (straight-across) or 2 (staggered)</td>
</tr>
<tr>
<td></td>
<td>Puffin</td>
<td>1, 2 (straight-across) or 2 (staggered)</td>
</tr>
<tr>
<td></td>
<td>Pelican</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Pegasus</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Diagonal or all red phase</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Toucan</td>
<td>1 or 2 (straight-across)</td>
</tr>
<tr>
<td>Controlled non-signalised crossing</td>
<td>Zebra</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Parallel</td>
<td>1 or 2 (straight-across)</td>
</tr>
</tbody>
</table>

12.3.5. At signalised junctions, controlled crossings can also take the form of:
- Straight-across single stage signal controlled crossing
- Straight-across two stage signal controlled crossing
- Staggered two stage crossing
- Semi-staggered two stage crossing
- Diagonal or all red phase crossing

12.3.6. These crossings are illustrated below, however, for further information on their purpose, use and accessibility features, please refer to London Pedestrian Design Guidance (2015).
Figure 12.5: Controlled crossings
12.4. Design objectives


Controlled pedestrian crossing design standards

<table>
<thead>
<tr>
<th>Straight-across signalised crossings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute minimum crossing width</td>
</tr>
<tr>
<td>Preferred minimum crossing width</td>
</tr>
<tr>
<td>Maximum crossing width</td>
</tr>
<tr>
<td>Minimum central refuge depth</td>
</tr>
<tr>
<td>Dropped kerbs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Staggered signalised crossings (as above, but with the following additional details)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kerb upstand around stagger</td>
</tr>
<tr>
<td>Minimum central refuge unobstructed width</td>
</tr>
<tr>
<td>Minimum central refuge length</td>
</tr>
<tr>
<td>Stagger for all two-way roads</td>
</tr>
<tr>
<td>Recommended minimum distance from uncontrolled junctions</td>
</tr>
</tbody>
</table>

Good practice

Materials
- Traffic signals should be merged where possible with other street furniture such as lighting columns, to minimise clutter
- 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 generally not be applied unless approved by the SRG
- It may be appropriate to continue footway materials across the carriageway where pedestrian priority or a unified space is being promoted. SRG approval is required

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 5.0 metre wide crossing or similar is recommended where footways are narrow (2.0 to 3.0 metres) 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
- At especially busy crossings, for example outside stations, the designer should review the potential for footway widening and the provision of crossings wider than 5.0 metres

**Signals**
- Countdown timers should be considered for all central London controlled crossings which have high pedestrian flows, to give pedestrians additional confidence as to whether to cross or not
- Signal timings should be appropriate to pedestrian flows and traffic volumes. Puffin crossings benefit from having sensors to detect when pedestrians are on the crossing
- All signal schemes are required to have a design and safety check in line with the Design Standards for Signal Schemes in London
- Rotating cones should be fitted to all controlled crossings and audio bleeps should be fitted where feasible as detailed in DfT TAL 4/91 and 5/91

**Signal controlled crossings**

12.4.2. Pedestrians establish priority over vehicles at 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.

**Pelican crossings**

12.4.3. Pelican crossings allow pedestrians to stop traffic through a push button. The green and red man symbols are located on far-side signals.

12.4.4. We do not install pelican crossings for signal schemes on the TLRN, instead opting for the Ped-X standard.

**Puffin crossings**

12.4.5. Puffin crossings use detectors to extend crossing time for pedestrians who are still crossing, and can cancel the ‘green man’ if pedestrians have crossed. Puffins use near-side signals to encourage pedestrians to look for approaching vehicles. Near-side signals also offer additional help to pedestrians with visual impairments, compared to far-side signal crossings.
12.4.6. We do not install puffin crossings for signal schemes on the TLRN, instead opting for the Ped-X standard.

**Pedestrian crossing facility (Ped-X)**

12.4.7. This is the preferred crossing for all new, modified and modernised signal layouts. The layout is as a pelican with far-sided pedestrian aspects, but the traffic light sequence is as a signalised junction, including Countdown and no flashing amber vehicle signal.
1. All works to be carried out to the relevant TfL specification.
2. Duct layout is indicative only & 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. All pushbuttons to have tactile rotating cones.
7. All pushbuttons to have audibles.

Engineer to specify width of crossing (between stud lines), width should be in increments of 400 mm to accommodate exact number of standard 400x400mm blister paving slabs.

Ideal tactile arrangement as shown with 2 rows of blister for the width of the crossing and a tail of 3 blister slabs wide from the right hand side of the crossing extending to back of footway or to 5000mm maximum.
**Toucan crossings**

12.4.8. Toucan crossings allow both pedestrians and cyclists to cross without segregation. These crossings are typically used in conjunction with cycle paths. Push buttons and far-sided signals have a green/red cycle symbol alongside a green/red man.

12.4.9. A two-stage toucan crossing should be carefully considered, as cyclists may not stop on the refuge. A refuge of minimum depth 5.0 metres is recommended.

**Pegasus crossing**

12.4.10. Pegasus crossings allow horses and their riders to cross. These crossings are similar to toucan crossings but have a red/green horse symbol and push buttons that are mounted at a greater height.
Figure 12.7: Toucan/Pegasus crossings
Parallel crossings

12.4.11. 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 parallel cycle/pedestrian facilities.

12.4.12. Parallel crossings allow pedestrians and cyclists to cross with segregation (appropriate for high cycle flows and where segregated shared-use areas meet a crossing).

Diagonal or ‘all red’ phase crossings

12.4.13. A diagonal or ‘scramble crossing’ provides an all red signal phase to enable pedestrians to use all crossing points simultaneously and enable diagonal crossing movements (may be appropriate for crossings with high, consistent pedestrian flows across all arms).
Controlled non-signalised crossings

Zebra crossings
12.4.14. 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, pedestrian should remain on the kerbside for safety until approaching vehicles have stopped
12.4.15. Zebra crossings are therefore only recommended for low speed environments, 35mph or less, provided there are clear sightlines
12.4.16. 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 crossingZebra crossings are not used on routes under the Urban Traffic Control (UTC) system

Zebra crossings with parallel cycle crossing
12.4.17. 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
12.4.18. This type of crossing can be used on roundabouts with an annular cycle lane, as shown below.
- For detailed information please refer to London Cycling Design Standards (2014)
Figure 12.8: Zebra and Parallel crossing

**ZEBRA CROSSING**

- BUILDING LINE
- REFER TO TACTILE PAVING DRAWING FOR DETAIL
- DROP KERB
- PAINTED ROAD MARKING
- PSV REQUIREMENTS TO BE CHECKED FOR SPECIFIC LOCATIONS
- KERB FLUSH WITH ADJACENT ROAD
- BELISHA BEACON
- CUTLINE
- PAVING SLABS

**PARALLEL CROSSING**

- BUILDING LINE
- TRAFFIC SIGNAL POLE
- REFER TO TACTILE PAVING DRAWING FOR DETAIL
- PAINTED ROAD MARKING
- PSV REQUIREMENTS TO BE CHECKED FOR SPECIFIC LOCATIONS
- KERB FLUSH WITH ADJACENT ROAD
- ASPHALT ROAD SURFACING

Dimensions:
- 2400mm MIN  
  10000mm MAX
- 1700mm MIN  
  3000mm MAX
- 1700mm MIN  
  3000mm MAX
- 1500mm MIN  
  1800mm MAX
- 1700mm MIN  
  3000mm MAX
Figure 12.9: Pedestrian refuge islands – staggered crossing

Notes
1. Granite kerbs to comply with BS 435.
2. Precast kerbs to comply with BS 7293: Part 1.
3. Refer to side road raised entry construction details for section details.
4. Refer to hooped bollard drawing for keep left sign.
5. Attention is drawn to the possible trip hazard associated with the raised kerb surround to the staggered crossing refuge island. It is recommended that a comprehensive safety audit is undertaken before employing this option.
6. Signal poles must be positioned to provide a minimum lateral clearance of 450mm from all signal equipment to kerb face.
7. All street furniture to be installed using retention sockets.
8. If a lighting column is required (subject to lighting levels) they should be combined with the signal posts/push buttons where possible.
9. Material in central refuge island to match material on footway.
12.5. Uncontrolled crossings

12.5.1. 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.

<table>
<thead>
<tr>
<th>Crossing category</th>
<th>Crossing type</th>
<th>Stages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncontrolled crossing types</td>
<td>Uncontrolled</td>
<td>1 or 2</td>
</tr>
<tr>
<td></td>
<td>Traffic island</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Dropped kerb</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Side road entry</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>treatment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Informal island</td>
<td>1 or 2</td>
</tr>
</tbody>
</table>
12.5.2. 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.

12.5.3. Where traffic capacity 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.

![Uncontrolled Crossing Flush Kerb Diagram]

**Figure 12.11: Uncontrolled crossing**

**Uncontrolled pedestrian crossing design standards**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred minimum central refuge width</td>
<td>2.0 metres</td>
</tr>
<tr>
<td>Absolute minimum central refuge width</td>
<td>1.5 metres</td>
</tr>
<tr>
<td>Dropped kerbs</td>
<td>Flush with carriageway</td>
</tr>
<tr>
<td></td>
<td>1:20 optimum gradient to 1:12 maximum</td>
</tr>
<tr>
<td></td>
<td>Provided at least every 100 metres on residential roads</td>
</tr>
<tr>
<td>Tactile paving</td>
<td>Contrasting grey/two rows deep/no tactile tail</td>
</tr>
</tbody>
</table>
12.5.4. 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.

12.5.5. 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.

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

<table>
<thead>
<tr>
<th>Objective</th>
<th>Corresponding design intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>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</td>
<td>Use materials to suggest greater pedestrian presence and priority on the side road</td>
</tr>
<tr>
<td>To emphasise pedestrian movements</td>
<td>Raise carriageway level to footway level</td>
</tr>
<tr>
<td></td>
<td>Reduce the carriageway crossing distance</td>
</tr>
</tbody>
</table>
Use materials to suggest greater pedestrian presence and priority

<table>
<thead>
<tr>
<th>Streetscape Guidance Part D – Physical design and materials</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reduce vehicle speeds on the approach</strong></td>
</tr>
<tr>
<td>Provide a change in surface before the junction</td>
</tr>
<tr>
<td>Include vertical deflection</td>
</tr>
<tr>
<td><strong>Reduce vehicle speeds through the turn</strong></td>
</tr>
<tr>
<td>Tighten corner geometries</td>
</tr>
<tr>
<td><strong>Improve junction visibility</strong></td>
</tr>
<tr>
<td>Provide footway build-outs to deter parking near the junction</td>
</tr>
</tbody>
</table>

**Additional site specific objectives**

<table>
<thead>
<tr>
<th>Identify the start of a 20mph zone or traffic calmed area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use a combination of measures including signage, carriageway surface materials and build-outs</td>
</tr>
</tbody>
</table>

**Design**

12.5.7. Side road entry treatments should consist of:

- An uncontrolled crossing with appropriate tactile paving treatment
- A crossing width of minimum 2.4 metres
- A flush crossing surface raised to footway level through vertical deflection
- Tight corner radii of 3.0 metres or less to control vehicle entry speeds, with radius kerbs used
- Footway build-outs where appropriate to reduce carriageway width

12.5.8. The extent of carriageway narrowing should be based on local traffic flows and classified turning movements.

- Entry treatments are classified as road humps in regulatory terms
- 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, in the range of 3.0 metres
- Two-way side roads should ideally be between 5.0 metres and 6.5 metres 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 acknowledge the impact of carriageway narrowing on cycling quality
SIDE ROAD (ONE-WAY) RAISED ENTRY TREATMENT UNCONTROLLED

1. Flags to be laid with courses set at 90° 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. Uncut flags should be used wherever possible, where this is not possible cutting should be kept to a minimum and should not be cut so that a width less than 300mm remains.
4. Standard kerb height to be 125mm above carriageway.
5. 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.
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. Where side road entry treatments are installed in an existing condition, 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.
9. Drainage locations shown are indicative and should only be used if required.

SCALE 1:100 @ A4
SIDE ROAD (TWO-WAY) RAISED ENTRY TREATMENT UNCONTROLLED

TRANITION TO BOROUGH MATERIALS SHOULD OCCUR AT A NATURAL POINT SUCH AS AT THE END OF A BUILDING OR DRIVEWAY. TRANSITION TO BOROUGH MATERIALS SHOULD BE AGREED BY TFL AND THE LOCAL AUTHORITY AND SHOULD AIM TO BE 1000mm MINIMUM.

1. Flags to be laid with courses set at 90° 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. Uncut flags should be used wherever possible, where this is not possible cutting should be kept to a minimum and should not be cut so that a width less than 300mm remains.

4. Standard kerb height to be 125mm above carriageway.

5. 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.

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. Where side road entry treatments are installed in an existing condition, 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.

9. Drainage locations shown are indicative and should only be used if required.

SCALE 1:100 @ A4
SEGREGATED/SHARED ROUTE SIDE ROAD ENTRY TREATMENT - SET BACK LESS THAN FIVE METERS

Ramps with a max. fall at 1:10
DRAINAGE IF REQUIRED TO BE CONNECTED TO NEAREST MAIN SEWER IF POSSIBLE
DISTANCE DETERMINED BY TFL AND THE LOCAL AUTHORITY AND SHOULD AIM TO BE EITHER 1000mm MIN OR IN LINE WITH THE BASE OF THE RAMP.

SETTS ON ENTRY TREATMENT TO BE APPROVED BY SRG AND DESIGNED IN ACCORDANCE WITH BS7533

3000mm NOMINAL (2000mm MIN.)
450mm MIN. 3000mm MIN. OR UP TO BUILDING EDGE

KERB AT THE BOTTOM AND TOP OF KERB IF REQUIRED TO ENSURE A CLEAN FINISH

SCALE 1:200 @ A4
Materials

12.5.9. 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 (SRG approval must be sought)

12.5.10. 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.

12.5.11. 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.

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

<table>
<thead>
<tr>
<th>Bespoke ‘blended footway’ treatment, continuing the footway surface across a side road</th>
<th>Blended footway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clapham Old Town, London</td>
<td></td>
</tr>
</tbody>
</table>

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 is a very successful scheme that could be replicated in many areas of London.

Key functions:

Additional information

Legislation:

The Highways (Road Humps) Regulations 1999

Informal crossings

12.5.13. 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.

12.5.14. 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. Refer to London Pedestrian Design Guidance (2015) for further information.

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 1.2 metres and 2.4 metres 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 4.0 metres where the speed limit is 30mph or greater, or 3.2 metres or less where the speed limit is 20mph or lower (subject to site conditions)
Figure 12.15: Segregated/shared route at uncontrolled crossing
Figure 12.16: Pedestrian refuge islands – straight across crossing

Notes
1. Granite kerbs to comply with BS 435
2. Precast kerbs to comply with BS 7268: part 1
3. Refer to side road raised entry construction details for section details
4. Refer to hooped bollard drawing for keep left sign.
5. Signal poles must be positioned to provide a minimum lateral clearance of 450mm from all signal equipment to kerb face.
6. 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 a minimum of 1.5m. However a width of 2.0m is recommended to permit a pedestrian with a pram or wheelchair to wait safely.
7. All street furniture to be installed using retention sockets.
8. If a lighting column is required (subject to lighting levels) they should be combined with the signal posts/push buttons where possible.
Additional information

Department for Transport:
- Guidance on the use of Tactile Paving Surfaces, 1998
- Local Transport Note (LTN 1/95): The Assessment of Pedestrian Crossings, 1995
- Local Transport Note (LTN 2/95): The Design of Pedestrian Crossings, 1995

Transport for London:
- Design Standards for Signal Schemes in London

12.6. Traffic signals and control boxes

12.6.1. Traffic control systems must be designed in accordance with TSRGD 2002 and should consider good practice design standards outlined in LTN 1/98 The Installation of Traffic Signals and Associated Equipment.

12.6.2. 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.

12.6.3. 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.

12.6.4. 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.

12.6.5. For proposed changes to traffic signal arrangements on roads where the London borough is the highway authority, we work closely with the borough’s engineers when undertaking operational and equipment modifications.

Streetscape issues

- A proliferation of traffic signals and poles can add unnecessary clutter to the streetscape. In addition, signal controller cabinets and associated equipment can, if poorly positioned, create obstructions on the footway.
• Design teams should undertake a streetscape review to ensure that junctions and crossings conform to current best practice in relation to urban design, accessibility, signal design and equipment

Placement

• All highways equipment including traffic signal poles must be positioned to provide a minimum lateral clearance of 450mm from any part of the signal equipment to the kerb face
• Traffic signal controllers should be positioned to allow unimpeded use of the footway by pedestrians and people with mobility impairments
• Control boxes should not be located where they might visually detract from listed buildings or other heritage features, unless there is no safe alternative placement
• Controller cabinets should be positioned to allow the outer case door and panels to be opened without causing unnecessary obstruction on the footway and provide sufficient clearance for signal operatives and maintenance contractors to work. Additionally, the junction and its signal heads need to be visible from the control cabinet for maintenance purposes
• Electrical feeder pillars should be sited at the back of the footway against a wall or fence and must not obstruct private property accesses or shop windows. They must also be positioned so that an engineer can work on the pillar without danger to themselves or others. Refer to Utility cabinets for further information
• Options exist to conceal traffic signal controllers within products such as the bench controller and subterranean controller systems

Decluttering

• Reducing street clutter should be prioritised by minimising the number of poles used to deliver a signal scheme. This may include mounting signal heads on street light columns or by combining multiple signal heads on one pole
• Mast arms or extra high 6.0metre poles with additional signal heads should be used where there is a clear design need or a safety issue
• Any redundant equipment must be removed and the footway reinstated to match the surrounding surfacing
• Within site design non mandatory signal heads should be kept to a minimum

Traffic signal scheme design

• The design of the signal head should be in accordance with our Design Standards for Signal Schemes in London, SQA-0064. Issues which impact on the size of the signal unit are detailed below, to ensure that designers only install these features where strictly necessary.
• 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. Backing boards should always be provided on signals mounted to a mast arm.

**Materials**

12.6.6. The design and colour of the controller cabinets should be consistent with other street furniture in the local area.

12.6.7. Low profile anti-graffiti and flyposting finishes should be considered for controller cabinets where flyposting is a potential problem.

**New technologies**

12.6.8. Split Cycle Offset Optimisation Technique (SCOOT) detects the volume of pedestrians waiting to cross and provides sufficient time for the entire group to fully cross, thereby varying pedestrian crossing time based on demand.

12.6.9. Pedestrian Countdown at Traffic Signals Junctions (PCaTS) consists of a far-side digital countdown time display fitted next to the pedestrian signal heads. By providing a visible countdown of the time remaining before the appearance of the ‘red man’, PCaTS is intended to give pedestrians a better understanding of the time available to complete crossing, reducing anxiety once the ‘green man’ is no longer displayed. This additional information is intended to help people make more informed crossing choices.
| Dancing red man keeps pedestrians safe | Smart’s ‘For More Safety’ campaign  
Lisbon, Portugal |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunity</td>
<td>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.</td>
</tr>
<tr>
<td>Benefits</td>
<td>The campaign is reported to have made 81 per cent more people stop at the junction.</td>
</tr>
<tr>
<td>Implementation</td>
<td>A video booth near the junction transmits live volunteers who dance to music of their choosing while feeding back reactions of people.</td>
</tr>
<tr>
<td>Applying in London</td>
<td>An entertaining pedestrian crossing such as this could be applied to one of London’s many busy central London junctions.</td>
</tr>
<tr>
<td>Key functions:</td>
<td>![Icons]</td>
</tr>
</tbody>
</table>

**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:
12.7. Grade-separated pedestrian crossings

General principles

Footbridge L01 crosses Ruckholt Road

12.7.1. 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.

12.7.2. 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.

12.7.3. Where grade-separated crossings are considered, there needs to be a well-justified reason for continuing the pedestrian and cycle access over or under the barrier.

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

**Grade-separated crossing design standards**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum grade-separated crossing width for pedestrian only use</td>
<td>2.0 metres</td>
</tr>
<tr>
<td>Optimum grade-separated crossing width for shared use with cyclists</td>
<td>3.0-3.9 metres</td>
</tr>
<tr>
<td>Minimum subway height for pedestrian only use</td>
<td>2.3 metres</td>
</tr>
<tr>
<td>Recommended subway height for shared use with cyclists</td>
<td>2.3-3.0 metres</td>
</tr>
<tr>
<td>Optimum ramp gradient</td>
<td>1:20</td>
</tr>
<tr>
<td>Optimum landing dimensions</td>
<td>1.2-1.8 metres in depth</td>
</tr>
<tr>
<td>Maximum number of steps in a flight</td>
<td>12 steps</td>
</tr>
<tr>
<td>Corduroy paving</td>
<td>One row provided at the top and bottom of each flight of steps</td>
</tr>
<tr>
<td>Handrails</td>
<td>Provided on both sides of steps Central handrail required for widths greater than 3.0 metres</td>
</tr>
</tbody>
</table>
| Distinctive, attractive and practical crossing for pedestrians and cycles | Melkwegbridge  
Purmerend, Netherlands |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opportunity</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Benefits</strong></td>
<td>The creation of the Melkwegbridge in Purmerand, Netherlands was such a project as it connected two communities and reinforced the identity of the area.</td>
</tr>
<tr>
<td><strong>Implementation</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Applying in London</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Key functions:</strong></td>
<td><img src="image_url" alt="Icons" /></td>
</tr>
</tbody>
</table>
12.8. **Subways**

12.8.1. Subways can provide high capacity pedestrian 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 when reviewing the TLRN streetscape
- Where at-grade crossings are implementable, subways should be closed for access (see TfL Surface Crossings)
Transport Panel note on Subways). This may open up new potential uses for the subway space, such as for storage, or could enable the creation of additional useable space where the access ramps are in-filled

Bricklayer’s Arms roundabout subway removal

**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 desire lines and should be supported with a consistent wayfinding signage to support legibility

**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

Photo credit: Marko&Placemakers (FoRM Associates)
Musical staircase encourages physical activity at subway entrance | Odenplan piano key staircase  
Stockholm, Sweden  

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 easily transferrable – potentially suitable for Tube stations that do not see huge tidal flows.

**Key functions:**

<table>
<thead>
<tr>
<th>Streetscape Guidance</th>
<th>Part D – Physical design and materials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Applying in London</td>
</tr>
<tr>
<td></td>
<td>Technology is relatively easily transferrable – potentially suitable for Tube stations that do not see huge tidal flows.</td>
</tr>
<tr>
<td></td>
<td>Key functions:</td>
</tr>
</tbody>
</table>

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**Crossings**

325
12.9. **Footbridges**

**Existing**

12.9.1. Footbridges within central London more often cross railway lines or watercourses than roads; however, they inherently form an important part of the streetscape, integrating routes within the walking and cycling networks.

12.9.2. 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.

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

**Proposed**

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

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

12.9.6. 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.

12.9.7. 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.

Image courtesy of David Hawgood

Image courtesy of Mark Humphreys

Additional information

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

12.10. Road bridges

12.10.1. 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/cycle bridge design guidance, see Footbridges).

12.10.2. 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 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 2.0 metres should be provided
- 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 unsignalised 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 SRG
- 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 & Special Substructures), Materials
12.11. Road underpasses

12.11.1. The density of London’s road network frequently creates situations where underpasses are necessary to provide convenient and direct routes for major trunk roads. Underpasses are most appropriate and cost effective where the existing topography can be used to enable two roads to cross without intersecting each other.

12.11.2. Underpasses are typically found on arterial routes, accommodating high volumes of motor vehicle traffic. They are therefore 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.

- Footways should preferably be provided on both sides of the underpass where there are local pedestrian links. An unobstructed width of minimum 1.5 metres should be provided; 2.0 metres for where adjacent traffic speeds are 40mph.
- 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.
- 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 Disability Discrimination Act (DDA) compliant.
- 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

**Materials**

- Paving materials should be consistent with either side of the underpass
- Gabions for underpass walls on the TLRN require SRG 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