C4 – Segregated Cycle Tracks: Hard Segregation

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Amendments:

Segregated Cycle Tracks – Hard Segregation

Segregated on-street cycle tracks involve the use of features such as kerbs, separating strips, islands, grass verges or planting to create a continuous physical barrier, the "buffer" between moving or parked vehicles and cyclists.

The buffer can be designed to provide additional amenities for the street – cycle stands, trees or planting and loading space.

See widths for buffer for various uses on **Buffers / Islands** factsheet.

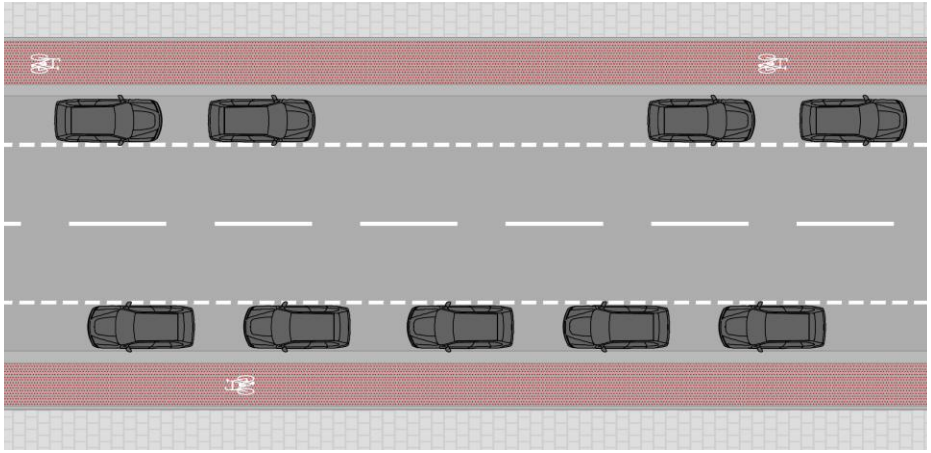
The main planning and design challenges arise at junctions and in relation to kerbside activity, particularly at bus stops and where parking and loading take place.

Waterloo Street, Glasgow

The City of Edinburgh Council

Bunhill Row, Islington (contraflow)

LCDS, 2015



DWG ref: HS-DR-C-0002

- **One-way with flow in each direction** – Given sufficient space this will often be the best option. Provides more straight forward design at junctions, especially non-signalised side roads.
- **Two-way in one direction** – Requires less space than one-way but junction design is usually more challenging and less easy to integrate at ends of facility. Can work well when there is more demand for parking/loading and bus stops etc. on one side of the road.
- **Central cycle tracks** – Exceptional circumstances only.

Relevant Factsheets:
Buffers / Islands (C4) Parking and Loading (G9) Street Trees (F5)

Segregation and User Needs

Balancing user needs

Designers' obligations under the Equality Act (2010) are particularly significant, given that segregated cycle lanes/tracks can introduce infrastructure that could be difficult to negotiate for people with protected characteristics under the Act.

It will usually be impossible for the designer to fully meet all user needs in designing segregated cycle infrastructure. Even the same user group may have different needs at different times. For example a blind person will benefit from a clear kerb to a cycleway when walking along a footway, but this same kerb will be a barrier to crossing the cycleway.

Overall, the design should aim to balance user needs appropriately, taking into account the ability of different user groups to adapt as well as relative numbers. **Bear in mind that cyclists using a segregated cycleway will include children, older people and others who are less confident on a bike, as well as more confident individuals.**

Actions

- Engage access groups and representatives; and
- Prepare an Equality and Rights Impact Assessment (ERIA) to address the issues in the table and arising from any consultation process.

Key user considerations when designing segregated cycle track /lanes

(Adapted from London Cycling Design Standards, 2015)

User Groups	Considerations
Cyclists	• Providing a clear and obvious route/path • Enabling a good cruising speed (10 – 15 mph) in locations where fewer conflicts are likely • Encouraging low speeds and courteous behaviour in locations where more conflicts are likely.
Pedestrian movements	• Pedestrian desire lines and legibility of infrastructure • Catering for desire lines including providing formal/informal crossing points • Considering trip hazards.
Blind or partially sighted people	• Provision of crossing points with tactile paving, and dropped or raised as appropriate • Physical segregation between cyclists and other users should be detectable by those with little or no vision; ground level detection should be available to ensure that long cane users can identify the segregated area
People using wheelchairs, pushchairs or buggies, or those with ambulant disabilities	• Provision of crossing points as for blind/ partially sighted people • Enabling easy access to footway from taxis and likely blue badge parking (including sections of yellow lines likely to generate such parking) • Provision of parking for blue badge holders.
Bus and coach infrastructure	• Pedestrian access to stops • Cycle provision at the stops • Interaction between waiting passengers and passing cyclists
Parking and loading	• Retaining and managing kerbside activity: appropriate line markings and enforcement, timing of deliveries • Potential for insetting bays or 'floating' them (between the cycle lane/track and the general traffic lane) • Access for blue badge holders
Personal security	• Appropriate lighting and visibility to and from the cycle facility where it is separate from the main carriageway
Motor vehicle access	• Breaks in segregation at junctions and to allow access to properties

Relevant Factsheets:

Segregated Cycle Lanes – Soft segregation (C3)
Pedestrian Desire Lines (P2)
Equality & Rights Impact Assessment (P2)
Crossings (G4)
Tactile Paving (M4)

Cycle Tracks on Hills

Cyclists can move <u>much</u> faster downhill than uphill. This is a key design consideration in Edinburgh.

Key considerations

Provision of infrastructure

If there is only space for segregation on one side of the road, provision should be made uphill because the difference in speed between cyclists and other traffic is much greater.

One-way cycle tracks

The buffer, and ideally cycleway, should be wider downhill.

Two-way cycle tracks

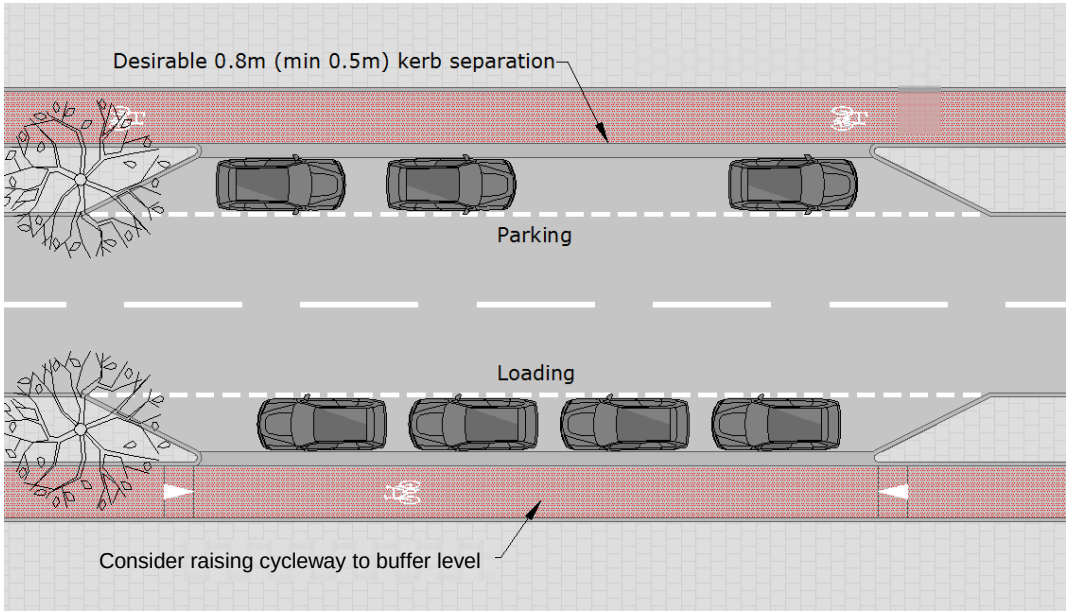
Other things being equal, uphill cyclists should be next to the buffer and traffic to reduce speed differentials.

Downhill speed reduction

Measures to reduce cyclists' speeds including raised areas and deviations in the cycle track should be considered.

Junctions

Intervisibility between driver and cyclist is critical on downhill approaches to side roads. Consider 'bending out' one-way cycleway.



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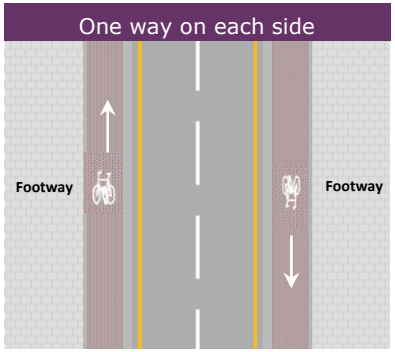
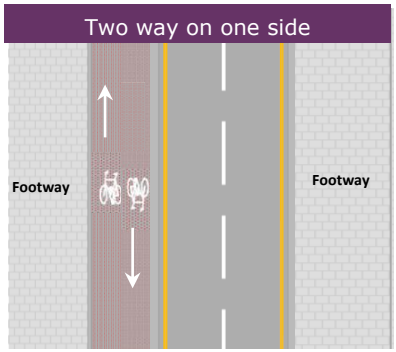
One and Two-way Cycle Tracks

A key design choice in providing segregated cycle ways is whether to have a one way track on each side of the road or two-way on one side. (Two-way on each side or one way on one side may sometimes also be options).

One way tracks on each side is sometimes seen as the norm and this layout has the advantage of being intuitive and easy to extend incrementally. In new development it should be the default option. However space constraints and other factors (see pros and cons table) can favour the two-way option.

	One way on each side	Two way on one side
Pros	• Intuitive design and road position. • Usually easier to integrate at junctions. • Usually easier to integrate into an un-segregated road layout at start and end of facility. • Related to above, usually needs less traffic management.	• Requires less space. • Scope to position cycleway on side of street that has less frontage activity or fewer conflicts with major side roads. • Greater cyclist 'presence' because larger numbers on the track. • Scope to increase separation of faster downhill cyclists from parked/loading vehicles if the cycle track is on the downhill side of the road. • More flexibility to deal with 'tidal' flows.
Cons	• Needs more road width than two way on one side. • Inability to locate track to minimise conflicts (e.g. At major junctions or with loading/parking). • Because of above, likely to create many conflicts with parking and loading on constrained streets.	• Unintuitive design, cyclists in unexpected places and travelling in opposite direction to expected. • Harder to integrate at junctions, especially at signalled junctions. • Harder to integrate into an un-segregated road layout at start and end of facility.





The City of Edinburgh Council

Visualisation of protected two-way cycleway on Haymarket terrace. Two way track used because the lesser overall space requirement means loading can be retained and 'floating' bus stops installed.

Two-way Cycle Tracks: Opportunities and Challenges

Opportunities
Ability to create a segregated cycle facility where there is no space for one-way cycle tracks on both sides of the road.
Where kerbside activity or side road access may be reconfigured so as to take place largely on one side
Arterial roads such as dual carriageways with infrequent crossings
One-way systems and gyratories
Where buildings, businesses or side roads are entirely or largely on only one side

Challenges
Can be unintuitive and generate risks associated with motorists and pedestrians not looking both ways when crossing a track
Complex arrangements at junctions and side roads, often with some confusion about priorities (see section 5.3.4 for more details)
Complex transitions to one-way, with-flow cycle provision
Connectivity for cyclists to and from the track can be difficult to manage
Need for greater use of signal controlled crossings for the above reasons

St Leonards St, Edinburgh

The City of Edinburgh Council

Buccleuch St, Edinburgh

The City of Edinburgh Council

The use of a centre line (to TSRGD diagram 1008) and/ or cycle symbols (diagram 1057) on two-way tracks can remind users that the track is two-way, and will help distinguish it from an adjacent footway.

TSRGD 2016 allows use of route numbers, cycle loops and arrows. Half width centre lines (diagram 1008) can also be used.

Widths: One-way and Two-way

Even small increases in cycle track width are beneficial. So in constrained situations a 2-way path 2.1m or 2.2m wide can create better riding experience for cyclists than 2.0m.

If cycle use is modest, local reductions to 1.25m for a 1-way path and 1.75m for two-way path may be acceptable in very constrained locations.

Footway and cycleway widths should reflect likely pedestrian and cycle flows. In streets with high pedestrian flows the footway should usually be wider than the cycleway.

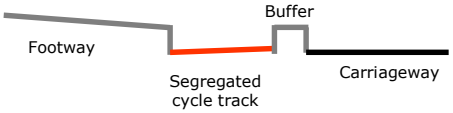
Table 1. Minimum cycle track widths

Widths	One-way	Two-way
Absolute min	1.5m*	2.0m*
Desirable	**1.75m**	**2.5m**
High flows	2.0m +	3.0m +

*A reduction of up to 0.25m may be acceptable in some cases

Cross Section

A key issue for segregated cycle tracks is level differences between pedestrians, cyclists and motor traffic.



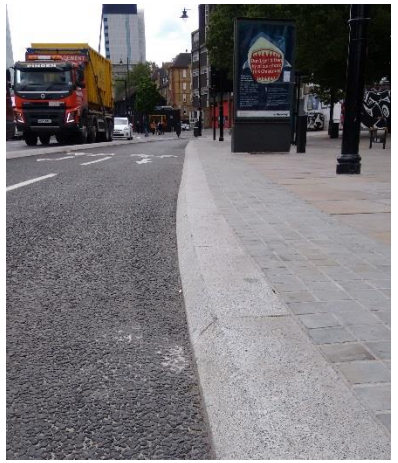
When deciding cross section, address the issues highlighted in '**Segregation and User Needs**' factsheet.

Cycle track kerbs

A full or half height battered kerb should be used to maximise the effective width of the cycle track. See Splay / Battered Kerb for Cycle Tracks for more information.

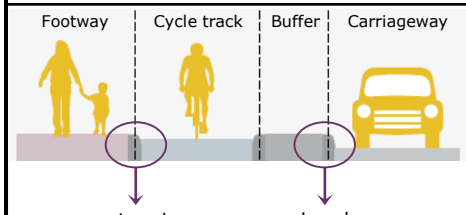
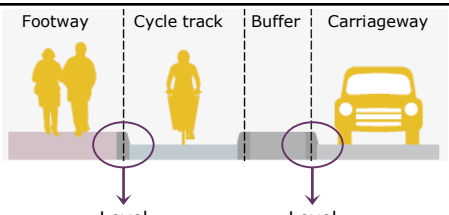
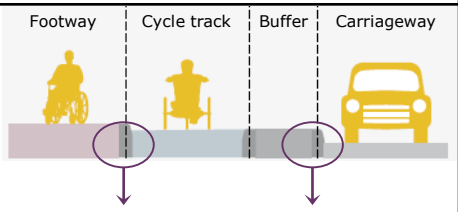
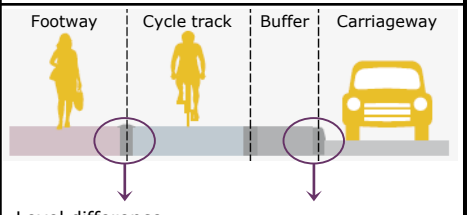
Buffer / islands

The type of separation used has a direct relationship with the degree of protection and subjective safety offered to cyclists. See Buffers/Islands factsheet for details.



The City of Edinburgh Council

Cycle Track Cross Section Options

Option 1	Option 2	Option 3	Option 4
			
Cycle track at intermediate level	**Cycle track at carriageway level**	**Cycle track and buffer at same intermediate level**	**Cycle track at footway level**
Pro's • Relatively easy for pedestrians/loading to cross. Discourages cycle encroachment on to footway • 50mm kerb can be detected by visually impaired users. **Con's** • Potentially complex drainage (consider gaps in the buffer). • Kerb <50mm difficult to detect for visually impaired users.	**Pro's** • Potentially cheaper than Option 1 especially if gaps in buffer for drainage. • Very clear pedestrian/cycle separation. **Con's** • Inconvenient/difficult to cross cycleway.	**Pro's** • Cheaper than Option 1 with raised buffer. • Easier to cross than Option 1 with raised buffer. **Con's** • Lower kerb to carriageway means less disincentive for parking/loading using cycleway.	**Pro's** • Easy to cross cycleway. • Simple drainage. **Con's** • Tactile separation of cycleway/footway takes more space than kerb. • More potential for cyclist encroachment on to footway.
Likely to be preferred for new construction in locations with medium to high pedestrian activity; except where pedestrian crossing movements are highest.	Likely to be preferred in areas of lower pedestrian activity where existing kerb line can be retained.	Likely to be preferred over option 1 for cost reasons where parking/loading pressures are lower.	Likely to be preferred where frequent pedestrian crossing of cycleway is expected. e.g. busy shopping street.

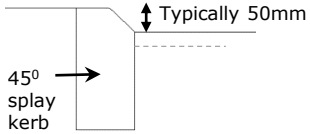
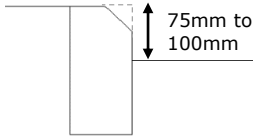
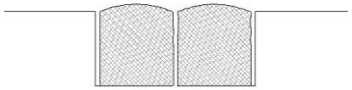
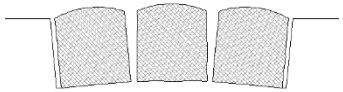
Diagrams adapted and modified from London Cycling Design Standards, 2016

Relevant Factsheets:

Integration with Parking and Loading (C4) Buffers/ Islands (C4)

Kerbs and Other Separation Options

Footway to cycleway

Option 1 /3	Option 2	Option 4.1	Option 4.2	Option 4.3
		 Corduroy tactile slab	 Setts or blocks	 Setts

- The kerb facing the cycle track should be a Splay / Battered kerb (45 degree face) as this presents less of a danger to cyclists of catching their pedals, allowing them to utilise the full width of the cycle track. This is particularly relevant where the track installed is at the minimum desirable width.
- Retaining an existing vertical kerb can be acceptable if the cycle track is wider and/or use is likely to be modest.
- Transitions from angled kerbs to other profiles can be complex to construct and so it is recommended that angled kerbs are used consistently on a link.
- Tactile slabs provide a standardised warning for blind and partially sighted users, however they are not well suited to laying on curves.
- Setts or blocks provide a non-standardised alternative option better suited for laying on curves and less visually intrusive. Depending on the profile of the top surface, they may offer a greater deterrent to cyclists (particularly option 4.3).

Buffer/Separation Strip

Buffer materials

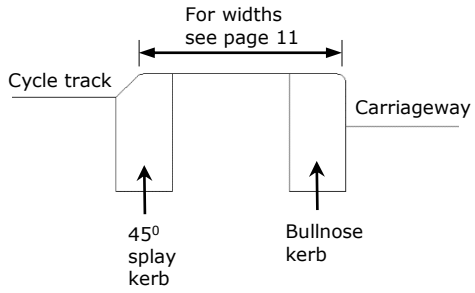
Narrow buffers

- Splay kerb and bullnose kerb (see option 1.1) with:
  - Asphalt infill with (anti-skid) coating; or
  - Setts or blocks infill;
- Integrated single block (See option 1.2 adjacent);

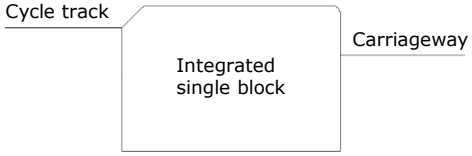
Wider buffers

- As above, simply larger, but not integrated single block (see option 2);
- Other infill options available for wider buffers are:
  - Paving;
  - Verges with or without tree planting; or
  - Inset parking and/or loading areas.

Option 1.1



Option 1.2

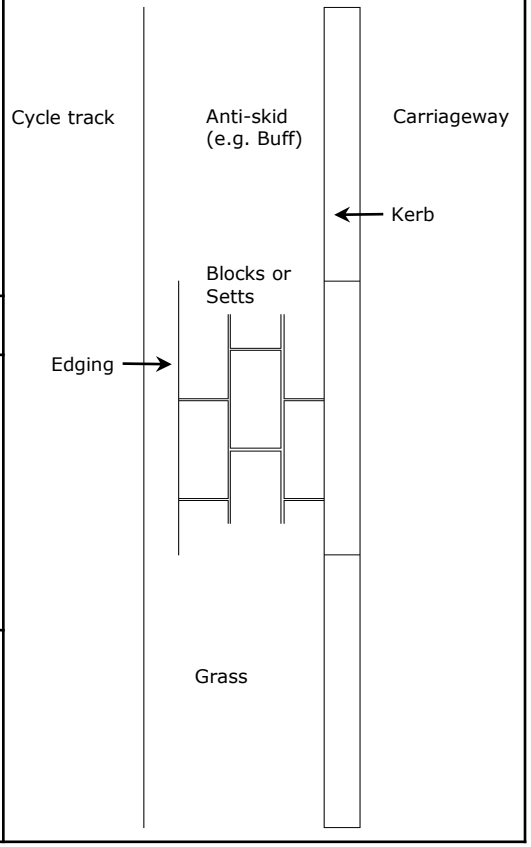


Option 2

As option 1.1 but with larger upstand from cycle track to buffer.

Infill Options

Plan view



Buffers / Islands

Buffers or islands are used to protect cyclists from moving traffic. They also provide a space for people entering or leaving vehicles at the kerbside, loading / unloading and for pedestrians to pause when crossing the road.

The type and width of buffer (e.g. island, verge, etc.) has a major influence on how safe users of the cycle track will feel and on activities such as loading / unloading.

The greater the width of the buffer, and the more continuous it is, the higher the degree of protection, but this has to be balanced with availability of space and meeting other user needs.

The appropriate width depends on many factors and an assessment of risks on a site-by-site basis.

Width of cycle lane/track, frequency and size of gaps and type of kerb all need to be considered in relation to access by vehicles for maintenance, cleaning, clearing of leaves and winter gritting.

Kerbside activity affects the width of the buffer and gaps required in the buffer strip.

A green verge/strip for trees, Utrecht

Stand alone kerb, Copenhagen

Hard surface area for cycle parking/ loading space or protection for pedestrians wanting to cross the road Illustrative London scheme

Hard surface buffer zone in Buccleuch Street, Edinburgh

Images: top and bottom left (LCDS, 2016), bottom and top right (The City of Edinburgh Council)

Buffer / Island Widths

Absolute min. width (m)	Desirable width (m)	Situation
0.25[1]	0.5	No parking or loading permitted/likely. Absolute min. required back to back kerbs.
0.4[2]	0.5	At the beginning of the segregation to accommodate a flexible post (100mm wide)
0.6[2]	0.6[2]	At the beginning of the segregation to accommodate a blank bollard (300mm wide)
0.5	0.8+	Where an adjacent parking or loading bay is provided. Prioritise widening on downhill gradient.
1.0	1.0+	Where any planting other than trees is included in the island
1.0	1.2+	For uncontrolled / informal pedestrian crossings of the cycle track
0.9[3]		For an island with low-level signal pole
1.5	2.0	For an island with trees
0.7[4]		For an island with a traffic signal pole
0.25[1]	0.5	For controlled pedestrian crossings
1.8		Where pedestrians or wheelchair users from disabled or community transport vehicles set down
4.5	5.0	At priority junctions to accommodate one vehicle turning in and giving way to the cycle track

Notes:
1.Not acceptable for two-way cycleway if significant numbers of buses of HGVs use inside lane.
2.Based on 200mm clearance on road side and 100mm on the cycle side
3.This assumes 450mm clearance to carriageway, 250mm signal head width and 200mm clearance to cycleway
4.7m width assumes a cranked signal pole to make the best use of space. A wider island would be required if the pole is not cranked

Key considerations

- Consistency of width of the cycle facility and of the adjacent general traffic lane .
- Consistency of island width.
- Gradient - wider buffer is more important downhill.

Relevant Factsheets:
Integration with Parking and Loading (C4) Integration with Side Road Provision (C4)

Start of segregation

If the cycleway would otherwise appear to form part of the carriageway, the start of a segregation island/buffer should be marked with a bollard/flexible post;

Using a demountable bollard in breaks in the segregating island allows access for maintenance vehicles.

Generally omit the bollard or flexible post:

- where segregation breaks and recommences at a pedestrian crossing.
- where markings clearly direct other road users away from the buffer (with hatching as necessary).
- when there is good visibility (well-lit at all times of day and night) and visual contrast between kerb and carriageway surface.
- on a link, where a mandatory cycle lane becomes a segregated cycle track without any likely turning movements at that location.

Signs/equipment/bollard on buffers/islands

- 100mm clearance between a sign/equipment/bollard and the cycle track.
- 200/300mm clearance between equipment/bollard/sign and carriageway

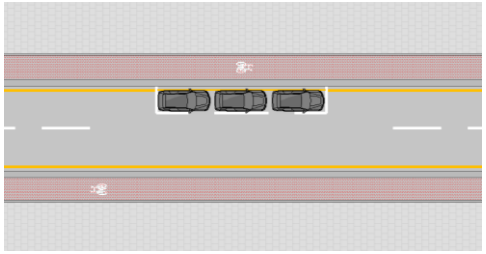
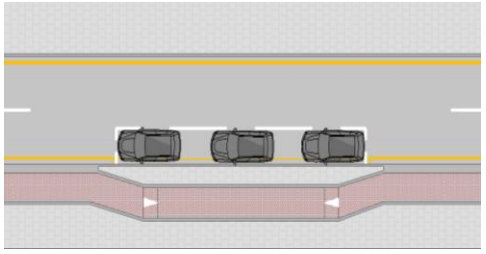
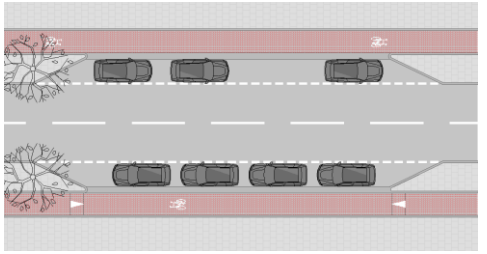
Where effective width of a one-way cycle track is 2m wide or more, the risk of providing 100mm clearance to a sign is low. Risk will increase with two-way cycle movement and where space dictates that overtaking and passing manoeuvres are likely to bring cyclists close to the kerb edge.

Bollard at the end of a segregated cycleway, showing the greater clearance to the carriageway

Image: SUSTRANS

Relevant Factsheets:
Street Furniture (F1)

Integration with Parking / Loading : Options

	A1. Floating Parking Bays	A.2 Floating Loading Island	B. Parking / Loading Bays inset into separating island
			
Suitability according to:			
Traffic flow	Allows use of bays for traffic movement at busy times.	Allows use of bays for traffic movement at busy times.	Less disruptive to traffic flow while bays are in operation.
Parking / loading needs	Works better for short term, off-peak parking/loading and small deliveries	Any / All especially for high volume and size deliveries	As A.2.
Space	Least space requirement.	Medium space requirement.	Biggest space requirement.
Cost	Lowest	Medium	Highest
2-way cycle track	OK	OK	OK

Option A.1: Floating Parking/Loading Bays

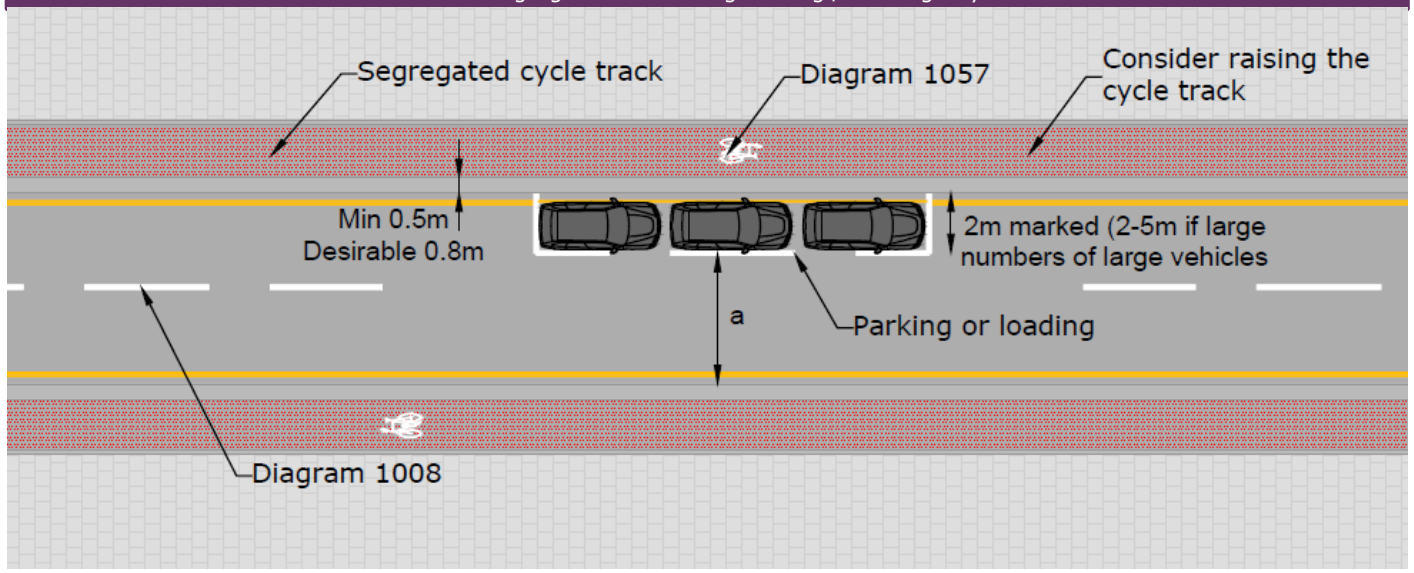
Clearly defined parking/ loading bays should be located outside the segregated cycle track with a min 0.5m (desirably 0.8m+) buffer zone for door openings.

This type of solution should be the default. However issues such as high cyclist speeds downhill or major issues with interaction between loading vehicles and overtaking traffic warrant consideration of alternatives.

Other options include:

- Raised loading islands where kerbside storage is needed during loading/unloading.

Hard segregation at Floating Parking / Loading Bay



DWG ref: HS-DR-C-0001

Absolute min. residential carriageway width (a)	Situation
4.3m	One way or low flow 2-way
5.0m	Low to medium flow 2-way, minimal buses or large vehicles
6.0m	Medium flow 2-way, low bus flow (≤10 per hour in both directions)
7.0m	Higher flows and/or ≥10 buses per hour in both directions)

Design requirements

Cycle track Width: 1.75m desirable, 1.5m absolute minimum.

a. ≥ 4.3m abs (≥7 on strategic streets with busy bus routes)
   If 3.8m ≤ a ≤ 4.5m remove centre line

b. =2m generally

Relevant Factsheets:
Buffers / Islands (C4) Segregation and User Needs (C4) Kerbs and Other Separation Options (C4)
Carriageway Widths (G2)

Option A.2: Floating Loading Islands

Loading islands should be provided if more space is needed for door openings and stacking goods.

Design Requirements

Loading island:

a. See Option A.1 See widths table page 6.

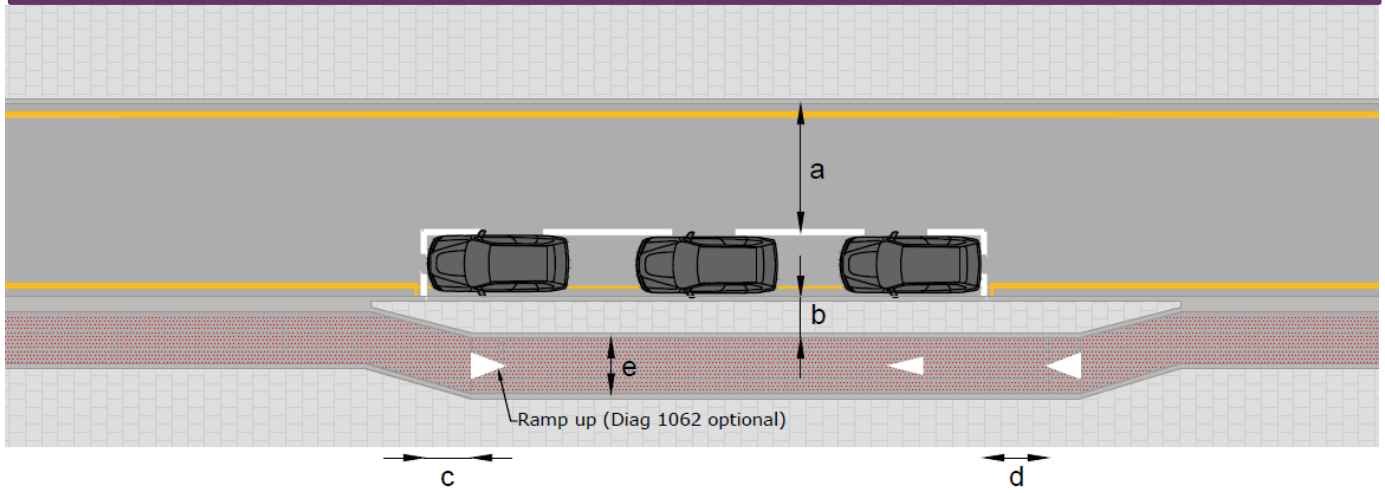
b. 1.5m preferable, 1.2m desirable min, 0.8 absolute min. (1.8m where disabled parking or community vehicles set down)

c. 1.5m max.

d. 2.0m min (to allow space to load/unload from rear of vehicle)

e. Local reductions to 1.25m (1-way) or 1.75m (2 way) may be acceptable

Hard segregation at Loading Island



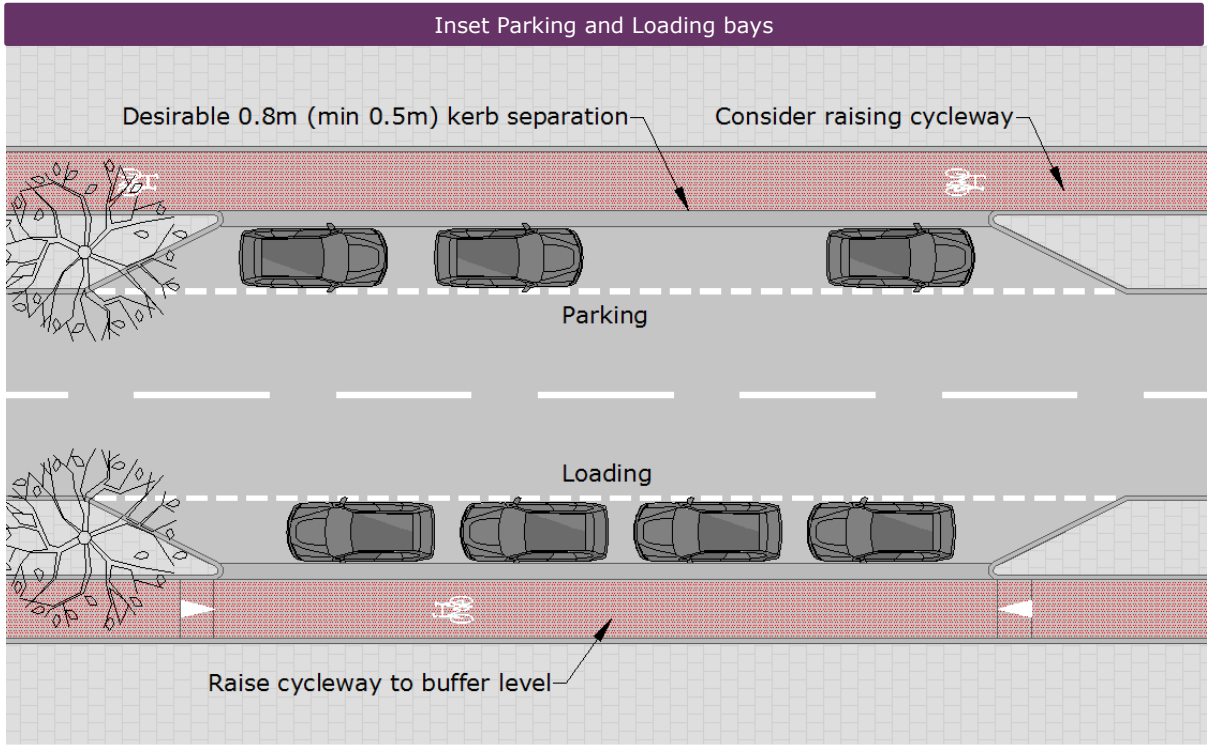
DWG ref: HS-DR-C-0011

Option B: Parking/Loading Bays inset into separating island

Parking / loading bays can be positioned between the cycle track and moving traffic in inset bays.

A separation island (desirable width of 0.8+) or soft segregators if cycle track is on carriageway level, can be used to provide protection between the cycle track and the bays. This will minimise the risk of collision between cyclists and car doors.

Separation using car parking in Newham, London (LCDS, 2016)



DWG ref: HS-DR-C-0010

Relevant Factsheets:

Buffers / Islands (C4) Segregation and User Needs (C4) Kerbs and Other Separation Options (C4)

Integration with Bus Stops : Options

	A. Floating bus stop 1.Bus shelter located on island 2. Bus shelter located on footway	**B. Cycle track through bus boarder**	**C. Shared use footway**
Suitability according to:			
Cycle flows	All	Better at medium to low	Less suitable the higher the flow
Type of cyclist use	Any/all	Any/all but harder to negotiate than A	Less suitable for significant commuter flows, especially if pedestrian numbers are significant.
Bus passenger numbers	Any - best option for high numbers	Suggest suitable for max 12 buses per hour stopping	Similar to B, comparative suitability depends on other factors
Available space	Biggest space requirement	2nd biggest space requirement	Smallest space requirement
Budget	High	Medium	Medium to low
Uphill/downhill (ie cyclist speed issues)	Better than B for downhill	Downhill problematic – suggest vertical cyclist traffic calming if used	Potentially better than B but worse than A for downhill
2-way cycle track	Consider inter-visibility of cyclists and bus stop users particularly carefully	Poor - only consider exceptionally	Better than B, worse than A
Key advantages	• Clear separation of cyclists and pedestrians • No conflict with bus passengers as they are getting on or off buses	• Less space and lower cost than option A • Layout easy to 'read' and less visually contrived than A	• Simple layout • Can work with less space than A or B
Key disadvantages	• Highest space requirement	• Risk of collisions between boarding/alighting passengers and cyclists – especially downhill (high cycle speeds)	• More potential for pedestrian / cycle conflict than A • Lack of clarity
Key design considerations	Generally best but needs the most space.	Essential to clearly signal to cyclists that bus users have priority - (raised) informal zebra	Only likely to be suitable in situations where bus passenger numbers or cyclist speeds are low

Consultation

Any proposal for cycling provision at a bus stop should involve consultation with pedestrian user groups and bus operators.

Floating Bus Stop Considerations

Volume of users

The likely number of waiting passengers must be taken into account when considering the size of bus boarder islands and other issues, such as the location and design of shelter on the islands. In cases where regular overspill of pedestrians onto the cycleway appears likely, the benefits of providing a protected cycleway must be balanced with the disadvantages of conflict at a floating bus stop. Measures to reduce conflicts that may result from overspill should be considered.

Vulnerable users

The provision and design of floating bus stops in close proximity to schools, hospitals, sheltered housing etc. should be given careful consideration as these are likely to generate larger than normal numbers of vulnerable bus users.

Visibility

Ensure that the placement and design of bus shelters considers the visibility of pedestrians crossing the cycle track from the footway so that the intervisibility between pedestrians and cyclists is not compromised. Consider omitting advertising end panels

Crossings

- Crossings should be on main pedestrian desire lines.
- Footway level crossings are preferred to emphasise pedestrian priority and to encourage speed reduction and courtesy from cyclists, especially where the cycle track is two way.
- Use flush kerbs and tactile paving where appropriate.
- Provide road markings on either side of the cycle track at the crossing locations to advise pedestrians of the direction of travel of cyclists.
- Use Diagram 1057 of Chapter 5, Traffic Signs Manual and "SLOW" markings to encourage cyclists to reduce speed.

Type

- Crossings over segregated cycle lanes can be uncontrolled or controlled.
- A Zebra-style cycle track crossing (allowed in TSRGD, 2016) with tactile paving and narrower stripes can be used for bus stop access and is recommended.
- In situations where large numbers of pedestrians (especially the most vulnerable pedestrians) and large numbers of cyclists are expected, it may be appropriate to consider installing a formal zebra crossing with suitable tactile paving.

Materials

Generally it will be appropriate to continue the contrasting red-chipped asphalt of the cycleway through the floating bus stop area for clarity of the cycle route and to assist users with visually impairments.

At the busiest bus stops in areas with flagged footways, use of smooth blocks in a visually distinct material may be appropriate.

Uncontrolled crossing, Brighton

Sustrans

Controlled crossing, Hoe Street, London

Google Maps, 2017

Relevant Factsheets:

Integration with Bus Stops (C4)
Buffers/Islands (C4)
Segregation and User Needs (C4)
Kerbs and Other Separation Options (C4)
Tactile Paving (M4)

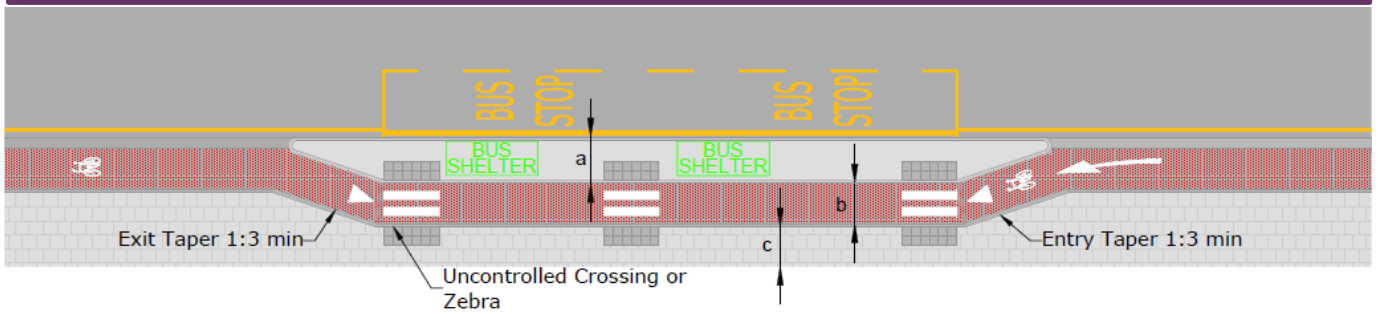
A.1: Floating Bus Stops – Bus shelter located on island

At floating bus stops passengers board and alight from an island between carriageway and cycle track.

Option 1

Where widths allow, the bus shelter can be located on the island. Access to bus shelter/stop on the island is provided by uncontrolled or mini zebra crossings.

Floating Bus Stops – Bus shelter located on island



DWG ref: HS-DR-C-0017

Floating Bus Stop, Brighton & Hove (LCDS, 2016)

Widths for bus shelter on island

(shelter is set back min 0.5m from the front kerb edge)

	Desirable Minimum			Absolute Minimum		
(a) island	Shelter width +0.5m front +0.5m back set back (Min 2.2m with cantilever bus shelter)					
(b) cycleway	1.5m (1-way) 2.5m (2-way)			1.2m (1-way) 2.0m (2-way)		
	Low ped. use	Medium ped. use	High ped. use	Low ped. use	Medium ped. use	High ped. use
(c) footway	2.0m +	2.5m +	3.0m +	2.0m +	2.5m +	2.5m +
Total width for 1-way	**5.7m** (4.3m + shelter width)	**6.2m** (4.8m + shelter width)	**6.7m** (5.2m + shelter width)	**5.4m** (3.7m + shelter width)	**5.65m** (4.75m + shelter width)	**5.9m** (5.0m + shelter width)
Total width for 2-way	**6.7m** (5.3m + shelter width)	**7.2m** (5.8m + shelter width)	**7.7m** (6.3m + shelter width)	**6.2m** (4.5m + shelter width)	**6.45m** (5.55m + shelter width)	**6.7m** (5.8m + shelter width)

Relevant Factsheets:

Buffers / Islands (C4)

Segregation and User Needs (C4)

Kerbs and Other Separation Options (C4)

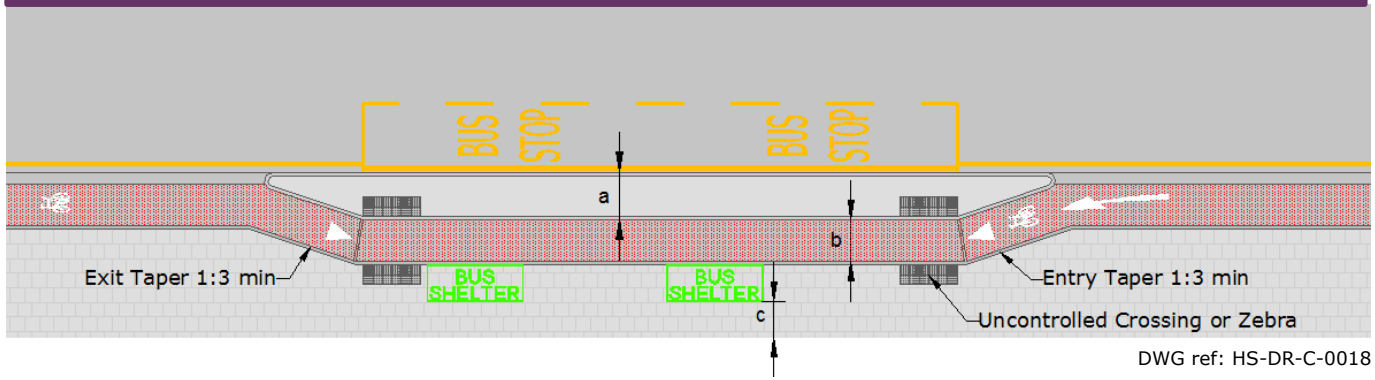
A.2: Floating Bus Stops – Bus shelter located on footway

At floating bus stops passengers board and alight from an island between carriageway and cycle track.

Option 2

If widths do not allow locating the shelter on the island, it can be located on the footway instead. Access to island for boarding / alighting is provided by an uncontrolled mini zebra crossings. Only marginal space savings over option 1 are possible.

Floating Bus Stops – Bus shelter located on footway



DWG ref: HS-DR-C-0018

Widths for bus shelter on footway

(shelter is set back min 0.5m from the cycleway kerb edges)

	Desirable Minimum			Absolute Minimum		
(a) island	2.0m			1.5m		
(b) Cycleway	1.5m (1-way) 2.5m (2-way)			1.2m (1-way) 2.0m (2-way)		
	Low ped. use	Medium ped. use	High ped. use	Low ped. use	Medium ped. use	High ped. use
(c) footway	Shelter width + 0.5m back set back					
	2.0m	2.5m	3.0m	2.0m	2.5m	3.0m
Total width for 1way	**5.5m** (5.3m + shelter width)	**6.0m** (5.8m + shelter width)	**6.5m** (6.3m + shelter width)	**4.7m** (4.5m + shelter width)	**5.2m** (5.0m + shelter width)	**5.7m** (5.5m + shelter width)
Total width for 2way	**6.5m** (6.3m + shelter width)	**7.0m** (6.8m + shelter width)	**7.5m** (7.3m + shelter width)	**5.5m** (5.3m + shelter width)	**6.0m** (5.8m + shelter width)	**6.5m** (6.3m + shelter width)

Relevant Factsheets:

Buffers / Islands (C4)

Kerbs and Other Separation Options (C4)

Segregation and User Needs (C4)

B - Bus Boarder – Cycle track through bus boarder

A bus boarder like footway extension can be created in line with the segregated cycle track, raised at footway level. The shelter is located on the footway edge whilst boarding/alighting takes place on the bus boarder/ cycleway section.

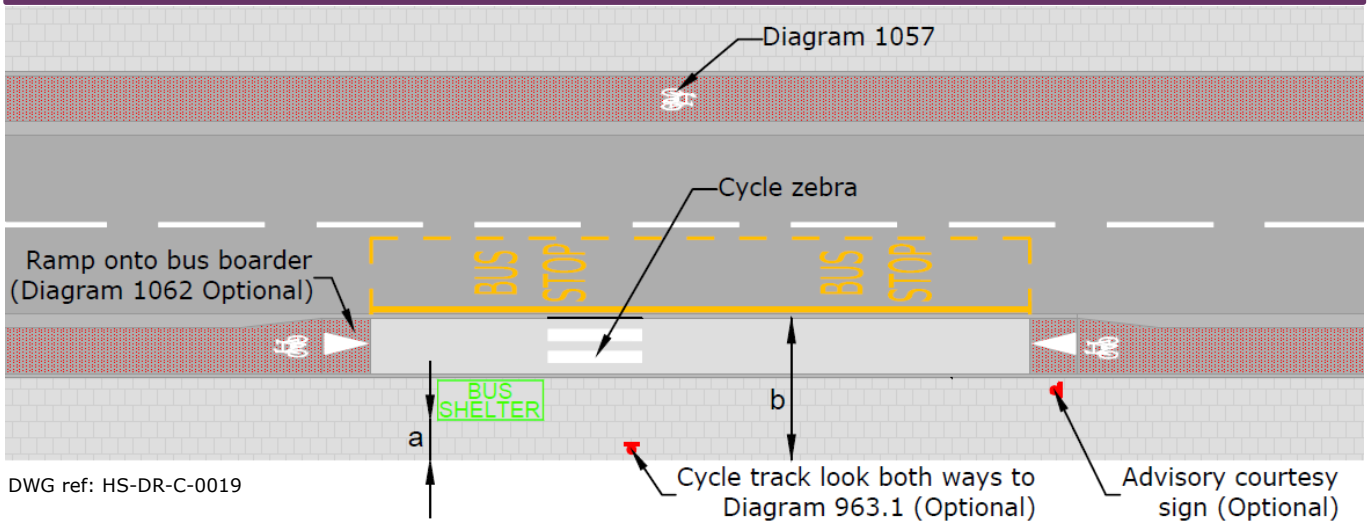
Combined Cycle Track and Bus Boarder, London

LCDS, 2016

Cycleway material

Careful consideration should be given to cycleway material, in particular use of blocks to denote pedestrian priority.

Bus Boarder – Cycle track through bus boarder



DWG ref: HS-DR-C-0019

Widths (applicable to one-way cycle tracks)

a: clear footway zone behind/in front of bus shelter

- min 1.5m behind shelter front panel (absolute min 0.9m clear of end panel) applicable to footways with low volume pedestrian use
- min 3.0m (absolute min 2.5m) applicable to high volume pedestrian use footways e.g. retail/high streets, high density residential

b: min 4.2m/5.2m respectively (0.5m buffer, 1.5m cycleway, 0.5m clearance, 0.2m cantilever shelter, 1.5m/2.5m clear footway)

Bus shelter location

Option 1: Locate shelter min 0.5m from the kerb edge

Option 2: Locate shelter max 0.5m from building line

Relevant Factsheets:

Buffers / Islands (C4) Bus Stop Box (PT2) Bus Boarder (PT2)
Segregation and User Needs (C4) Kerbs and Other Separation Options (C4)

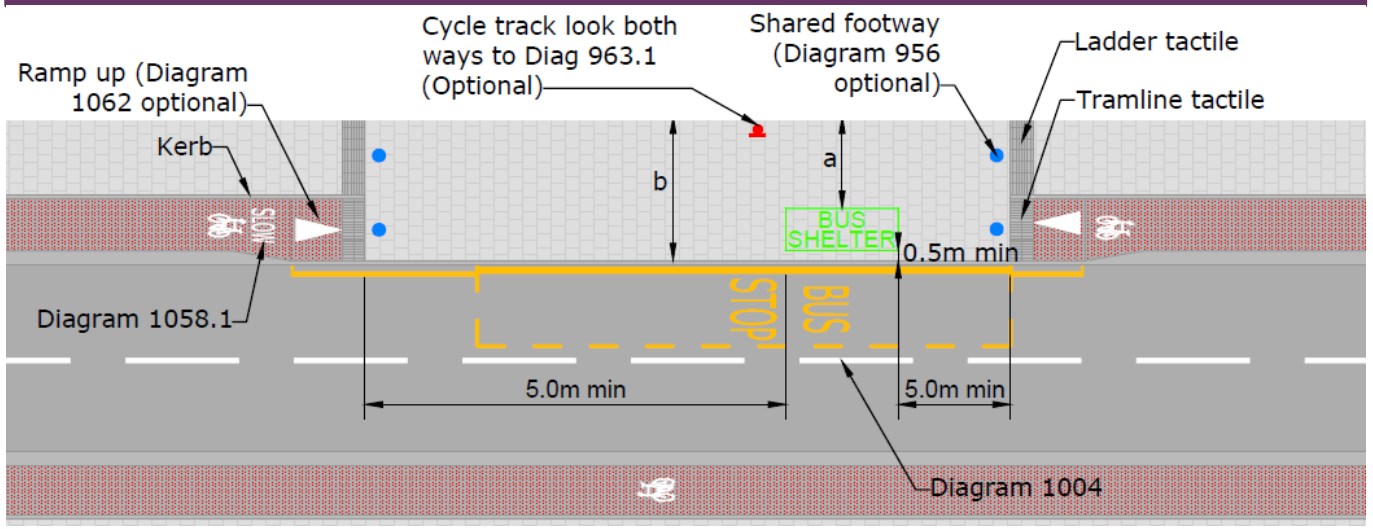
C: Bus Boarder – Shared use footway

A bus boarder like footway extension can be created in line with the segregated cycle track. The shelter is located at the kerb edge for ease of boarding/ alighting.

Both the footway and footway extension will require a Redetermination Order for shared use.

Unsuitable for higher use bus stops where waiting passengers are likely to occupy the full footway width

Bus Boarder – Shared use footway



DWG ref: HS-DR-C-0020

Widths

a: clear zone behind/in front of bus shelter (measured to side panel or front panel whichever is the smaller distance)

- min 3m (absolute min 2.5m) applicable to footways with low volume pedestrian use
- min 4m (absolute min 3m) applicable to high volume pedestrian use footways e.g. retail/high streets, high density residential

b: Absolute min 3.2m with cantilever shelter, 3.0m + shelter width for other shelter types, 3.0 with no shelter. Add 1.0m for busy footways.

One way/Two way

Both clear width (a) and total width (b) should be increased wherever possible for a two way cycleway.

Relevant Factsheets:

Buffers / Islands (C4) Bus Stop Box (PT2) Bus Boarder (PT2)

Segregation and User Needs (C4) Kerbs and Other Separation Options (C4)

Integration with Side Roads

At crossroads and T-junctions vehicle priority is given to traffic on the major road. Priority is usually indicated by give-way or stop-lines and associated signs.

For cyclists, key issues relate to the safety and comfort of moving ahead through a priority junction while motorised traffic seeks to turn in or out of the minor road, and the safety, comfort and directness of cycle turns into and out of junctions.

Consider continuous footway, raised entry treatments, reduced corner radii, reduced side street width and making the side street one way.

Highway Code (rule 183): 'When turning, give way to any vehicles using a bus lane, cycle lane or tramway from either direction'.

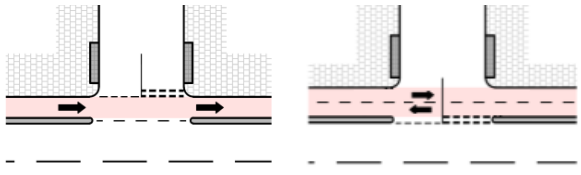
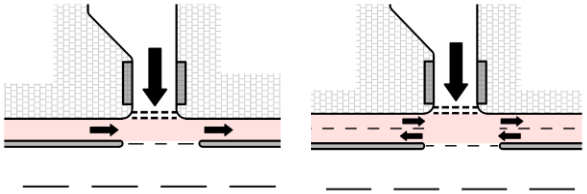
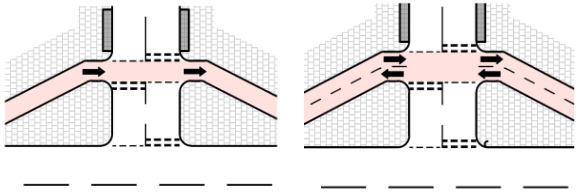
Summary of options for cycle-friendly interventions at priority junctions

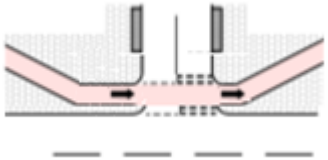
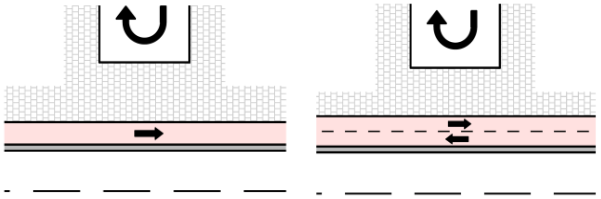
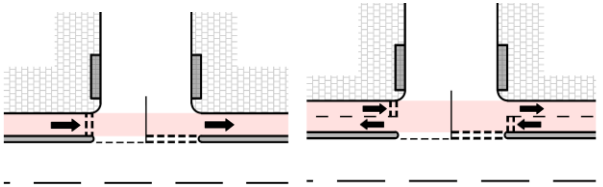
Reduce speed on main road and turning	Changes to geometry that support speed reduction include: continuous footways, raised tables, kerb realignment, reduced corner radii, reduced width of junction mouth and footway build-outs. Continuous footways and raised entry treatments can address common risks on turning and suggest visual priority for cyclist and pedestrians.
Ensure good visibility	Preventing or restricting parking and loading close to the junction is an important supporting measure in most cases, helping to maintain good visibility. It is particularly important in relation to cyclists travelling relatively fast downhill.
One way side street or one way plug	Generally consider to avoid conflicts between vehicles turning into the side street and cycle track users.
Road Closure	Illuminates vehicle/cycle and vehicle/pedestrian conflicts but often creates wider issues.
Change or reverse priority / Ban specific movements	Banning movements or changing priority can help address specific conflicts between turning motorised vehicles and cyclists and enhance the directness, safety and comfort of a cycle route. Wider traffic management implications of these changes must be considered.
Convert to signalised crossing or junction	This approach should only be employed of other measures appear unlikely to be effective.
Road markings through junction	Visual priority can be supported by a combination of TSRGD diagram 1057 cycle symbols, dashed diagram 1010 markings across the mouth of the junction and coloured surfacing. These interventions raise road user awareness of the presence and legitimacy of cycling and specific cycle movements.

Relevant Factsheets:

Cycle Lanes (C2)
Segregated Cycle Lanes – Soft Segregation (C3)
Priority Junctions (G7)
Corner Radii (G6)

Cycle Track Options

Option 1	Option 2	Option 3
		
No Deviation	**One-way Side Streets (out)**	**Bending Out**
Pro's • Direct Cycle Route. • Minimal space requirement. • Simple layout. **Con's** • Potential conflict with vehicles turning into side road (worse for two-way). **Best For** • Low flow or very low flow side roads. One-way (e.g.<800vpd), two-way (e.g. <100 vpd), in particular cul de sacs as drivers will nearly all be familiar with the layout. • Good Visibility. • No parking / loading close to junction. (upstream) **Potential Show Stoppers** • Parking / Loading obstructing inter-visibility of cycleway users and drivers especially if there are significant flows into the side road. • For two-way cycleways, anything other than very low flows presents significant risks, especially for through roads where drivers are less likely to be familiar with layout. Measures to reduce these (e.g. banning right turns into side road) should be considered.	**Pro's** • Direct Cycle Route. • Minimal space requirement. • Simple layout. • Significantly reduced potential for conflict compared with option 1 (especially for two-way). **Con's** • Potential inconvenience from one–way street. **Best For** • Higher Flow side roads. • Parking or loading close to junction on main road. **Potential Show Stoppers** • No alternative route for diverted side road traffic.	**Pro's** • Space / time for vehicles turning into side street to give way to cycleway users. **Con's** • Needs more space. • More complex layout - adds to visual clutter, • Tends to require deviation of pedestrians from their desire lines. **Best For** • Higher volume two–way side roads (or one-way in) • For two-way cycleways, worth considering for all side streets. **Potential Show Stoppers** • Lack of space.

Option 4	Option 5	Option 6
		
one-way cycleways only	one-way two-way	one-way two-way
Bending In	**Full Closure**	**Cyclist give way**
Design • Waiting/loading ban imperative over "bent in" section. • Consider replacement of segregation by mandatory lane to increase drivers awareness of cyclists over "bent in" section. **Pros** • Cyclists more visible than bending out **Cons** • Needs more space. • Complex layout - adds to visual clutter, • May require deviation of pedestrians from their desire lines. **Best For** • Higher volume two–way side roads. **Potential Show Stoppers** • Lack of space. • Avoid for two-way cycle tracks.	**Pros** • Removes cycle/vehicle and pedestrian vehicle conflicts. **Cons** • Requires alternative route for side road traffic. • When turning movement is not possible, need to allow refuse vehicles (potentially large delivery vehicles) through closure. **Best For** • Any situation where road closure is a realistic option and doesn't cause any significant knock-on problems. **Potential Show Stoppers** • Issues relating to turning in side road and alternative routes for side road traffic.	**Pros** • Though undesirable, may be only safe option (e.g. not enough space to bend out two-way cycleway at busier side road) **Cons** • Inconvenience for cycle users. • Discourages cycleway use. **Best For** • Situations of last resort when no other option is safely deliverable. **Potential Show Stoppers** • N/A, but highly undesirable especially for higher cycle flows. **Design** • Consider a degree of bending out to make it easier for cyclists to assess safe crossing options.

Option 1: Continuing cycle track without deviation

At side roads, hard segregation will be interrupted but route will continue on the same line as cycle track.

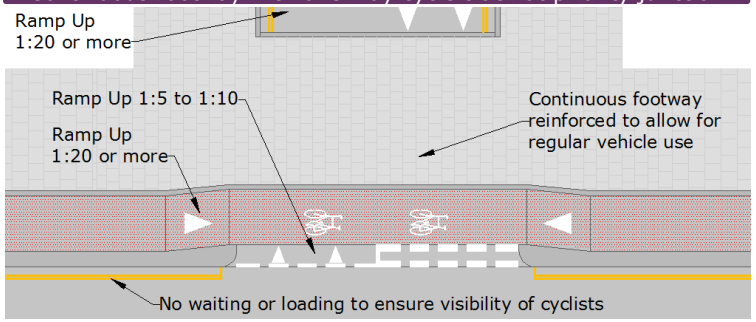
Key design issues

- End/recommence hard segregation **0-5m** (maximum) from side road to maintain cyclist security. Consider using flexible posts to delineate end of separation and for visibility, safety and durability.
- Red chipped surface continues with cycle symbols to highlight cyclists' presence.
- Minimise corner radii and side street carriageway width.
- 'Continuous footway', raised side road crossing and cycle track for further vehicle speed reductions.
- Entry to and from side roads should be reviewed to ensure appropriate sightlines and speeds.
- Diagram 1010 (not elephant's footprint markings) to define cycle lane if at carriageway level.

Transition across junction should be straightforward for users, and design – London Shoreham (LCDS, 2016).

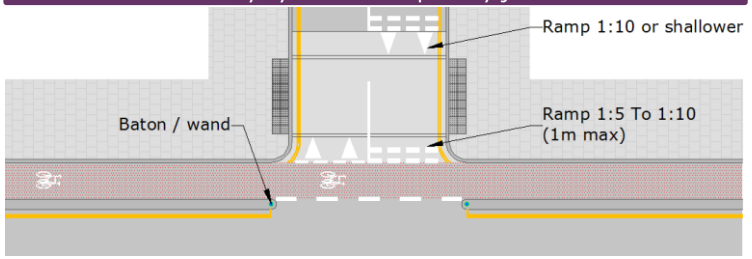
- Consideration should be given to applying give-way markings for vehicles turning from the main carriageway into the side road, should space be available to do so, but the treatment relies more on visual priority than on any specific use of signing. This is likely to work well in combination with continuous footway and cycleway treatments.
- Reintegrating cyclist with other traffic in the area around the priority junction is not recommended. Where considered, refer to TRL report PPR703, Trials of Segregation Set-back at Side Roads (2014).

Continuous footway with one-way cycle track at priority junction



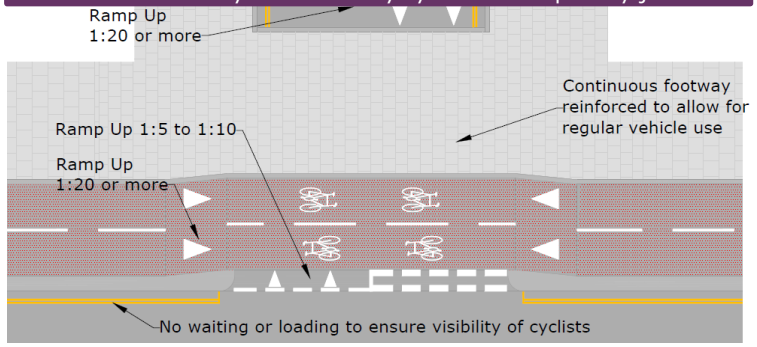
DWG ref: CF-DR-C-0008

One-way cycle track at priority junction



DWG ref: HS-DR-C-0021

Continuous footway with two-way cycle track at priority junction



DWG ref: CF-DR-C-0018

Relevant Factsheets:
Crossings (G4) Continuous Footways (G7)

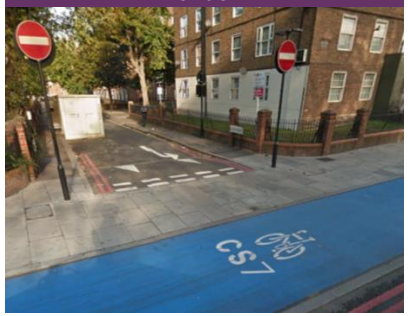
Option 2: One–way side roads

Turning movements in to side road can be banned (using a one way plug) to avoid risks related to the visibility of cyclists to motorised traffic turning into the side road.

Key design issues

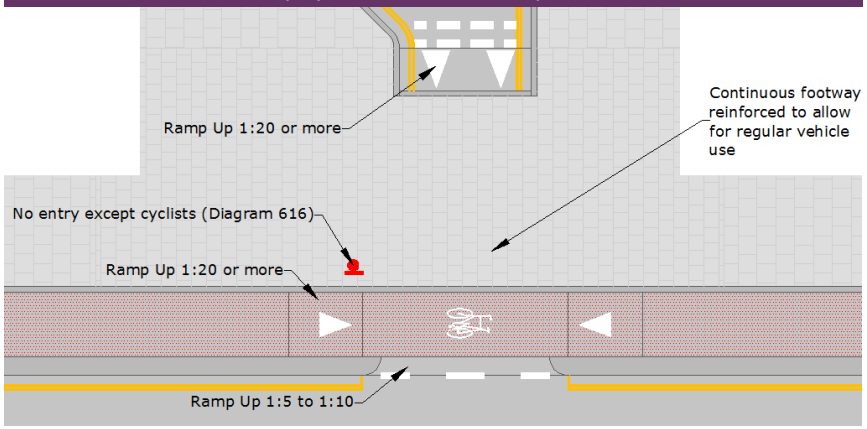
- Raised side road crossing and cycle track for further vehicle speed reductions.
- This is likely to work well in combination with continuous footway and cycleway treatments.
- One-way away from main road can be considered. This required similar treatment to two-way but can be beneficial to reduce width of side road.

One-way side road, Magee Road, London



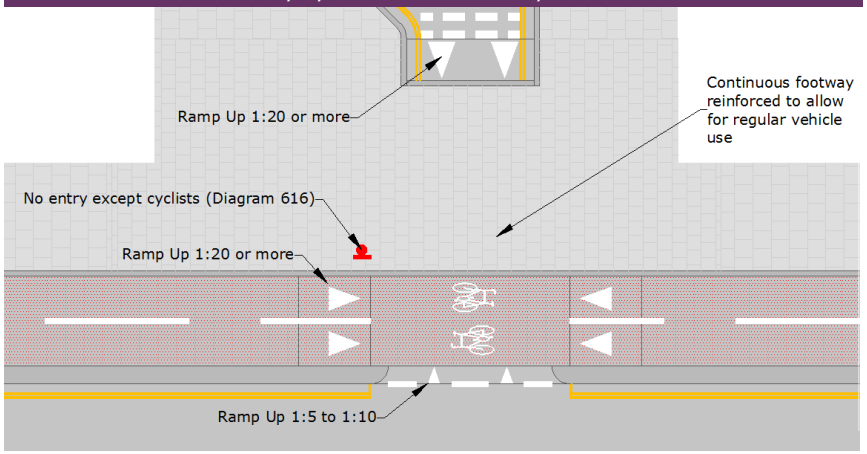
Google Maps, 2017

One-way cycle track at one-way side street



DWG ref: CF-DR-C-0004

Two-way cycle track at one-way side street



DWG ref: CF-DR-C-0017

Relevant Factsheets:
Crossings (G4) Continuous Footways (G7)

Option 3: Bending-out

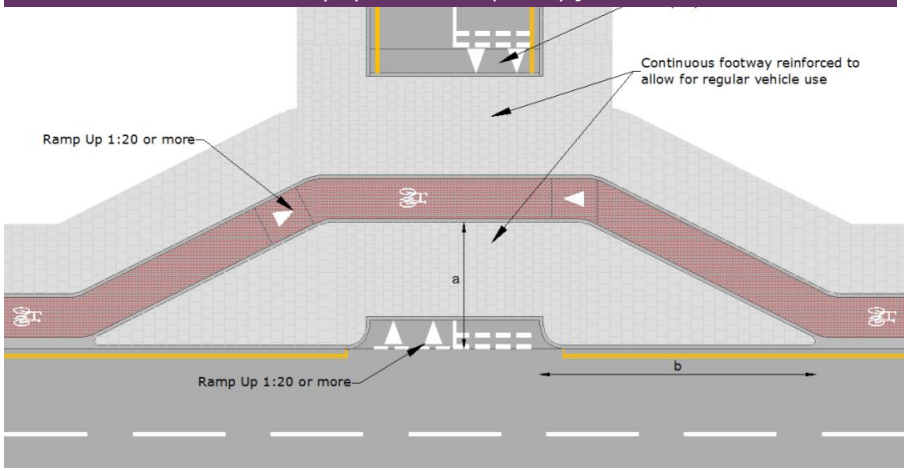
For two-way tracks crossing two-way side roads, 'bending-out' by at least 4.5m is the recommended option. Where island separation is wide, this can be achieved with little or no deviation of the cycle track.

City of Edinburgh Council

Key design Issues

- Red chipped surface continues with cycle symbols to highlight cyclists' presence.
- Minimise corner radii and side street carriageway width.
- Continuous footway or raised side road crossing and cycle track for further vehicle speed reductions.
- Reintegrating cyclists with other traffic in the area around the priority junction is not recommended. Where considered, refer to the options presented in TRL report PPR703, Trials of Segregation Set-back at Side Roads (2014).

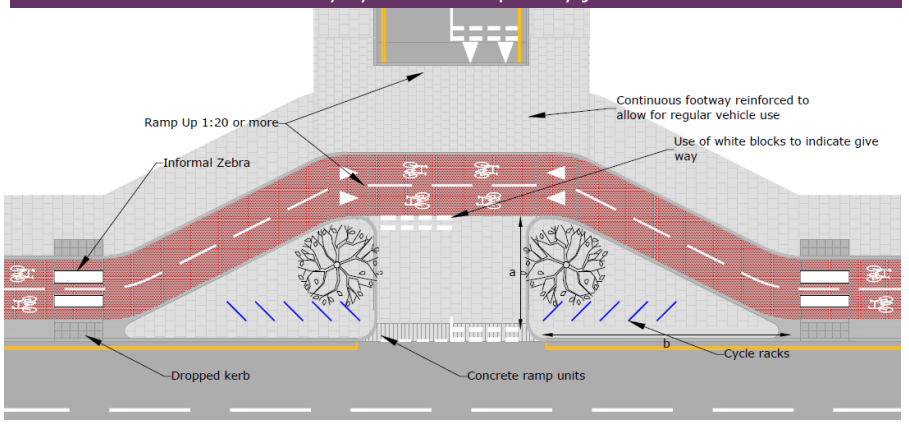
One-way cycle track at priority junction



DWG ref: CF-DR-C-0005

a: Min 4.5m
b: Desirable 10m

Two-way cycle track at priority junction



DWG ref: CF-DR-C-0019

Relevant Factsheets:
Crossings (G4) Continuous Footways (G7)

Option 4: Bending-In

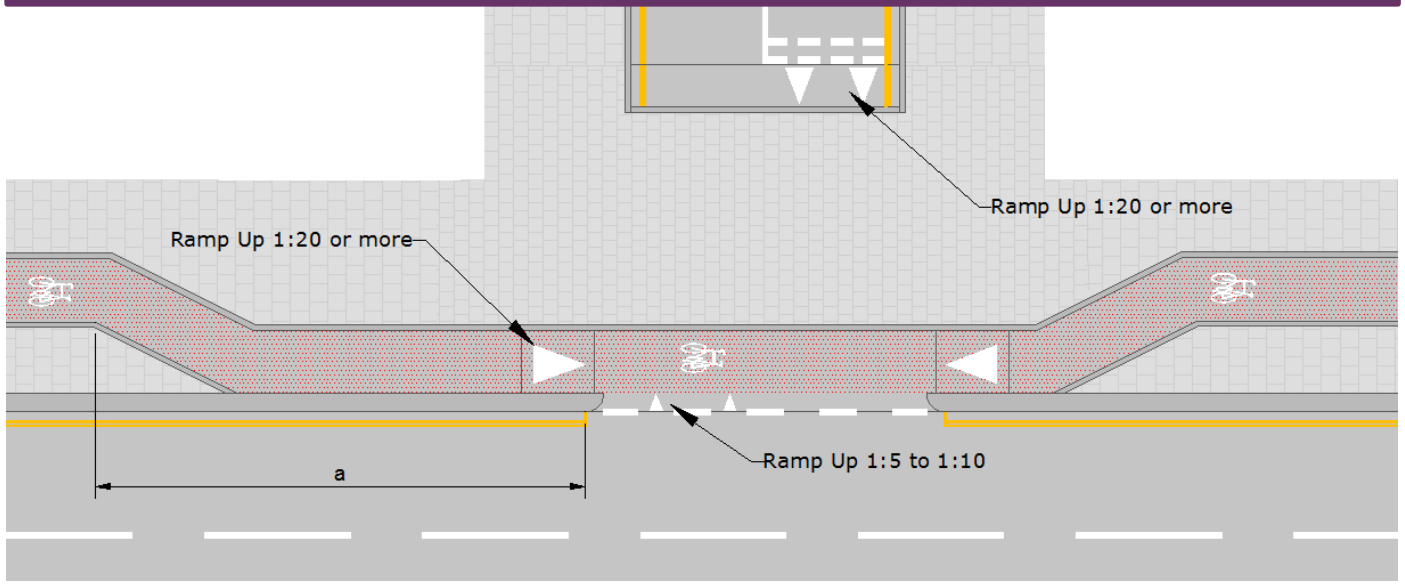
"Bending in" the cycle track towards the junction mouth aims to bring cyclists into the view of the turning traffic.

Key design issues

- This design relies on visibility of cyclists as they approach the junction mouth. The key risk is that the driver turning into the side road does not see a cyclist approaching it.
- It is critical that parking and loading are banned upstream of the junction and that there is a sufficiently long run-in to the junction which is free of parking and loading.
- Red chipped surface continues with cycle symbols to highlight cyclists' presence.
- Minimise corner radii and side street carriageway width.
- Preferably, continuous footway or raised side road crossing.

- Reintegrating cyclists with other traffic in the area around the priority junction is not recommended. Where considered, refer to the options presented in TRL report PPR703, Trials of Segregation Set-back at Side Roads (2014).

Continuous footway - Bending-in one-way cycle track



DWG ref: CF-DR-C-0013

a: min 15m - no parking or loading. A greater distance is required downhill and less uphill.

Relevant Factsheets:
Crossings (G4) Continuous Footways (G7)

Option 5: Full Closure

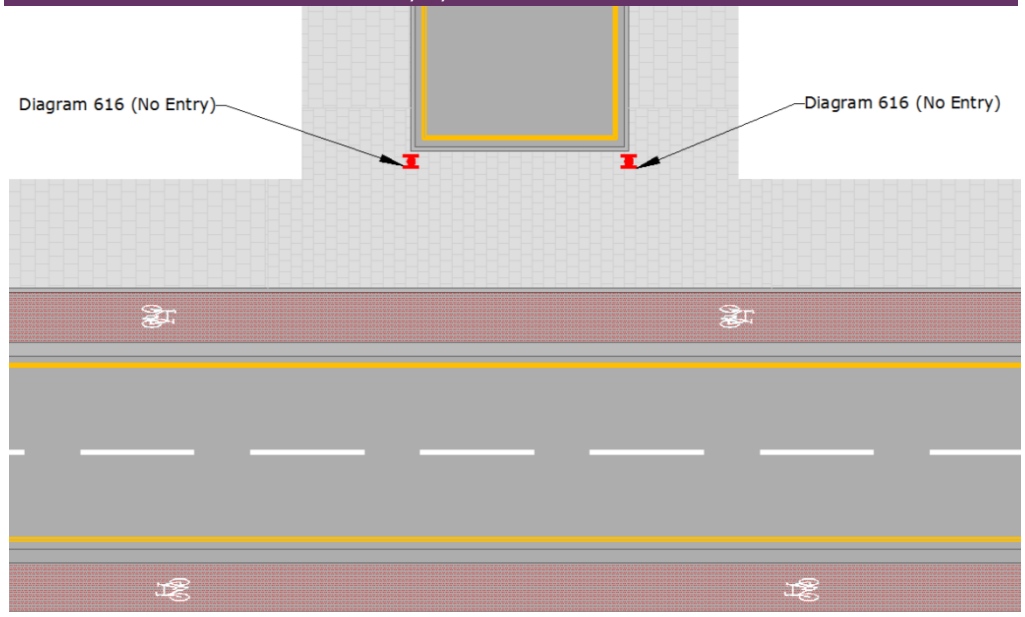
Full closure of the side road aim to remove cycle, vehicle and pedestrian conflicts.

This option requires an alternative route for side road traffic to access the main road and this should be given due consideration.

Design considerations

- Parking closer to main road should be removed to allow turning manoeuvre on side roads.
- The clear unobstructed width of the side road should allow turning manoeuvres of refuse vehicles. If not possible consider option 2.

One-way cycle track – Full Closure



DWG ref: HS-DR-C-0022

Option 6: Cyclists Give-way

Cyclists giving way at side roads should be avoided wherever possible because:

a) This makes using the cycle track relatively slow and inconvenient.
b) Consequently the cycle facility is less attractive, less likely to encourage people to cycle and less likely to be used.
c) Cyclists have to check in several directions to see if there are any approaching vehicles or pedestrians.

This option should be considered where:

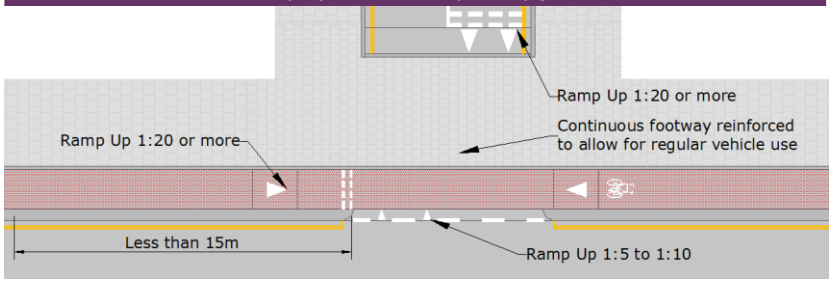
a) A 2-way cycleway crosses a side road with more than low flows (i.e. >100 vpd, 2-way), where traffic can enter from the main road, without bending in. Higher flows are likely to be acceptable where is it reasonable to expect that most drivers will be familiar with the layout, particularly when the side road cannot be used as part of a through route and flows on the main road are modest (<10,000 vpd, 2-way)

b) A with-flow 1-way cycleway crosses a side road without bending in and with potential poor intervisibility between cyclists and motor vehicles turning into the street.

Grange Avenue, Bradford (Google Maps, 2017)

- Reintegrating cyclists with other traffic in the area around the priority junction is not recommended. Where considered, refer to the options presented in TRL report PPR703, Trials of Segregation Set-back at Side Roads (2014).
- Bending in – If some degree of bending in is possible, this should be considered in order to make it easier for cyclists to assess crossing opportunities.

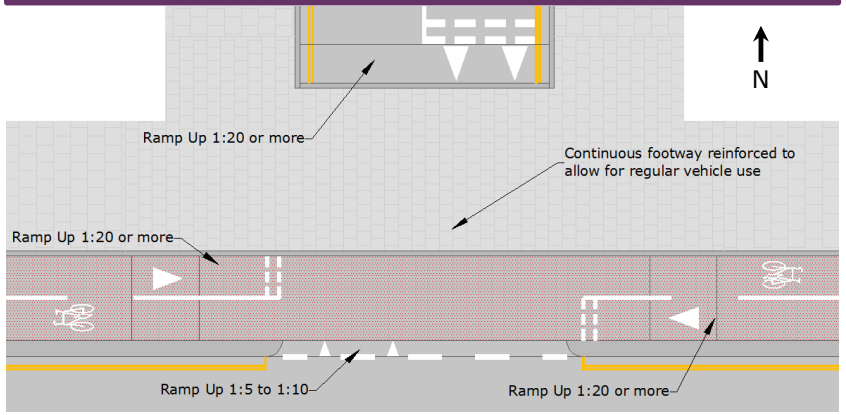
One-way cycle track at priority junction



DWG ref: CF-DR-C-0007

Any loading, parking or bus-stop less than 15m upstream of the junction will mean that inter-visibility between cyclists and turning vehicles is likely to be poor.

Two-way cycle track at priority junction



DWG ref: CF-DR-C-0014

The most significant conflict in the above example is turning vehicle into the side road vs. cyclist travelling west.

Relevant Factsheets:
Crossings (G4) Continuous Footways (G7)

Integration with Crossings

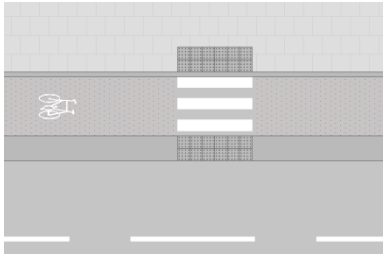
The Council is currently developing its approach to the integration of cycle tracks with pedestrian crossings.

Page 33 provides guidance on pedestrian crossing of the cycle track including levels. Further guidance in detail is being prepared in due course which will take into account current national guidance and experience from elsewhere. For guidance on this issue, please discuss with the City of Edinburgh Council Active Travel Team.

Pedestrian Crossings of the Cycleway

Design principles

- Crossings should be on main pedestrian desire lines.
- Drainage issues must be considered for all crossings.
- Use flush kerbs and tactile paving appropriately.



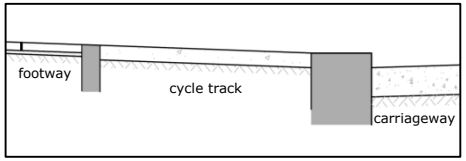
Footway level (raised) crossings are preferred to:

- Emphasise pedestrian priority;
- Reduce cyclist speeds; and
- Encourage courtesy from cyclists (especially where the cycle track is two way).

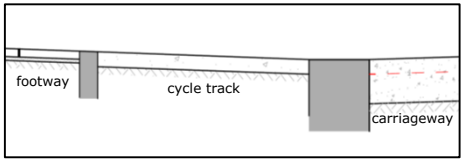
Google Maps, 2017

Cycle track at footway level

Cross section away from crossing

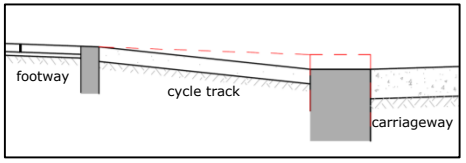


Cross section at crossing point



Option 1 (desired) Carriageway is raised to footway/cycle track level to provide level access for pedestrians

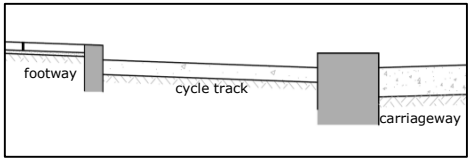
Cross section at crossing point



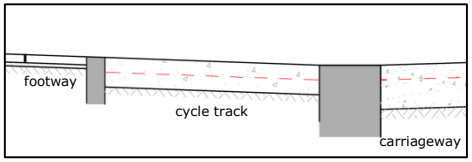
Option 2 Cycle track vertically aligned at crossing point to provide dropped kerb access for pedestrians

Cycle track at carriageway level

Cross section away from crossing

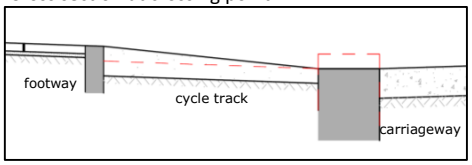


Cross section at crossing point



Option 1 (desired) Cycle track and carriageway are raised to footway level to provide level access for pedestrians

Cross section at crossing point



Option 2 Cycle track vertically aligned at crossing point to provide dropped kerb access for pedestrians

Relevant Factsheets:

Crossings (G4) Signalled Crossings at or near Junctions (G5) Dropped / Flush Kerbs (G4)

Integration with Signal Controlled Junctions

Improvements to cycle safety and comfort, and to the directness and coherence of cycle routes may be achieved through remodelling, removing or introducing signal control at junctions, particularly where signal timings can be changed to reallocate time between road users and generate time saving benefits for cyclists.

Care should be taken to avoid introducing signal control where it is not justified. This can result in increased journey times for all users and is costly to install and maintain.

Over-complicated signal staging and operation can lead to excessive waiting times for cyclists and an increase in frustration and non-compliance.

Summary of options for cycle-friendly interventions at signal-controlled junctions

Using ASLs and feeder lanes	Advanced stop lines (ASLs) can help cyclists move away from a safer, more advantageous position at a signal-controlled junction at the start of a stage and so, selectively, can assist cycle movements through a junction.
Managing conflict with turning vehicles	This may be done by giving cyclists an advantage in time or space, or by seeking to move the point of crossing conflict away from the junction itself (managing the conflict).
2 stage cycle right turn	As part of a segregated cycling system or a wider strategy on a route or a series of junctions to keep cyclists in a predictable position on the nearside, cyclists can be assisted with right turns by staying on the nearside and making the turn in two stages.
Cycle bypass of signals	In some instances, particularly through signalised T-junctions, cyclists making certain movements may be permitted a bypass of the signal control.
Signalisation to remove conflict	Complete separation at junctions involves signalling cyclists separately to remove all conflicting movements with other users. This tends to increase delays.
Banning selected motorised vehicle movements	Generally in conjunction with other measures listed here, certain vehicle movements can be banned to improve cycle safety and directness. The wider traffic management implications must be considered
Convert to a priority junction	Signal removal can have some beneficial effects where the volume and mix of traffic and nature of conflicting movements does no longer justify the existence of a signal-controlled junction.
Remove all vehicle priority and declutter	As part of an integrated area-wide approach, designers may explore the potential benefits of removing signal control altogether in order to promote more consensual road user behaviour. This may still include features to encourage drivers to give way to pedestrians and cyclist.

LSDG 2016 Fig. 5.7

Two stage right turn and early release at signal junctions

The illustrative junction design presented here demonstrates how a soft segregated cycle route can continue through a signal controlled junction by using two-stage rights turn and early release arrangement trailed in London. This can also apply to hard segregation.

Two-stage left turn marking at junction in Stockholm (top); and cyclists in different streams in Copenhagen (bottom) – left turners are heading to the waiting area to the right.

All images: (LCDS, 2016)

Two-stage right turn and early release arrangement (from SQA0651)

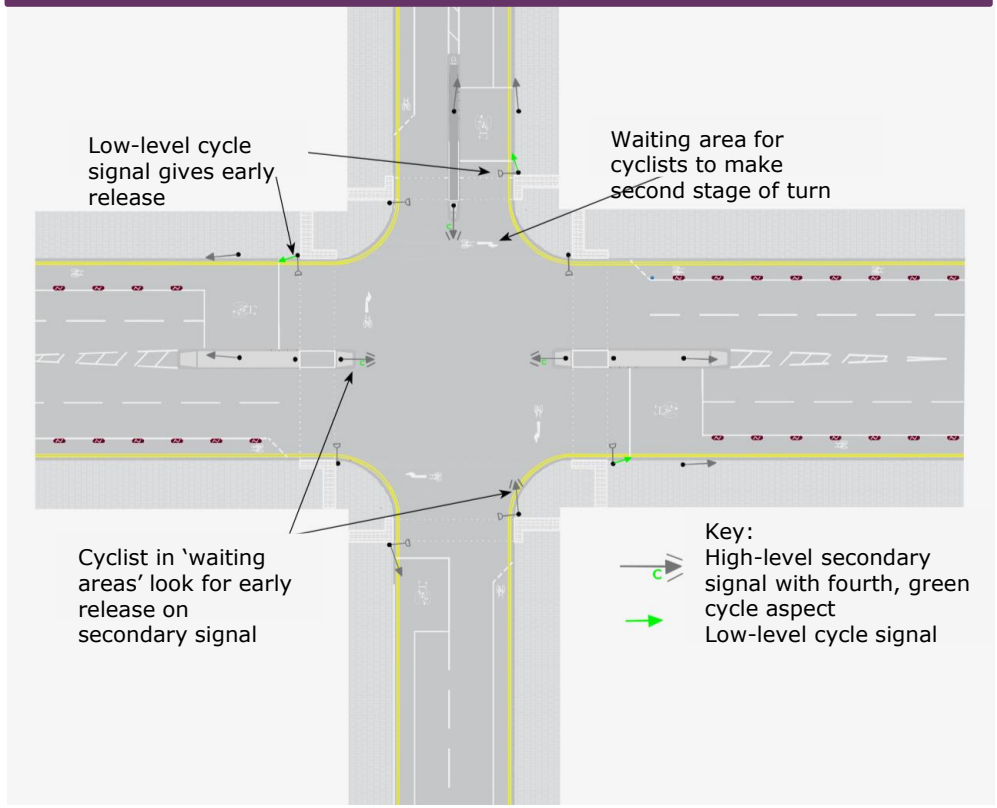


Diagram adapted from LCDS, 2016

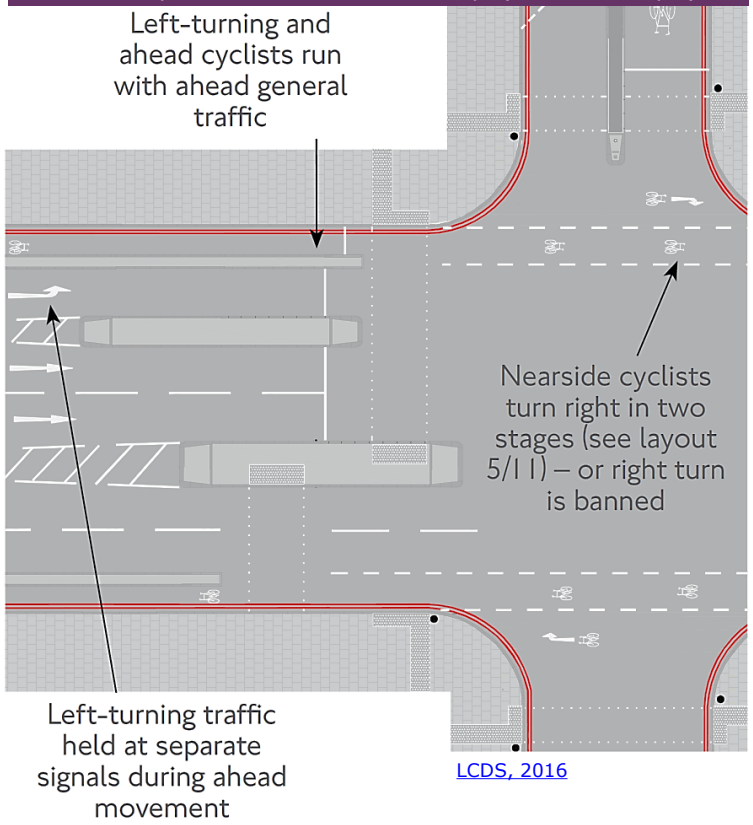
A minimum horizontal clearance of 450mm (or 200mm in space constraint areas, see Street Furniture factsheet) should be provided between the edge of the carriageway and a low-level cycle signal. Less clearance is needed to a cycle track, indicatively a minimum of 250mm but to be determined on a site-specific basis.

Relevant Factsheets:
Street Furniture (F1)

Holding the left turn at signalled junctions

The illustrative junction design presented here demonstrates how a segregated cycle route can continue through a signal controlled junction by using a two-stage right turn and early release arrangement trailed in London.

Indicative layout for 'hold left turn' concept (London example)



LCDS, 2016

Visualisation showing proposal for 'hold left turn'

LCDS, 2016

A minimum horizontal clearance of 450mm (or 200mm in space constraint areas, see Street Furniture factsheet) should be provided between the edge of the carriageway and a low-level cycle signal.

Less clearance is needed to a cycle track, indicatively a minimum of 250mm but to be determined on a site-specific basis.

Relevant Factsheets:
Street Furniture (F1)

Cycle Gate at signal junctions

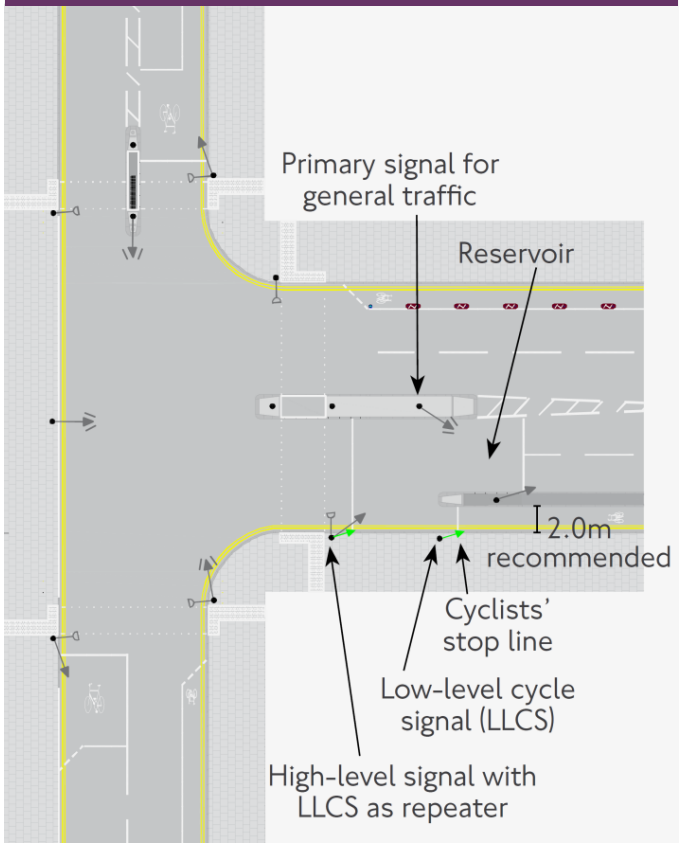
A 'cycle gate' is an alternative method of giving cyclists some time and space to move away from a junction ahead of motorised vehicles.

Layout principles

- The cycle lane/track on the approach must be physically segregated, at least 1.5 m wide, preferably 2 m, to allow for overtaking.
- The general traffic stop line should be positioned behind the advanced cycle stop line.
- The segregating strip should widen to allow clearance for mounting the traffic signal head; for a signal head mounted in front of a traffic signal pole, the segregating strip should be at least 1.3 m
- The distance from the first cycle stop line to the advanced stop line at the junction (the depth of the reservoir) should be at least 15 m; this is to disassociate the two stop lines from each other and reduce the see through issue between the two sets of traffic signals

Cycle gate at Bow: (top) segregated approach and first cycle stop line, and (bottom) advanced cycle stop line. Trial low-level cycle signals (used as repeaters) are mounted below the main signal heads.

Indicative layout for cycle gate (London example)



Images and diagram: (LCDS, 2016)

Signal layouts with dedicated cycle phases may also be considered. Typically this is appropriate where one or more arms of the junction allow access for cyclists only, but it may also be applied where cyclists are physically segregated from other traffic.

Image References

Segregated Cycle Tracks – Hard Segregation
All images: Transport for London: London Cycling Design Standards 2016 [ONLINE]. Available at: https://tfl.gov.uk/corporate/publications-and-reports/streets-toolkit#on-this-page-2 [Accessed 02 February 2017]

One and Two-way Cycle Tracks
Visualisation Haymarket Terrace: The City of Edinburgh Council

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Cross Section
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B – Parking/ Loading Bays inset into separating island
Separation using car parking: Transport for London: London Cycling Design Standards 2016 [ONLINE]. Available at: https://tfl.gov.uk/corporate/publications-and-reports/streets-toolkit#on-this-page-2 [Accessed 02 February 2017]

A.1: Floating bus stops – bus shelter located on island
Floating bus stop, Copenhagen: Transport for London: London Cycling Design Standards 2016 [ONLINE]. Available at: https://tfl.gov.uk/corporate/publications-and-reports/streets-toolkit#on-this-page-2 [Accessed 02 February 2017]

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B – Bus Boarder – Cycle track through bus boarder
Image: Transport for London: London Cycling Design Standards 2016 [ONLINE]. Available at: https://tfl.gov.uk/corporate/publications-and-reports/streets-toolkit#on-this-page-2 [Accessed 02 February 2017]

Option 2: One-way side roads
One-way side road, Magee Road, London: Google Maps [ONLINE]. Available at: https://goo.gl/maps/5EjWmpuMTKF2 [Accessed 02 February 2017]

Option 3: Bending
Bent-out cycle track 1: The City of Edinburgh Council

Option 2: One-way side roads
One-way side road, Magee Road, London: Google Maps [ONLINE]. Available at: https://goo.gl/maps/5EjWmpuMTKF2 [Accessed 02 February 2017]

Option 6: Cyclists Give-way
Grange Avenue, Bradford: Google Maps [ONLINE]. Available at: https://goo.gl/maps/D4WcCxVGDpE2 [Accessed 02 February 2017]

Pedestrian crossing of the Cycleway
Image: Google Maps [ONLINE]. Available at: https://goo.gl/maps/FeiF5NuDhK42 [Accessed 02 February 2017]

Two stage right turn and early release at signal junctions
All images: Transport for London: London Cycling Design Standards 2016 [ONLINE]. Available at: https://tfl.gov.uk/corporate/publications-and-reports/streets-toolkit#on-this-page-2 [Accessed 02 February 2017]

Hold the left turn at signal junctions
All images: Transport for London: London Cycling Design Standards 2016 [ONLINE]. Available at: https://tfl.gov.uk/corporate/publications-and-reports/streets-toolkit#on-this-page-2 [Accessed 02 February 2017]

Cycle Gate at signal junctions
All images: Transport for London: London Cycling Design Standards 2016 [ONLINE]. Available at: https://tfl.gov.uk/corporate/publications-and-reports/streets-toolkit#on-this-page-2 [Accessed 02 February 2017]

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