G6 – Speed Reduction and Traffic Management

Speed Reduction and Traffic Management	1
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Amendments:

Speed Reduction and Traffic Management

Design should be used to influence driver behaviour to reduce vehicle speed to levels that are appropriate for the local context and deliver safe streets for all.

- Designing Streets

Managing the speed of motor vehicles is a critical function of urban street design. Firstly, lower motor vehicle speeds enhance safety, for every 1 mph reduction in average speed, casualties fall by 6% [TRL 421]. Secondly, lower motor vehicle speeds help people to feel safer walking and cycling, and so are an important component of encouraging active travel and creating pleasant places.

As far as is practicable, speed reduction should be achieved through an integrated approach to street design in preference to the addition of conventional traffic calming features. This approach is most likely to be feasible in new development areas or when carrying out full reconstruction..

For more information refer to Achieving Appropriate Traffic Speeds, Department for Transport's Manual for Streets (1)

Overview -1

Street features that support/attract activity can influence the speed at which people drive.

- Consider incorporating features such as street art, street trees, soft landscaping, active frontages, closer building lines, seating etc. to encourage people to stay in a space or navigate through it.
- Use soft landscaping and street furniture strategically to tighten the carriageway at key points to reduce speed.

Changes in priority or no priority at junctions can be used to interrupt flow and therefore bring overall speeds down.

- Different surface materials indicate changes in priorities. Contrasting surface materials highlight crossings and suggests drivers should slow down.
- Re-balance priorities towards high pedestrian activity and flexible use to encourage a calmer, low-speed environment and considerate behaviour by all.

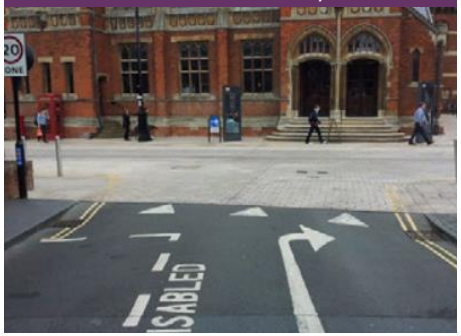
Street dimensions can have a significant influence on speeds.

- Keep block sizes small in new developments.
- Vary carriageway widths (through on-street parking and loading bays, build-outs, refuge islands, street furniture elements etc.)
- Altering street dimensions includes footway and carriageway widths and corner radii.

Soft landscaping

Designing Street, 2010

Pedestrian Priority



Sustrans Design Manual Chapter 7, 2010

Short lengths of streets

Google Maps, 2016

Relevant Factsheets:

Omitting Centrelines (G3)
Priority Junctions (G7)
Street Furniture Layout (F1)
QuietRoutes (C1)
Carriageway Widths (G2)
Setted Streets (M6)
Sustainable Urban Drainage Systems (W1)
Drainage (W2)
Street Trees (F5)
Shared Space (P8)

Overview -2

Reductions in forward visibility are associated with reduced driving speeds.

- Reducing visibility by street alignment, such as introducing sharp bends helps reduce speeds at junctions.

Physical features involving vertical or horizontal deflection can be very effective in reducing speed.

- Domed or flush median strips can visually narrow widths yet allow for overrun by buses or emergency vehicles if necessary.
- Physically narrow carriageway widths (through widening footways or constructing segregated cycle lanes/tracks)
- Vertical elements (e.g. lamp posts) along the carriageway edge give an accurate gauge of speed and distance for drivers.

Materials such as cobbled surfaces and setts can help reduce speed because of their appearance and physical characteristics.

- Changes in colour and surface texture visually narrow carriageways. Keep the variety of materials to a minimum to reduce cluttering and maintenance.
- Create transitions at road entry points to emphasise a reduced speed setting.

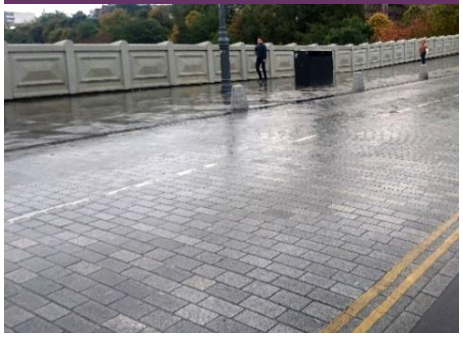
Reduced visibility

Designing Street, 2010

Visual Narrowing

Sustrans Handbook for Cycle Friendly Design (draft), 2014

Contrasting materials



Atkins, 2016

Relevant Factsheets:

Omitting Centrelines (G3)
Priority Junctions (G7)
Street Furniture Layout (F1)
QuietRoutes (C1)
Carriageway Widths (G2)
Setted Streets (M6)
Sustainable Urban Drainage Systems (W1)
Drainage (W2)
Street Trees (F5)
Shared Space (P9)

Corner Radii - 1

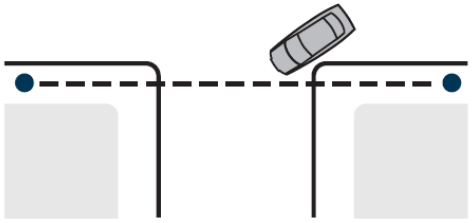
At junctions, corner radii should be minimised to ensure that crossings are as close as possible to the pedestrian desire line.

Reducing turning radii:

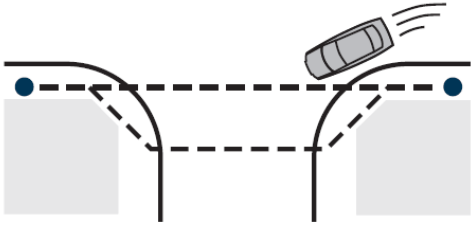
- increases pedestrian safety by shortening crossing distances
- increases pedestrian visibility
- decreases vehicle turning speed

The length of crossings should be minimised by keeping side street carriageways as narrow as possible (4.5m-6m desirable at entry points to local streets).

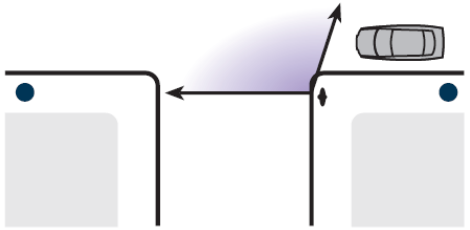
Effect of corner radii on pedestrians



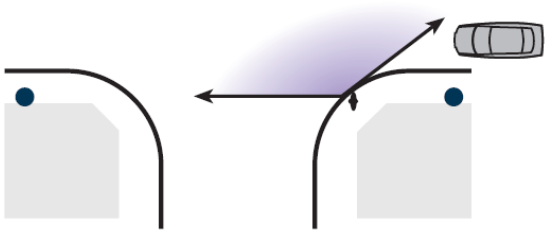
- Pedestrian desire line is maintained
- Vehicles turn slowly (10-15 mph)



- Pedestrian desire line deflected
- Detour required to minimise crossing distance
- Vehicles turn faster (20-30 mph)



- Pedestrians do not have to look further behind to check for turning vehicles
- Pedestrian can easily establish priority against slow moving vehicles



- Pedestrians must look further behind to check for fast turning vehicles
- Pedestrian cannot normally establish priority against fast turning vehicles

All images: Designing Streets, 2010

Large vehicles will generally not be frequent users of local side streets, and only used as the control vehicle to assess the risk(s) associated with their infrequent use of the full width of the carriageway to turn and of corner overrun.

The designer should adopt the most pedestrian friendly design unless there is a compelling reason to deviate from this.

Further guidance:

Designing Streets

Manual for Streets (1)

Relevant Factsheets:

Pedestrian Desire Lines (P2)

Crossings at or Near Junctions (G5)

Carriageway Widths (G2)

Street Furniture (F1)

Priority Junctions (P7)

Corner Radii - 2

Maximum corner radii

The table below sets out the maximum and desired corner radii for different street types.

The following factors need to be considered to achieve a balance between the needs of pedestrians and cyclists, and the ability to make vehicular manoeuvres:

- Volume of pedestrians, cyclists and motor vehicles and
- Width of major and minor roads

Use of full carriageway width

Use of the full carriageway width to turn will be appropriate in all local and, in most cases, secondary streets where:

- speed limits are 30mph or less;
- vehicle flows on the main street are moderate; and/or
- large vehicles are expected to make turns infrequently (e.g. for refuse vehicle collections and domestic deliveries only).

Overrun of corners

When constructing junctions on strategic/secondary streets, it may be appropriate to provide over-run areas to cater for occasional large vehicles, whilst retaining a tight radius (e.g. 3m) for cars. Footway corners should be strengthened to allow overrun of larger vehicles.

Where a medium-high frequency of large turning vehicle movements is anticipated, consider the placement of street furniture to reduce the likelihood of vehicle overrun on the footway; ensuring that adequate visibility at the junction is maintained. These measures can be combined with raising the junction.

Vehicle tracking

When determining corner radii, allowing the use of the full carriageway width to turn and strengthened footway surface area, the following control vehicle types will be tracked:

- Emergency vehicles for all streets
- Refuse vehicles for all local streets
- 12m bus for secondary streets and 15m bus for strategic retail streets
- 16.5m articulated HGV for all strategic streets.
- Ensure sufficient corner radii on 'abnormal load routes'.

Maximum corner radii (desirable in brackets)

<table>
<tr><th colspan="2">Minor Street</th><th colspan="7">Strategic</th><th colspan="7">Secondary</th><th colspan="7">Local</th></tr>
<tr><th colspan="2">Place Type</th><th>R/NF</th><th>IE</th><th>LDR</th><th>MDR</th><th>HDR</th><th>SSE</th><th>R/HS</th><th>R/NF</th><th>IE</th><th>LDR</th><th>MDR</th><th>HDR</th><th>SSE</th><th>R/HS</th><th>R/NF</th><th>IE</th><th>LDR</th><th>MDR</th><th>HDR</th><th>SSE</th><th>R/HS</th></tr>
<tr><td rowspan="3">Major Street Type</td><td>Strategic</td><td colspan="2">9</td><td>6</td><td colspan="4">6 (3)</td><td rowspan="2">9</td><td rowspan="2">9(6)</td><td rowspan="2">6(3)</td><td colspan="4" rowspan="2">6 (3)</td><td colspan="2" rowspan="2">9(6)</td><td rowspan="3">6(3)</td><td colspan="4" rowspan="3">3(1)</td></tr>
<tr><td>Secondary</td><td colspan="6"></td></tr>
<tr><td>Local</td><td colspan="7"></td><td colspan="2">9(3)</td></tr>
</table>

Key:
R/NF – Rural Road / No Frontage
IE – Industrial Employment
LDR – Low Density Residential
MDR – Medium Density Residential
HDR – High Density Residential
SSE – Service Sector Employment
R/HS – Retail / High Street

Relevant Factsheets:
Pedestrian Desire Lines (P2)
Crossings at or Near Junctions (G5)
Carriageway Widths (G2)
Street Furniture (F1)
Priority Junctions (P7)

Visibility

Reducing forward visibility for lower speeds

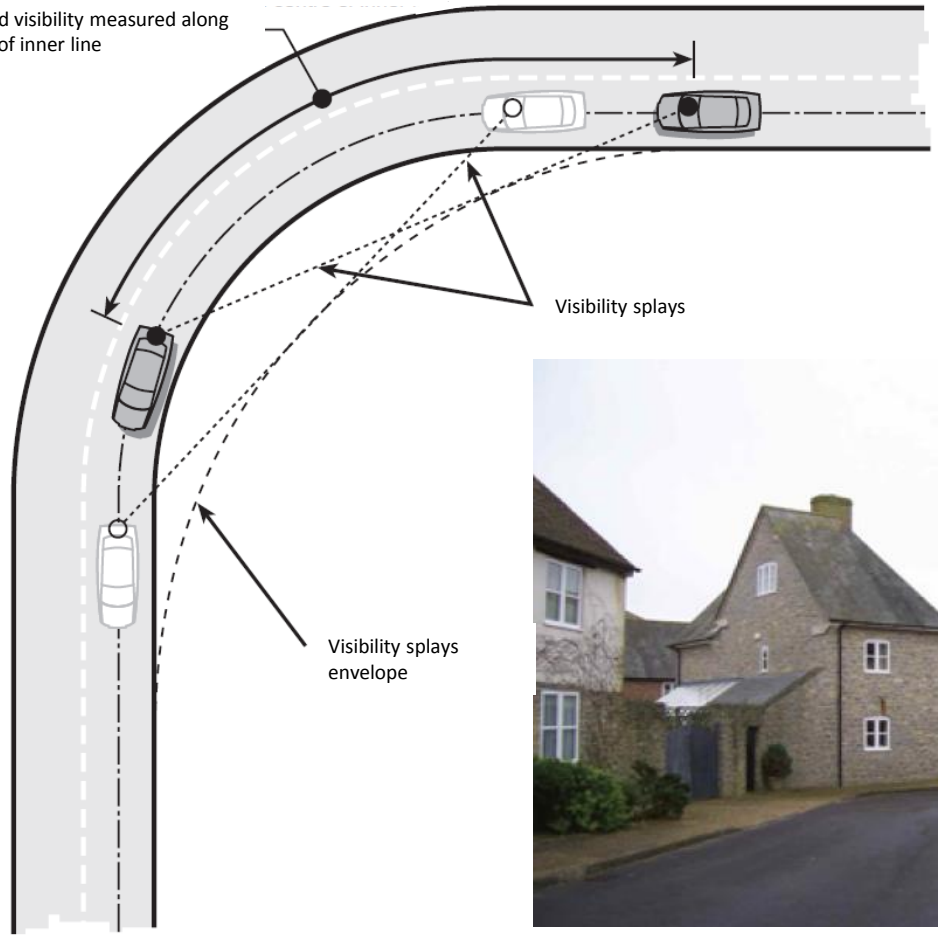
Where the speed limit is 20mph it is desirable to reasonably restrict forward visibility to control traffic speed without the need for use of physical traffic calming measures.

The minimum forward visibility, i.e. the distance a driver needs to see ahead to stop safely for obstructions in the street, is equal to the minimum Stopping Sight Distance (SSD) shown overleaf.

In 20mph streets it will be acceptable for SSDs to be below 25/22m.

It is checked by measuring between points on a curve along the centreline of the inner traffic lane.

Consideration should be given to vertical geometry and any other obstructions.



All images: Designing Streets, 2010

Further guidance:
Designing Streets
Manual for Streets (1)

Relevant Factsheets:
Pedestrian Desire Lines (P2)
Crossings at or Near Junctions (G5)
Carriageway Widths (G2)
Street Furniture (F1)
Priority Junctions (P7)

Reducing Visibility at Junctions

Research carried out for *Manual for Streets 2* has found **no evidence** that reducing visibility at junctions (between vehicles on the major and minor arms) will result in an increased risk of injury or collisions.

Research into cycle safety at T-junctions found higher cycle collision rates are associated with greater visibility.

The absence of wide visibility splays will encourage vehicles to emerge cautiously.

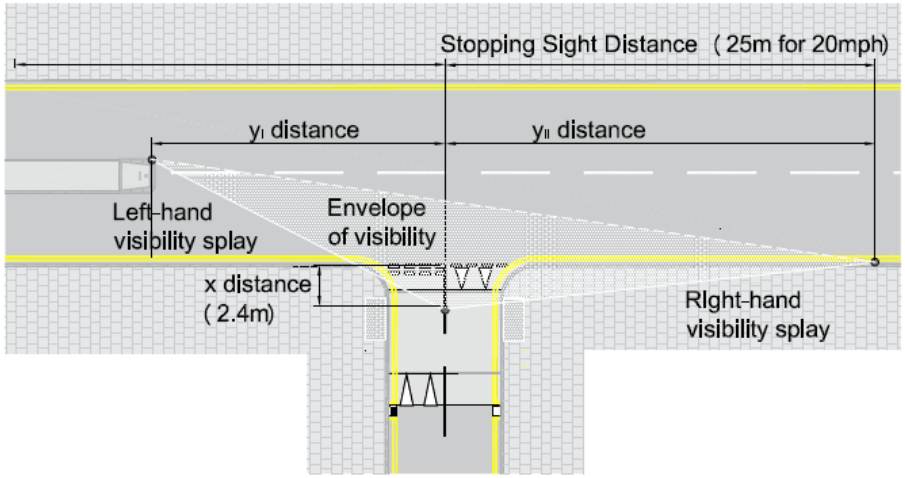
X distance

(Measured from Give Way line along minor street)

- **Desirable: 2.4m** in most streets
- **Maximum: 4.5m** because longer X distance enables drivers to look for gaps on approach to the junction which may increase capacity, but also increases the possibility that drivers fail to take into account pedestrians and cyclists.
- **Minimum: 2m** can be used in 20mph streets with low traffic flows, but using this value will mean that the front of vehicles slightly overhangs the major street

Y distance

- This is usually based on recommended SSD (Stopping Sight Distance) values. Based on the research carried out, a reduction in visibility below recommendations will not lead to significant issues.



Source: Transport for London: London Cycling Design Standards, 2016

Stopping Sight Distances (SSD)

Speed	Km per hour	16	20	24	25	30	32	40	45	48	50	60
	Miles per hour	10	12	15	16	19	20	25	28	30	31	37
SSD	Meters	9	12	15	16	20	22	31	36	40	43	56
	Adjusted for bonnet length	11	14	17	18	23	25	33	39	43	45	59

Subject to local conditions, where the combined proportion of HGV's and buses is greater than 5% of the traffic flow, SSD should be reviewed in line with the recommendations of paragraphs 10.1.6 to 10.1.13 of Manual for Streets 2. The Y distances stated are based on moderate gradients. Where streets are steeper (i.e.> 5%), reference should be made to the calculation in paragraph 10.1.5 of MfS2

Further guidance:

- Designing Streets
- Manual for Streets (1)

Relevant Factsheets:

Pedestrian Desire Lines (P2)
Crossings at or Near Junctions (G5)
Carriageway Widths (G2)
Street Furniture (F1)
Priority Junctions (P7)

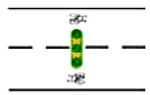
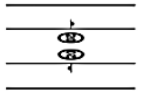
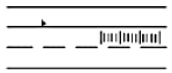
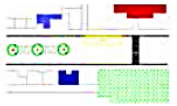
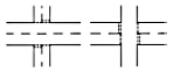
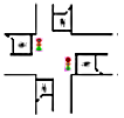
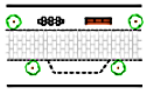
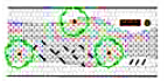
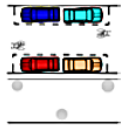
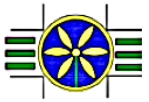
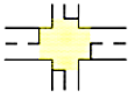
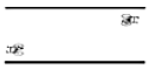
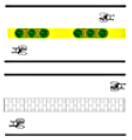
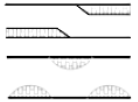
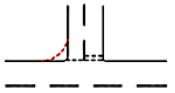
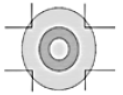
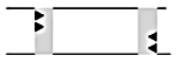
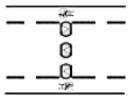
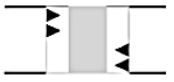
Traffic Management Measures

A wide variety of measures can be introduced to deliver better places and safer streets for everyone.

When designing streets, consideration should be given to introducing measures and features that have a dual function and positively contribute to a space to make it look and feel like a reduced-speed environment. In many cases, conventional traffic calming measures will remain appropriate.

The table identifies strategies and types of design interventions aimed at speed reduction and place enhancement that can result in traffic calming, both on links and at junctions:

Overview

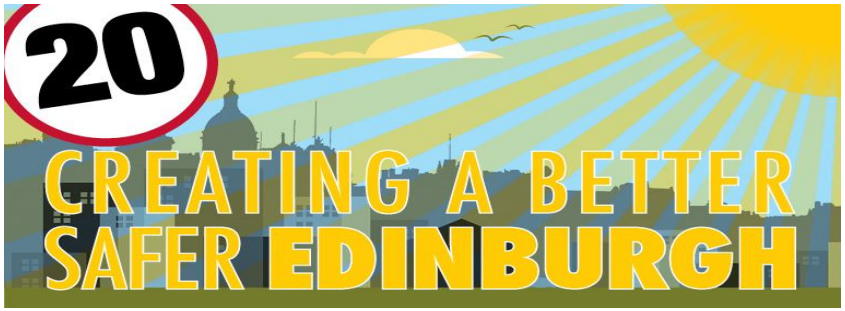
Area-wide traffic management – on links					– at junctions	
Filtered permeability 	Speed limits 	Speed cameras 	Emphasise place over movement 		Change in priority 	Signalise 
Calming through street design – on links					**– at junctions**	
Formal / informal crossings 	Streetcape enhancements 	Rebalance priorities 	Objects, eg parking 	Street trees/ planting 	Street art 	Change in materials/colour 
Centre line removal 	Apparent lane narrowing 	Median strip 	Modal filter with cycle bypass 	Lane deflecton / chicane 	Tighten geometry 	Implied roundabout 
Physical traffic calming – on links					**– at junctions**	
Sinusoidal speed humps 	Raised table (sinusoidal profile) 	Cushions (cycle-friendly gaps) 	Footway build-outs 		Entry treatment 	Raised table (sinusoidal) 

Source: Transport for London: London Cycling Design Standards, 2016

Relevant Factsheets:

Street Trees (F5)
Omitting Centrelines (G3)
Priority Junctions (G7)
Corner Radii and Visibility (G6)
Crossings (G4)

Designing for 20mph



The City of Edinburgh Council

By April 2018 approximately 80% of the urban road network in Edinburgh will comprise of 20mph speed limit zones with the remaining strategic roads having a maximum of 30 or 40mph.

Click here for more information about 20mph for Edinburgh

20mph roundel on Waverley Bridge, Edinburgh

The City of Edinburgh Council

Existing streets in 20mph zones

When undertaking medium to large scale capital schemes on existing streets, designers should review street layout and geometry and existing speed reduction measures with a view to ensuring that the new street layout helps reduce speeds.

Signing for 20mph zones

In order to create a 20 mph zone, it is a legal requirement that "measures" are installed to ensure that low speeds are maintained throughout. Such measures now include 20 roundels and repeater signs.

Design speed on new streets

All new streets should have a design speed of 20 mph with the exception of:

- streets on strategic public transport corridors which may be designed for 30 mph; and
- streets with no or few frontages which may be designed for 30 mph or higher speeds.

Developers will be asked to contribute a fee to promote a suitable order to introduce a 20pmh speed limit zone within the development and subsequently install all necessary signs/markings/traffic calming features as required at no cost to the Council. Contact the Development Management Team for details.

Further guidance:

Designing Streets

Manual for Streets (1)

Some of the key design aspects of 20mph streets include:

- tight corner radii (e.g. 1m for residential local streets);
- narrow carriageway widths (through widening footways or constructing segregated cycle lanes/tracks etc.);
- varied carriageway widths (through on-street parking, build-outs, refuge islands etc.);
- normally omitting centre line on street that has only one general traffic lane in either direction;
- reduced forward visibility;
- street structure e.g. short lengths of streets between junctions;
- changes in priorities at junctions
- surface materials (e.g. setts)
- street furniture and soft landscaping (e.g. tree lined streets);
- high pedestrian activity and bringing building line closer to footway edge;
- road humps, speed tables and speed cushions; and
- 20mph signs and road markings (e.g. "20" roundels, false humps).

Relevant Factsheets:

Omitting Centrelines (G3)
Carriageway Widths (G2)
Street Furniture Layout (F1)
Setted Streets (M6)
Corner Radii and Visibility (G6)
Street Trees (F5)

Street Furniture and Landscaping in Speed and Traffic Management

Consideration should be given to the use of alternative means to design out street clutter and promote pedestrian priority by using street furniture and soft landscape for traffic management. These are especially likely to be appropriate in new developments but should be considered in comprehensive renewals projects or when a new traffic calming scheme is being considered.

	Speed Reduction / Control	Access Control	Transition Points	Protection/Buffer
Traditional approach	• Speed bumps • Build-outs • Raised tables • Chicanes • Median Strips • Signage	• Barriers • Bollards • Signage	• Bollards • Kerbs • Signage	• Corduroy • Bollards • Barriers • Guardrails
Alternative Approach	• Vertical elements (trees, lampposts, etc.) to increase speed Perception • Physical/Visual Narrowing • Edge Friction • Transition Points	• Transition Points • In-situ planters • Street Trees • Lighting Columns • Cycle Parking • Benches	• Street trees • Physical/Visual Narrowing • Signs/gateway features	• In-situ planters • Street trees • Lighting columns • Green verge • Benches • SUDS features/Swales

Speed Perception with vertical elements

Sustrans, 2014

Access Control with street furniture

The Scottish Government, 2010

Transition points at road entry

Mike Biddulph, 2016

Street trees in a green verge

City of Edinburgh Council

Relevant Factsheets:

Street Furniture Layout (F1)
Seating (F2)
Street Trees (F5)
Sustainable Urban Drainage Systems(W1)

Vertical Traffic Calming

In many situations complete street re-design will not be an affordable way to deliver speed reduction. However there are a number of traffic calming measures available that reduce speeds and/or encourage walking and cycling.

If other forms of traffic calming are not deemed adequate to bring down traffic speeds, provide the following forms of road humps:

- **raised entry treatments** locally at side roads
- **raised tables and/or continuous footways** across the full extent of a junction or crossing areas to encourage motorists to make careful turning movements and improve safety for cyclists and pedestrians.

General Considerations:

Use **materials** that have a visual contrast with the carriageway surface to create spatial awareness.

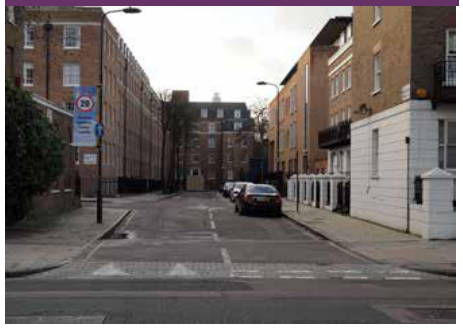
Use **build-outs** to narrow pedestrian crossings where suitable.

Note that road humps should not be used under or over bridge structures.

The following vertical deflection types should not be used due to adverse effects on cyclists:

- Rumble-strips.
- Humps with vertical upstands or steep ramps.
- Ramps with uneven or slippery surfaces.

Entry Treatment with Asphalt Table



Raised Table at Junction

Type of Flat-topped Hump to be Avoided

Cycle-friendly Speed Cushions

All images: Transport for London: London Cycling Design Standards, 2016

Relevant Factsheets:

Priority Junctions (G7)

Crossings (G4)

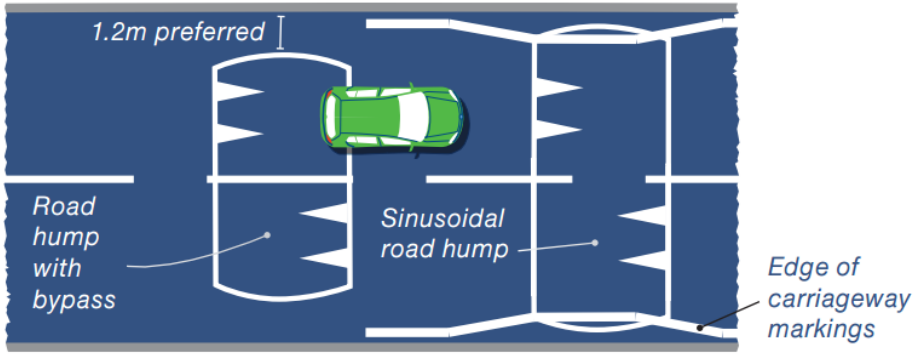
Speed Humps and Cushions

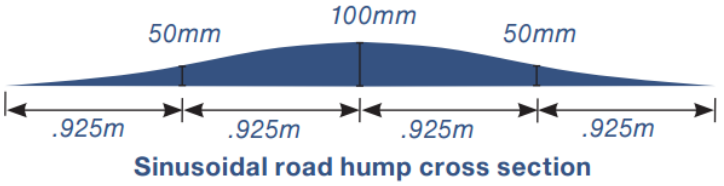
Sinusoidal road humps

Where cyclists are expected to travel over a vertical feature, a **sinusoidal hump** should be used. These are more comfortable and allow cyclists to maintain speed.

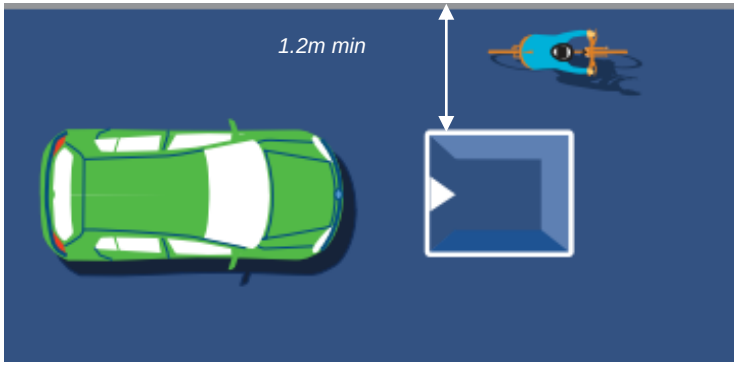
Speed cushions

Humps should not be used on routes used by emergency vehicles. Speed cushions are an alternative, but adequate gaps for cyclists should be provided. This should include 1.2m-1.5m between kerb and feature or at least a 1.5m gap between parked vehicles and feature in streets where the kerbside is generally occupied by parked cars.





Sinusoidal road hump cross section



Sustrans Handbook for Cycle Friendly Design (draft), 2014

Relevant Factsheets:

Cycle Friendly Traffic Management

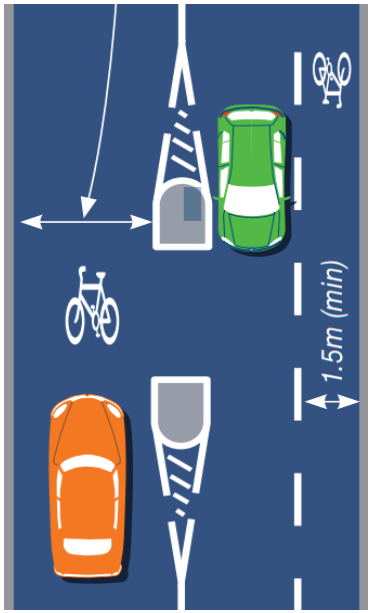
Horizontal features

Refuges, narrowings and chicanes reduce the available space for vehicles thereby reducing speeds. However cyclists should not be disadvantaged by creating uncomfortable narrow passing places.

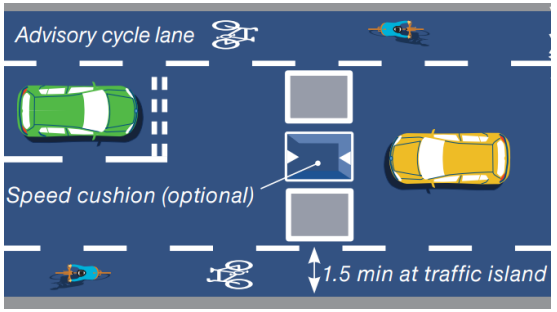
General considerations:

- Cycle facility should be continued past the refuge/narrowing.
- If carriageway widths are not sufficient, consider removal of the horizontal features and potentially replacements with alternatives (e.g. zebra crossings).
- Mandatory cycle lanes should be the default provision where feasible.
- Cyclists should not have to merge abruptly with traffic after the horizontal feature.
- Specific thought should be given to how segregated cycle lanes (hard or soft) are integrated with the traffic management. Route continuity and if possible, infrastructure type should be retained for the cyclist past the refuge / narrowing.

Recommended width depends on speed, but avoid gaps of 3.1-3.9m. Where pinch point can not be removed consider cycle symbol centrally



Sustrans Handbook for Cycle Friendly Design (draft), 2014



Sustrans Handbook for Cycle Friendly Design (draft), 2014

Cycle Bypass, Boswall Parkway, Edinburgh

The City of Edinburgh Council

Cycle bypass

- Preferred minimum cycle lane width of 1.75m (1.5m absolute min) should be maintained.
- Transition to and from the bypass should be considered.
- Adequate drainage should be provided - gully grating hazards or raises to footway that create debris-traps should be avoided.
- Mechanical sweeping should be allowed for.
- Bypasses should be protected from parking or loading.

Lane widths at pinch points with no cycle bypass

Speed limit	Lane width (m)	
	<5% HGV	>5% HGV
20mph	2.5m max	3.0m max
30mph	4.0m min(1)	4.0m min(2)

[1] 3.0m if frequent traffic calming measures along route

[2] Increase to 4.5m where 85%ile speeds exceed 30mph

Relevant Factsheets:

Cycle Lanes (C2)
Crossings (G4)
Soft Segregation: Integration with Crossings (C3)
Hard Segregation: Integration with Crossings (C4)

Image References

Speed Reduction and Traffic Management

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Cycle Bypass: City of Edinburgh Council

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