Designing for Cycling Bitesize – October 2023

Peter Leslie

Introductions

Safety Moment

Part 1 | Planning

Part 2 | Links

Part 3 | Junctions

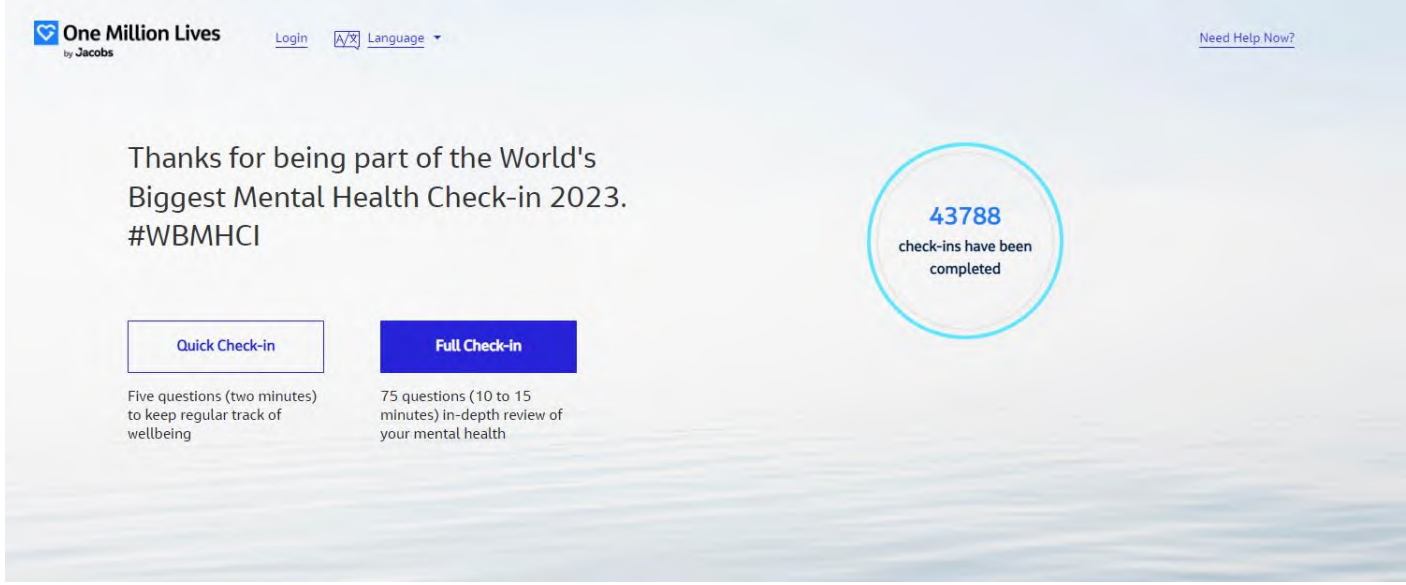
Part 4 | Crossings

Part 5 | Supporting measures

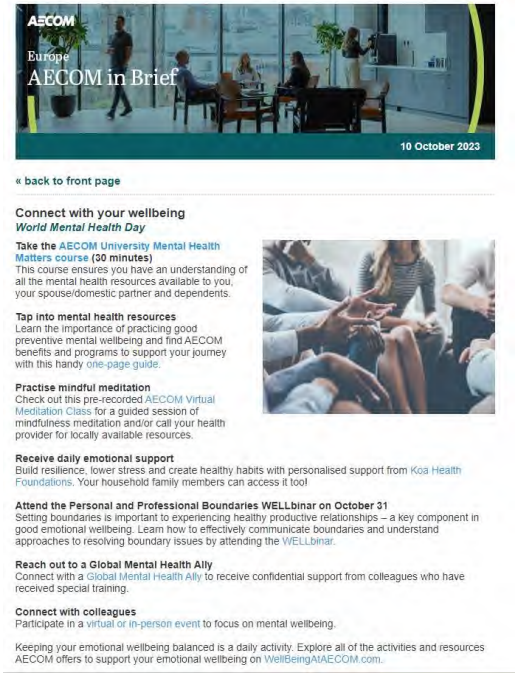
Discussion

Peter Leslie
Regional Director
(Scotland)

Wellbeing – World Mental Health Day



[World Mental Health Day 2023]



Part 1 | Intro and Planning

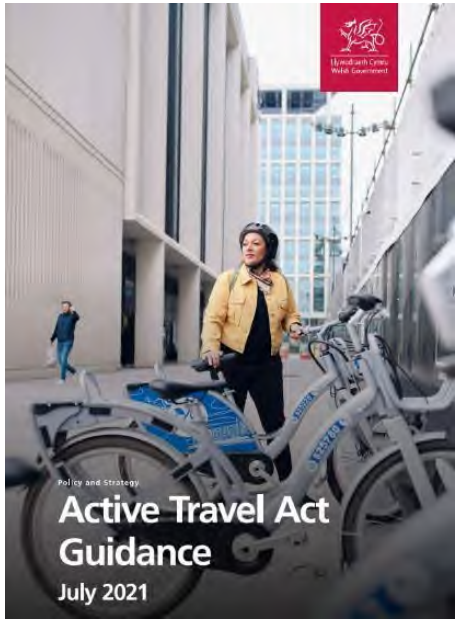
The first few chapters – What are the similarities?

Design Manuals

England & Northern Ireland (2020)

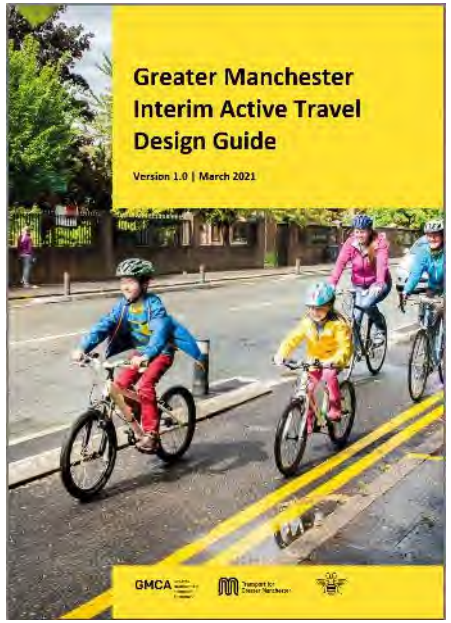
Scotland (2021)

Wales (2021)



Republic of Ireland (2023)

Design Manuals



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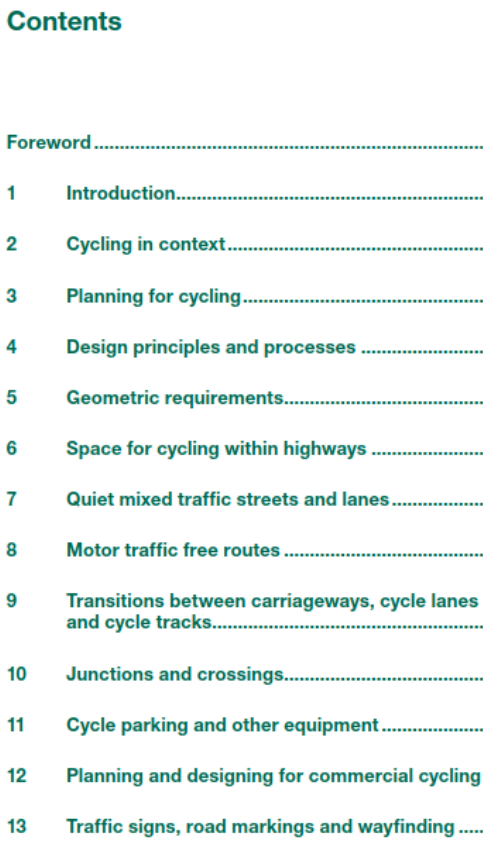
Guidance Structure



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7 Quiet mixed traffic streets and lanes .....

8 Motor traffic free routes .....

9 Transitions between carriageways, cycle lanes and cycle tracks .....

10 Junctions and crossings .....

11 Cycle parking and other equipment .....

12 Planning and designing for commercial cycling

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Design Guidance: Active Travel (Wales) Act 2013

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version 1
December 2014

Cycle Design Manual — Version 1.0

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Cycling by Design 2021

Recurring Themes

Introduction – Why we support designing for people cycling and during this process, how as designers we must appreciate and prioritise other users in particular more vulnerable users.

Summary – Each of them summarise the legality of the manual and terminology with in it.

Principles – An early indication of design principles.

Importance – How important the design guidance is and how delivery of the infrastructure will be enforced.

Planning

Summary of planning chapters and key points

2.0 Planning for Cycle Users

Measure	Purpose	Location	Example
Modal filter	To restrict vehicle movements whilst permitting walking, wheeling and cycling. (further guidance in Chapter 3)	On streets or at junctions where this will help to remove through-traffic. Care is needed to minimise the lengths of any reverse movements needed by local motor traffic.	
Pocket park	To create a green space between modal filters used for walking, wheeling, cycling and play.	On parts of streets where no local vehicle access is required.	
Diagonal filters	To enforce turning restrictions at crossroad junctions, whilst permitting walking, wheeling and cycling in all movements.	Crossroad junctions	
Turning restrictions	To restrict vehicle turning movements.	Junctions	
One-way streets	To limit vehicle access or egress from a street as part of a wider network plan. (further guidance in Chapter 3)	Only on streets which can be designed to avoid any potential for increased motor traffic speed resulting from one-way operation.	
Bus gates	To permit through-movements by local bus and cycling, whilst restricting through-traffic.	On key local bus routes that permeate low traffic neighbourhoods.	

For all measures, keeping sign clutter to a minimum is a key objective. Using planters and other measures sympathetic to the local environment will enhance the placemaking aspect of the neighbourhood.

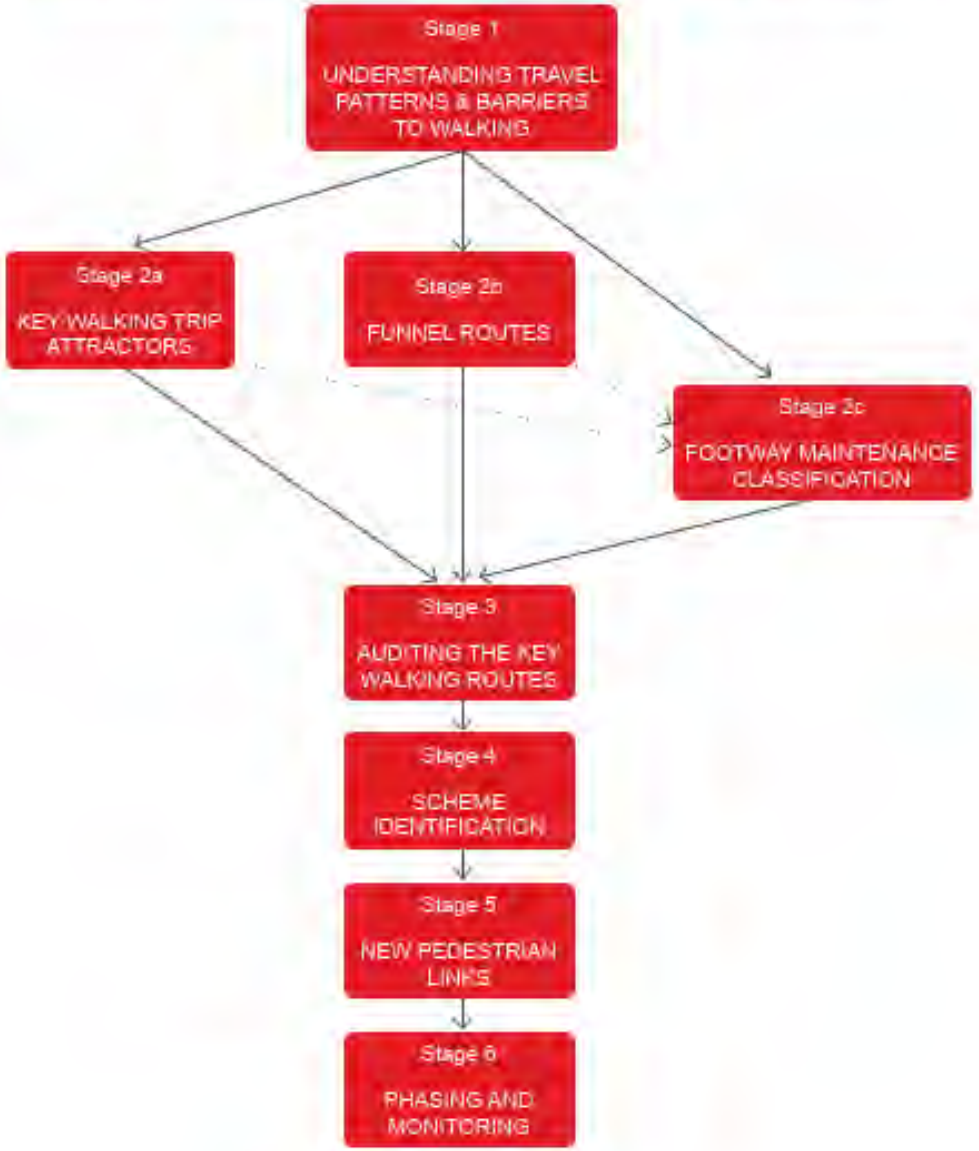
Table 2.4: Low Traffic Neighbourhood measures

Standard	Tandem	Recumbent	Cargo Bike
			
• 1.8 m length • 0.65 m width • 1.65 m turning circle	• Additional turning circle requirements up to 3.2 m	• Additional turning circle requirements up to 3.2 m • Lower eye height for visibility envelope	• Up to 0.85 m width • Additional turning circle requirements up to 2.65 m
Handcycle	**Wheelchair User Tricycle**	**Additional Child Trailer**	**Additional Trailer Bike**
			
• Additional turning circle requirements up to 2.65 m • Lower eye height for visibility • Lower clearance to kerbs and other objects	• Additional turning circle requirements up to 3.2 m	• Additional turning circle requirements up to 2.65 m	• Additional turning circle requirements up to 3.2 m

Table 2.2: Cycle vehicle requirements

Source: Cycling by Design, 2021

Figure 5.1: Recommended Process for Network Planning for Walking



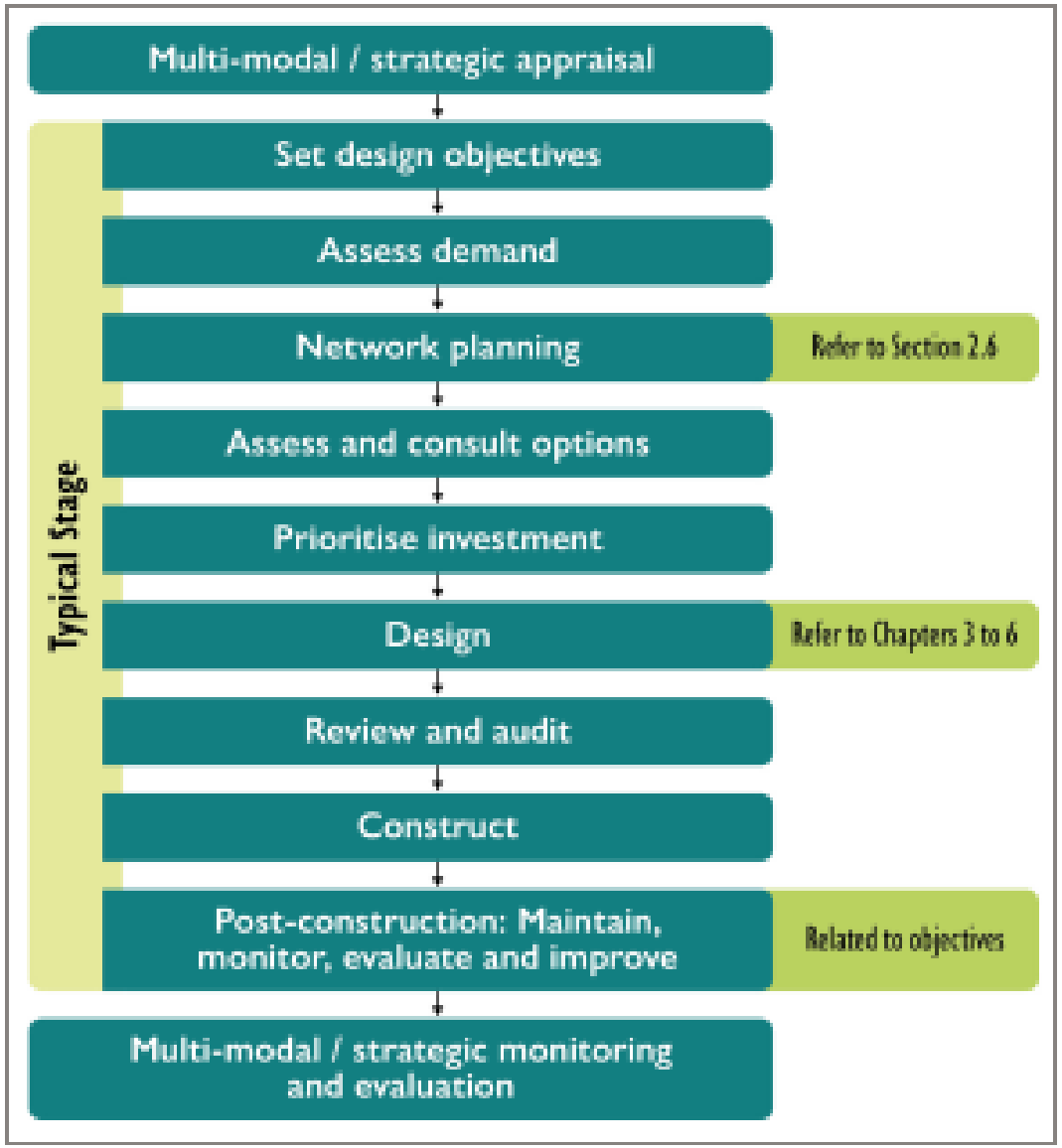


Figure 2.1: Planning and delivery process

Planning for cycling

Figure 3.2: Analysis of local trip patterns using travel survey data

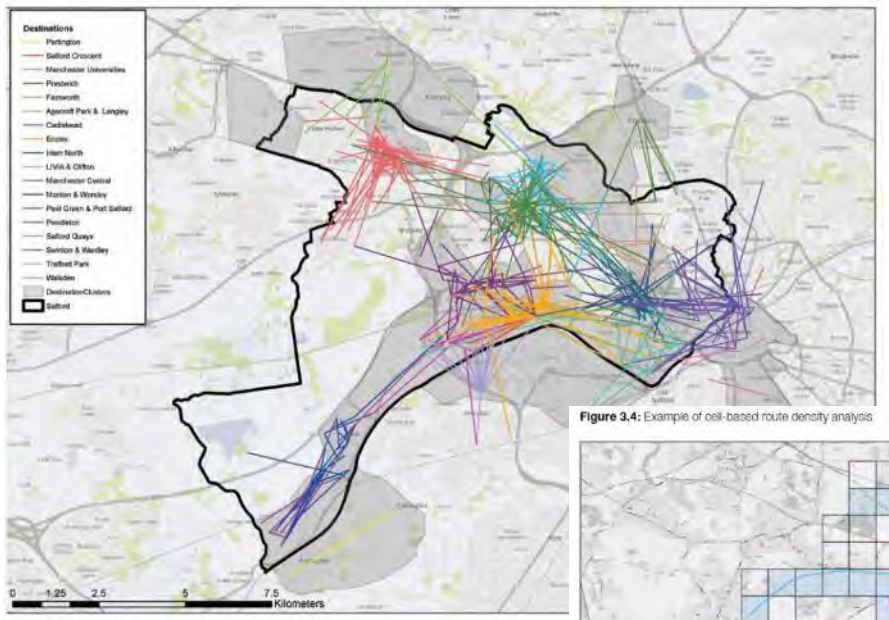
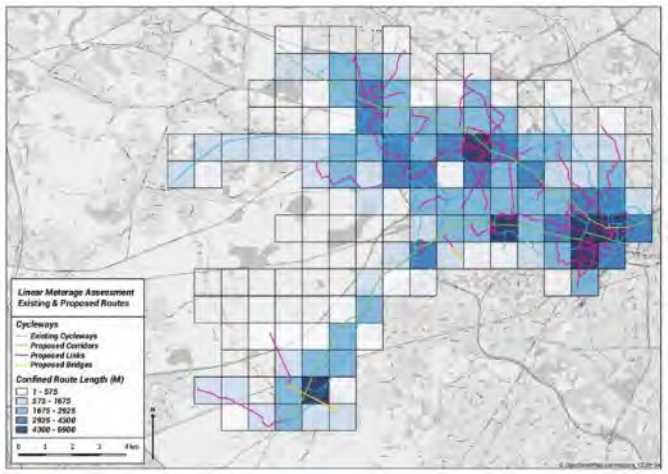


Figure 3.4: Example of cell-based route density analysis



Local Cycling & Walking Infrastructure Plans (LCWIPs)

- Based on **potential demand** (eg Propensity to Cycle Tool) not existing cycling levels
- **Area-based approach valid** (eg Low Traffic Neighbourhoods)

A local network will typically be made up of various elements:

- Dedicated space for cycling within highways
- Quiet mixed traffic streets
- Motor traffic free routes
- Junction treatments and crossings
- Cycle parking at origins, destinations and interchanges with other modes

Mode prioritisation

- Conscious of retro-fitting cycle infrastructure, consider mode priority on routes when planning

Planning for cycling

Principle	●●● High level of service	●● Medium level of service	● Low level of service
 Safety	Cycle users are always protected from motor traffic when required by the conditions set in Table 3.2 in Chapter 3.	In some cases, cycle users are expected to mix with motor traffic in higher speed or volume conditions that are set out in Table 3.2 in Chapter 3.	In some cases, cycle users are expected to mix with motor traffic in significantly higher speed or volume conditions that are set out in Table 3.2 in Chapter 3.
 Coherence	Cycle routes are continuous and fully joined-up. They allow cycle users to maintain consistent speed, are well-signed and intuitive.	Cycle routes contribute to a network, but users experience some disruption when connecting between routes, and navigation may be difficult.	Cycle users must dismount or are 'abandoned' at the end of a route.
 Directness	Cycle route is at least as direct as the equivalent motor traffic journey, with minimal need to stop or give-way. Delay for cycle users at junctions is less than for motor traffic.	Cycle route is up to 20% less direct than the equivalent motor traffic journey, with some need to stop or give-way. Delay for cycle users at junctions is equal to motor traffic delay.	Cycle route is more than 20% less direct than the equivalent motor traffic journey, with frequent need to stop or give-way. Delay for cycle users at junctions is greater than for motor traffic.
 Comfort	Cycle route surfaces are machine laid, smooth and well-maintained (at least as regularly as the road network). Desirable minimum widths and gradients are fully achieved.	Sections of route are hand-laid with frequent joints. Route is maintained less frequently than the road network. Desirable minimum widths or gradients are not achieved for some of the route.	Sections of the route are unbound, bumpy, not regularly maintained or otherwise hazardous. Desirable minimum widths or gradients are not achieved for the majority of the route.
 Attractiveness	Cycle route and parking areas are well lit, overlooked and do not create any personal security issues for users. The cycle route adds to the sense of place in the area, encouraging people to spend time there.	Some sections of the route are infrequently lit or not overlooked. Parking areas are secure but not overlooked or are insufficient in number.	The majority of the route is infrequently lit or not overlooked. Parking areas are not secure or are insufficient in number.
 Adaptability	Cycle route and parking areas have the flexibility to expand, evolve or adapt to changing demands.	Only some of the cycle route or parking areas has the flexibility to expand, evolve or adapt to changing demands.	No scope to amend cycling infrastructure once installed.

Table 2.3: Summary of Level of Service indicators

Source: Cycling by Design, 2021

AECOM

Key Design Principles

Core Principles

DfT LTN 1/20

Accessibility for all

Coherent	Direct	Safe	Comfortable	Attractive
				
DO Cycle networks should be planned and designed to allow people to reach their day to day destinations easily, along routes that connect, are simple to navigate and are of a consistently high quality.	**DO** Cycle routes should be at least as direct – and preferably more direct – than those available for private motor vehicles.	**DO** Not only must cycle infrastructure be safe, it should also be perceived to be safe so that more people feel able to cycle.	**DO** Comfortable conditions for cycling require routes with good quality, well-maintained smooth surfaces, adequate width for the volume of users, minimal stopping and starting and avoiding steep gradients.	**DO** Cycle infrastructure should help to deliver public spaces that are well designed and finished in attractive materials and be places that people want to spend time using.

Welsh Design Guidance

4.1.2 The needs of people walking and cycling can be summarised under the following headings, which are also reflected throughout the guidance. People wish to use routes that are:

- Coherent
- Direct
- Safe
- Attractive
- Comfortable

Scotland Cycling by Design

Safety: Designs should minimise the potential for actual and perceived accident risk. Perceived risk is a key barrier to cycle use. Users should feel safe as well as be safe at all stages of their journey, including parking at their origin and destination. It is important to provide consistency of design and avoid ambiguity.

Coherence: Cycling infrastructure should form a coherent network which links origins and destinations. This allows the cycle network to link communities, facilities and integrate with other modes of travel. Routes should be continuous from an origin to a destination, easy to navigate, well signed, intuitive and of a consistently high quality.

Directness: Cycle users should be offered the most direct route based on existing and latent trip desire lines, minimising detours and delays. Directness has both geographical and time elements, with delays at junctions and crossings, as well as physical detours, affecting it.

Comfort: Cycle user comfort is critical to journey experience and making cycling an everyday choice for users. Routes should minimise mental and physical stress and effort, be convenient and avoid complex manoeuvres. Smooth, uninterrupted surfaces with gentle gradients and secure, sheltered cycle parking will enhance comfort. Cycling infrastructure should be well-maintained to ensure its continued comfort and appeal.

Attractiveness: Infrastructure should be designed in harmony with its surroundings in such a way that the whole experience makes cycling an attractive option. A route should complement and enhance the area through which it passes. Lighting, personal security, aesthetics, environmental quality and noise are important considerations.

Adaptability: Cycling infrastructure should be able to evolve and improve as cycle demands change. Meeting the preceding design principles in a way that allows infrastructure to adapt to changing user needs will form a critical component of cycle networks. Trialling of potential measures using more flexible infrastructure will assist in meeting this aim.

Irish National Cycle Manual

can also provide important transport corridors so it is important that this is factored into such scheme designs.

6. Universal Design and Inclusive Mobility

Cycle facilities should be designed to be useable by people of all ages and abilities using a variety of different types of cycles and wheeling equipment. It is worth noting that there has been a noticeable increase in recent years in the use of non-standard cycle equipment such as cargo bikes, tricycles, electric bicycles etc. and it is anticipated that their popularity will continue to increase as our cycle networks become more developed.

The use of motorised wheelchairs and mobility scooters is also permitted on cycle tracks and it would be similarly anticipated that as our cycle networks are developed further, more people using wheelchairs and mobility devices will be encouraged and enabled to use the networks as is commonly seen in other countries with more mature cycle networks (see Figure 2.6).

It is also worth noting that legislation to allow the use of Powered Personal Transporters e.g. E-Scooters, on Irish Roads including cycle facilities, was enacted in June 2023. It is anticipated that further guidance in relation to the accommodation of these devices on cycle infrastructure will be issued in due course.

Figure 2.6: Person using a mobility scooter on cycle track in the Netherlands.

*Infrastructure that meets principles **AS A MINIMUM**.*

Key Messages for Designers

The following 12 key messages summarise how designers should approach the application of Cycling by Design's requirements in this new context:

1. We must plan and design for **mass cycling** by all kinds of people on different types of bike. Cycling infrastructure should no longer be something that we provide on the road network to only be used by the same people who are currently cycling. Instead it needs to be something that can be used by everyone.

2. Cycle users must be **protected from motor traffic** by physical separation or by significantly reducing the volume and speed of motor traffic on local neighbourhood streets. Additional space for protected facilities should be taken from the road carriageway and not from the footway.

3. Cycling infrastructure must be **fully accessible** by anyone who wants to use it, regardless of age, ability or experience. This means that gates or other access barriers which restrict the movement of many people, including those with disabilities, should not be included in design.

4. Cycle routes must form part of **fully connected networks** and be of a consistent quality throughout. We would not design a road network that 'abandoned' drivers or required them to get out and push their vehicle between routes. Cycling must be no different.

5. Cycles must be **treated as vehicles**. People cycling travel at different speeds from those walking and wheeling. In most circumstances these two user categories should be separated from each other.

6. Cycling takes **physical effort**. By minimising the number of times that cycle users have to stop, slow down and regain momentum, designers can provide more attractive facilities that encourage increased uptake of cycling.

7. Cycling infrastructure should be **intuitive for all who use it** or interact with it. It should be clear which space is allocated to different users, including pedestrians and motor vehicles, and how interactions are managed.

8. Cycling infrastructure should contribute positively to a **sense of place**. Along with other aspects of street design, it should attract people to use the infrastructure and spend time in the places that it is part of.

9. **Design with maintenance in mind**. Well-designed and constructed cycling infrastructure can be easily undermined if it becomes too difficult to maintain. This must be planned for at the earliest stage.

10. Creating safe cycling infrastructure can often be done quickly and economically by removing through-traffic from networks of local streets and safely connecting these networks. **Trialling these and other measures** on a temporary basis can help to test, monitor and improve the infrastructure and to gain public support.

11. **Designers should cycle** and experience each route they design to fully appreciate how the users of their infrastructure experience the network.

12. For these reasons, the design requirements of Cycling by Design 2021 are **higher than they were previously**. Exceptions may be needed where it would otherwise prevent the completion of a full cycle network, but these can only be applied when absolutely necessary and with due consideration of the level of service and Design Review processes set out in this document.

NB: LTN 1/20 has 22 summary principles including:

- Use of side street routes in place of segregation

Auditing Links - Cycle Level of Service – LTN 1/20 Appendix A

Appendix A: Cycling Level of Service Tool

Cycle Infrastructure Design

Key requirement	Factor	Design principle	Indicators	Critical	0 (Red)	1 (Amber)	2 (Green)	Score	Comments
Cohesion	Connections	Cyclists should be able to easily and safely join and navigate along different sections of the same route and between different routes in the network.	1. Ability to join/leave route safely and easily: consider left and right turns		Cyclists cannot connect to other routes without dismounting	Cyclists can connect to other routes with minimal disruption to their journey	Cyclists have dedicated connections to other routes provided, with no interruption to their journey		
	Continuity and Wayfinding	Routes should be complete with no gaps in provision. 'End of route' signs should not be installed – cyclists should be shown how the route continues. Cyclists should not be 'abandoned', particularly at junctions where provision may be required to ensure safe crossing movements.	2. Provision for cyclists throughout the whole length of the route		Cyclists are 'abandoned' at points along the route with no clear indication of how to continue their journey.	The route is made up of discrete sections, but cyclists can clearly understand how to navigate between them, including through junctions.	Cyclists are provided with a continuous route, including through junctions		
	Density of network	Cycle networks should provide a mesh (or grid) of routes across the town or city. The density of the network is the distance between the routes which make up the grid pattern. The ultimate aim should be a network with a mesh width of 250m.	3. Density of routes based on mesh width ie distances between primary and secondary routes within the network		Route contributes to a network density mesh width >1000	Route contributes to a network density mesh width 250 – 1000m	Route contributes to a network density mesh width <250m		
Directness	Distance	Routes should follow the shortest option available and be as near to the "as-the-crow-flies" distance as possible.	4. Deviation of route Deviation Factor is calculated by dividing the actual distance along the route by the straight line (crow-fly) distance, or shortest road alternative.		Deviation factor against straight line or shortest road alternative >1.4	Deviation factor against straight line or shortest road alternative 1.2 – 1.4	Deviation factor against straight line or shortest road alternative <1.2		

- Same approach in Welsh guidance
- Design Review in Cycling by Design (qualitative)
- Irish Cycle Manual includes a Quality of Service Evaluation

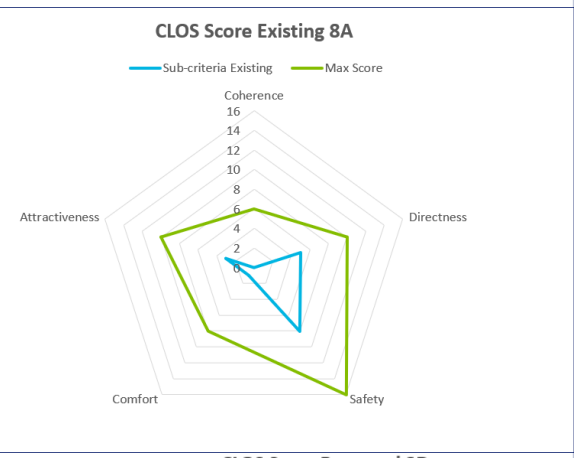
Quality of Service	Pavement condition (PCI range)	Number of adjacent cyclists	Number of conflicts per 100m of route	Journey time delay (% of total travel time)	HGV influence (% of total traffic volume)
Level A+	86 – 100	2 + 1	0 – 1	0 – 5%	0-1%
Level A	66 – 85	1 + 1	0 – 1	6– 10%	0-1%
Level B	51 – 65	1 + 1	1 – 3	11 – 25%	2 – 5%
Level C	41 – 50	1 + 0	4 – 10	26 – 50%	6 – 10%
Level D	20 – 40	1 + 0	>10	>50%	>10%

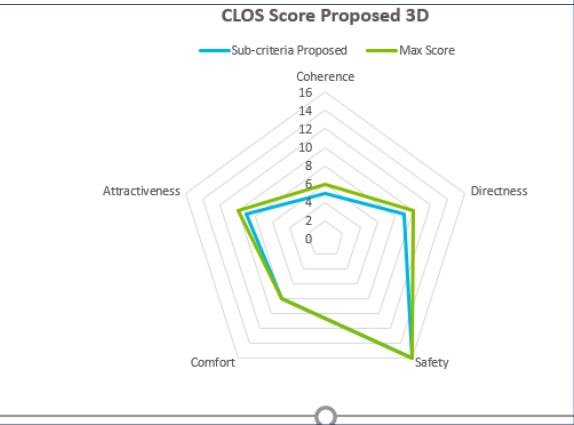
	Proposed 4A		Proposed 4B	
	Score	Comments	Score	Comments
	2	Cyclists are provided with a segregated two-way cycle track, with links at major junctions to alternative routes within the proposed cycle network - North Queen Street & York Street	2	Cyclists are provided with a segregated two-way cycle track, with links at major junctions to alternative routes within the proposed cycle network - York Street & Corporation Street.
	2	Cyclists are provided with a segregated two-way cycle track, with links at major junctions to alternative routes within the proposed cycle network - North Queen Street & York Street	2	Cyclists are provided with a segregated two-way cycle track, with links at major junctions to alternative routes within the proposed cycle network - York Street & Corporation Street.
	1	The proposed cycle networks provide a mesh of routes across Belfast with a network density width between 250 - 1000m.	1	The proposed cycle networks provide a mesh of routes across Belfast with a network density width between 250 - 1000m.
	2	Brougham Street is both straight and direct.	2	Dock Street is both straight and direct.
	0	Four signalised junctions over 420m route.'	0	Four signalised junctions over 420m route.'
	1	Cyclists are provided one-way cycle tracks on either side of the carriageway, but are still required to stop at the majority of signalised junctions.	1	Cyclists are provided one-way cycle tracks on either side of the carriageway, but are still required to stop at the majority of signalised junctions.
	2	Cyclists are provided with a one-way cycle track and can choose an appropriate speed.	2	Cyclists are provided with a one-way cycle track and can choose an appropriate speed.
	2	Unknown, though no significant gradients observed.	2	Unknown, though no significant gradients observed.
	2	Segregated off-carriageway facilities allowing cyclists to by-pass junction. Motor traffic speed has no impact on cyclists.	2	Segregated off-carriageway facilities allowing cyclists to by-pass junction. Motor traffic speed has no impact on cyclists.
	2	Segregated off-carriageway facilities provided. Motor traffic speed has no impact on cyclists.	2	Segregated off-carriageway facilities provided. Motor traffic speed has no impact on cyclists.
	2	Segregated off-carriageway facilities provided. Motor traffic volume has no impact on cyclists.	2	Segregated off-carriageway facilities provided. Motor traffic volume has no impact on cyclists.

+ Existing baseline

	Existing 3F	Proposed 3F
Max possible score	50	50
Audit % score	42%	92%
Pass/Fail (70% threshold)	Fail	Pass
Any Critical Fails? (Y/N)	Yes	No
Number of Critical Fails	2	0

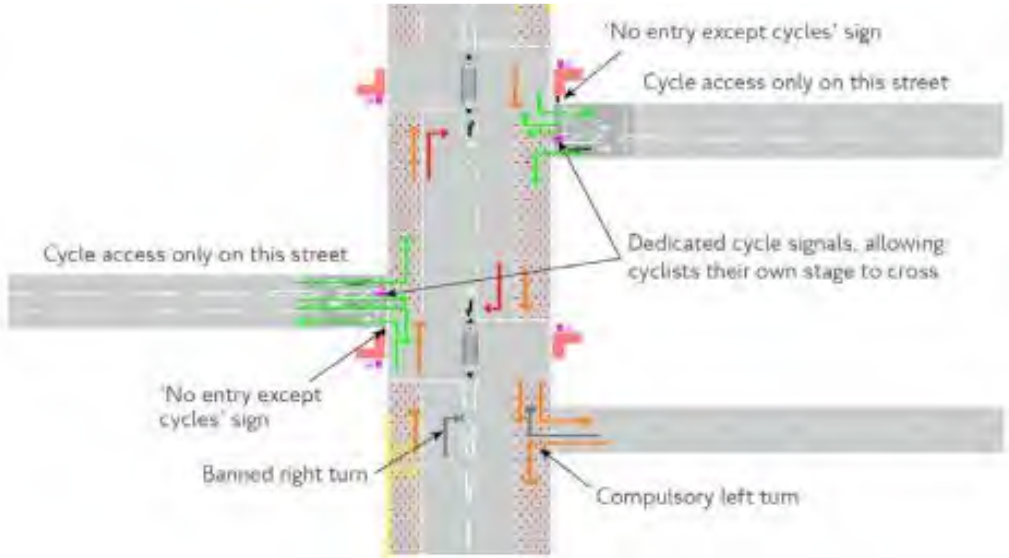
Sub-criteria Existing	% score Proposed	Sub-criteria Proposed	% score Proposed
0	0%	5	83%
6	60%	9	90%
6	38%	15	94%
3	38%	8	100%
6	60%	9	90%





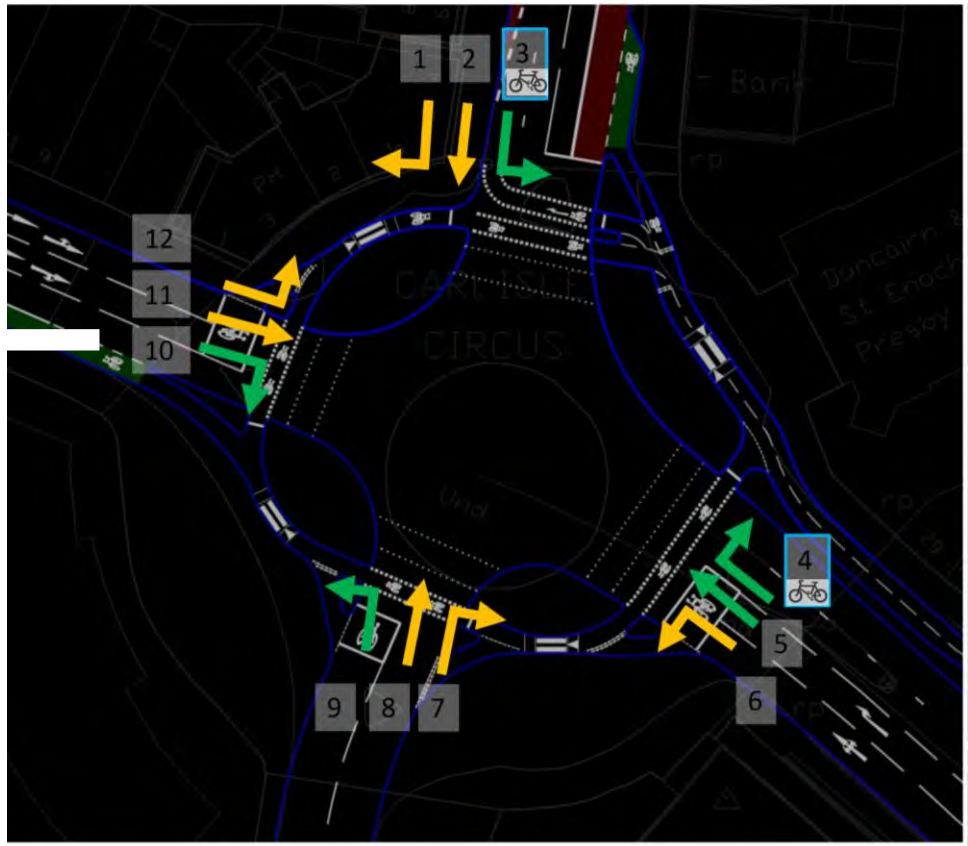
Auditing Junctions - Cycle Level of Service – LTN 1/20 Appendix B

Type of junction	Cycle movement being assessed	Suitable only for confident existing cyclists, and may be avoided by some experienced cyclists Conditions are most likely to give rise to the most common collision types Score = 0	Likely to be more acceptable to most cyclists, but may still pose problems for less confident or new cyclists The risk of collisions has been reduced by design layout or traffic management interventions Score = 1	Suitable for all potential and existing cyclists The potential for collisions has been removed, or managed to a high standard of safety for cyclists Score = 2
Any type of junction	Any movement	• Cycle movement in potential conflict[57] with heavy motor traffic flow.[58] • Cycle movement mixed with or crossing traffic with 85th percentile speed exceeding 60kph, or where vehicles accelerate rapidly. • Necessary to cross more than one traffic lane (without refuge or protection) to complete cycle movement unless traffic flows are low.	• Cycle movement in potential conflict with moderate traffic flow.[59] • Cycle lanes through junction meeting appropriate desirable minimum width requirements for the movement under consideration. • Raised table at junction crossed by traffic in potential conflict with cycle movement. • Cycle movement made by transiting onto section of shared use footway.	• Low[60] traffic speed and volume in mixed traffic environment (e.g. access-only streets in a residential area). • Cycle movement separated physically and/or in time from motor traffic and also separated from pedestrians. • Cycle movement bypasses junction completely, including via good quality grade separation.



Cycle Strategy Route Review Junction 3.3 - Proposed

Movement	Score	0	1	2	Comment
1	1		1	2	Cycle movement in potential conflict with moderate traffic flow.
2	1		1	2	Cycle movement in potential conflict with moderate traffic flow.
3	2			3	Cycle movement separated physically and/or in time from motor traffic and also separated from pedestrians.
4	2			3	Cycle movement separated physically and/or in time from motor traffic and also separated from pedestrians.
5	2			3	Cycle movement separated physically and/or in time from motor traffic and also separated from pedestrians.
6	1		1	2	Cycle movement in potential conflict with moderate traffic flow.
7	1		1	3	Cycle movement in potential conflict with moderate traffic flow.
8	1		1	2	Cycle movement in potential conflict with moderate traffic flow.
9	2			3	Cycle movement separated physically and/or in time from motor traffic and also separated from pedestrians.
10	1		1	3	Cycle movement in potential conflict with moderate traffic flow.
11	1		1	2	Cycle movement in potential conflict with moderate traffic flow.
12	1		1	2	Cycle movement in potential conflict with moderate traffic flow.



Part 2 | Links

Links

1. Overview of when to protect cyclists
2. Kerbed segregation
3. Stepped segregation
4. Footway level segregation
5. ‘Light’ segregation
6. Mixed traffic routes
7. Offline / ‘Greenway’ routes
8. Link features (coloured surfacing; bus stops; parking/loading bays; transitions; tactile paving)
9. Key Geometric requirements

When to Protect?

Figure 4.1: Appropriate protection from motor traffic on highways

Speed Limit[1]	Motor Traffic Flow (pcu/24 hour)[2]	Protected Space for Cycling			Cycle Lane (mandatory/ advisory)	Mixed Traffic
		Fully Kerbed Cycle Track	Stepped Cycle Track	Light Segregation		
20 mph[3]	0					
	2000					
	4000					
	6000+					
30 mph	0					
	2000					
	4000					
	6000+					
40 mph	Any					
50+ mph	Any					

Provision suitable for most people

Provision not suitable for all people and will exclude some potential users and/or have safety concerns

Provision suitable for few people and will exclude most potential users and/or have safety concerns

Notes:

1. If the 85th percentile speed is more than 10% above the speed limit the next highest speed limit should be applied
2. The recommended provision assumes that the peak hour motor traffic flow is no more than 10% of the 24 hour flow
3. In rural areas achieving speeds of 20mph may be difficult, and so shared routes with speeds of up to 30mph will be generally acceptable with motor vehicle flows of up to 1,000 pcu per day

Speed & Volume Primary Factors (+ accesses)

Design in context of location (shared suitable in low density rural location?)

LTN 1/20

Kerbed Segregation (from carriageway)

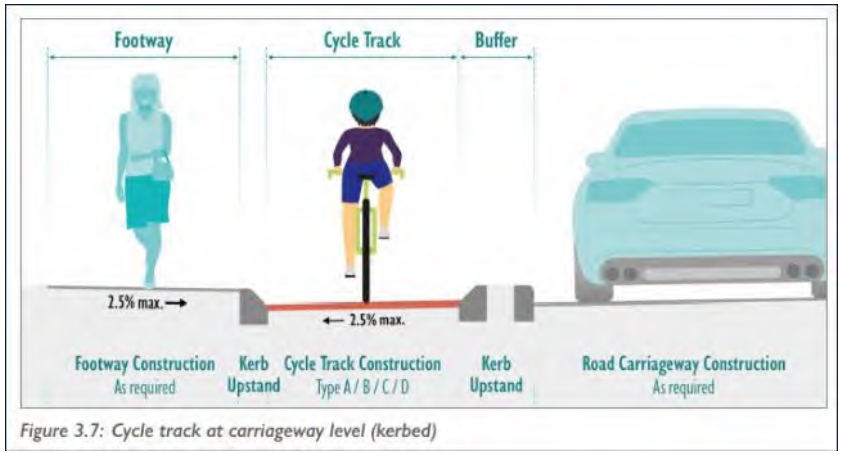


Figure 3.7: Cycle track at carriageway level (kerbed)

Cycling by Design

One-way or two-way (Cycling by Design)?

> One-way cycle tracks are preferred to two-way cycle tracks when adjacent to the road carriageway, as they provide greater certainty to all road users of expected cycle movements and the interactions to be managed.

- Subject to kerbside activity, number of junctions, which side of road etc.
- Two-way not suitable with intermittent light segregation

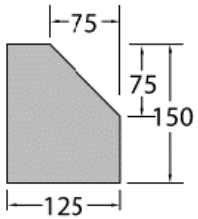
Kerbed segregation

- Less space efficient
- Can be cheaper than stepped
- Can maintain crossfalls
- Consider drainage and upstand….

Kerbs

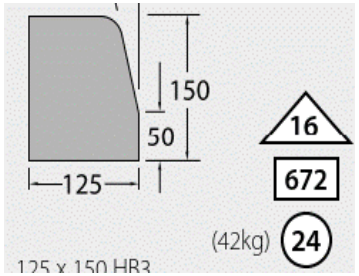
Manual	Height
Cycling by Design	60mm minimum (f/way)
Welsh Design Guide	50mm minimum (c/way)
LTN 1/20	50mm minimum (f/way) 50mm minimum (c/way)
Irish Cycle Manual	50mm minimum (c/way) 50-75mm (f/way)

PCC kerb availability



125 x 150 SP3

No BS 50mm splay option, splay >60mm a ‘fixed object’ (LTN 1/20)



125 x 150 HB3

Half batter laid at <60mm not a ‘fixed object’

Stepped Segregation (from carriageway)

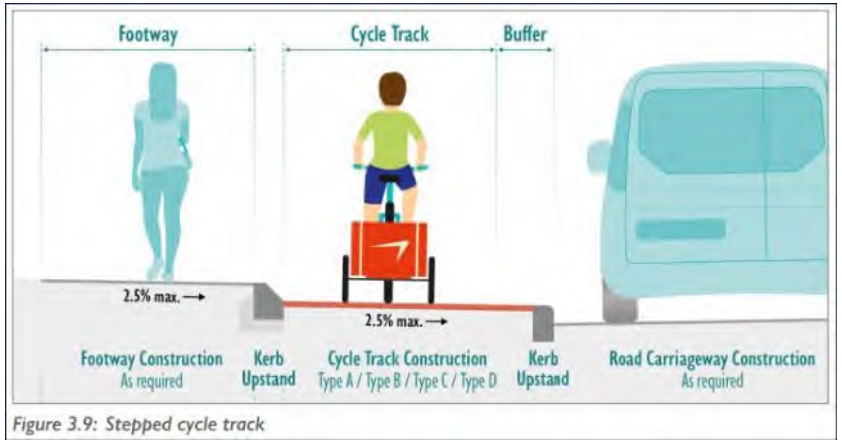


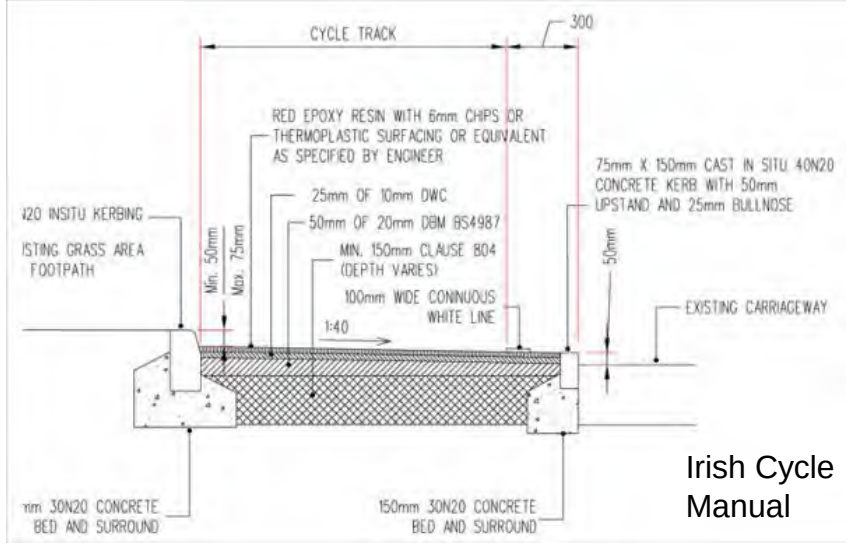
Figure 3.9: Stepped cycle track

Stepped segregation:

- More space efficient segregation
- More expensive than most kerbed segregation
- Altered crossfalls
- Potential obstruction by other users
- Consider drainage

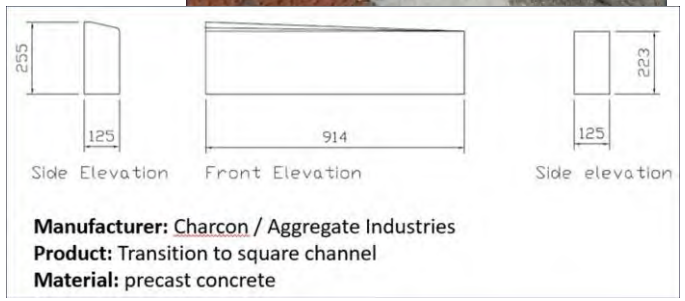
Kerbs

Manual	Height
Cycling by Design	60mm minimum (f/way)
Welsh Design Guide	50mm minimum (c/way)
LTN 1/20	50mm minimum (f/way) 50mm minimum (c/way)
Irish Cycle Manual	50mm minimum (c/way) 50-75mm (f/way)



Irish Cycle Manual

Cambridge kerb (flush transition available)



Half batter/bullnose kerb (lowered at accesses)

Footway level (segregated from carriageway)

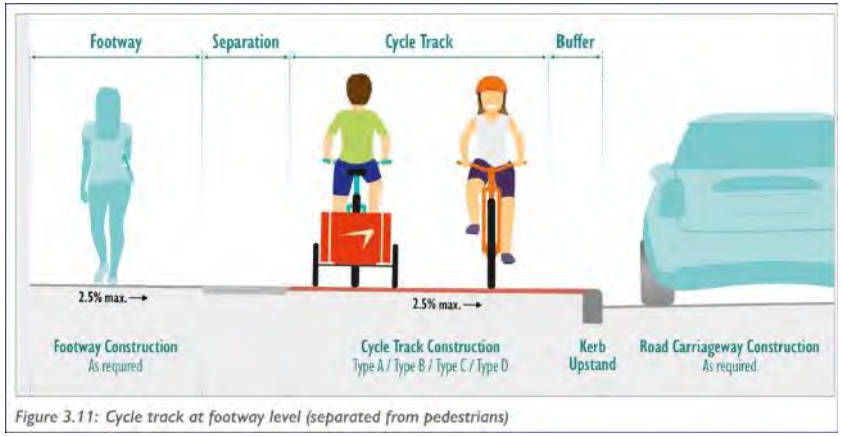


Figure 3.11: Cycle track at footway level (separated from pedestrians)

Footway level least desirable segregation however:

- May be part of a holistic designed street
- May be joining a detached track at same level
- May be regular crossing of track by prams/wheelchairs

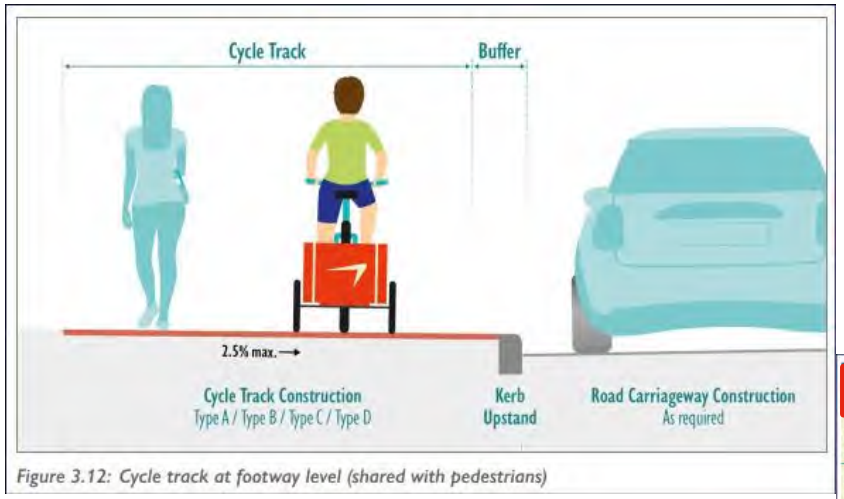
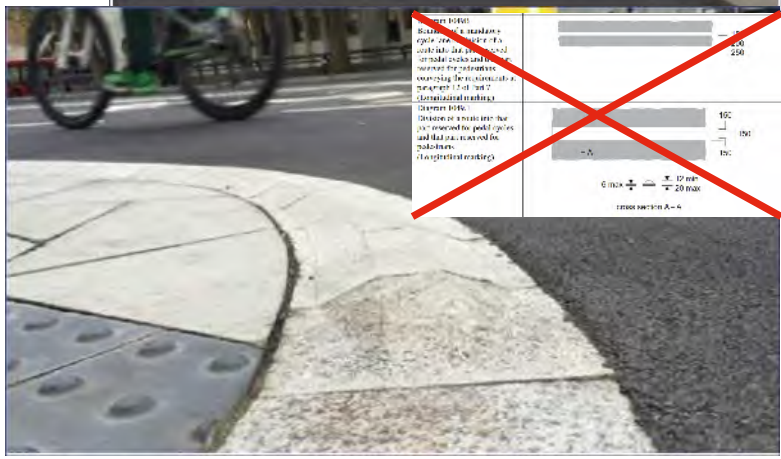


Figure 3.12: Cycle track at footway level (shared with pedestrians)

Shared use route:

- Presumption not suitable on urban streets
- Where less pedestrian & cycle activity/conflict (e.g. rural, consider frequency of interaction below)



Experience of Pedestrian	Cycle Flow (2-way) 30 per hour	Cycle Flow (2-way) 50 per hour	Cycle Flow (2-way) 100 per hour	Cycle Flow (2-way) 150 per hour	Cycle Flow (2-way) 300 per hour	Formula
Meeting a cycle user in opposite direction	3 mins	1 min 48 s	54 s	36 s	18 s	$\frac{3600}{\text{(1-way flow of cycles)} \times [1 + \text{(speed of peds / speed of cycles)}]}$
Being overtaken by a cycle user	6 mins	3 mins 36 s	1 min 48 s	1 min 12 s	36 s	$\frac{3600}{\text{(1-way flow of cycles)} \times [1 - \text{(speed of peds / speed of cycles)}]}$

Table 3.3: Average time between interactions for a pedestrian

Experience of Cycle User	Pedestrian Flow (2-way) 30 per hour	Pedestrian Flow (2-way) 50 per hour	Pedestrian Flow (2-way) 100 per hour	Pedestrian Flow (2-way) 150 per hour	Pedestrian Flow (2-way) 300 per hour	Formula
Meeting a pedestrian in opposite direction	1 min	36 s	18 s	12 s	6 s	$\frac{3600}{\text{(1-way flow of cycles)} \times [1 + \text{(speed of cycles / speed of peds)}]}$
Overtaking a pedestrian	2 mins	1 min 12 s	36 s	24 s	12 s	$\frac{3600}{[\text{(1-way flow of cycles)} \times \frac{\text{(speed of cycles} - \text{speed of peds)}}{\text{speed of peds}}]}$

Table 3.4: Average time between interactions for a cycle user

Product Specifications

Supplier: Rediweld
Model: MiniOrca
Colour: Black/White Standard (Red, Grey & Granite Grey)
Fixings: 4 Fixings per unit - Bolt Down
Width: 120mm
Length: 720mm
Height: 50mm
Weight: 3 kg

Supplier: Rediweld
Model: Wand Orca
Colour: Black/White (Red, Grey or Granite Grey)
Fixings: 3 x per end section 4 x per middle - Bolt Down
Width: 175mm
Length: 750mm per end / 1000mm per middle
Height: 80mm
Weight: 7.0kg per end / 10.5kg per middle.

Jislon Pole Cones are available in 800mm high or 1000mm heights, colour Black with TSRGD reflective banding and offer a NSE fixing.

Supplier: Rosehill Highways
Model: Wide Cycle Lane Defender
Colour: Grey
Fixings: LS01 - 4 x per double curve section - Bolt Down
LS02 5 x per single curve section - Bolt Down
LS03 6 x per extension piece - Bolt Down
Width: 500mm
Length: 1500mm
Height: 130mm
Weight: LS01 – 95kg / LS02 - 105kg / LS03 – 105 kg

Bollard not included but can be purchased seperatelly.

Supplier: Zicla
Model: Zebra
Colour: Black/White Standard (Red, Yellow, Blue or Green)
Fixings: 3 Fixings per unit - Bolt Down
Width: Z5 - 120mm / Z9 – 164mm / Z13 - 210mm
Length: Z5 - 748mm / Z9 – 775mm / Z13 - 820mm
Height: Z5 - 50mm / Z9 – 90mm / Z13 - 130mm
Weight: Z5 – 2 kg / Z9 – 4.5 kg / Z13 – 8.5kg

Supplier: Rediweld
Model: Jilson TSRGD Highway
Colour: Black/White or Orange/White
Fixings: 1 x NS or NSE fixing
Diameter: 80mm
Height: 1000mm above ground
Weight: 2.15 kg

Batons or wands are typically used at the beginning or end of a segregated cycle lane. Sign caps with cycle symbol or directions arrows can also be included.

Supplier: Rediweld
Model: Orca
Colour: Black/White – Zig Zag or Tip Toe
Fixings: 3 x per unit – Bolt Down.
Width: 200mm
Length: 920mm
Height: 100mm
Weight: 6.5kg per unit.

Supplier: Rosehill Highways
Model: Narrow Cycle Lane Defender
Colour: Grey
Fixings: NCL end- 4 x per end section - Bolt Down
NCL mid - 4 x per continuation section - Bolt Down
NCL DL end - 4 x per double end piece - Bolt Down
Width: 235mm
Length: 2000mm
Height: 130mm
Weight: 60 kg unit

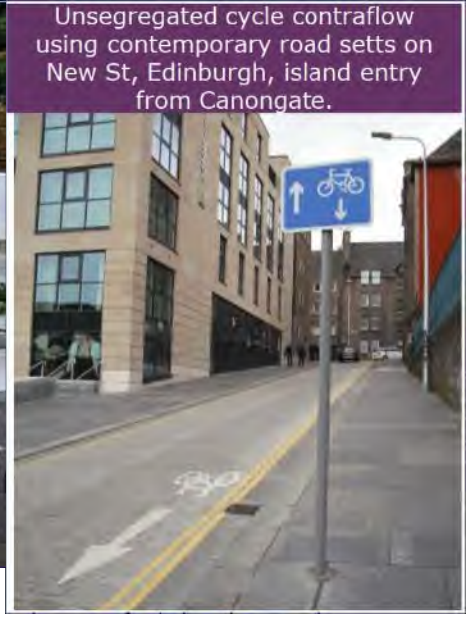
Bollard not included but can be purchased seperatelly.

Supplier: NAL
Model: X-Last Nuvo Sign
Colour: Various colours and styles dependant on bollard design.
Fixings: Bolt Down Flange Plate;
Retention Socket Install; or
Concrete In Root
Diameter: Bollard depedant – Approx 150mm
Height: Depedant on bollard option – Approx 1000mm above ground.
Weight: Less than 6kg.

Illuminated and non-illuminated bollards with various sign faces available.

Mixed Traffic Routes

Figure 7.2: Primary and secondary riding positions



Unsegregated cycle contraflow using contemporary road setts on New St, Edinburgh, island entry from Canongate.

- Low speed, low volume!
- Avoid 3.2m – 3.9m ‘dilemma zone’
- Traffic management can help
- Presumption that contraflow allowed?

Table 7-2: Minimum acceptable lane widths*

Feature	Desirable minimum	Absolute minimum	Notes
Traffic lane (cars only, speed limit 20/30mph)	3.0m	2.75m	2.5m only at offside queuing lanes where there is an adjacent flared lane
Traffic lane (bus route or >8% HGVs, or speed limit 40mph)	3.2m	3.0m	Lane widths of between 3.2m and 3.9m are not acceptable for cycling in mixed traffic.
2-way traffic lane (no centre line) between advisory cycle lanes	5.5m	4.0m	4.0m width only where AADT flow <4000 vehicles** and/or peak hour <500 vehicles with minimal HGV/Bus traffic.

* these lane widths assume traffic is free to cross the centre line, see 7.2.9 for details on critical widths at pinch points
** While centre line removal is still feasible with higher flows, the frequency at which oncoming vehicles must enter the cycle lane to pass one another can make the facility uncomfortable for cycling.

LTN 1/20

Offline / ‘Greenway’ routes

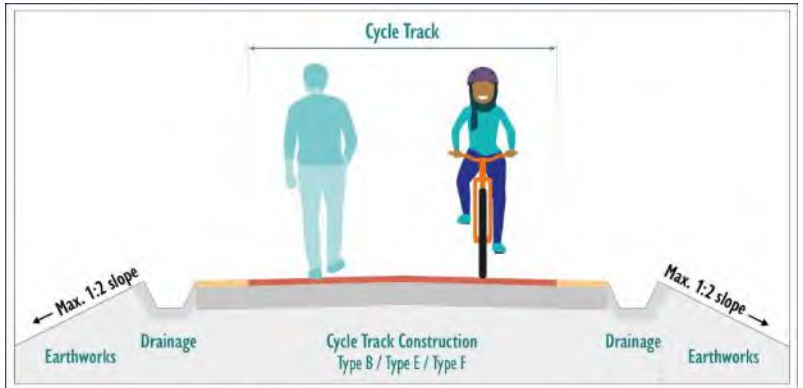


Figure 3.4: Detached or remote cycle track (shared with pedestrians)

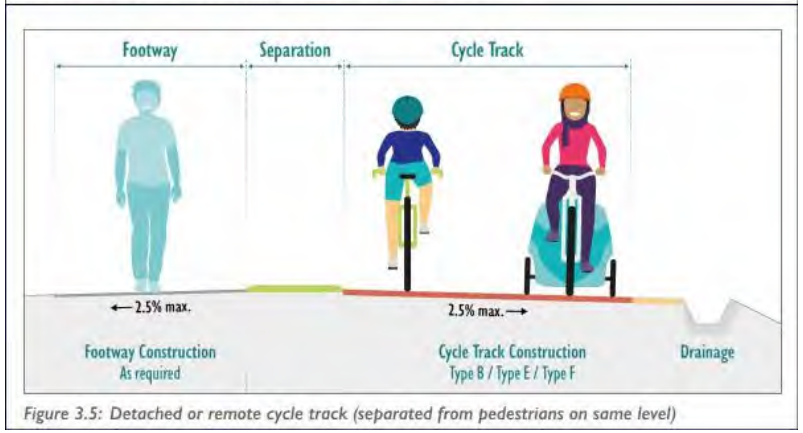


Figure 3.5: Detached or remote cycle track (separated from pedestrians on same level)

Uses can include:

- Longer distance cycle routes (recreational trips or commuting)
- Attractive routes in urban environment (e.g. towpaths)

River Shannon Greenway at University of Limerick – 4m columns with highly focussed lighting that restricts light spill into the trees.

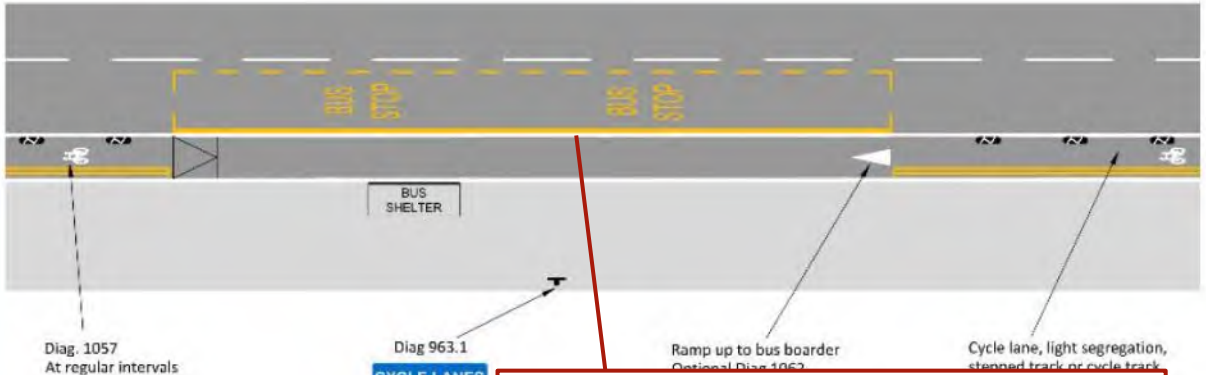
Low bollard lighting on Baldoyle Greenway, Dublin adjoining SAC.

- Limit access control unless valid security concern
- Control cycle speeds through alignment

Link Features – Bus Stops

Figure 6.32: Bus stop boarder layout

LTN 1/20



Not shown: Recommended if space permits, 1.5 – 2.0m contrasting buffer area for alighting, 2.0 – 3.0m footway behind

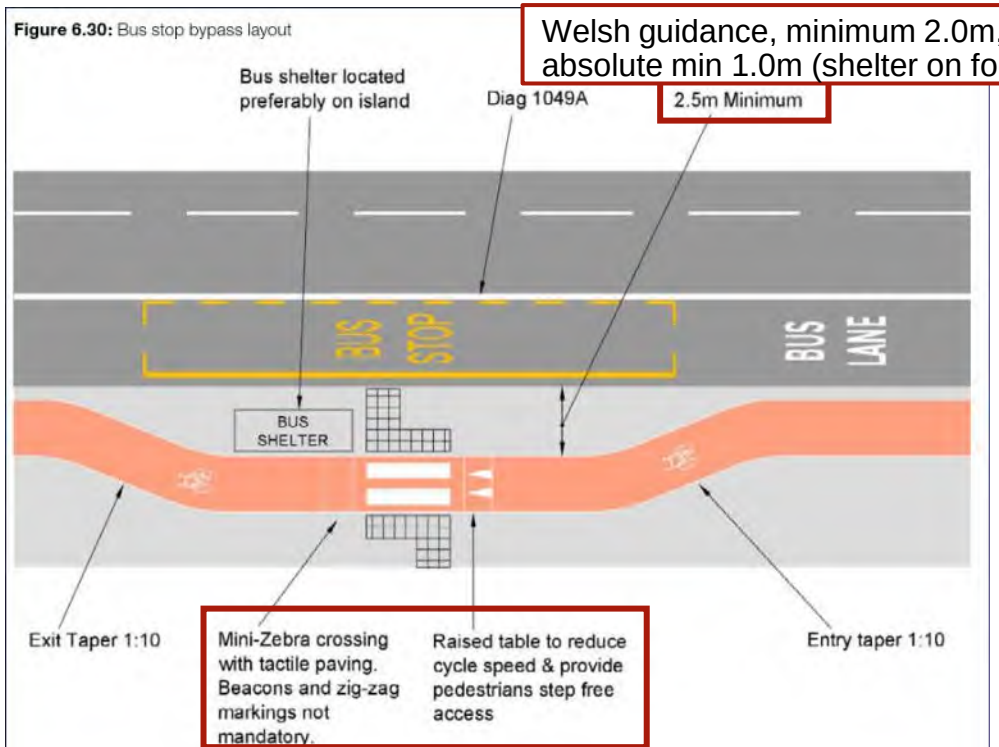
Cycling by design

Irish Cycle Manual

Upstand between footway and cycle track. Pedestrian yield to cyclists.

Figure 6.30: Bus stop bypass layout

Welsh guidance, minimum 2.0m, absolute min 1.0m (shelter on footway?).

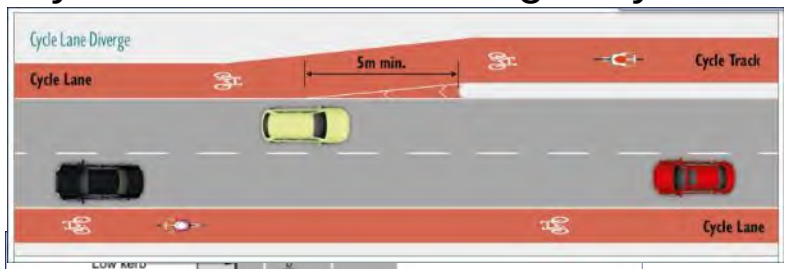


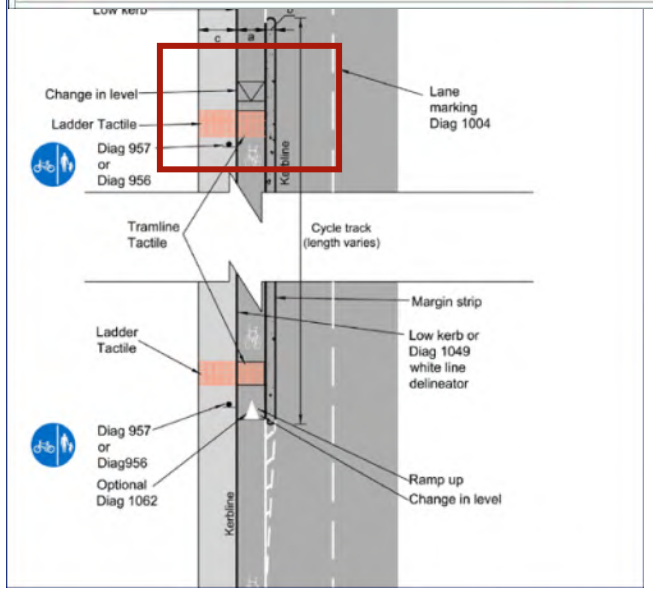
Cycle priority at crossings.
3m minimum bus shelter waiting area.

Cycling by design

Link Features – Transitions

Cycle Track ←→ Carriageway





Carriageway to Cycle Track/Shared

Cycle Track to Shared Use

Geometric requirements

Width

Radii

Visibility

Crossfalls

SSD

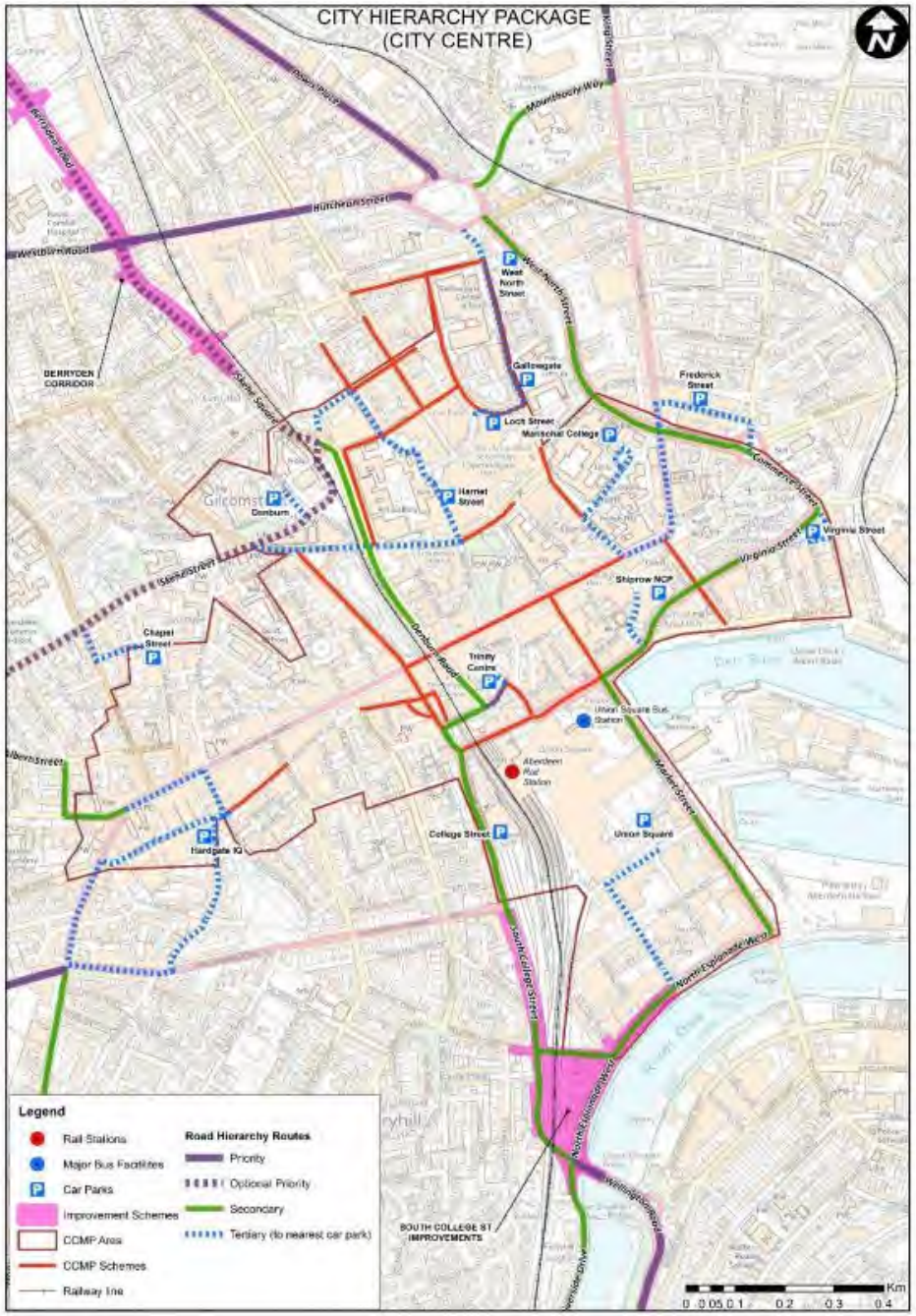
Table 1: Ellon Park & Ride to Garthdee Stage 2 Option Packages

Package Description	Summary Cross Section
Active Travel Priority Package Provide active travel priority through segregated cycle tracks throughout the corridor (and thereafter consider what level of bus priority may be possible within main corridor)	*Single traffic lane + segregated cycle tracks + footways (+ bus lanes, space permitting)*
Public Transport Priority Package Provide bus priority infrastructure along the corridor through bus lanes (and thereafter consider what level of active travel improvements may be possible within main corridor)	*Single traffic lane + bus lane + footways (+ segregated cycle track, space permitting)*
Multi-Modal Transport & Travel Package Provide active travel and bus priority infrastructure along the corridor with requirement for third party land and carriageway redistribution	*Single traffic lane + bus lane + segregated cycle tracks + footways*
Public Transport Priority & Active Travel Parallel Routes Package Provide bus priority along the main corridor and parallel active travel routes on Hardgate, Golf Road and/or Beach Esplanade	***Holburn Street and King Street*** *– single traffic lane + bus lane + footways* ***Ellon Road*** *– traffic lanes + bus lane + segregated cycle tracks + footways* *Connections to and from parallel routes*

Why are all these routes not Segregated Cycle Routes?

AECOM

Figure B2: Proposed Roads Hierarchy, City Centre



Part 3 | Junctions

Junctions

1. Key principles
2. Priority junctions
3. Review others at your leisure
    1. ASL
    2. Hold the Left Turn
    3. Early Release

Key Principles

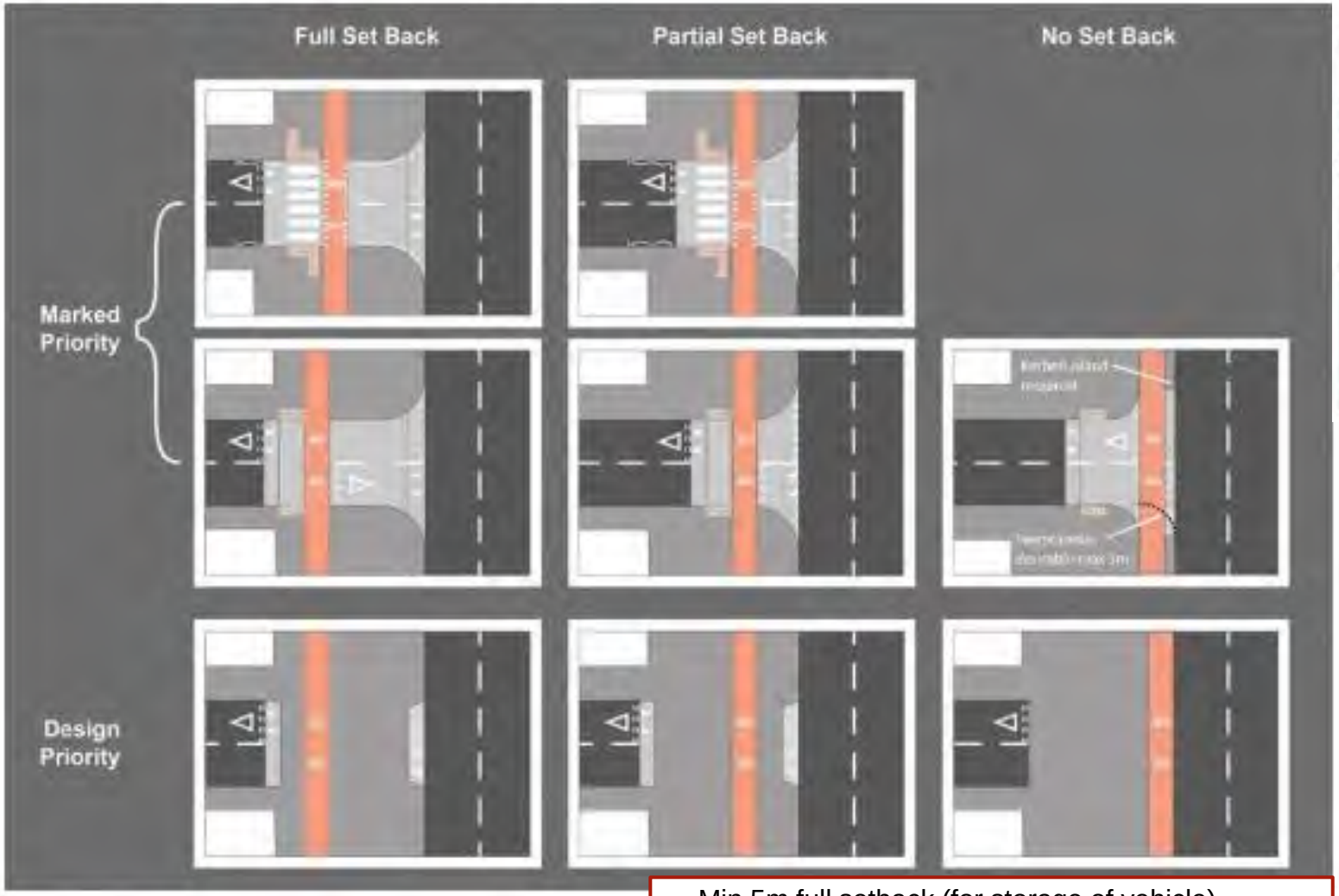
Table 10-1: Application of core design principles to junctions and crossings

Core design principle	Design aspects to consider
Safety	Junctions should be designed to remove or manage conflicts between cyclists, motor traffic and pedestrians by one or more of the following: » separating cyclists from motor traffic and pedestrians in space and/or time; » banning one or more motor traffic movements; » providing priority for cyclists over motor traffic; and/or » reducing the speed and volume of motor traffic movements so that cyclists can safely be integrated with them Designs should identify and reduce conflict with Heavy Goods Vehicles.
Directness	The distance and time required for cyclists to travel through a junction should be minimised. Wherever possible their level of delay should be less than for motor traffic without increasing pedestrian delay. Exempting cycles from turning movements that are banned for other vehicles will significantly increase directness and should always be considered. Cycle crossings at junctions and across links should not be staggered.
Coherence	Junctions should enable and facilitate cycle movements in all permitted directions. These should be made in a legible manner, without requiring people to deviate significantly from their overall desire lines.
Comfort	The occasions when cyclists need to stop or to give way should be minimised. Routes through junctions should ease the passage of cyclists by providing a smooth surface of adequate width, with flush surfaces at transitions, and avoid street clutter.
Attractiveness	Junctions are often important places where people gather and should be designed to suit and enhance their context.

Source: LTN 1/20

Priority junctions

Figure 10.13: Priority crossings of cycle tracks at side roads*



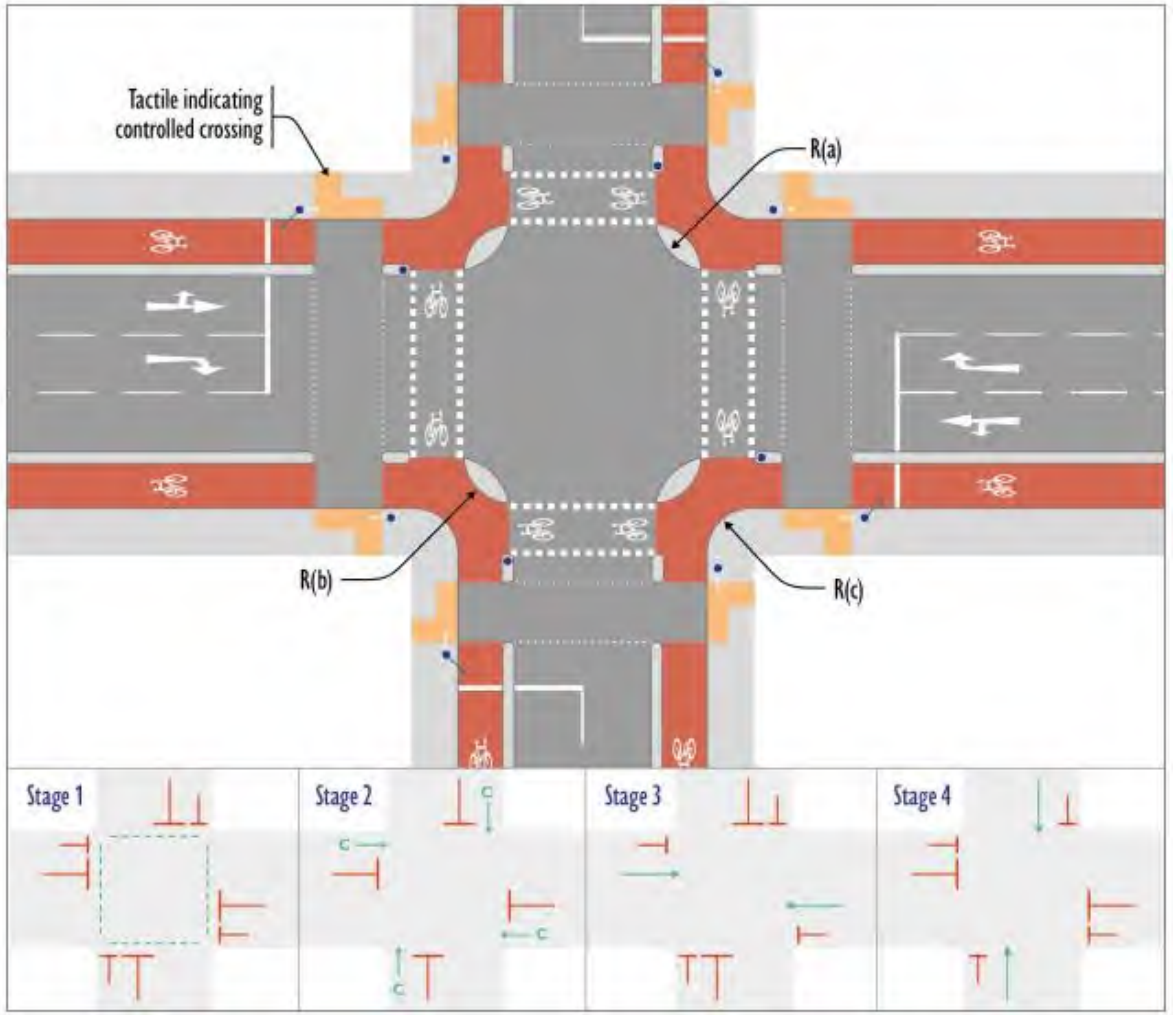
Source: LTN 1/20

Figure 10.17: No setback crossing with design priority,– Bournemouth

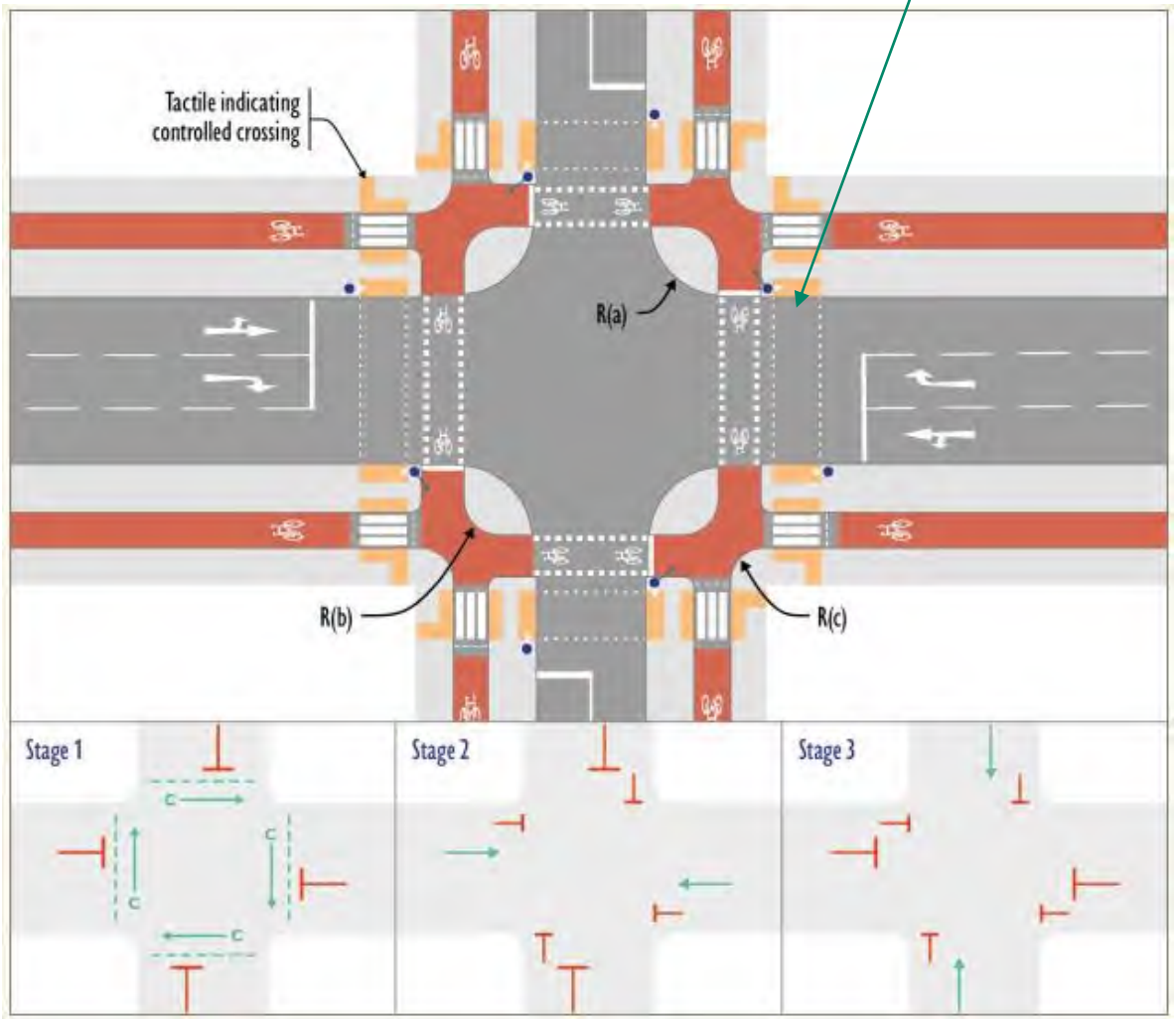
- Min 5m full setback (for storage of vehicle)
- No set-back layouts not suitable for two-way tracks
- Two-way tracks, more important to highlight junction and reduce speeds.

Signal-controlled junctions : Protected cycle movements

Option 1 | Cyclists on the inside



- Straight across pedestrian crossings
- Two all-red stages
- Variant includes internal stop lines

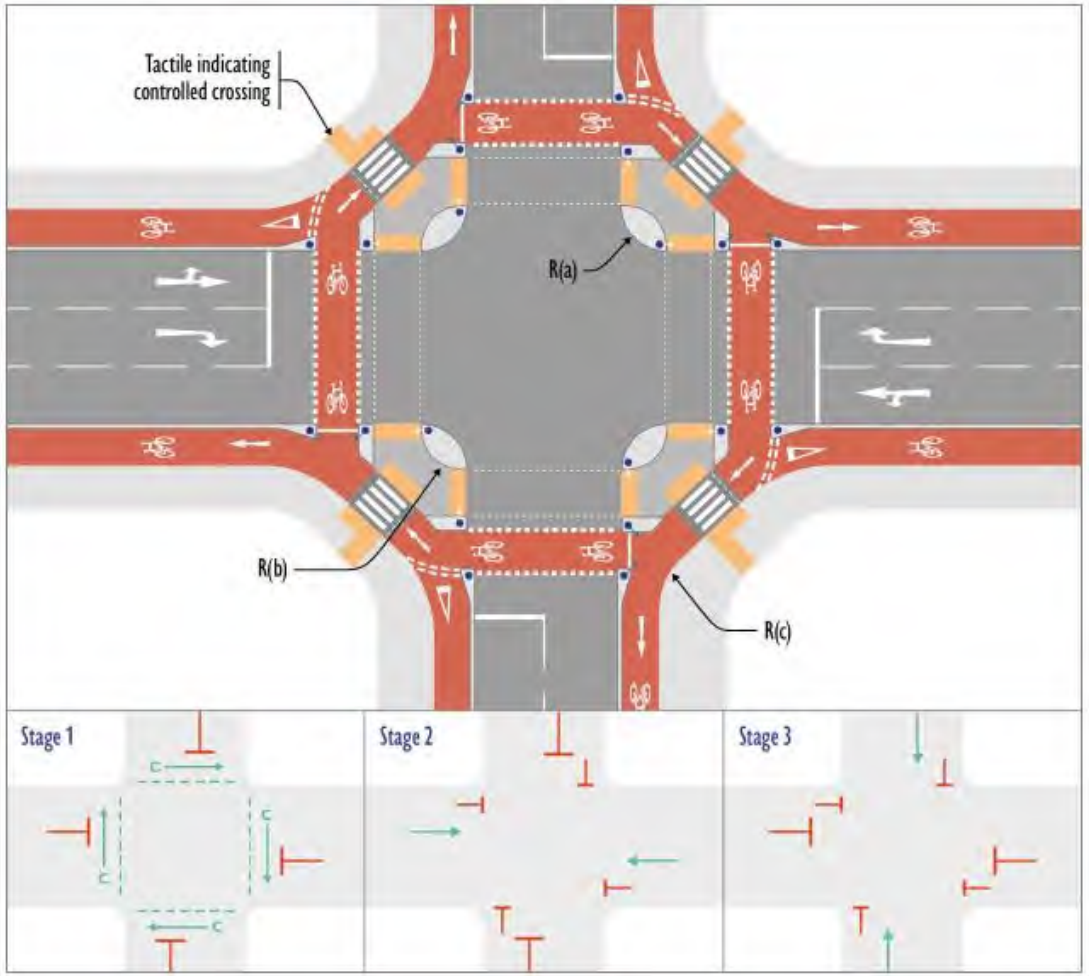


- Split movement pedestrian crossings
- Single all-red stage
- Increased crossing space requirement further from junction

Source: Cycling by Design, 2021

Signal-controlled junctions : Protected cycle movements

Option 2 | Cyclists on the outside (CYCLOPS)



Royce Road / Chorlton Road, Manchester

+ Improved angle of approach for cyclists
+ Storage capacity for cyclists

- Junction footprint requirements
- Potentially more difficult of pedestrians to negotiate, especially blind and partially sighted users

Source: Cycling by Design, 2021

Part 4 | Crossings

Summary of the Crossing Types and Tools to assist your choice

Crossings

6.35. Crossing and Junction Design – General Principles

Function, form and use

6.35.1 The design of junctions and crossings must be comprehensible to all users, and it is essential that this is applied to pedestrians and cyclists as well as motorised road users.

User requirements for junctions and crossings

6.35.2 The user requirements of directness, safety and comfort are significant at junctions and crossings.

It is essential that the needs of cyclists are taken into account in the design of all new and improved junctions, not just those on designated cycle routes, and that crossings are provided where cycle routes continue across busy highways. Safety is vital, but junctions and crossings should also enable cyclists to negotiate them in comfort without undue delay or deviation. Junctions should be designed to enable cycle movements in all permitted directions. The design of cycle facilities should take into account the volume and speed of motor traffic and the type and size of the junction. At quieter junctions it may be safer to integrate cyclists into the general traffic streams to reduce the number of conflicts but at busier junctions it will be necessary to separate and protect cycle movements. The Junction Assessment Tool (Appendix B) should be used to assess how well junctions meet cyclists' needs.

Crossings

1. What crossing type?
2. Parallel & Zebra
3. Uncontrolled
4. Cycle Priority Crossing
5. Signal controlled crossings
6. Grade separated crossings

6.36. Crossing Types

6.36.1 There are two overall types of crossing – grade-separated, such as bridges and subways and at-grade crossings such as zebra crossings.

6.36.3 There are two overall types of at-grade crossing:

- Uncontrolled crossings – pedestrian / cyclist usually has to give-way to road traffic, but in some cases these can be designed as a courtesy crossing where drivers are encouraged to give way to pedestrians / cyclists through the overall design; or can give priority to cycle traffic through the use of appropriate signs; and
- Controlled crossings – road traffic has to give-way to or stop for pedestrians and / or cyclists

How do you make the decision?

Table 10-2: Crossing design suitability

Speed Limit	Total traffic flow to be crossed (pcu)	Maximum number of lanes to be crossed in one movement	Uncontrolled	Cycle Priority	Parallel	Signal	Grade separated
≥ 60mph	Any	Any					
40 mph and 50 mph	> 10000	Any					
	6000 to 10000	2 or more					
	0-6000	2					
	0-10000	1					
≤ 30mph	>8000	> 2					
	>8000	2					
	4000-8000	2					
	0-4000	2					
	0-4000	1					

Provision suitable for most people

Provision not suitable for all people and will exclude some potential users and/or have safety concerns

Provision suitable for few people and will exclude most potential users and/or have safety concerns

Notes:
1. If the actual 85th percentile speed is more than 10% above the speed limit the next highest speed limit should be applied
2. The recommended provision assumes that the peak hour motor traffic flow is no more than 10% of the 24 hour flow

Motor Traffic Speed (85th percentile)	Uncontrolled	Controlled Zebra or Parallel	Signal-Controlled	Grade Separated
0 to 30 kph	●●	●●●	●●●	●●●
30 kph to 55 kph	●	●●	●●●	●●●
55 kph to 80 kph	●	✕	●●●	●●●
More than 80 kph	●	✕	✕	●●●

●●● **High Level of Service:** Suitable for most users.

●● **Medium Level of Service:** May not be suitable for some users, particularly novice users. Designer shall consider the lack of attractiveness of the facility to these users and how this can be overcome or mitigated.

● **Low Level of Service:** Not suitable for a range of users, including novice and intermediate users. Shall be avoided unless the risk to these users is conveyed to the Overseeing Organisation by the designer and accepted by the Overseeing Organisation. See Section 2.4.

✕ **Should not be used.**

Table 4.1: Selection matrix for road crossings

Crossing - Summary

Cycle Design Manual

Table 4.19: Sugested Cycle Priroity at Side Roads

Main Road Movement Function	Centre (≤ 50 km/h typically)	Neighbourhood/ suburban (≤ 50 km/h typically)	Business Parks/ Industrial Estate (≤ 50 km/h)	Rural fringe (≤ 60 km/h typically)	Rural (> 60 km/h)
Arterial					
Link					
Local					

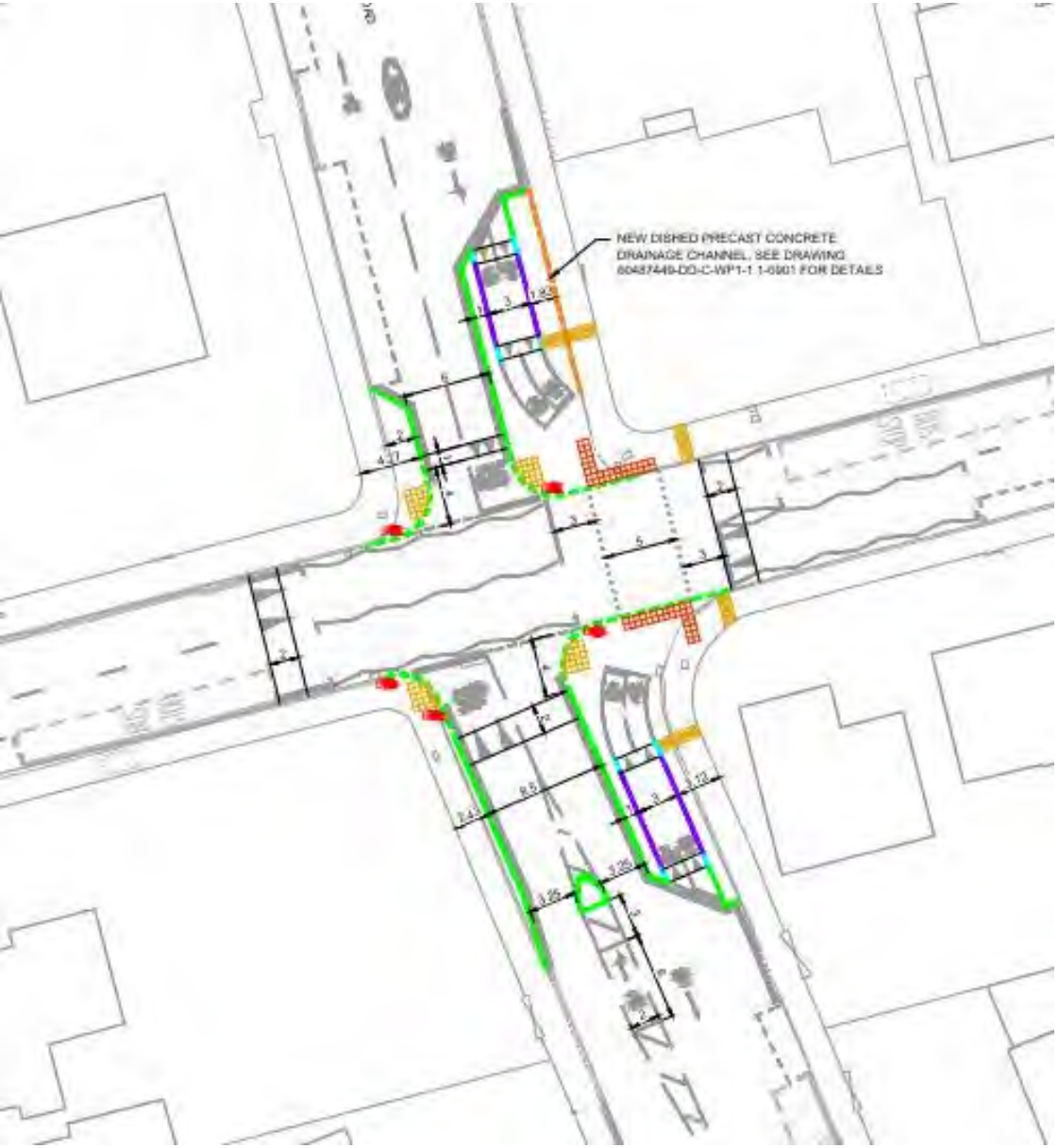
Place Context

Cycle priority recommended
Cycle priroity should be considered
Vehicle priority recommended

Note: Designers should refer to DMURS Section 3.2 for guidance and definitions on movement function and place context.

Crossing - Types

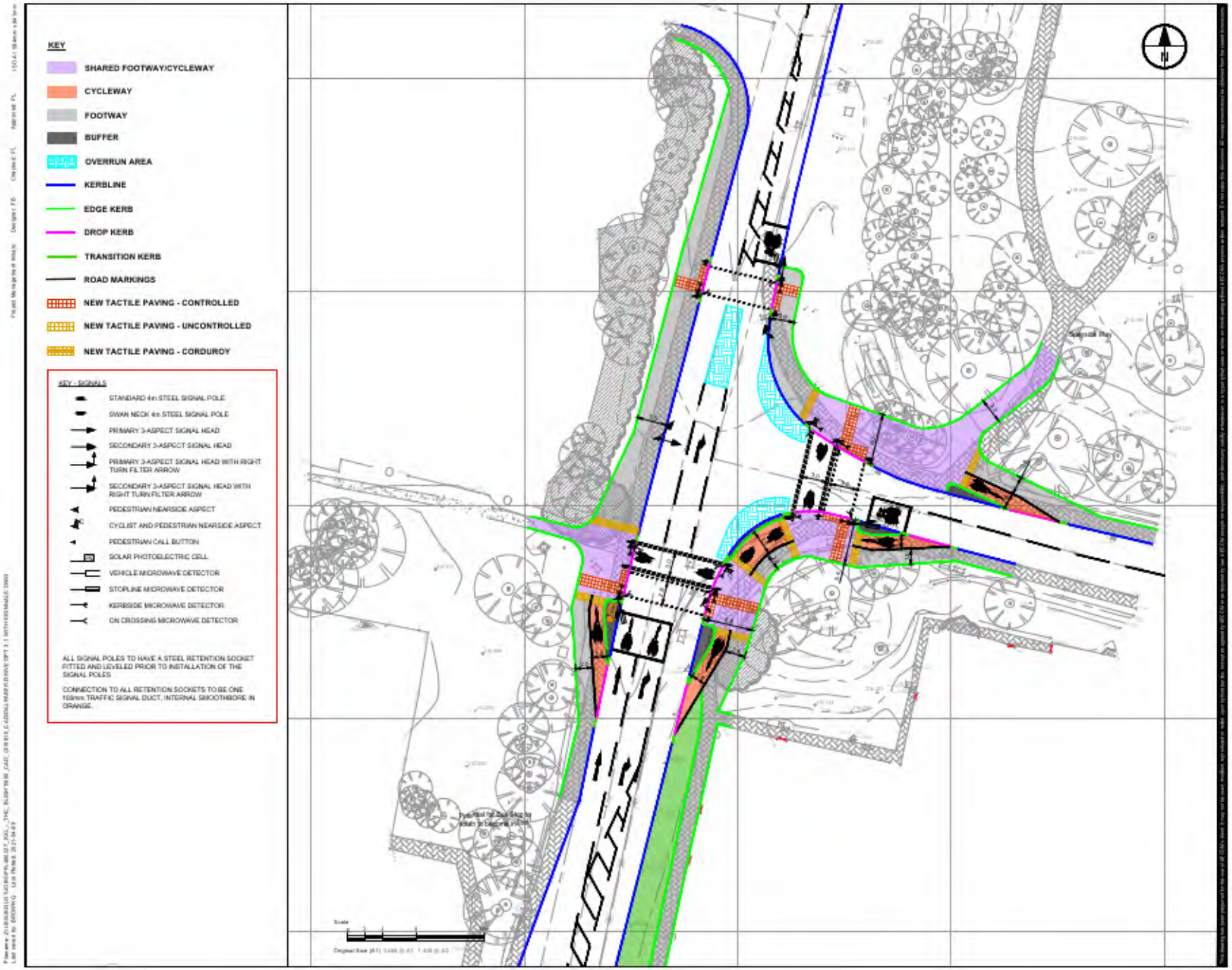
Crossing - Types



Crossing - Types

Crossing - Types

Crossing - Types



Crossing - Types

Part 5 | Supporting Measures

We could have spent a whole session on the next chapters, but we felt discussion was important.

So please jump into the manuals as we have and explore the advice.

11 Cycle parking and other equipment

Cycle parking is an essential component of cycle infrastructure. Sufficient and convenient residential cycle parking enables people to choose cycling. At the trip end, proximity to destinations is important for short stay parking, while for longer-stay parking security concerns can be a factor. As with other infrastructure, designers should consider access for all cycles and their passengers. Additional equipment and services enhance the quality of experience and convenience of cycling, making it accessible and attractive to more people.

6.0 Trip End Facilities

8 Related Facilities

This Chapter provides guidance on the design of important related facilities for walking and cycling, including seating, cycle parking and direction signing. It provides guidance in relation to Section 2(9) of the Active Travel Act. In determining whether anything constitutes related facilities for the purposes of this Act a local authority must have regard to this guidance.

8.1. Introduction

8.1.1 Section 2 (8) of the Active Travel Act defines a range of features as related facilities for the purposes of the Act including:

a) facilities for shelter, resting or storage,

b) toilets or washing facilities,

c) signing, or

d) other facilities, which are available for use by, or by any description of, walkers and cyclists using the active travel route.

8.1.2 As noted in Chapter 4 walking and cycling have many similarities and yet they have different user needs. This also applies for related facilities; cyclists will require facilities for showering and secure locations to leave their cycle whilst pedestrians will require seating and shelter to rest. Both pedestrians and cyclists will require clear direction signing, whilst well maintained planting and public art can contribute to visual amenity.

13 Traffic signs, road markings and wayfinding

Traffic signs and road markings must comply with the Traffic Signs Regulations and General Directions, or be authorised by the Secretary of State, when used within the highway, but the legislation allows for considerable flexibility in their use. There is a balance to be struck between providing enough signs for people to be able to understand and follow cycle infrastructure and ensuring that the signs themselves do not create confusion or street clutter. Routes on other rights of way not on the highway can use customised waymarking.

Questions & Discussion

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Thank you.

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