C1 – Designing for Cycling

Cycle Route Design Principles	1
The Active Travel Action Plan	3
QuietRoutes	4
Cycle Friendly City	6
Maintenance & Signing	7
Key Parameters	8
Separating Cyclists from Traffic	9
Degree of Protection	11
Roundabouts and Tram Tracks	13

Amendments:

Introduction

The cyclist has to steer, power and balance their vehicle simultaneously. They have a manoeuvrable vehicle but they are as vulnerable as pedestrians to injury. This combination gives designing for cycling its special characteristics as outlined below:

- **The bicycle is a vehicle** – when designing for cycling, criteria such as sightlines, horizontal and vertical alignment should all be carefully considered. Cyclists should not be required to dismount on cycle routes.
- **Bicycles are muscle powered** – so design should aim to minimise wasted energy, for example due to stopping, hills and sharp corners
- **Bicycles have no crumple zone** – People are vulnerable on a bike. Most design for cycling aims to reduce exposure to danger generally by separating cyclists from motorised traffic.
- **The most important deterrent to cycling is perceived danger** – Worldwide experience demonstrates that people need to feel that they can avoid mixing with heavy/fast traffic if they are to choose cycling as a means of transport. The Council's **QuietRoutes** network and segregated cycle tracks on main roads aim to tackle this issue.
- **A design does not have to have "cycle facilities" to help cyclists (and vice versa)**

Achieving good design for cycling can be achieved by following the six core cycle route design principles set out over the following factsheets.

Relevant Factsheets:

On Foot By Bike

The City of Edinburgh Council

Cycle Route Design Principles

Follow the six Core Principles / Outcomes, which together describe what good design for cycling should achieve.

Consideration should be given to improving existing streets as well as providing new infrastructure.

Cycle route core design principles include:

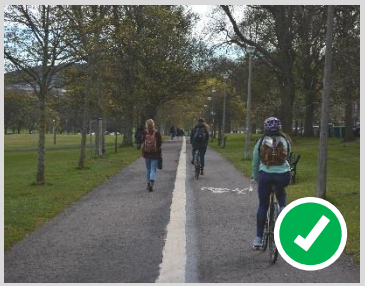
1. Safety
2. Directness
3. Comfort
4. Coherence
5. Attractiveness
6. Adaptability

1- Safety

Good infrastructure should help to make cycling safer and address negative perceptions about safety, particularly when it comes to moving through junctions.

Space for cycling is important but a narrow advisory cycle lane next to a narrow general traffic lane and guardrail at a busy junction is not an acceptable offer for cyclists.

2- Directness



Routes should be logical and continuous, without unnecessary obstacles, delays and diversions, and planned holistically as part of network.

This track works well on links but requires cyclists to give way at each side road. Cyclists often choose to stay on carriageway rather than take fragmented routes with built-in delay.

3-Comfort

Riding surfaces for cycling, and transitions from one area to another, should be fit for purpose, smooth, well constructed and well maintained.

Uncomfortable transitions between on-and off-carriageway facilities are best avoided, particularly at locations where conflict with other road users is more likely.

Relevant Factsheets:

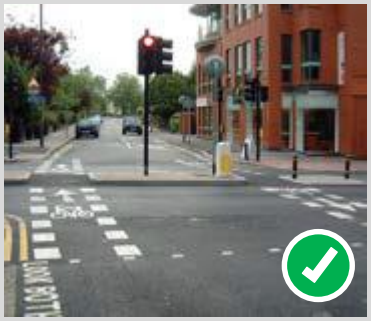
Segregated Cycle Lanes– Soft Segregation (C3) Cycle Lanes (C2)

Segregated Cycle Tracks – Hard Segregation (C4)

How these principles are applied will depend on site-specific conditions and on detailed design, but schemes should demonstrate that these issues have been taken seriously and have informed design decisions.

For further guidance:
- Making Space for Cycling (2014)
- DfT: Local Cycling and Walking Infrastructure Plans (2017)

4- Coherence



Infrastructure should be legible, intuitive, consistent, joined-up and inclusive. It should be usable and understandable by all users.

Neither cyclists nor pedestrians benefit from unintuitive arrangements that put cyclists in unexpected places away from the carriageway.

5- Attractiveness

Infrastructure should not be visually intrusive or add unnecessarily to street clutter. Well designed cycling infrastructure should enhance the urban realm.

Sometimes well-intentioned signs and markings for cycling are not only difficult and uncomfortable to use, but are also unattractive additions to the streetscape.

6 – Adaptability

Cycling infrastructure should be designed to accommodate users of all types of cycle, and an increasing numbers of users over time.

Where streets have been engineered primarily for use by motor vehicles, it is difficult to make infrastructure for cycling that is legible and adaptable.

Relevant Factsheets:
Segregated Cycle Lanes– Soft Segregation (C3) Cycle Lanes (C2) Minimising Street Clutter (P7)
Segregated Cycle Tracks – Hard Segregation (C4)

The Active Travel Action Plan

The Active Travel Action Plan (ATAP) sets out two parallel approaches to cycle infrastructure in Edinburgh. Firstly developing a '**QuietRoutes**' network with an emphasis on catering for less confident cyclists, secondly moving towards a **Cycle Friendly City**.

'QuietRoutes'

This is a network of cycle routes, known as QuietRoutes, which will feel attractive and safe to people of all ages and abilities.

Quiet Route on Canal Path, Edinburgh

The City of Edinburgh Council

Cycle friendly city

The Cycle Friendly City programme aims to make travel by bike anywhere in the city convenient and attractive.

Advanced Stop Line, Edinburgh

The City of Edinburgh Council

Advisory Cycle Lane, Edinburgh

The City of Edinburgh Council

Relevant Factsheets:

Signalled Crossings at or near junction (G5)
Creating Active Travel Networks (P2)
Speed Reduction & Traffic Management (G6)
Cycle Lanes (C2)

QuietRoutes

The QuietRoute network in Edinburgh seeks to maximise the potential for everyone's everyday trips to be made easily, directly and enjoyably by bike. It is focussed on making cycling a realistic travel option for an ever increasing proportion of people: children, the elderly, men and women, not just a confident minority who are happy to cycle in busy traffic

The developing network consists of traffic-free paths (including cycle paths in parks and greenspace), quiet roads and separate cycle tracks on main streets. It seeks to provide for both utility and leisure journeys.

QuietRoutes should be designed to achieve the Sustrans National Cycle Network standard (i.e. they should be suitable for use by an unaccompanied 12 year old).

Segregated Cycle Tracks

The City of Edinburgh Council

Mandatory Cycle Lanes

Google Maps, 2017

Off-Street Paths

The City of Edinburgh Council

Cycle Streets

Google Maps

Technical standards that are suitable for QuietRoutes are based on **Sustrans National Cycle Network Design Guidance.**

These images illustrate how some of the key components of QuietRoutes can be applied to our streets to provide safe and attractive routes for people of all ages and abilities, especially for those who are new to cycling as means of transport.

Click the link for more information: **Edinburgh QuietRoute network**

Relevant Factsheets:

Segregated Cycle Lanes – Soft Segregation (C3) Cycle Lanes (C2)
Segregated Cycle Tracks – Hard Segregation (C4)

While much of the QuietRoutes network will be off-road or on quiet roads, to effectively 'join up' and to create reasonable directness, the QuietRoutes network needs to negotiate some busy streets and junctions.

At these points, the aim will be to retain a high standard of safety and convenience.

This will generally mean using protected separate cycle tracks, or potentially wide mandatory cycle lanes complemented by parking and loading restrictions.

Well defined routes through any busy junctions are also essential.

On the QuietRoutes network, coherence is of the utmost importance. A single 'missing link' can seriously undermine the effectiveness of a route or the entire network.

Toucan Crossing, Rankeillor Street, Edinburgh

The City of Edinburgh Council

Segregated cycleway, St Leonards Street, Edinburgh

The City of Edinburgh Council

Continuous footway, Middlefield, Edinburgh

The City of Edinburgh Council

Toucan crossing, Buccleuch Street, Edinburgh

The City of Edinburgh Council

Streets and paths that are part of this network should be designed in consultation with the Council's Cycle Team. As a general guide, the following principles / standards will apply:

Local streets

The emphasis will be on providing a high standard of safe crossings where these streets join or cross secondary or strategic streets.

Secondary streets

Physically segregated cycle facilities (using kerb or similar) will generally be necessary.

Strategic streets

Physically segregated cycle facilities (using kerb or similar) will always be necessary.

Relevant Factsheets:

Segregated Cycle Lanes – Soft Segregation (C3)
Segregated Cycle Tracks – Hard Segregation (C4)
Cycle Lanes (C2)
Crossings (G4)
Signalled Crossings at or near junctions (G5)

Cycle Friendly City

The Cycle Friendly City programme aims to make travel by bike anywhere in the city convenient and attractive.

This will be achieved by:

- Citywide application of cycle friendly street design
- Varying degrees of separation from traffic

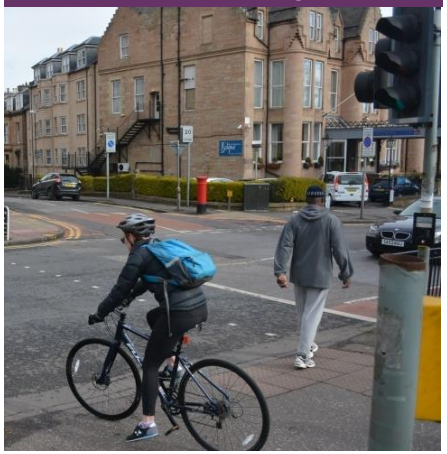
This involves provision for cyclists on main roads as well as crossings linking up quieter side roads.

Whilst recognising the multiple pressures and constraints in space on the road network, this programme is designed to make cycling feel as convenient, safe and comfortable as possible for day to day cyclists on the roads, including; commuters, shoppers and anybody going from A to B.

Advanced Stop Lines

The City of Edinburgh Council

Toucan Crossings



The City of Edinburgh Council

Cycle Lanes

The City of Edinburgh Council

20mph Zones

The City of Edinburgh Council

These images illustrate what cycle specific measures can be applied and how some of the traffic management measures can be designed with cyclists in mind to make cycling in Edinburgh safe, convenient and attractive for larger numbers.

View the most up to date cycling and walking routes in Edinburgh using the QuietRoutes and cycle parking map compiled by the City of Edinburgh Council.

Maintenance & Signing

Maintenance is crucial to the continued success of both on and off street cycle routes.

Poor surfaces, overhanging vegetation, ponding, worn markings, broken glass, poor lighting etc, all affect cyclists more quickly and more seriously than motorists and area continuous source of complaint.

It is therefore essential that cycle tracks, both on and off road, are inspected and maintained on a similar basis to the rest of the road network.

The City of Edinburgh Council

The City of Edinburgh Council

The quality, frequency and coherence of signing is crucial to the successful operation of cycle routes. Continuity of destinations is also crucial.

Particular attention must be given to signing off-road routes from the main road network.

Cycle signing must be maintained on the same basis as other road signs.

Adhere to the hierarchy of destinations in the Active Travel Action Plan Signage Guidance Document, please contact the Active Travel Team for details

Contact the Cycle Team for additional detailed guidance.

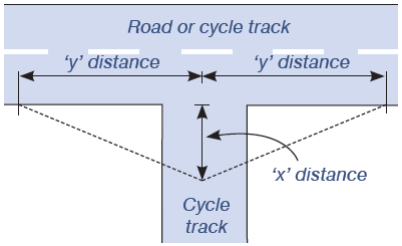
The City of Edinburgh Council

Key Parameters

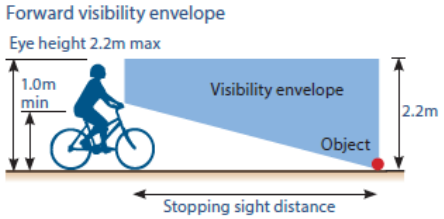
Visibility at Junctions

Recommended X distances for cyclists are:

- 4m preferred
- 2m recommended
- 1m where geometry is tight



If these visibility requirements cannot be achieved the alternative is to use the full range of markings and signs available to make clear the need to cyclists to slow down.



Visibility: Link design parameter: traffic free				
Type of cycle route	Design speed	Min. Stopping sight distance	Sight distance in motion	Min. Radius of curve
Commuter route	20 mph	25 m	80 m	25 m
Local access route	12 mph	15 m	50 m	15 m

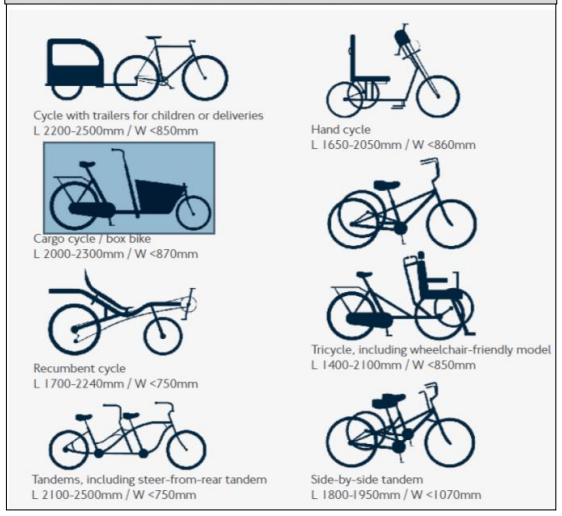
Gradients	
3%/1:30	Preferred
5%/1:20	Desirable maximum
7%/1:12	Normal absolute maximum
>7%	For short lengths

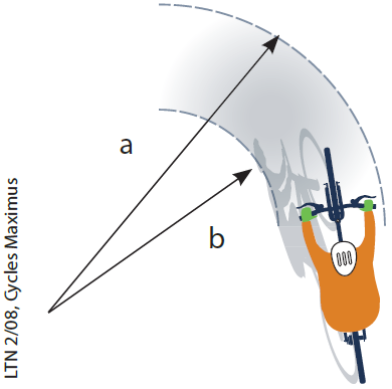
In hilly areas, many roads have steeper gradients but can still make acceptable cycle routes

Visibility at Junctions											
85%ile speed (kph)	20	25	30	40	45	50	60	70	85	100	120
'y' distance (m) on road	14	18	23	33	39	45	59	120	160	215	295

Source: Manual for Street & TD 42/95

Indicative dimension of typical 'non-standard' cycles





Images: Sustrans, HfCD, 2014

Cycle parking and manoeuvring at low speeds: minimum dimensions				
	Overall Width (mm)	Overall Length (mm)	Minimum turning circle (mm)	
			Outer radius (a)	Inner radius (b)
Conventional bicycle	700	1800	1650	850
Tandem	700	2400	3150	2250
Bicycle and trailer	800	2700	2650	1500
Cargo trike	1200	2600	2300	100

Note: a wider range of adapted bikes are used for disability cycling: their design requirements will generally fall within the ranges in this table

Relevant Factsheets:

Cycle Lanes (C2) Signalled Crossings at or near junctions (G5) Crossings (G4)

Separating Cyclists from Traffic

On-street cycle lanes (integrated with general traffic)

- Mandatory cycle lanes
- Advisory lanes
- Bus lanes

Google Maps, 2017

The City of Edinburgh Council

The City of Edinburgh Council

On-street segregated cycle facilities

- Cycle track with soft segregation
- Cycle track with hard segregation
- Shared footway

The City of Edinburgh Council

The City of Edinburgh Council

The City of Edinburgh Council

Off-street cycle paths

- Shared pedestrian/cycle paths
- Segregated pedestrian/cycle paths
- Separate pedestrian /cycle paths

The City of Edinburgh Council

The City of Edinburgh Council

Google Maps, 2017

Other facilities

- Cycle streets
- Contra-flow cycling

Google Maps, 2017

The City of Edinburgh Council

Degree of Protection from Motorised Traffic

Protecting cyclists from motorised traffic is a crucial component of encouraging cycling. But, in deciding what, if any infrastructure is needed, there is a need to balance the following:

- Quality of provision for cycling, taking into account the target user group
- Danger to cyclists with/without infrastructure costs
- Impact on other street users

A key factor will be whether the street or junction is on the **QuietRoutes** network. If it is, a significantly higher degree of protection will ne necessary.

The table on the following page (12) gives guidance on the type of infrastructure that should be considered, depending on the key variables of the volume and speed of the motorised traffic.

Hard Segregated Cycle Track, Edinburgh

The City of Edinburgh Council

Traffic Calming Side Road Entry Treatment

Google Maps, 2017

Relevant Factsheets:

Segregated Cycle Lanes – Soft Segregation (C3)
Segregated Cycle Tracks – Hard Segregation (C4)
Speed Reduction andTraffic Management (G6)

Degree of Protection Required for Cycling and Cycle Friendly Cities

Flow / Speed Table

Flow (2 way)	Expected 85th percentile speed			
	20 mph Limit		30 mph Limit	40 mph Limit
	<20 mph Very Low	>20 mph Low	Medium	High
Very Low Less than 1,500 vpd, Or 150 vph	Quiet Street	Quiet Street	Rural quiet road or cycle lanes	Cycle lanes or tracks
Low 1,500-3,000 vpd, Or 150-300 vph	Quiet Street or cycle lanes	Quiet Street or cycle lanes	Cycle lanes or tracks	Cycle lanes or tracks
Medium 3,000-8,000 vpd, Or 300-800 vph	Cycle lanes or segregation from traffic	Cycle lanes or segregation from traffic	Cycle lanes or segregation from traffic (QR)	Cycle lanes or segregation from traffic (QR)
High 8,000-10,000 vpd, Or 800-1,000 vph	Cycle lanes or segregation from traffic (QR)	Cycle lanes or segregation from traffic (QR)	Cycle lanes or segregation from traffic (QR)	Segregation from traffic (QR)
Very High Greater than 10,000 vpd	Cycle lanes or segregation from traffic (QR)	Cycle lanes or segregation from traffic (QR)	Cycle lanes or segregation from traffic (QR)	Segregation from traffic (QR)

Relevant Factsheets:
Segregated Cycle Lanes – Soft Segregation (C3) Cycle Lanes (C2) Quiet Routes (C1)
Segregated Cycle Tracks – Hard Segregation (C4)

Roundabouts and Tram Tracks

Roundabouts

Cycle lane interaction with roundabouts is a particularly complex area.

The Council is currently developing its approach to this and a guidance factsheet will be made available as soon as practicable. It will take into account current national guidance and experience from elsewhere. It should be noted that this experience has resulted in a strong desire to avoid the use of peripheral lanes.

For more detailed guidance, please refer to the guidance provided by the Sustrans Design Manual. For more information contact the City of Edinburgh Council Active Travel Team.

Tram Tracks

Cycle lane interaction with tram tracks on the carriageway is another complex area.

The Council is currently developing its approach to this and a guidance factsheet will be made available as soon as practicable. It will take into account current national guidance and experience from elsewhere

For guidance on this issue, please contact the City of Edinburgh Council Active Travel Team for more information.

Image References

Introduction
Main image: The City of Edinburgh Council

Cycle Route Design Principles
Safety – top image: The City of Edinburgh Council

Safety – bottom image: Google Maps [ONLINE]. Available at: https://goo.gl/UacgQa [Accessed 06 December 2017]
Directness– top image: The City of Edinburgh Council
Directness– bottom image: Sustrans Technical Information note No.12: Side Road Crossings [ONLINE]. Available at: https://goo.gl/c1t2EM [Accessed 06 December 2017]
Comfort – top image: London Cycling Design Standards – Chapter 1 [ONLINE]. Available at: http://content.tfl.gov.uk/lcds-chapter1-designrequirements.pdf [Accessed 12 December 2017]
Comfort – bottom image: London Cycling Design Standards – Chapter 1 [ONLINE]. Available at: http://content.tfl.gov.uk/lcds-chapter1-designrequirements.pdf [Accessed 12 December 2017]
Coherence– top image: London Cycling Design Standards – Chapter 1 [ONLINE]. Available at: http://content.tfl.gov.uk/lcds-chapter1-designrequirements.pdf [Accessed 12 December 2017]
Coherence– bottom image: London Cycling Design Standards – Chapter 1 [ONLINE]. Available at: http://content.tfl.gov.uk/lcds-chapter1-designrequirements.pdf [Accessed 12 December 2017]
Attractiveness– top image: London Cycling Design Standards – Chapter 1 [ONLINE]. Available at: http://content.tfl.gov.uk/lcds-chapter1-designrequirements.pdf [Accessed 12 December 2017]
Attractiveness– bottom image: London Cycling Design Standards – Chapter 1 [ONLINE]. Available at: http://content.tfl.gov.uk/lcds-chapter1-designrequirements.pdf [Accessed 12 December 2017]
Adaptability– top image: London Cycling Design Standards – Chapter 1 [ONLINE]. Available at: http://content.tfl.gov.uk/lcds-chapter1-designrequirements.pdf [Accessed 12 December 2017]
Adaptability– bottom image: London Cycling Design Standards – Chapter 1 [ONLINE]. Available at: http://content.tfl.gov.uk/lcds-chapter1-designrequirements.pdf [Accessed 12 December 2017]

The Active Travel Action Plan
All images: The City of Edinburgh Council

QuietRoutes
Segregated Cycle Tracks: The City of Edinburgh Council
Mandatory Cycle Lanes: Google Maps [ONLINE]. Available at: https://goo.gl/maps/JZ6V834USxo[Accessed 02 February 2017]
Off-street paths: The City of Edinburgh Council
Cycle streets: Google Maps [ONLINE]. Available at: https://goo.gl/iEZV78 [Accessed 07 December 2017]
Toucan crossing at Rankeillor St: The City of Edinburgh Council
Segregated cycleway: The City of Edinburgh Council
Continuous footway: The City of Edinburgh Council
Toucan crossing at Buccleuch Sr: The City of Edinburgh Council

Cycle Friendly City
All images: The City of Edinburgh Council

Maintenance & Signing
All images: The City of Edinburgh Council

Key Parameters
All images: Sustrans Design Manual: Handbook for Cycle-friendly Design 2014. [ONLINE]. Available at: http://www.sustrans.org.uk/sites/default/files/file_content_type/sustrans_handbook_for_cycle-friendly_design_11_04_14.pdf [Accessed 02 February 2017]

Separating Cyclist from Traffic
Mandatory cycle lane: Google Maps [ONLINE]. Available at: https://goo.gl/maps/JZ6V834USxo [Accessed 02 February 2017]
Advisory cycle lane: The City of Edinburgh Council
Bus lane: The City of Edinburgh Council
Cycle track with soft segregation: The City of Edinburgh Council
Cycle track with hard segregation: The City of Edinburgh Council
Shared footway: The City of Edinburgh Council
Shared pedestrian/cycle paths: The City of Edinburgh Council
Segregated pedestrian/cycle paths : The City of Edinburgh Council
Separate pedestrian/cycle paths : Google Maps [ONLINE]. Available at: https://goo.gl/maps/CPcv8h4aJkH2 [Accessed 02 February 2017]
Cycle streets: Google Maps [ONLINE]. Available at: https://goo.gl/maps/Kp6BrKG3ePM2 [Accessed 02 February 2017]
Contra-flow cycling: The City of Edinburgh Council

Degree of protection
Hard segregated cycle track: City of Edinburgh Council
Traffic calming: Google Maps [ONLINE]. Available at: https://goo.gl/7Dj8Vj [Accessed 07 December 2017]

Index

Subject	Page
Active travel action plan	C1.4
Cycle friendly city	C1.4, C1.7
Cycle route design principles	C1.2
Designing for cycling	
Cycle separation from traffic	C1.10
Protection from motorised traffic	C1.11-12
Visibility at junctions	C1.9
Local Cycling and Walking Infrastructure Plans (2017)	C1.3
Maintenance	C1.8
Making Space for Cycling (2014)	C1.3
Roundabouts	C1.13
Tram tracks	C1.13
QuietRoutes	C1.1, C1.4-6
Signage	C1.8
Sustrans Design Manual – Chapter 7	C1.13
Sustrans Handbook for Cycle Friendly Design	C1.9
Sustrans National Cycle Network Design Guidance	C1.5