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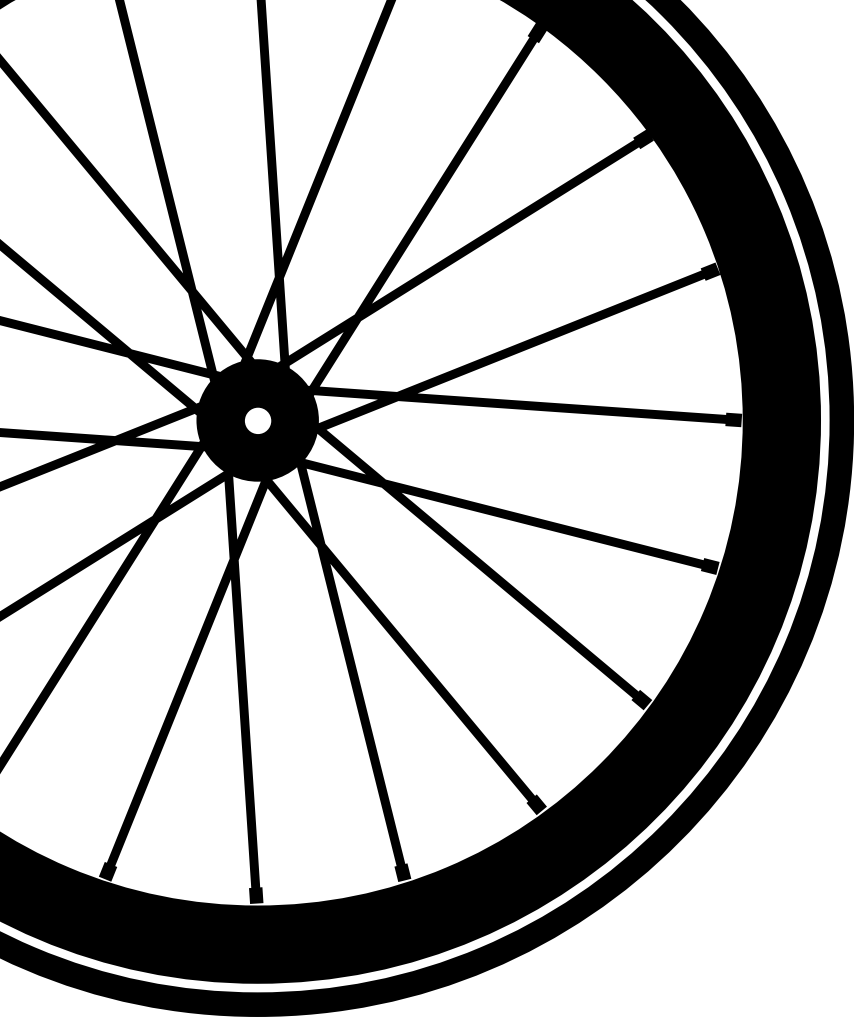
CYCLING IN THE CITY

A COMPENDIUM OF
INTERNATIONAL PRACTICE

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RESEARCH | PLANNING | STRATEGY | DESIGN





CYCLING IN THE CITY:
A COMPENDIUM OF
INTERNATIONAL PRACTICE

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00 INTRODUCTION

This document aims simply to collect in one place a range of urban cycle design guidance, for features great and small, from different countries. We looked up what **Compendium** means, and we've tried to adhere to the following definition: "A concise, yet comprehensive, compilation of a body of knowledge." What we wanted to do was to help provide a reference resource for fellow practitioners and others involved in making streets more attractive to cycle along.

You may notice that we've only described the contents as **International Practice**, and have consciously omitted any reference to 'best', or even 'good'. We have, we trust, excluded any downright 'bad practice', but our purpose is to let you see what others say, not pass judgement on it.

We have tried hard to ensure that we are not treading on any toes as regards intellectual property. Other than a few points where we've added our own take on a topic, everything in this document is freely available online. We claim no credit for it, and want only to point you in its direction. (If you think we may have over-stepped the mark here, or have failed to give credit where it's due, please do let us know.)

It's our intention to update this document from time to time, so we'd be very happy to receive suggestions about additional material the compendium could contain (to make it more comprehensive) or stuff you think is best left out (to help make it more concise). Any other feedback or queries would also be welcome.

Thank you.



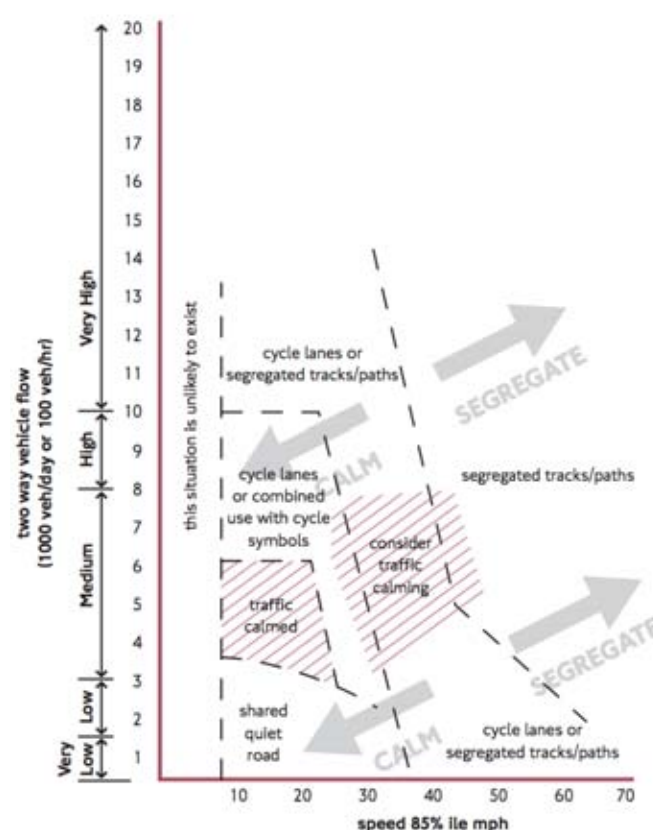
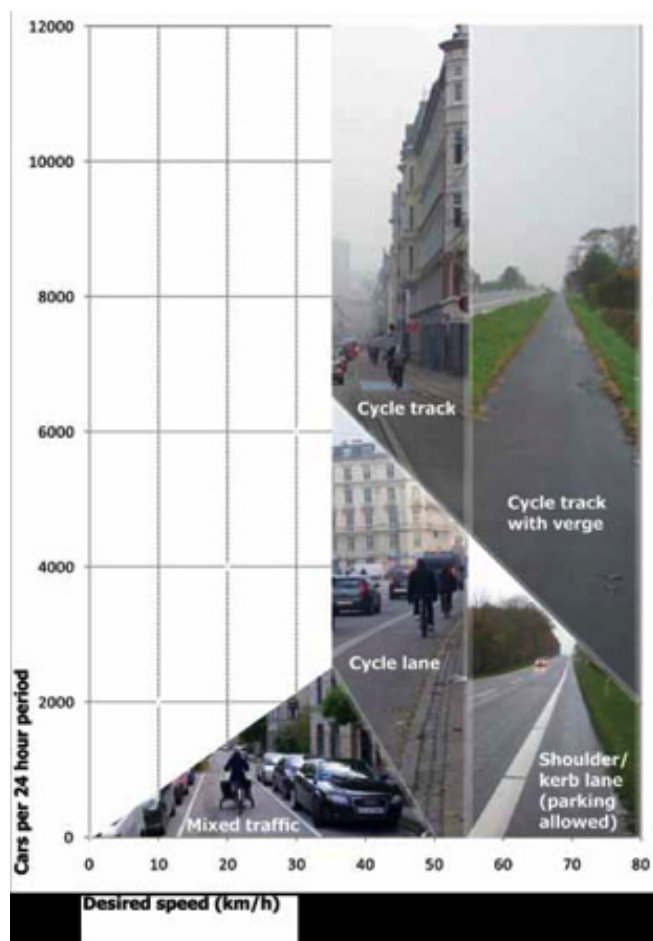


LINKS

01 OVERVIEW OF OPTIONS/PRINCIPLES

THE CYCLING EMBASSY OF DENMARK USES THIS DIAGRAM TO GUIDE CHOICES OVER THE FORM OF PROVISION:

THE LONDON CYCLE DESIGN STANDARDS USES THIS DIAGRAM FOR THE SAME PURPOSE:



LONDON CYCLE DESIGN STANDARDS

Figure 4.1
Matrix of cycle facility solutions based on motor traffic volume and speed

	85%ile Speed			
	<20mph Very Low	20-30mph Low	30-40mph Medium	>40mph High
Very High >10,000VPD	Lanes or Tracks/paths	Lanes or Tracks/paths	Lanes or Tracks/paths	Tracks/paths
High 8,000-10,000VPD 800-1,000VPH	Lanes	Lanes	Lanes or Tracks/paths	Tracks/paths
Medium 3,000-8,000VPD 300-800VPH	Lanes or combined use with cycle symbols	Lanes or combined use with cycle symbols	Lanes or Tracks/paths	Tracks/paths
Low 1,500-3,000VPD 150-300VPH	Combined use with cycle symbols	Combined use with cycle symbols	Lanes or Tracks/paths	Lanes or Tracks/paths
Very Low <1,500VPD <150VPH	Combined use – no symbols necessary	Combined use with cycle symbols	Combined use with cycle symbols	Lanes or Tracks/paths

THE **IRISH NATIONAL TRANSPORT AUTHORITY** PROVIDE THESE OBJECTIVES FOR CYCLE LINKS:

Links are the physical cycling infrastructure that join origins to destinations. They can take a variety of forms depending on particular conditions. We recommend providing for cyclists in a manner that supports and promotes a more sustainable approach to travel.

The key objectives include:

- Providing for two abreast where possible – this makes cycling more enjoyable, but the wider cycle facility also makes it safer, more visible and more attractive.
- Providing consistently for cyclists – minimising the need to make transitions from one type of link to another, and making the overall facility predictable and legible; wider cycle facility also makes it safer, more visible and more attractive.
- Designing junctions where cyclists are safely integrated with the main traffic flow – ensuring better bicycle provision and reducing bicycle / pedestrian conflicts.

It is not acceptable to simply provide whatever space is left over after traffic has been catered for – this approach often results in facilities that are substandard and unsafe for cyclists. Substandard facilities have been shown to be dangerous, increasing the likelihood and severity of conflict. It would be better not to provide any cycling facility at all, and to review the overall cycle network.

Solutions may include reducing the number of traffic lanes, reducing the design speed of adjoining traffic, or introducing a segregated or off-road cycle facility.

THOUGH SOMEWHAT LONG IN THE TOOTH (& SOME WOULD SAY OUT-DATED), THE **UK DEPARTMENT FOR TRANSPORT'S LOCAL TRANSPORT NOTE 2/08** ON 'CYCLE INFRASTRUCTURE DESIGN' REMAINS AN IMPORTANT REFERENCE DOCUMENT:



02 CYCLING IN THE CARRIAGEWAY

IN MANY LIGHTLY-TRAFFICKED, RELATIVELY NARROW STREETS, LIKE RESIDENTIAL STREETS USED ONLY OR PREDOMINANTLY FOR LOCAL ACCESS, CYCLING IN THE CARRIAGEWAY WILL BE THE ONLY PRACTICABLE OPTION. WHERE VEHICLE FLOWS ARE BOTH LOW AND SLOW, SUBJECTIVE SAFETY IS LIKELY NOT TO BE A DETERRENT TO CYCLING. NO SPECIAL FACILITIES, OTHER THAN POSSIBLY CYCLE SYMBOLS TO INDICATE THE LIKELY PRESENCE OF CYCLISTS IN THE CARRIAGEWAY, WILL USUALLY BE NECESSARY.

HOWEVER, WHERE CYCLISTS ARE REQUIRED TO USE THE CARRIAGEWAY IN CIRCUMSTANCES WHERE THE LEVEL

OF SUBJECTIVE SAFETY IS LOWER, PEOPLE MAY BE DETERRED FROM CYCLING.

IN THE UK, THE CONCEPTS OF 'VEHICULAR CYCLING' AND THE 'PRIMARY POSITION' WERE PROPOUNDED TO DESCRIBE HOW CYCLISTS SHOULD BOLDLY 'TAKE THE ROAD' AND ACT LIKE DRIVERS OF MOTOR VEHICLES.

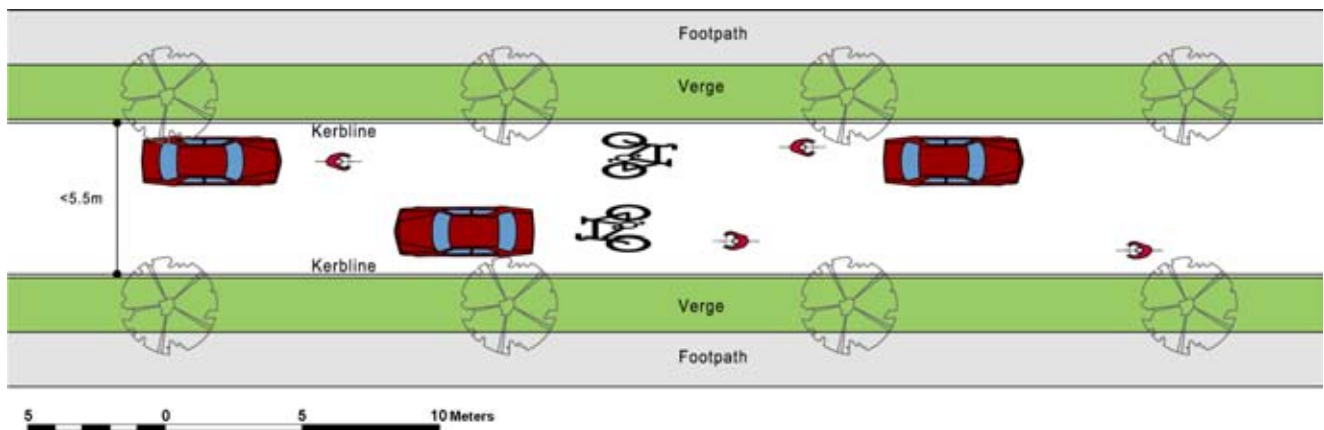
WHILE THE EVIDENCE SUGGESTS THAT SUCH CONCEPTS HAVE NOT BEEN FOUND ATTRACTIVE BY THE VAST MAJORITY OF THE NON-CYCLING PUBLIC, IT IS WORTH BEING FAMILIAR WITH THEM. TRY SEARCHING **WIKIPEDIA FOR 'VEHICULAR CYCLING'**

THE **IRISH NATIONAL TRANSPORT AUTHORITY** PROVIDE THESE RULES FOR WHEN CYCLING IS INTENDED TO TAKE PLACE IN THE CARRIAGEWAY:

Mixed or shared streets are suitable in low traffic single lane environments where cyclists and pedestrians take precedence over vehicular traffic. The key feature from a cycling perspective is that cyclists "take the lane" in line with vehicles.

Where such streets are less than 5.5m in width, there should be no central lane marking, thereby ensuring all road users in either direction yield to each other.

For widths between 5.5 and 7.0m, a central lane marking should be provided to separate opposing traffic.



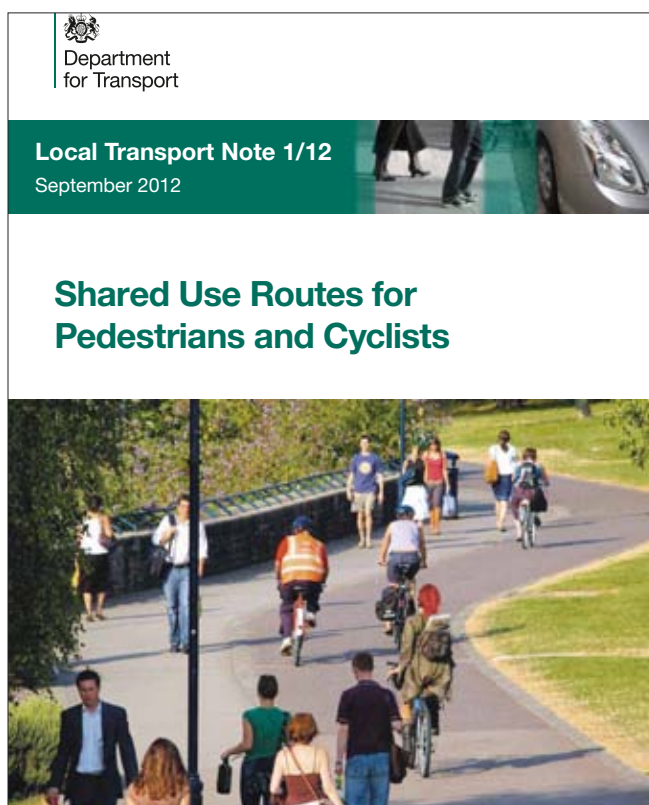
03 SHARED USE FOOT/CYCLE PATHS

THE **LONDON CYCLE DESIGN STANDARDS** HAS THIS GUIDANCE ON WIDTHS OF SHARED PATHS:

The recommended width for a shared use path is 3.0m with a minimum width of 2.0m, plus an additional 0.5m for each side of the track that is bounded (e.g. by a wall, railings, fence or hedge).



THE **UK DEPARTMENT FOR TRANSPORT LOCAL TRANSPORT NOTE 1/12** ON 'SHARED USE ROUTES FOR PEDESTRIANS AND CYCLISTS' PROVIDES THE LATEST OFFICIAL UK GUIDANCE FOR SUCH ROUTES.

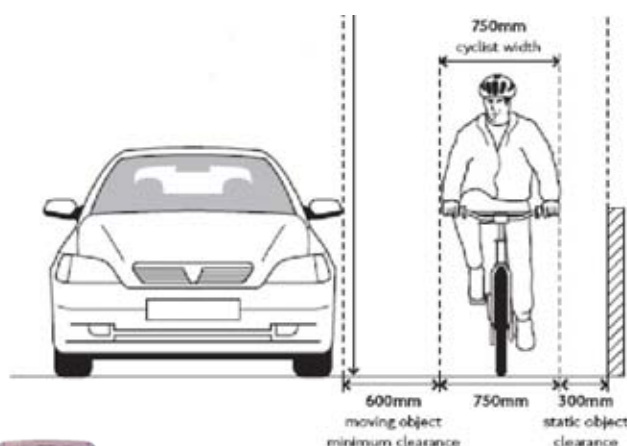


04 IN-CARRIAGEWAY CYCLE LANES

THE **CYCLING EMBASSY OF DENMARK** HAS THE FOLLOWING RULES ON CYCLE LANE WIDTH:

- Cycle lanes should be 1.5m wide including a 0.3m solid white line, and repeater cycle symbols should be used every 100m. Coloured surfaces is used in cycle lanes >1.8m to avoid confusion with highways.
- Cycle lanes running alongside parking should be 2-2.5m wide to provide sufficient width for cyclists to comfortably overtake vehicles with opening doors etc.

LONDON CYCLE DESIGN STANDARD'S WIDTH GUIDANCE



IRISH NATIONAL TRANSPORT AUTHORITY'S
WIDTH CALCULATOR



A Inside Edge	B Cycling Regime	C Outside Edge	D Additional Features
Kerb 0.25m	Single File 0.75m	30kph, 3.0m wide lane 0.50m	Uphill 0.25m
Channel Gully 0.25m	Single File + Overtaking, Partially using next lane 1.25m	50kph, 3.0m wide lane 0.75m	Sharp bends 0.25m
Wall, Fence or Crash Barrier 0.65m	Basic Two-Way 1.75m	Raised kerb, dropped Kerb or physical barrier 0.50m	Cyclist stacking, Stopping and starting 0.50m
Poles or Bollards 0.50m	Single File + Overtaking, Partially using next lane 2.00m	Kerb to vegetation etc. (ie. cycleway) 0.25m	Around primary schools, Interchanges, or for larger tourist bikes 0.25m
	2 Abreast + overtaking (tracks and cycleways) 2.50m		Taxi ranks, loading, line of parked cars 1.00m (min 0.8m)
			Turning pocket cyclists 0.50m

Example:

To determine required cycle width, select the appropriate Inside Edge, Cycling Regime, Outside Edge and any Additional Features

Channel Gully 0.25m	Single File + Overtaking, Partially using next lane 1.25m	50kph, 3.0m wide lane 0.75m	Around primary schools, Interchanges, or for larger tourist bikes 0.25m
------------------------	--	--------------------------------	--

0.25m
+ 1.25m
+ 0.75m
+ 0.25m

Required width = 2.50m

HOW THE **DUTCH** DEAL WITH THE ISSUE OF CYCLES IN THE CARRIAGEWAY IN THE **CROW DESIGN GUIDE**
(Cited from <http://wiki.coe.neu.edu/>)

Many two-way roads are too narrow to simultaneously allow two lanes of traffic to travel and also allow two bicycles to travel. The solution in the Netherlands has been to install shared bicycle lanes on these roads called advisory lanes. Advisory lanes are created in areas where separate cycle tracks cannot be made, whether from spatial or government restrictions. The basic set up for advisory lanes is a road for motorised vehicles sandwiched between two bicycle lanes with dashed lines. Advisory lanes do not have any centerlines and therefore leaves passing and decision making up to

the cyclists and vehicle operators. These lanes ensure the best use of the entire width of the road by directing cars down the center of the road and allowing lanes of bicycles to pass on either side. When two cars traveling in opposing directions meet, they yield to passing bicyclists and then utilise the shared bicycle lanes to perform their pass. In the Netherlands, roads with shared bicycle lanes are usually collector roads that collect the traffic from small local roads and direct it to a main road. They normally do not have a centerline and mainly have low to moderate volume traffic traveling at speeds of 30 - 50 km/hr in urban areas and up to 60 km/hr in rural areas. These lanes make safe bike and vehicle travel possible on narrow roads.



LONDON CYCLE DESIGN STANDARD'S CYCLE LANE WIDTH GUIDANCE

	Half-road width (m)	Minimum cycle lane width (m)	General traffic lane width (m)	Notes
No parking/loading	3.5-4.4	1.5	2.0-2.9	2-way motor vehicle flows<5000vpd 30mph max speed limit
	3.5-4.0	1.5	2.0-2.5	2-way motor vehicle flows<5000vpd 30mph max speed limit with central refuge/islands Diag 1010 marking alongside refuge/islands
	≥4.0	1.5	≥2.5	
	4.5-5.0	1.5-2.0	≥3.0	All cases (mandatory lanes preferred)
With parking/ loading bay 1.8m wide	5.3-6.3	1.5-2.0	2.0-2.5	2-way motor vehicle flows<5000vpd 30mph max speed limit Coloured surface lane only with no road markings – minimum width of 1.5m
	≥6.3	1.5 plus 0.5m gap to parking bay	≥2.5	2-way motor vehicle flows<10000vpd 30mph max speed limit

05 SEPARATION: PRINCIPLES + DIMENSIONS

THE ADVANTAGES + DISADVANTAGES OF CYCLE TRACKS FROM **ALTA PLANNING + DESIGN**

Cycle tracks provide increased comfort and safety for cyclists as well as providing greater clarity about the expected behavior of cyclists, as well as other road users. Properly designed cycle tracks eliminate conflicts between bicycles and parked cars by placing the cycle track on the inside of the parking lane. They also provide adequate space to remove the danger of “car dooring.” Danish research has shown that cycle tracks can increase bicycle ridership 18 to 20 percent, compared with the five to seven percent increase found resulting from on carriageway bicycle lanes. The same study also found that fewer cyclists were hit or run over from behind, were hit when turning left, or ran into a parked car. On the other hand, there also a number of cycle track design issues. As cyclists are not traveling directly alongside automobiles, motorists may not be aware of their presence, leading to increased vulnerability at intersections. In addition, regular street sweeping trucks cannot maintain the cycle track; however, smaller street sweepers can accommodate the narrower roadway. Finally, conflicts with pedestrians and boarding or alighting bus passengers can occur, particularly on cycle tracks that are less well-differentiated from the sidewalk, or that are between the sidewalk and a transit stop.

CYCLING EMBASSY OF DENMARK’S GUIDANCE ON CYCLE TRACK SEGREGATION

- Cycle tracks should be designed to have their own level between the carriageway and footway. The minimum width for a one-way cycle track is 1.7m, but it is recommended to not go under 2m, and the preferred width is 2.2m.
- At the beginning + end of a cycle track, a 15-20m long solid white line should be painted on the highway. This line should maintain the width of the cycle track.
- The kerb height between the cycle track and carriageway should be 7-12cm, and 5-9cm between the cycle track and the footway.
- Two-way tracks can be introduced in some circumstances such as major roads with few junctions, or through recreational areas. The track should be at least 2.5m wide with a 1m verge separating it from the carriageway in urban areas, and a 1.5m wide verge on high ways.

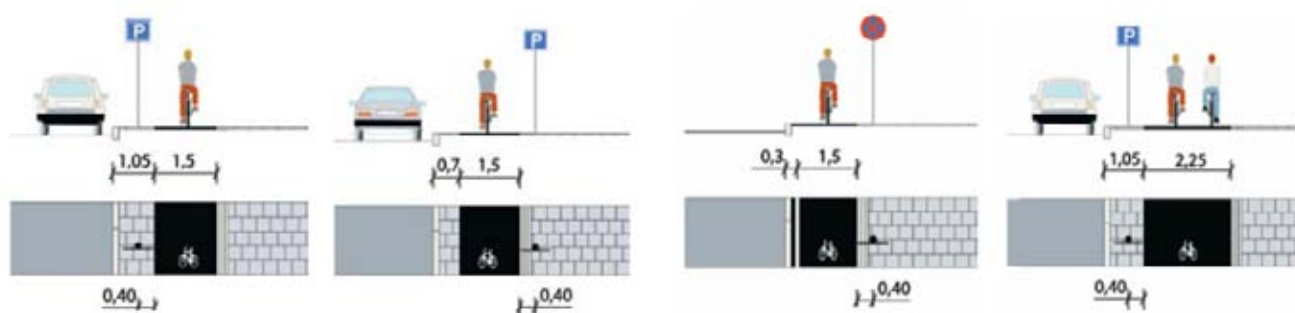


CYCLE SEPARATION ON OLD SHOREHAM ROAD, BRIGHTON



CYCLE SEPARATION AFTER A JUNCTION IN COPENHAGEN

STOCKHOLM DESIGN STANDARDS' GENERAL CYCLE TRACK PRINCIPLES



LONDON CYCLE DESIGN STANDARDS' CYCLE TRACK WIDTH GUIDANCE

	Desirable minimum width (m)	Absolute minimum width (m)	Safety strip to carriageway kerb edge minimum width (m)
One Way	2.0	1.5	0.5
Two Way	3.0	2.0	0.5

Notes:

- 0.5m should be added for each side of the track that is bounded (e.g. by a wall, railings fence or hedge)
- Safety strip to carriageway kerb edge minimum width should be 1.0m adjacent to frequently accessed parked cars

LESSONS ON THE **DUTCH** APPROACH TO CYCLING FROM THE **CROW DESIGN GUIDE**

(Cited from <http://wiki.coe.neu.edu/>)

Dutch design for bicycle traffic is based on the idea that separation from cars keeps cyclists safer and gives them a low-stress, comfortable ride. The standard method of keeping bicycles separate from motor traffic is one way cycle tracks.

A one way cycle track is a dedicated lane of travel, in one direction only, for use by bicycles separated from motor (and sometimes pedestrian) traffic by a physical barrier. One way cycle tracks can be distinguished by their red pavement with bicycle silhouettes. Unlike two way cycle tracks they do not have the white dashed center line. Physical barriers used include medians, curbs, parking lanes, and separation by elevation. According to the CROW Design Guide for Bicycle Traffic cycle tracks are the safest solution for bicycle traffic on 50 kmh roads, being preferred over cycle lanes.

CROW has recommendations for the widths of one way cycle tracks based on rush hour intensity. For 0-150 bikes per hour in one direction the recommended width is 2.00 meters, for 150-750 b/h 3.00 meters, and for more than 750 b/h 4.00 meters. While these are the ideal sizes, the guide recognizes that the widths may not be able to be that large, and it may be necessary to reduce track width by 0.5 meters, sacrificing some comfort for feasibility. Most of the low traffic volume cycle tracks have a width of 2.40 meters, which is the width of eight 30 cm pavers.

Cycle tracks should have a design speed of 30 km/h along main cycle routes and 20 km/h for basic networks. The cycle track should also be painted red or red asphalt typical of other bicycle ways. The barrier provided between motor traffic and the cycle track should be at least 0.35 meters and where there are lamp posts it should be 1.00 meter.

In instances with narrow profiles, it is still possible to provide a physical barrier between cyclists and motor traffic. In such instances the guide provides 6 circumstances to separate cycle tracks and main carriageways. These are all variations of small curbs. While they act as a physical barrier the small curbs do not provide total protection, as motor vehicles can still cross the curb without too much trouble. Dimensions of narrow one way cycle tracks must take into consideration the height of the curb and the height of bicyclists pedals to prevent cyclists from crashing near curbs.

Rush Hour Traffic Volume (Bikes/ Hour)	Recommended Design Width, (Minimum Width) in meters	Recommended Design Width, (Minimum Width) in feet
0-150	2.00	6.5
150-750	3.00, (2.50)	9.8 (8.2)
>750	4.00, (3.50)	13.1 (11.5)

(CROW 2007)

TYPES OF CYCLE TRACK



Street level with 'C' curb

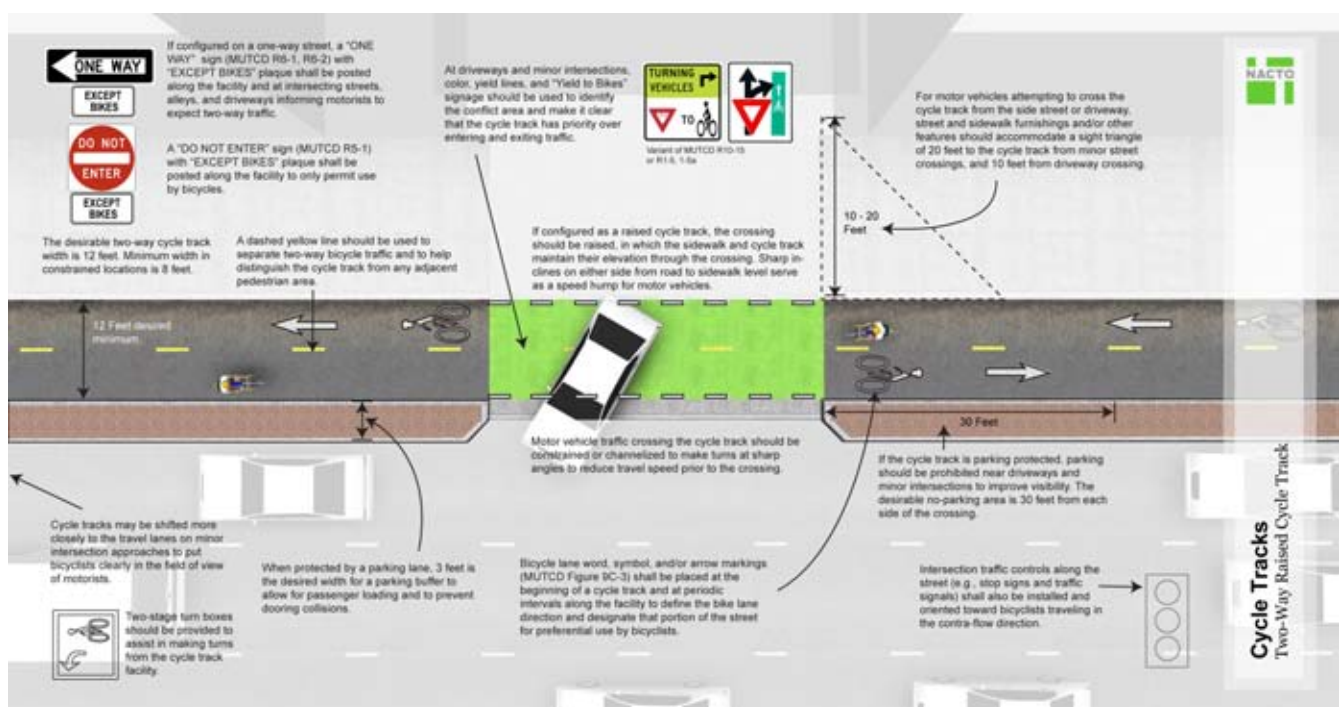
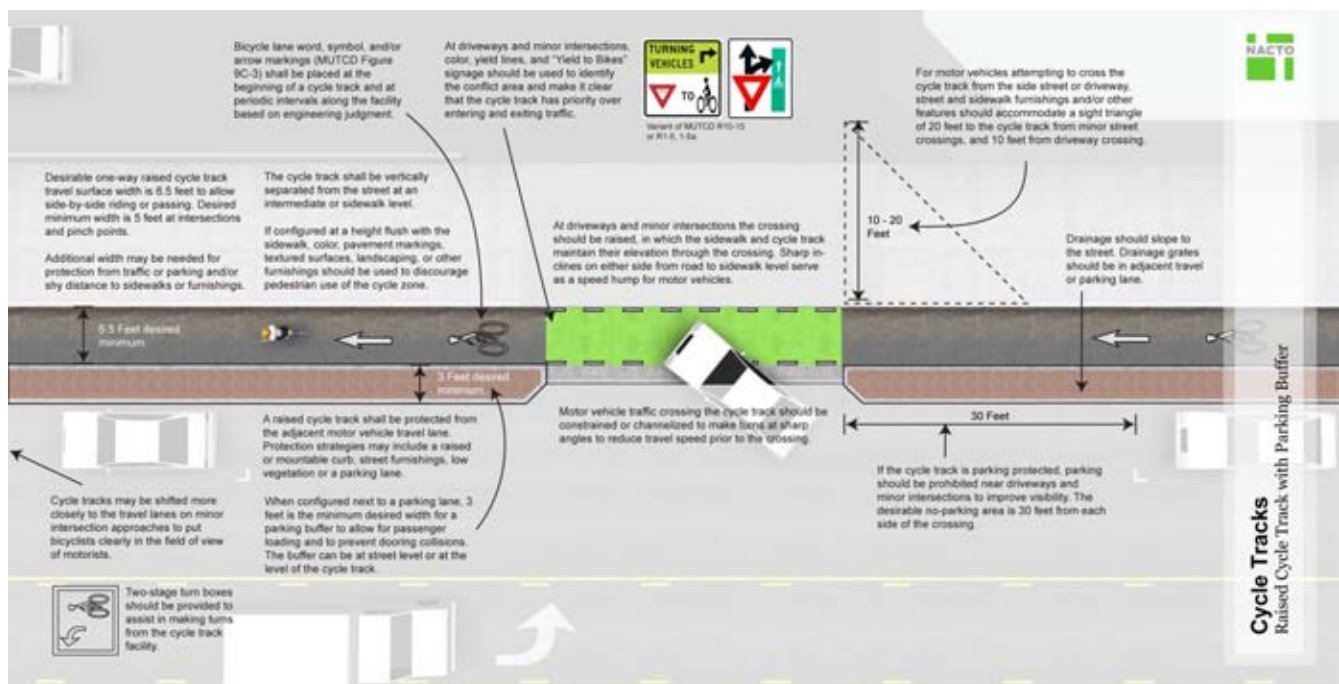
C curbs are curbs of various shapes, built of concrete, asphalt or rubber. C curbs are a good way to provide physical separation from motor traffic in a narrow road section. C-curbs are more dangerous than raised medians because a small curb can still be crossed by a motor vehicle, but they will provide enough separation that a cyclist and motorist driving close to the barrier will not hit each other.

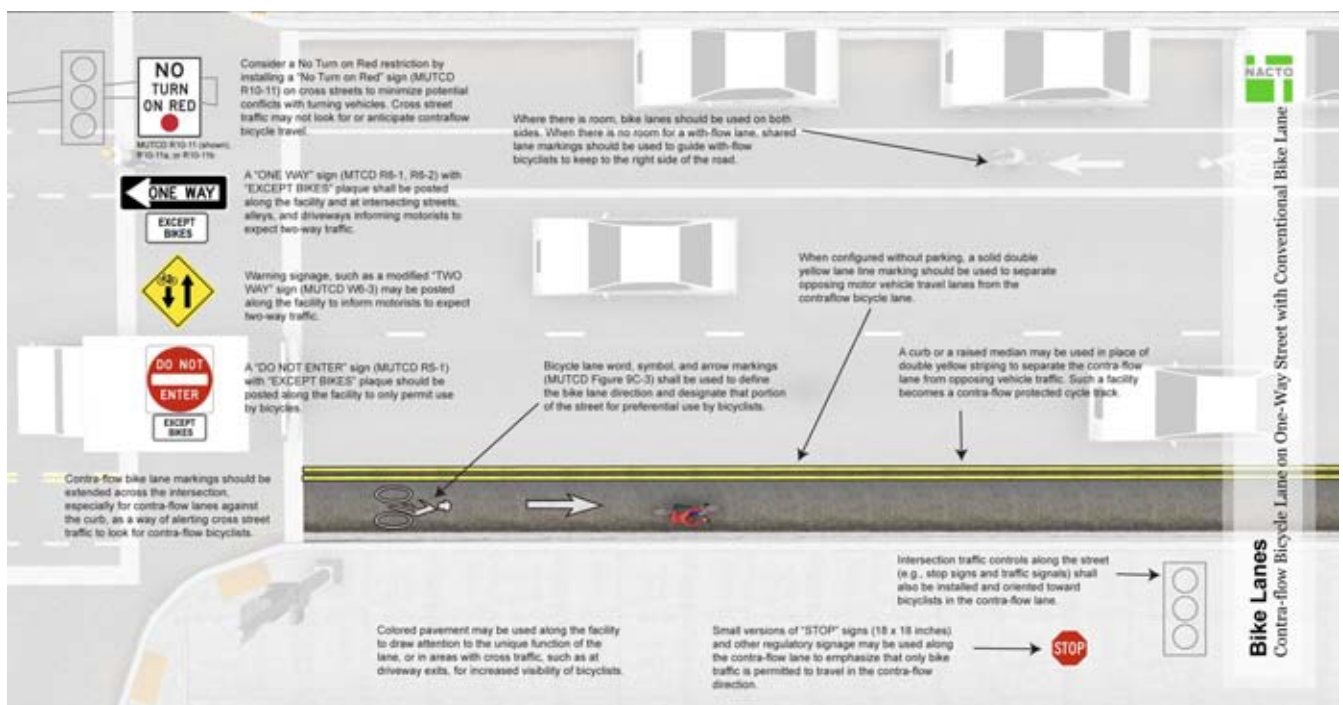
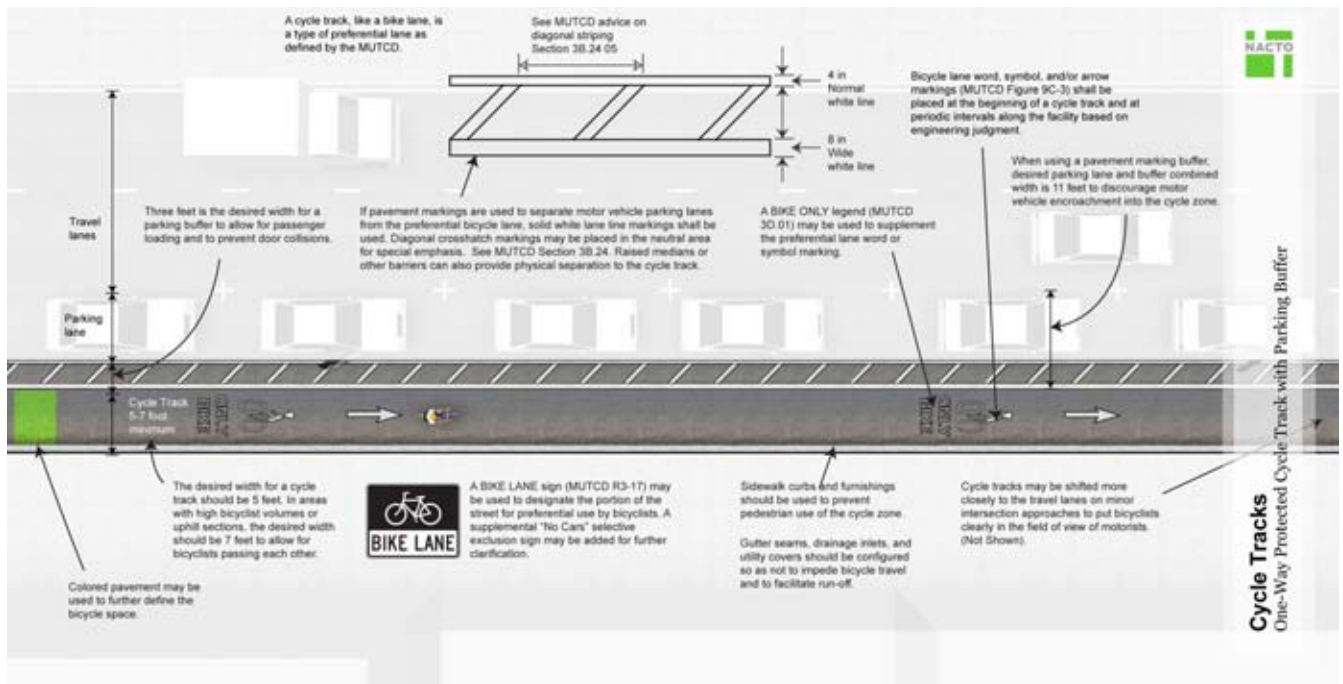


Separated from footway by kerb and/or parking

In some instances the Dutch will raise a cycle track to an intermediate level. In intermediate cycle tracks, the pedestrian walk way will be elevated slightly above the cycle track. In the photo above there is a 2-3 cm curb between the two. The separation between the roadway and cycle track is usually a curb with a buffer. Intermediate level cycle tracks are the most common type in the Netherlands. They provide protection from motor vehicles as well as keep pedestrians aware that there is a cycle track.

NACTO DESIGN GUIDELINES ON CYCLE TRACKS





06 SEPARATION: DESIGN OPTIONS

By definition, cycle tracks are separated from other vehicular lanes and pedestrians by a physical barrier, such as on-street parking or a curb, or are grade-separated. Shy-distances (Space left between vehicles or pedestrians as they pass each other) increase the perception of separation and of wider lanes by providing additional clear space through pavement markings or low barriers. Cycle tracks using a barrier separation can be at-grade, or either above or below the level of the travel lanes and cross-streets. Visual and physical cues should be present that show where bicyclists and pedestrians should travel. This can be done through grade separation, pavement coloration or surfacing. Whatever form of separation is used, openings in the barrier or curb are necessary for driveway and minor street access, these points will become potential conflict points between bicyclists, pedestrians and motorists.

Choices regarding cycle track width and type are dependent on road safety and costs, as well as ease of passage, perceived risk, comfort, and experience of the route. Types of cycle track separation are shown in the photographs and descriptions following.

[“Cycle Tracks: Lessons Learned” 2009 ALTA Planning + Design]

DIFFERENT TYPES OF SEGREGATION

Increasingly we are seeing a ‘paint + planters’ approach to cycle track design, also known as ‘Soft or Light segregation’. This is due to the fact that it can be essentially achieved overnight and it allows people to test schemes for relatively small amounts of money, schemes that if successful can be ‘sealed’ with more permanent materials at a later date when funds become available. Soft or Light segregation is an effective means of increasing support for a scheme and altering peoples perceptions of change, plus it is cheap!



‘SOFT/LIGHT’ SEGREGATION IN PORTLAND, USA
Credit: Jonathan Maus



‘SOFT/LIGHT’ SEGREGATION IN SEVILLE
Credit: Ride Your City



‘SOFT/LIGHT’ SEGREGATION IN VANCOUVER, CANADA
Credit: Dylan Passmore



'SOFT/LIGHT' SEGREGATION IN VANCOUVER, CANADA
Credit: Dylan Passmore



'SOFT/LIGHT' SEGREGATION IN OTTAWA, CANADA
Credit: Ottawa Citizen



'HARD/FULL' SEGREGATION IN COPENHAGEN, DENMARK



'HARD/FULL' SEGREGATION IN COPENHAGEN, DENMARK

CASE STUDIES

SOFT SEGREGATION | ROYAL COLLEGE STREET, LONDON BOROUGH OF CAMDEN

Royal College Street (RCS) had a higher than average number of accidents. There were 17 accidents on RCS within a 3 year period up until February 2012, including 2 serious and 15 slight accidents. 15 of the accidents involved cyclists and 2 were pedestrians. The vast majority of the accidents occurred at junctions with side roads and many involve cyclists heading southbound colliding with vehicles turning out of a side road. Evidence suggested that drivers were not anticipating southbound cyclists as they turned onto RCS.

The proposals are to move southbound cyclists to the opposite side of RCS to significantly reduce accidents. Speed surveys were undertaken along the street and the average traffic speed was 29.8 mph which is well in excess of the 20 mph speed limit. The proposals are to narrow the carriageway with parking bays and the new southbound cycle track, to help encourage slower driving speeds

making it safer and easier to cross the street.

The changes would also protect southbound cyclists and make them more visible to drivers. Narrowing of the carriageway should encourage slower driving speeds in these areas. Raised tables across all junctions will also ensure that speeds are reduced particularly where turning movements are possible. **Camden Council**



HARD SEGREGATION | OLD SHOREHAM ROAD, BRIGHTON + HOVE

The new facilities aimed at creating a more pleasant and safe walking and cycling environment, encouraging young people and adults to use the route to and from school, work and leisure activities. As well as this the proposals want to create more efficient and safe traffic light junctions with pedestrian and cycle crossing points. Pedestrian priority was emphasised with raised crossings at junctions helping people with buggies, wheelchairs and scooters. A wide, raised zebra crossing also reinforced this pedestrian priority particularly for children on route to school. The scheme also delivered accessible bus stops and improved street lighting.

Brighton + Hove City Council



CYCLING SUCCESS | SEVILLE

Taken from the 'London Cycling Campaign' website - 'Cycling increased tenfold in Seville after construction of miles of bike tracks', written by Laura Laker

Any city serious about increasing cycling could do a lot worse than look to Seville as a role model. In six years, this unlikely paragon of cycling has achieved what very few cities in the world can boast, increasing cycling tenfold. Since 2006 Seville has increased the number cycling journeys daily from under 5000 to a whopping 72,000 per day, from a modal share of less than 0.5% to around 7%. This happened largely due to a 80-mile Dutch-style network of well-connected cycle tracks and a 2,500-bike hire scheme, all put in place by politicians determined to encourage cycle journeys over motor traffic. Built on what the architect Jan Gehl might describe as "on a human scale", Seville's narrow streets, plazas and diverse architecture reflect its vibrant history bordering Europe and Africa. As a popular tourist destination, like many European cities, Seville's ancient streets were designed for horse and pedestrian traffic. With four rush hours per day, as workers returned home for siesta, it witnessed a great deal of motor traffic and almost no cycling. Not surprisingly, the city's narrow streets suffered gridlock.

But back in 2005 Jose Garcia Cebrian, head of urban planning and housing at Seville city council, believed that with the right infrastructure the bicycle could solve Seville's traffic congestion problems. Cebrian noted, however, that for any scheme to be a success cycle lanes had to form a joined-up network that people would really use. Cebrian approached Manuel Calvo, an urban consultant and former biologist, to help design and rapidly implement such a network, and moved responsibility for cycling from the traffic department to town planning, giving the project more clout. Calvo, under his consultancy Estudio MC, views the city as a living organism, and believes that cycle lanes need to be where people will use them for entire journeys - ie, along existing routes, rather than where it's convenient for motor traffic. Seville's cycling group A Contramano has helped push the cycling agenda forward in the city since it started in 1987. Co-founder and former president, Ricardo Marques Sillero, said:

"We feel this was one of the keys for our success in Sevilla: the basic network (50 miles) was made in just one year, and the first extension (up to 80 miles) in the next three years."

Sillero, who now works with the University of Sevilla as a lecturer and on their cycle promotion scheme, adds the secret to the city's success was its political backing:

"Political will is essential. Sometimes politicians want to check first if the idea works, for instance making one or two isolated bike paths before making a stronger decision. But isolated cycle paths are almost useless if they're not connected, making a network from the beginning. Therefore people don't use them and the politician becomes disappointed."

MAKING CYCLISTS FEEL SAFE

He adds that a cycle route is only as safe as its most dangerous part, and people will only use a route if it is safe from the beginning to the end of their journey. Cyclists now share road space with slow-moving traffic in the older parts of the city where streets are narrower, while the newer parts of the city, with wider streets and faster-moving traffic, are given segregated cycle lanes, as in the Dutch model. Pedestrians have priority where cycle lanes cross footways and cyclists have priority where cycle lanes cross roadways.

Critics might sneer at the fact that many of the cycle tracks are two-way, when one each side of a main road would be optimum. Also some tracks are relatively narrow compared with the best in the Netherlands, but there's no doubt among locals the new cycle network has benefited the city.

Jorge Sanchez was born in Seville and has also lived in London and Madrid, and has witnessed the city's transformation. He said:

"Seville is now a cleaner, greener place. Drivers in Seville were known for driving too fast, now the centre of town is less chaotic, also due to the gradual pedestrianisation of streets. I used to cycle in London and have been cycling in Seville in the last four years; the cycle lanes always make it much easier to feel secure."

It's not just the cycle numbers that are demonstrating a positive trend. The types of people who cycle are very diverse. Sanchez says:

"You can certainly see lots of younger and older people cycling, which destroys the myth that cycling is 'dangerous.' Over the last few years it is obvious there is a gradual increase in the number of people who cycle because they

feel safe from the traffic. My sister thought it was not for her, but I encouraged her to get a bike and use the infrastructure and these days she doesn't take the car to work anymore. People close to me say it is relaxing after a long day at work, cheaper and makes them feel happier and healthier. The day they don't take the bike they are moody."

The figures certainly stack up in terms of investment return: the €32m cycle network carries 72,000 cyclists on weekdays compared with the city's underground system, which cost €600 million and carries 40,000 people daily.

Meanwhile Seville's cycle hire scheme, Sevici, has more than 250 docking stations across the city, including the suburbs, making it the fifth largest in Europe, for a city of around a million people. The importance of political leadership in boosting city cycling has been highlighted recently by a change in leadership in Seville, less positive towards cycle promotion. This has meant the closure of the city cycling office, and the implementation of other policies that encourage tourist cycling over the expansion of cycling among city-dwellers. Not least (in some ways mirroring the doubling in Barclays Cycle Hire access charges in London) Seville's cycle hire fares have risen by 21%, compared with a 10% rise in other city transport fares.

Despite the significant successes since 2005, local cycling campaigners are having to lobby as hard as ever to keep Seville's magnificent cycling revolution firmly on track.



COPENHAGEN: WALKING, CYCLING + FUN

In April 2013, Urban Movement went on a two-day fact-finding Streettour to Copenhagen. As usual, we wanted to see how other people do stuff; and we were particularly keen to experience how the city has dealt with providing for cycling on complex urban streets.

Arriving at the airport, we headed straight to the Metro that took us to the city centre in 15 minutes, something that is rather enviable (especially after it took me about an hour and a half to get back home from Gatwick). Alighting at Nørreport station, home of the new and fantastically popular Torvehallerne food market, we immediately encountered upheaval associated with the works to create a new Metro line. On taking to the streets and walking to our hotel, I was quite pleased that (admittedly by complete fluke) we had arranged to stay on what seemed to be one of the most recently improved streets in the city: Vester Voldgade. A wide street, it caters well for reasonably heavy use by pedestrians, cyclists and motor vehicles alike, as well as accommodating plenty of trees and cafe seating. And all in granite that's not just tough but also pleasing to the eye.

Staying on this boulevard afforded me time to watch how the street worked and how people behaved. The carriageway is generally made up of one lane in each direction with, as seems to be the case at junctions throughout the city, turn lanes separated from the straight ahead lane. The cycle lane (one in each direction) was outside the carriageway and grade separated both from it and the adjacent footway. Cycleways and footways were laid to granite (see pictures below). One instantly striking element of the cycle lane was its width, about 3m, allowing enough space for cyclists to comfortably pass one another or ride side-by-side chatting. The vertical separation from the cycle track to the footway was small, approximately 25mm and with a slightly bevelled edge, allowing cyclists to 'bump up' onto the footway should they need. The line between the two was also marked very neatly by white dots painted onto the stone, providing an additional element of visual separation. The vertical separation of cycleway and carriageway was more pronounced (around 50mm).



We walked everywhere on Day 1 and cycled all of Day 2. Whichever mode we used ourselves, it was evident that the city is much more of a pleasure to cycle around than London because its cycle infrastructure is not just more developed, but because it is consistent: wide cycle tracks on both sides of the street, going with the direction of traffic and grade separated from both the carriageway and the footway. Generally, cycling is treated like a separate mode of transport, with established, standard terms of negotiation with motor traffic. On the whole, cyclists don't have to mingle with vehicles if they do not wish. This standardisation is one of the greatest assets of the city, I think, as cyclists never get the rug pulled from under their feet (so to speak) when they turn around a corner and the cycle lane they were on has not been continued, or simply stops on a street as there was no width to fit it in after the carriageway was kept at a consistent width. Cyclists know they will be catered for and looked after on streets and designers know that this provision is simply what must happen.

As well as the physical provision, another equally important factor in the city's cycling success that I observed is people's (drivers', cyclists', pedestrians') manner: their consideration, if you will. (This, I am sure, has taken a good while to develop, and is 'encouraged' by law; but this should only give us more impetus to get going sooner in the UK.) What I mean by people's consideration is that all street users are constantly on the lookout for others. Right-turning (left in the UK) drivers expect to have cyclists coming up on their right hand side (where the latter are going straight ahead or turning right), and they both look for them and wait for them. They expect this, as cycle provision and cyclists are on every busy street. This is not to say that Danish drivers are better than ours; it's simply to say that expecting to see a cyclist 'on the inside', checking for them and giving way to them is an engrained part of the Danish driving culture (not an anomaly, as is the case for the most part on UK streets at the moment). Having a standard situation that drivers and cyclists encounter on the vast majority of streets is easier and safer for everyone involved.

The same culture of 'giving way to the more vulnerable user' also applies to cyclists. While pedestrians respect, and generally stay out of, cycle lanes, there are situations – such as at bus-stops and where footways may be over-crowded – where pedestrians and cyclists find themselves temporarily in the same space. From my observations, cyclists are used to watching out for such situations and yield to pedestrians if necessary. The interaction of buses, cyclists and pedestrians at bus stops

was fascinating. Sometimes the cycle track passes behind the bus stop, but commonly buses simply pull over next to the cycle track and passengers simply board and alight by walking across the cycle track from/to the footway. Often, there are no zebra-style or any other markings to encourage cyclists to give way; but they still do. Consideration again.



Moving on from cycle infrastructure, another thing that stuck in my mind throughout my stay in the city (which extended another two days beyond the 'official' UM tour) was the inclusion of elements of recreation, spontaneity and fun throughout the public realm. It is something that I'm never that aware of in London, although it may help being a tourist in order to see these things. If we don't do them here it could be for many reasons: maybe because (rightly or wrongly) designers are afraid of law suits if someone hurts themselves; maybe the process would get too tied up in 'red tape'; or maybe the maintenance burden is something authorities simply don't want to take on. Whatever the reason, I don't see these elements much in the UK, and I would really rather like to.

What I mean is things such as those pictured below. We were all walking down by Nyhavn, the picture postcard historic harbour area, and came across a run of trampolines: just there in the public realm. They were not fenced off and even on a rather wet and cold day there were people playing on them, and thoroughly enjoying it. As well as this, the recently implemented Superkilen public realm scheme in the Nørrebro district has transformed a rather busy but shabby and uninspiring space, into a vibrant, fun and active (and colourful!!) place that people use and obviously enjoy. Skateboard areas, a mini velodrome, basketball facilities, a boxing ring and outdoor gymnasium equipment, are all dotted around a public space where

people sit and chat, walk through and cycle through en masse. This desire and ability to have a place for numerous activities, in an open public space, is something that I would like to see more of in London; rather than having sports facilities fenced off and down quiet streets.



Credit: Bjarke Ingels Group



Like many, I think Copenhagen is a good model for progressing the state of cycling in London. The streets are busy with vehicles as well as cyclists and pedestrians, as indeed are ours. Cycle infrastructure is important to the city and is a great asset to it; it's not always pretty, but it's always there. While newly-improved streets, like Hans Christian Andersen's Boulevard, are extremely well detailed and look great, so are many of London's; but the latter hasn't had cycling so high up the list of 'design drivers' for its streets.

The most important thing to take away from Copenhagen, in my opinion, is the desirability of deciding on, rolling out, and sticking to a consistent approach for cycling infrastructure (which could happily be Copenhagen's). This would enable everyone – drivers, pedestrians and cyclists alike – to get used to how it works, and get used to new ways of how they interact with one another. This change would, ideally, come hand-in-hand with legislative/regulatory change; but I believe that, over time, we can reasonably hope it will become more and more about "This is just what we do", rather than "If I don't do this I'll get a ticket".



Credit: Bjarke Ingels Group

Having cycle infrastructure on the majority of London's streets will raise the profile of cycling and increase the numbers of people who want to do it, something that we sorely need. It will also lead to London drivers autonomously looking when they want to turn left across the cycle lane, knowing cyclists will be going straight on and they will need to wait. It will lead to London cyclists knowing that they need to give way to pedestrians at bus stops and other situations of potential conflict.

I think London needs this. We have been governed for a long time by old thinking that 'the car is king', even though our rhetoric and guidance has been against this for a good while now. I think if we develop our cycle infrastructure and give people using our streets more protection, and a fairer share of the street, then I think everyone (including drivers) will benefit and become more considerate to the others on the road. Call me a romantic, but I'm certain it will work. So shall we give it a go?



Credit: Bjarke Ingels Group

CHRISTOPHER MARTIN | URBAN MOVEMENT

07 CONTRA-FLOW FACILITIES

BRUSSELS' CONTRAFLOW STANDARDS IN DIFFERENT CARRIAGEWAY CONDITIONS

Brussels Contraflow Design Standards				
<2.6m	2.6-3m	3-4.6m	4.6-5m	>5m
No Contraflow	Contraflow allowed.	Contraflow Mandatory	Contraflow Mandatory	Contraflow Mandatory
No Parking	No Parking	No Parking	Parking Possible	Parking Possible

WHAT DO OTHERS SAY ABOUT CONTRA-FLOW CYCLING FACILITIES?

CYCLING EMBASSY OF DENMARK:

- Segregated cycle facilities are not essential in lightly-trafficked streets.
- If necessary, a cycle track should be 1.7m and a cycle lane should be 1.5m wide. If there is parking, the cycle facility should be 2m wide.

UK DEPARTMENT FOR TRANSPORT CYCLE INFRASTRUCTURE DESIGN (LTN 2/08)

- Where the 85th percentile is less than 25mph and traffic flows are below 1,000 vehicles per day, or where the street forms part of a 20mph zone, it may be possible to dispense with any marked cycle lane.

NACTO DESIGN GUIDELINES

- Contraflow lane markings should be extended across junctions at the entry/exit to a Contra flow lane to raise drivers' awareness of Contra-flow cycles.

THE **UK DEPARTMENT FOR TRANSPORT TRAFFIC ADVISORY LEAFLET (TAL) 6/98** HAD THE FOLLOWING TO SAY:

- If provided, Contraflow lanes should be at least 1.5m wide, but 2m is preferred. Where no cycle lane is provided, a short section (between 4-5m long) should be considered at entry/exit points.
- Segregation at entry/exit points should always be provided if there is sufficient room to do so.

HOWEVER, UK RESTRICTIONS ON PROVIDING 'TWO-WAY CYCLING ON ONE-WAY STREETS' HAVE BEEN RELAXED FOLLOWING TRIALS AND RESEARCH BY TRANSPORT FOR LONDON. **PARAGRAPHS 5.27-5.29 OF 'SIGNING THE WAY' BY THE UK DEPARTMENT FOR TRANSPORT (OCT 2012)** REFERS TO SPECIFIC EXEMPTIONS TO 'NO ENTRY' SIGNS (SEE OPPOSITE.)

CARDIFF CYCLE DESIGN GUIDANCE'S EXAMPLES OF ENTRANCES TO CONTRA-FLOW STREETS:

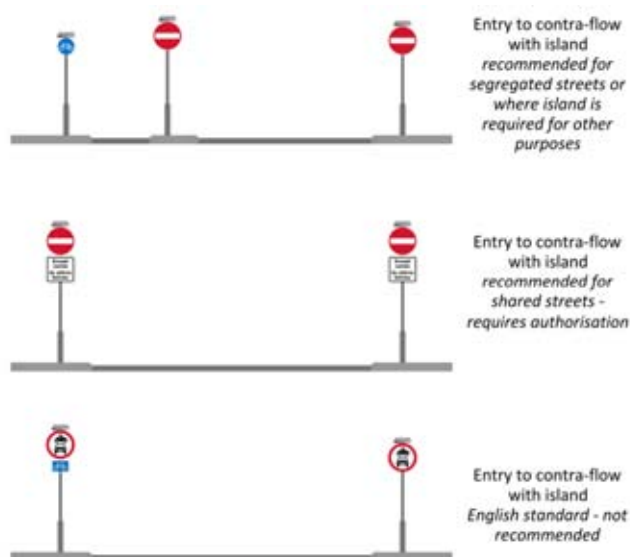


Figure 36 – Examples of entrances to contra-flows on one-way streets



EXAMPLES OF CYCLE CONTRAFLOW | IRISH NATIONAL TRANSPORT AUTHORITY



CYCLE CONTRAFLOW | LIVERPOOL



ONE-WAY EXEMPTION FOR CYCLISTS



'NO-ENTRY EXCEPT CYCLES' SIGNS PROMOTES CYCLING

STOP PRESS: AT THE LONDON CYCLING CAMPAIGN AWARDS ON 8TH MAY 2013, THE LONDON BOROUGH OF CAMDEN AND THE CITY OF LONDON WERE JOINT WINNERS OF THE 'BEST BOROUGH PROJECT' FOR THEIR IMPLEMENTATION OF SIMPLE CYCLE CONTRAFLOW MEASURES.



JUNCTIONS

08 JUNCTIONS: GENERAL

CYCLING EMBASSY OF DENMARK

- If a cycle lane continues up to a junction, a marked cycle crossing should be carried through that junction to increase visibility of cyclists.
- If possible, cyclists should be given their own traffic heads. However this is generally used when there is a pre-green phase for cyclists.
- Where cyclists are fast moving in advance of a junction, the cycle lane/track should be stopped between 20-30m in advance of the junction. The left-turn lane should also be 4m wide if there isn't a marked cycle lane.
- Vehicle stop lines should be at least 5m back from a junction to increase visibility of cycles.
- Cycle lanes can be continued through junctions to raise road users awareness of potential conflict. Cycle crossings can be marked in blue, white, or use a dashed 0.3m wide lane marking. All are marked by repeater cycle symbols.

CYCLING EMBASSY OF GB: DUTCH INFRASTRUCTURE

While separated cycle tracks are acknowledged to be safe along the run of the road, there are concerns that they increase the danger to cyclists at junctions due to conflicts from turning cars, lack of visibility of cyclists, and increased vehicle speeds with bikes being separated out of the way. The Dutch guidelines are designed to mitigate these problems as far as possible.

Where the speed limit is less than 70km/h (45mph), as the cycle track approaches the junction it should move closer to the carriageway (< 0.35 metres) to improve the visibility of cyclists to drivers. If the speed is greater, the track should bend away from the road, to leave space for turning cars to give way before crossing the track, and drivers should be warned of the track through signs. Bus stops and parking should not be allowed within 5m of a junction, and stop lines pulled back, while cyclists are allowed to wait as far forward on the intersection as possible. Bike tracks can be converted to bike lanes also about 5m before the junction to increase visibility and should be coloured. These lane markers can continue right through the junction and the lane should be 2.5m wide. Sharper corners, rather than sweeping bends mean cars slow down and cross a smaller area of the junction when turning. Where bike paths have right of way across side streets, the crossing should be on a raised surface. This is particularly important where a two-way bike lane crosses a road.



SIDE STREET ENTRY TREATMENT A CYCLE LANE IN DELFT
Credit: 'wiki.coe.neu.edu'



UK JUNCTION INNOVATIONS ARE CURRENTLY BEING INVESTIGATED BY TRANSPORT RESEARCH LABORATORY FOR TRANSPORT FOR LONDON

Safer Cycling Innovations





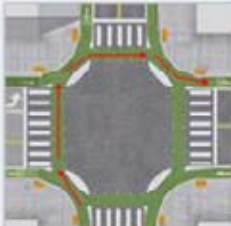







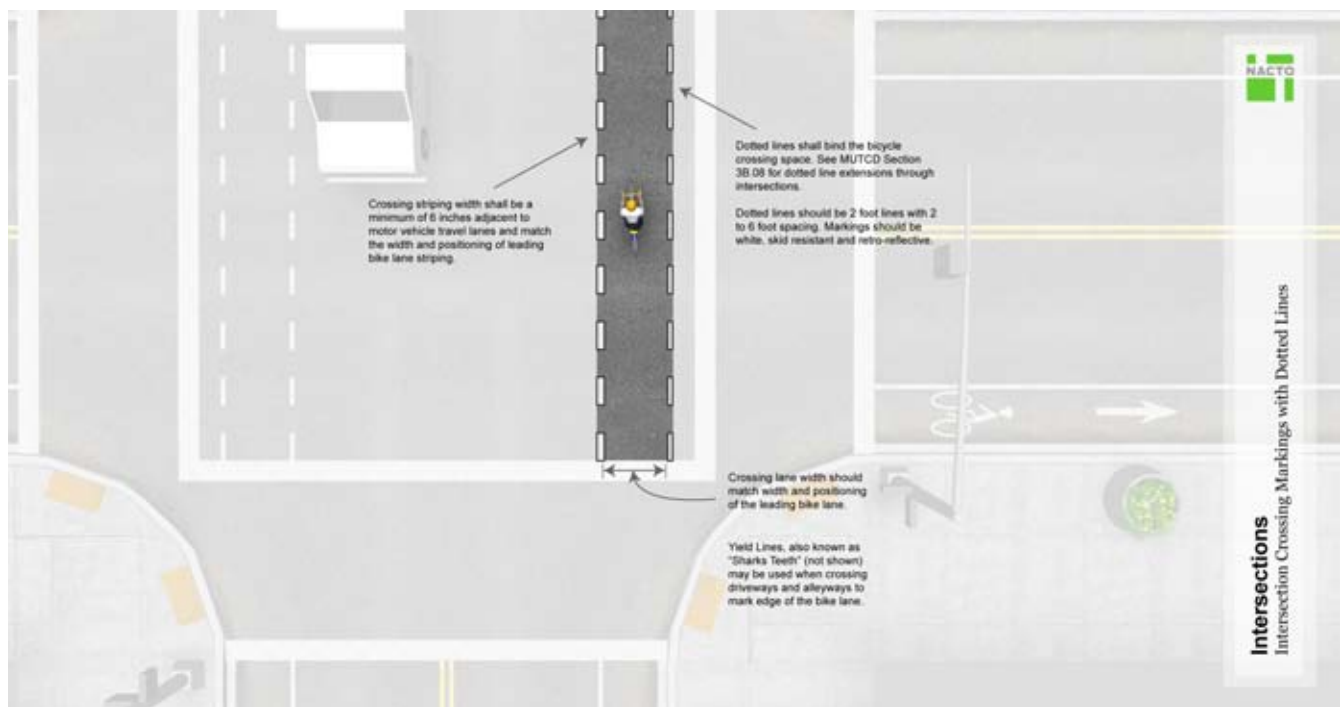
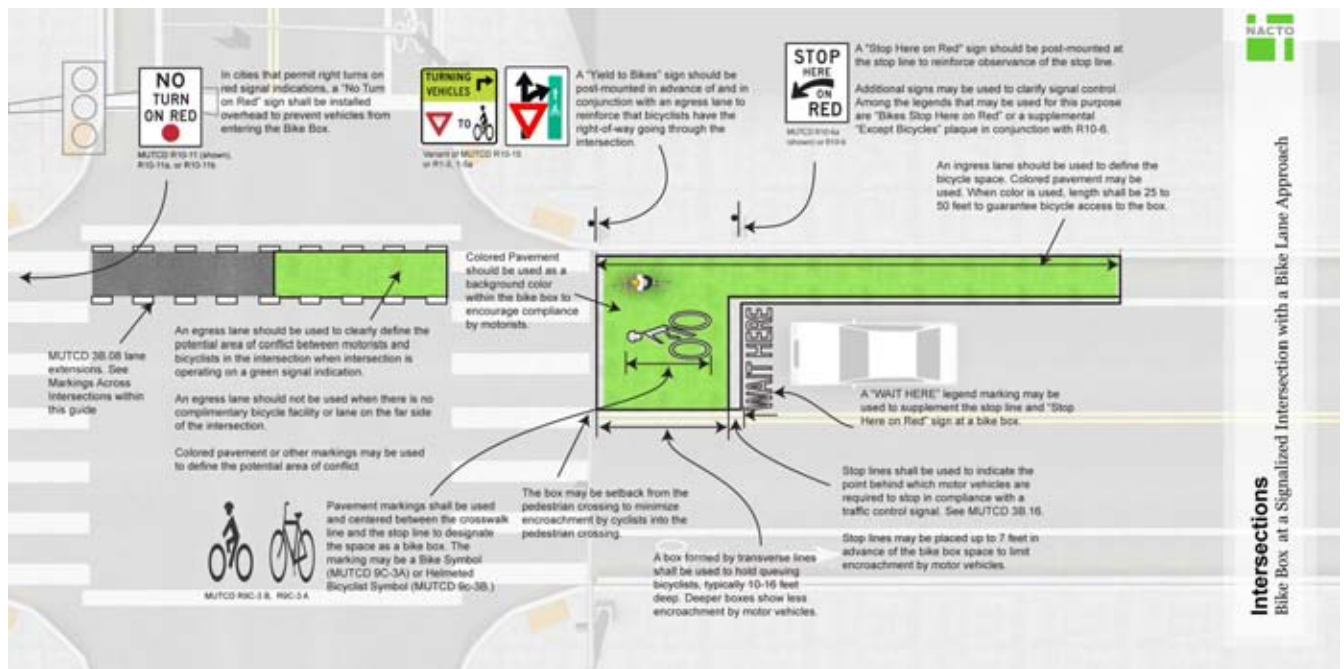
Transport for London

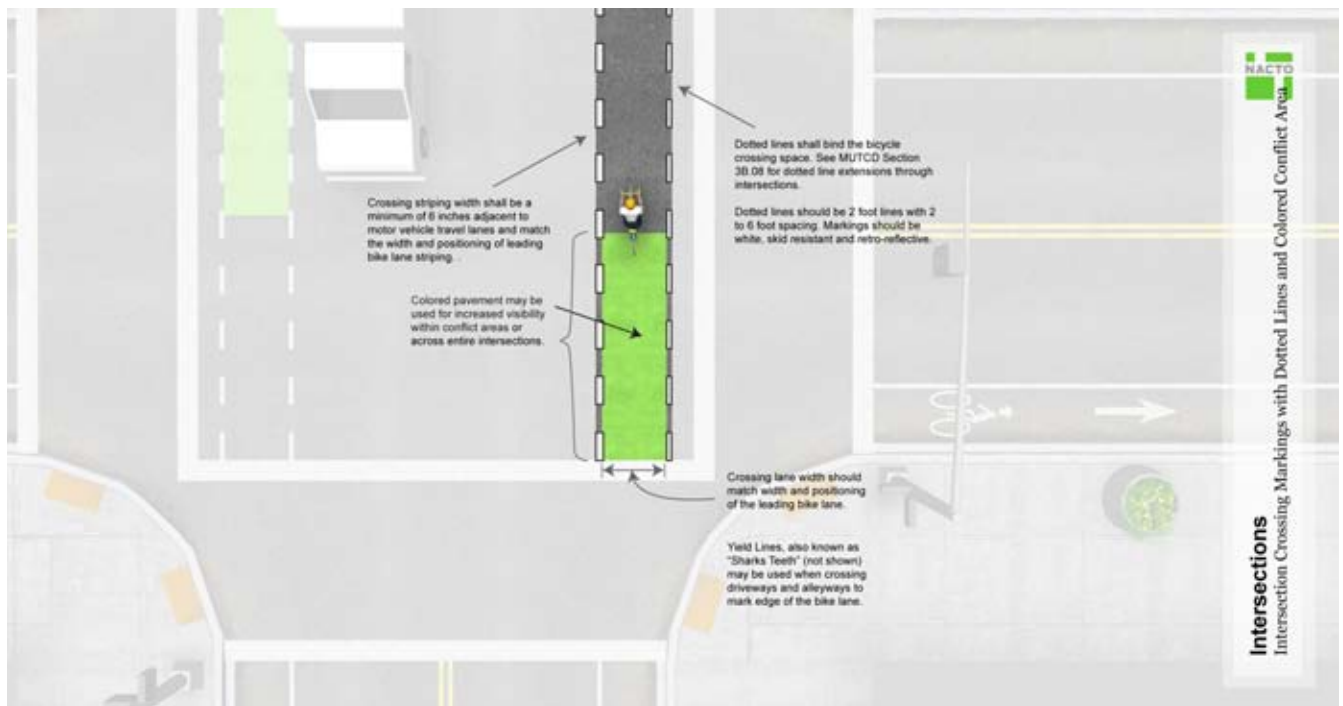
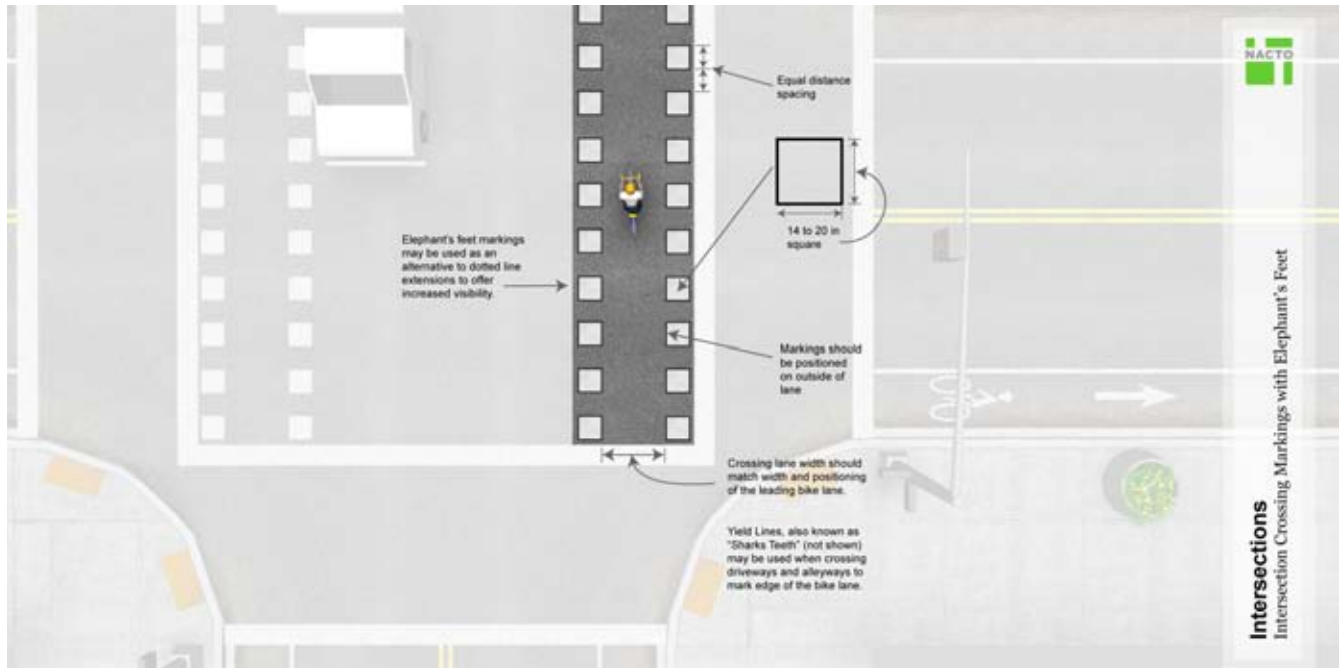
Transport for London has commissioned TRL to undertake a range of off-street trials of innovative cycling improvements. These off-street trials will look at a number of options and based on analysis of the trials, decisions will be made as to whether or not they can be introduced on-street, subject to Department for Transport approval.

To find out more about the trials themselves, click on the various links below. More information will be added as the trials progress. There is also an opportunity to participate in the work and you can also feedback your thoughts on the various measures to the Better Junctions team.

 <p>Segregated Cycle Lanes</p> <p>Segregated cycle lanes within the carriageway can provide a safe and comfortable environment for cyclists, avoiding some of the disadvantages posed by fully off-road cycle tracks.</p> <p>>> More Information</p>	 <p>Dutch Style Roundabouts</p> <p>Large roundabouts can be intimidating for some cyclists as conflicts with other traffic can often occur, especially when the cyclist is turning right.</p> <p>>> More Information</p>
 <p>Low Level Cycle Signals</p> <p>Low level cycle logo signals are used widely in Europe, to provide signals closer to cyclists' eye-level, and also to provide separate signal phases for cyclists at junctions.</p> <p>>> More Information</p>	 <p>High Level Cycle Signals</p> <p>Signal heads specifically for cyclists are widely used and outside of Great Britain all three aspects would have cycle logos fitted.</p> <p>>> More Information</p>
 <p>Ways of Turning Right for Cyclists</p> <p>Cyclists can face difficulties turning right at signalized junctions, having to cross traffic lanes and potentially getting caught between opposing streams of traffic.</p> <p>>> More Information</p>	 <p>RFID Cycle Detection by HGV</p> <p>Since 2009, 28 cyclists have been killed in a collision with a large goods vehicle on London's roads, with a large proportion of these collisions occurring when the goods vehicle was turning left.</p> <p>>> More Information</p>
 <p>Bus Stop Island</p> <p>A cycle lane which passes behind a bus stop creates in effect a bus stop island, enabling cyclists to continue pass a stationary bus away from the traffic lane and makes it possible to provide continuity for segregated cycle lanes.</p> <p>>> More Information</p>	 <p>Be a Participant</p> <p>Find out how to take part in the trials.</p> <p>>> Become a Participant</p>

NACTO DESIGN GUIDELINES TALK ABOUT OPTIONS FOR JUNCTION DESIGN





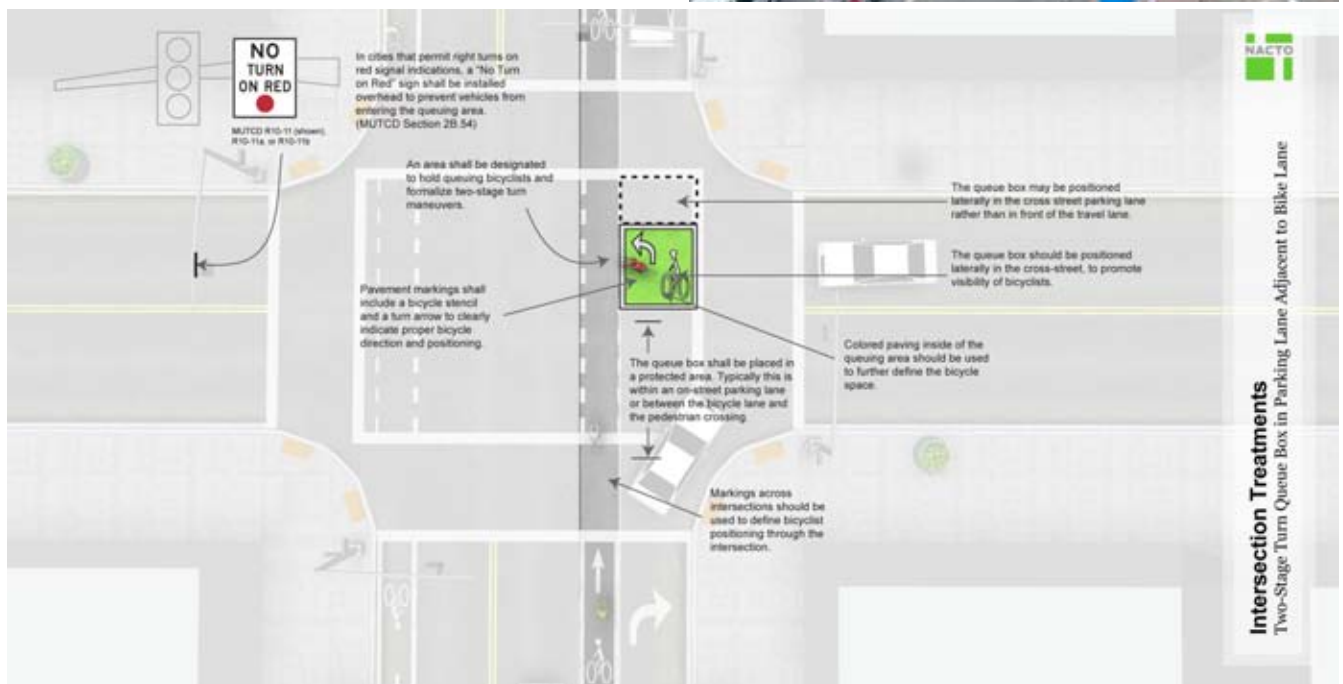
09 SIGNALISED JUNCTIONS

The **DUTCH CROW DESIGN MANUAL** offers a 'menu' of bike-friendly measures which can be used singly or in combination. These include:

- Shortened cycle time
- Include additional green light options for cyclists
- Permit right turn through red (for bicycles) – or even a 'slip road' for cyclists allowing them to bypass the light altogether.
- Give all cycling directions a green light at the same time
- Accept motorised vehicle/bicycle sub-conflicts
- Set favourable waiting times for cyclists
- Set favourable phase sequence for cyclists turning left (allowing them to turn in a single cycle)
- Green wave for bicycle traffic so that cyclists travelling at 12mph do not encounter red lights.
- Introduce advance detection/pre-request for cycle traffic
- Introduce expanded cycle stacking lane for bikes slowing down to turn right without delaying cyclists wishing to cycle straight on
- Increase flow capacity for motorised traffic
- Set two-way green light

TWO-STAGED TURNS

ALTA PLANNING + DESIGN (in "Cycle Tracks: Lessons Learned" 2009) highlight The 'Copenhagen Left' (also known as the 'Jug-Handle Turn') is a way of enabling a safe left turn (or right turn in the UK) movement by cyclists in a cycle track. Cyclists should not be allowed to make left-turn movements from the cycle track and are often physically barred from moving into the roadway by the cycle track barrier. Instead, cyclists approaching an intersection can make a right into the intersecting street from the cycle track, to position themselves in front of cars. Cyclists can go straight across the road they were on during next signal phase. All movements in this process are guided by separate traffic signals - motorists are not allowed to make right turns on red signals. In addition, motorists have an exclusive left-turn phase, in order to make their movements distinct from the cyclists.





A 'TWO STAGE LEFT' IN TORVEGADE, COPENHAGEN



A DESIGN FOR A 'TWO STAGE LEFT' CURRENTLY PROPOSED FOR SOUTHAMPTON



A 'TWO STAGE LEFT' IN UTAH, USA

Credit: www.saltcycle.org



A 'TWO STAGE LEFT' IN NEW YORK CITY, USA

Credit: progressivetransit.wordpress.com



A 'TWO STAGE LEFT' IN PORTLAND, USA

Credit: <http://hcrum.tumblr.com/>

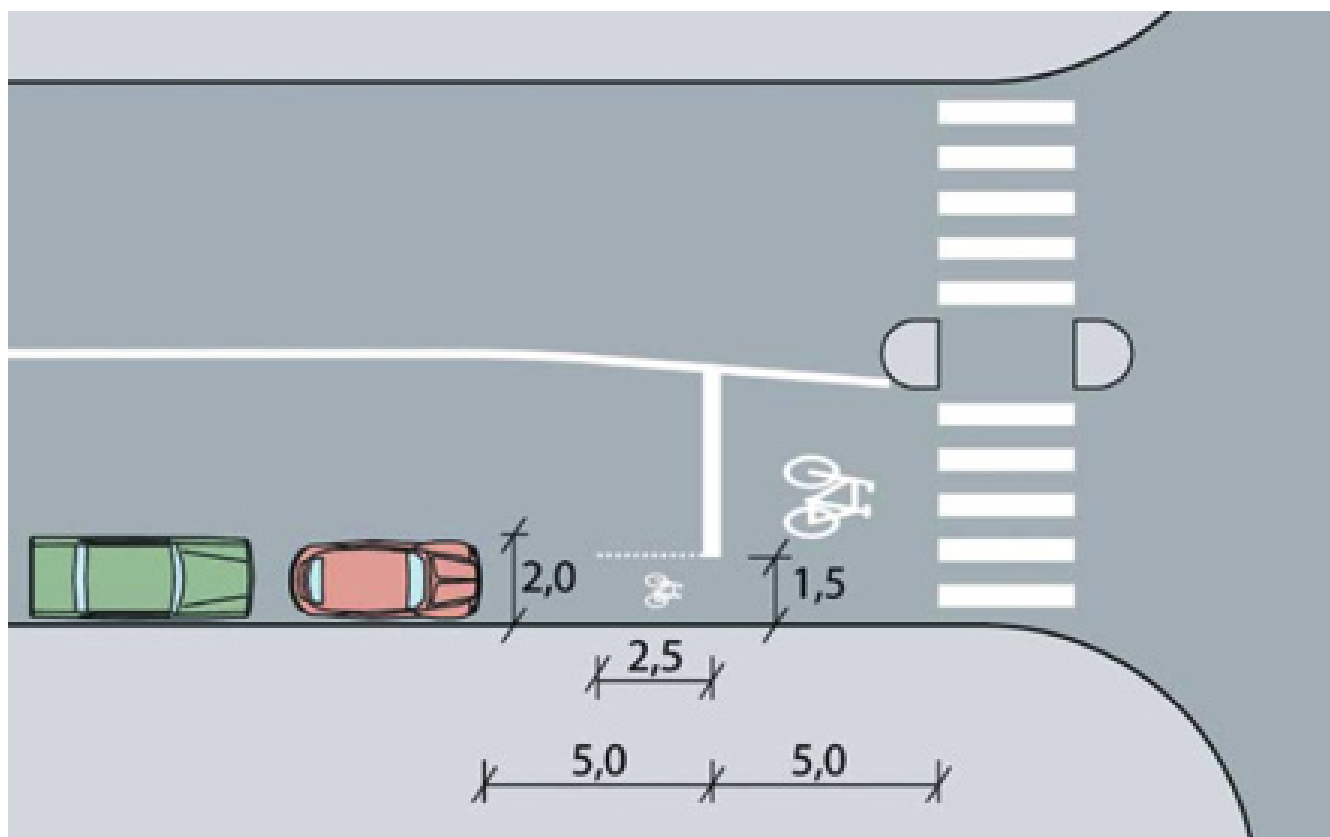


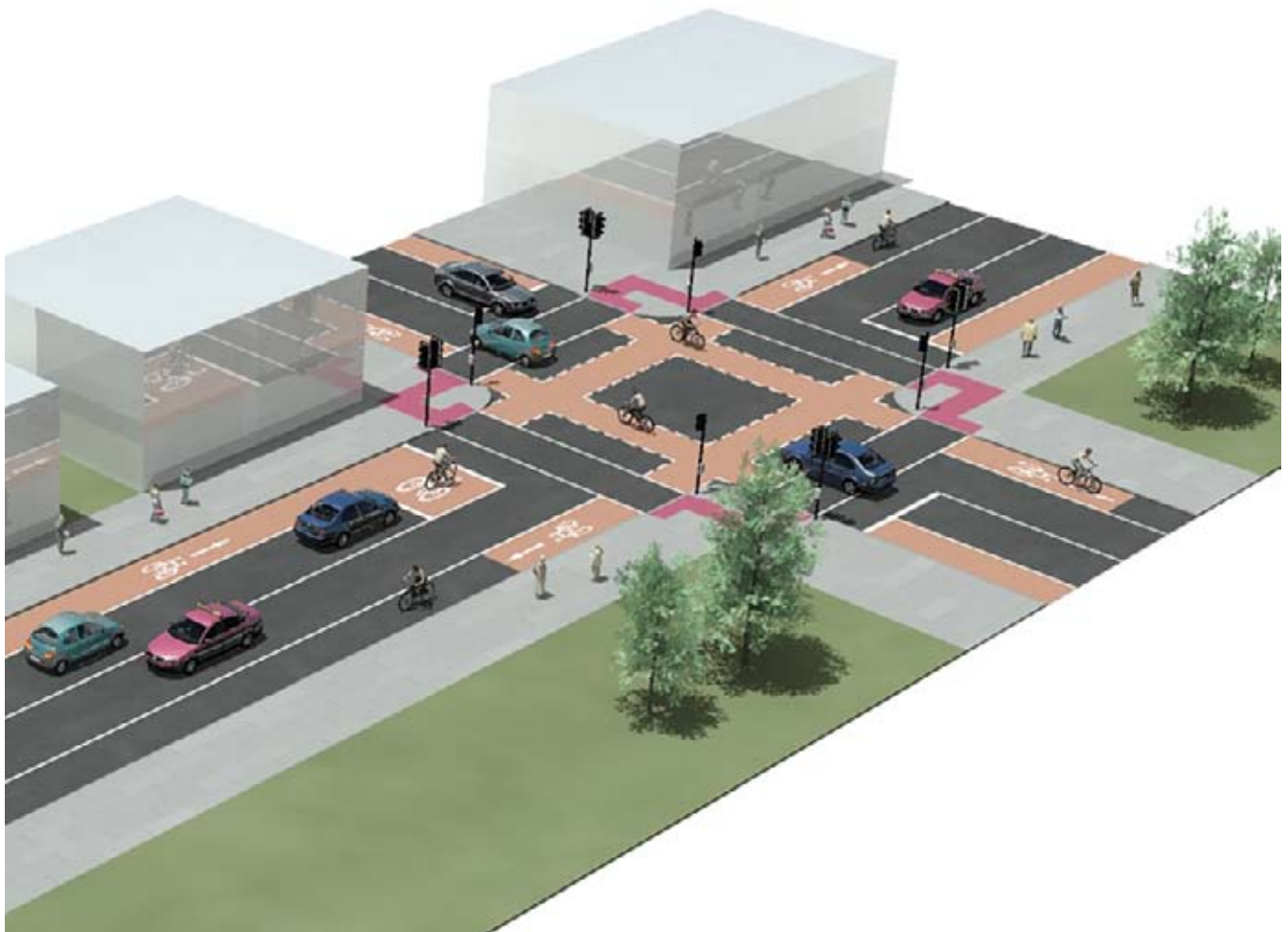
A 'TWO STAGE LEFT' IN COPENHAGEN

CYCLING EMBASSY OF DENMARK'S ADVICE ON TAKING
CYCLE TRACKS THROUGH JUNCTIONS

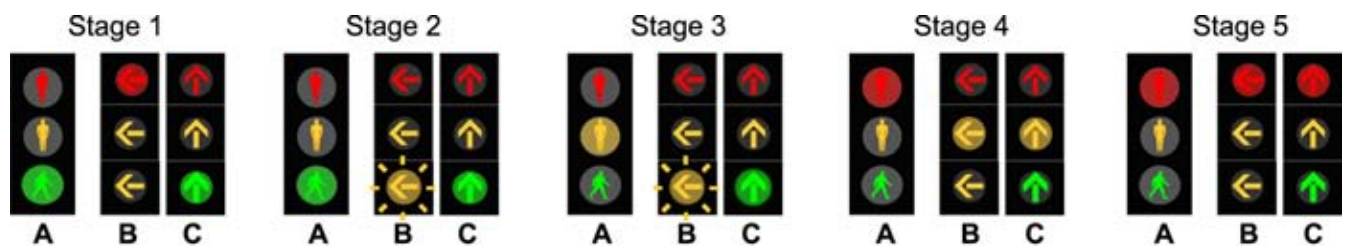
- Cycle tracks/lanes should be carried through T-junctions when traffic from the adjoining road is relatively small in volume.
- When there are large volumes of traffic on the primary road, the cycle track crossing the secondary road should be offset by 5-7m away from the junction and should be on a raised crossing.

STOCKHOLM DESIGN STANDARDS GUIDANCE ON
DETAILING JUNCTION MARKINGS





SIGNALISED JUNCTION | IRISH NATIONAL TRANSPORT AUTHORITY



EXAMPLE OF A 'LATE-RELEASE' SIGNALISED JUNCTION | IRISH NATIONAL TRANSPORT AUTHORITY

10 ROUNDABOUTS

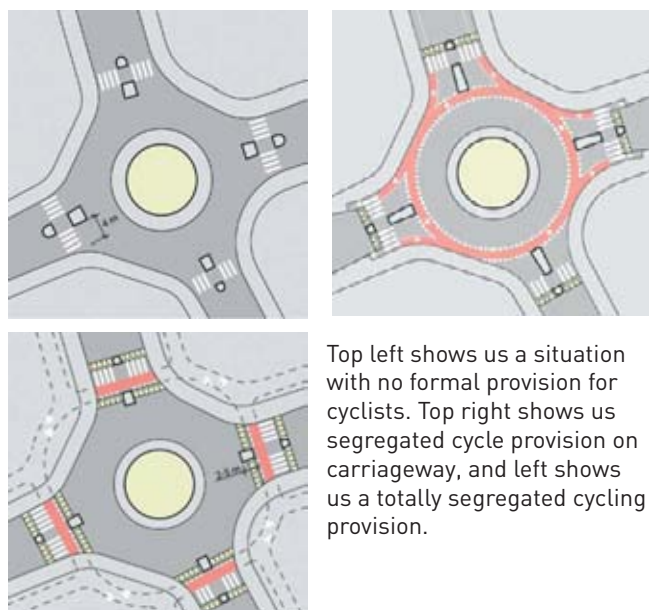
CYCLING EMBASSY OF GB: DUTCH INFRASTRUCTURE

Large multi-lane roundabouts can be extremely daunting for cyclists in the UK, with many opportunities for conflict with traffic, and requiring cyclists to be fast, alert and confident of their abilities to accelerate out of trouble. In contrast, the recommended standard for Dutch roundabouts is for there to be a physically separated circular cycle track running around the outside of the main carriageway (shown below in the 'bottom left scenario'). In urban areas, cars should give way to cyclists on the track (this is implemented in about 60% of urban roundabouts); whereas in rural areas, bikes generally give way to cars coming on and off the roundabout. The track is separated from the rest of the roundabout by about 5m, allowing space for a single car to stop without blocking the passage of bikes. Clearly marked pedestrian crossings usually run alongside the bike tracks, making both more visible. These crossings should have traffic islands to make crossing easier and should be raised about 12cm from the rest of the carriageway, starting 5m before the crossing itself, to make them more obvious to cars. Larger two lane roundabouts generally have two entry lanes per leg of the roundabout, but only a single exit lane increasing the visibility of bikes and pedestrians using the crossings. Some roundabouts, known as 'turbo roundabouts' have spiral lane markings removing the necessity for cars to change lane as they negotiate it – indeed, there are raised markers between the lanes to prevent corner cutting – giving drivers fewer distractions as they exit the roundabout. Most cycle tracks are one-way, running in the same direction as the rest of the traffic on the roundabout, but some busy roundabouts have two-way lanes which can increase conflicts and accidents. On the whole, roundabouts have been found to be much safer than four-way intersections, and separated tracks safer than lanes on the roundabout itself; giving cyclists right of way over drivers entering or exiting the roundabout does increase the number of accidents slightly (amounting to 52-73 extra hospital admissions a year). Shared space roundabouts, such as the one in Drachten, also have a cycle track around the outside, giving bikes right of way over drivers entering or exiting. The main difference is that there is no marked lane separating bikes from pedestrians, fewer warning signs, no traffic islands, and the bike track is less clearly distinguished from the carriageway, in line with the shared space principle of minimum regulation. Despite this, a study found that 95% of bikes using the roundabout were able to proceed without stopping as drivers mostly gave way to them. It was also shown to be safer than the intersection which preceded it, but perceptions by people using it were that it was less safe although they did feel that it had improved the area and traffic flow through the junction.

CYCLING EMBASSY OF DENMARK GUIDANCE ON DESIGNING ROUNDABOUT

- When there is more than one running-lane within the roundabout itself or in the arms of the junction: cycle facilities should be placed at the perimeter of roundabouts.
- On lightly trafficked roads with a speed limit of between 30-50km/h cyclists should mix with vehicles. The roundabout should be traffic calmed, with a 10m diameter roundabout and no pedestrian islands on the arms.
- Cycle tracks can be introduced on major roundabouts. The roundabout itself should be between 15-30m in diameter, and the cycle track should be installed 5m from the 'circulation' area.
- In larger roundabouts where the diameter of the roundabout is between 20-30m, cycles should not mix with traffic and a cycle track should be installed between 5-7m from the 'circulation' area.
- Cycles should mix with traffic in lightly-trafficked mini-roundabouts. Where traffic counts are between 6-8000 vehicles per day, a cycle track should be installed 5m from the 'circulation area'.

STOCKHOLM DESIGN STANDARDS



Top left shows us a situation with no formal provision for cyclists. Top right shows us segregated cycle provision on carriageway, and left shows us a totally segregated cycling provision.



FULLY SEGREGATED ROUNDABOUT, BUT CYCLISTS + PEDESTRIANS SHARE THE FOOTWAY | IRISH NATIONAL TRANSPORT AUTHORITY



SEGREGATED CYCLE ROUNDABOUT | IRISH NATIONAL TRANSPORT AUTHORITY



DUTCH-STYLE ROUNDABOUT BEING TRIALLED BY THE TRANSPORT RESEARCH LABORATORY FOR TfL

Credit: Cyclists in the City



A FULLY SEGREGATED ROUNDABOUT | THE NETHERLANDS

Credit: London Cycling Campaign



A FULLY SEGREGATED ROUNDABOUT | THE NETHERLANDS

THE CROW DESIGN MANUAL (HOLLAND) REQUIREMENTS FOR CYCLE PROVISION AT ROUNDABOUTS
 (Cited from <http://wiki.coe.neu.edu/>)

The safest roundabout for pedestrians, bicycles, and vehicles is a single lane roundabout. Two lane roundabouts are still safe for vehicles, and the CROW manual says they're safer than signalized intersections, but Dutch practice does not place bicycles at multiple lane roundabouts. The appropriate bike facility for a multi-lane roundabout in Dutch practice is a fully separated bypass route or a below grade underpass. For this reason, multi-lane roundabouts are almost never built in urban areas.

On single lane roundabouts in rural areas with light traffic, bicycles sometimes share the circulatory lanes with cars. Most of the time, however, Dutch roundabouts have a separate path (cycle track) for bicycles. Dutch policy is that within built-up (urbanized) areas, the bike path has priority where it crosses roundabout entries and exits, while in rural areas the bike path must yield priority at roundabout entries and exits.

The CROW manual also makes recommendations for how to separate a cycle track from the road at a roundabout. A "relatively quiet" roundabout, up to 6000 PCUs per day, requires no dedicated bicycle facilities. However, installing a cycle track is still encouraged to improve subjective safety (the feeling of safety); many cyclists, especially children, feel uncomfortable sharing a sharply curved lane with motor vehicles. Above 6000 PCUs, dedicated cycle tracks are required. Striped bike lanes are not recommended. The CROW manual also states that at the location where a cycle track cross the roundabout legs, the bike facility needs to be extremely visible and conspicuous. A driver of a motor vehicle should have excellent sight lines while approaching the roundabout exit, and be looking for a bicycle traveling parallel to them on their right. The facility itself should also be clearly designated, with red asphalt, or other visibly different pavement, and proper signage. Furthermore, the entries and exits to / from the roundabout should have the "shark's teeth" marking applied to the pavement indicating that the motorist must yield to crossing cyclists, and the "elephant's feet" marking indicating the location of the cycle track crossing (because colored pavement is not sufficiently visible at night). In the photo below, in addition to all those features, there is a speed hump marking, because the cycle track and pedestrian crossing is raised.



CYCLIST PRIORITY AT DUTCH ROUNDABOUTS

DIFFERENT TYPES OF DUTCH ROUNDABOUTS FROM **BICYCLE DUTCH**

(Cited from <http://bicycledutch.wordpress.com/2013/05/09/a-modern-amsterdam-roundabout/>)

TURBO ROUNDABOUT

A turbo-roundabout is usually several lanes wide and has a very special spiral shape. The aim of turbo-roundabouts is to get the traffic flow into a higher speed. For that reason it has been made impossible to change lanes on the roundabout itself with a physical division between the lanes. Sometimes with only a narrow divider, but sometimes simply by (a lot of) space. This eliminates weaving conflicts and that makes that traffic can flow very fast. In the Dutch situation a turbo-roundabout always has separate cycling infra at some distance, often grade separated. Sometimes, on level crossings, cyclists have to give way to motor traffic entering and leaving the roundabout. Because of the high speeds and the multiple lanes, that can be a difficult undertaking. The

Dutch Cyclists' Union is therefore not happy with turbo-roundabouts combined with at-grade crossings, especially in the built-up area. One such Turbo-roundabout in Eindhoven is notorious. The turbo-roundabout proposed in Bedford doesn't even have separate cycling infra! Cyclists are expected to use the roundabout. Given the fact that due to the dividers and the narrow lanes, traffic is unable to overtake cyclists, that is a recipe for disaster!



Small Dutch Turbo Roundabout. Clearly visible are the grade separated bicycle crossings on two sides. Turbo roundabouts are not suited for cycle traffic. The high speeds also make at grade crossings, even at some distance, dangerous.



Large Dutch Turbo Roundabout. Clearly visible is the grade separated cycle crossing to the left. The spiral shape makes that there is a separate route for traffic for each possible direction. Drivers cannot change their direction once they are on the roundabout. Traffic chooses a direction before it gets to the roundabout.

'ORDINARY' ROUNDABOUT (without priority for cyclists)

Normal roundabouts in the Netherlands are usually only one lane wide. They are kept small, so the radius is tight. That decreases speeds. When they are built outside the built-up area cyclists do not have priority. Cyclists cross the entrances and exits at some distance. That is easier because of the low speeds and because of the fact that cyclists only have to cross one lane at the time. To make clear cyclists do not have priority, the shape of the cycle tracks is not circular. Of course there are also shark-teeth on the surface and give-way signs to also make the priority clear.



Dutch roundabout without priority for cyclists. The design of the cycle paths is not circular to make that clear. This type is usually seen outside of built-up areas (and in some municipalities that do not comply with the guidelines, like Assen).

'ORDINARY' ROUNDABOUT (with priority for cyclists)

The roundabouts inside the built-up area are generally built with a separated cycle path in the shape of a perfect circle. This makes clear that cyclists have priority. This is the type of roundabout that TfL is testing. One important feature is the space for exactly one car between the cycle path and the roundabout itself. Cars entering the roundabout can wait there to give traffic on the roundabout priority, without being in the way of cyclists. Cars leaving the roundabout can wait there to give passing cyclists priority without being in the way of motor traffic on the roundabout.



Dutch roundabout with priority for cyclists on the circular separated cycle path all around the roundabout. This type of design is for the built-up area. This is also the design of the Amsterdam roundabout of the videos in this post and also the design TfL is testing. These roundabouts have existed since 1992 when the first one was built in Enschede.



SPECIALS

11 BUS STOPS

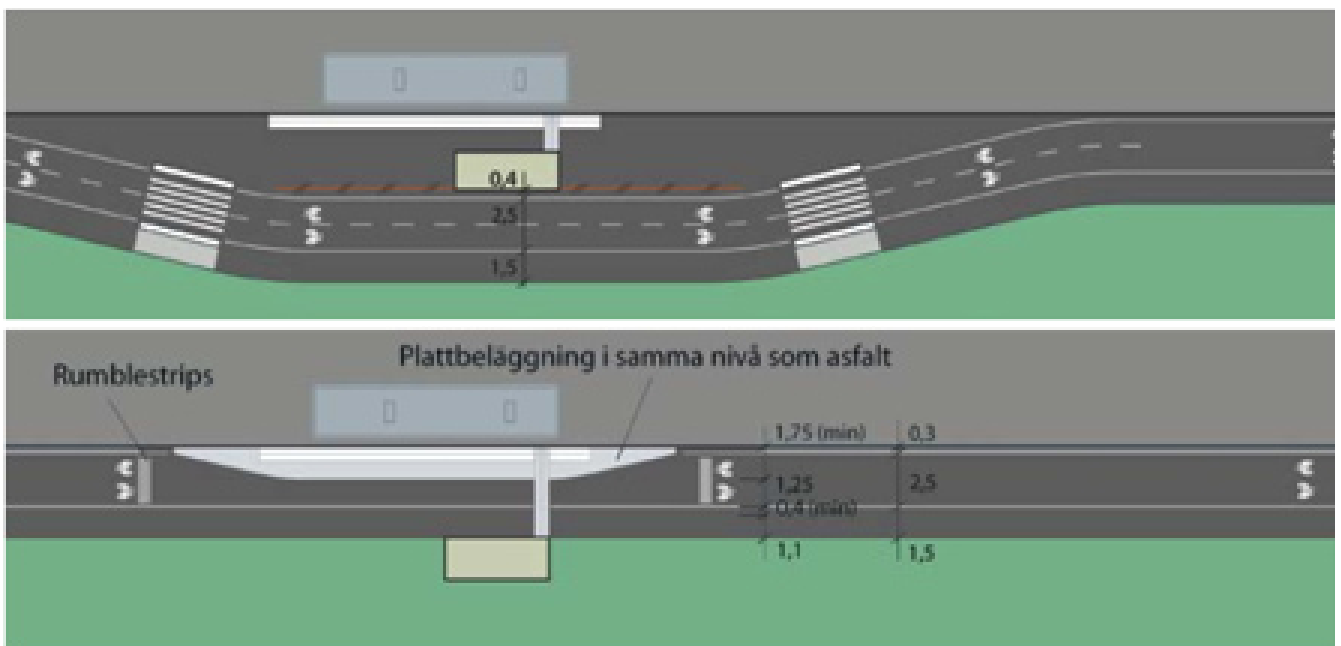
CYCLING EMBASSY OF DENMARK'S ADVICE ON CYCLE TRACK DESIGN AT BUS STOPS

- Cycle lanes which go around bus stops should be marked by wide dashed lines and additional cycle symbols.
- Bus stops should be placed at least 20m before junctions.
- Assuming that the cycle tracks run behind bus stops, the recommendation is for a mini-zebra across the track. The bus waiting area between the carriageway and the off-street cycle track should be between 1.5-2.5m wide.

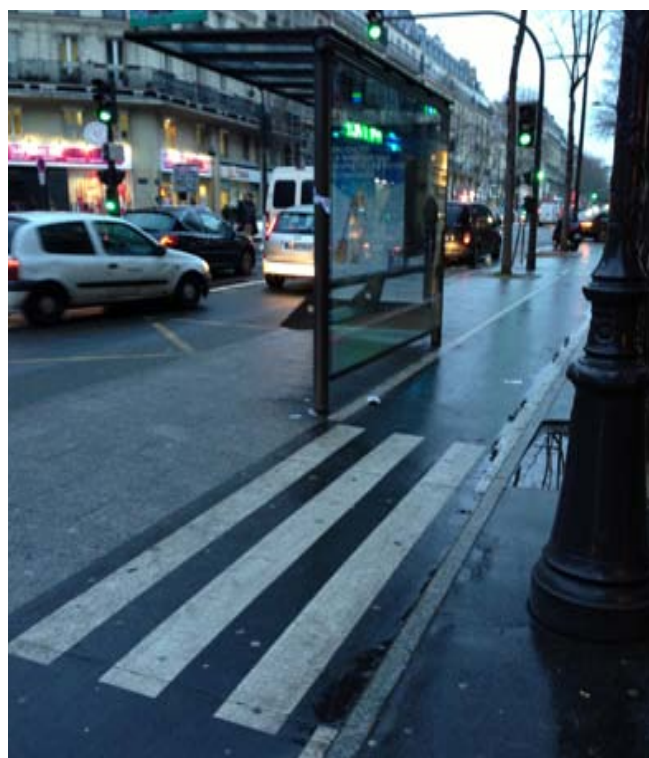
THE LONDON CYCLE DESIGN STANDARDS TALKING ABOUT CYCLE TRACK ROUTING AT BUS STOPS

Cycle lanes should not normally be routed around the outside of a bus stop cage, unless it is a terminus stop or layover space. However, there may be locations where it is appropriate to route a cycle lane outside a bus stop cage, particularly if the cycle lane on the approach to the bus cage is located outside routinely occupied parking or loading bays.

STOCKHOLM DESIGN STANDARDS DESIGN OPTIONS USING A BUS ISLAND (ABOVE) + WITH PARALLEL BUS LOADING (BELOW).



IRISH NATIONAL TRANSPORT AUTHORITY'S OPTIONS FOR BUS STOP DETAILING.



A CYCLE LANE AND BUS STOP DETAIL, PARIS

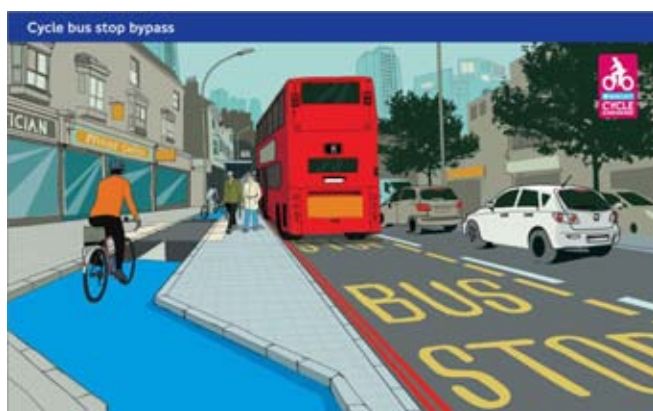


BUS STOP DETAILS IN COPENHAGEN: WITH + WITHOUT 'ZEBRA' MARKINGS

CASE STUDY BIKE TRACKS + BUS STOPS

In February 2013, I was with some folk and we were talking about one of the latest 'vexed issues' in street design: how to deal with off-carriageway cycle tracks when they pass bus stops; and I'll begin these comments by stating that, at least and at last, this is a 'vexed issue' rather than a non-issue. The fact that we're having to think about how best to design in the context of better provision for cycling is a good thing. As a cliché goes for football managers who can't play all their very talented players at the same time: 'it's a nice problem to have'.

Our meeting arose from concern expressed by some who represent pedestrians' interests about the design of proposed 'floating bus stops' (bus stop by-passes for bikes) on the extended 'Cycle Superhighway' in Stratford, East London (CS2). This concern had been provoked specifically by the following sketch, published by Transport for London.



Working with Living Streets (of which I'm a Trustee), the meeting was called for two main reasons: (a) to try and head off any unnecessary, unedifying and helpful 'us and them' exchanges between 'cyclists' and 'pedestrians', bearing in mind the many priorities for change that are shared by people who walk and cycle in urban streets; and (b) to see if we could contribute positively to the development of design thinking on the relationship between bus stops and cycle tracks, of which there is – sadly – all too little British experience. (I've seen a few in Brighton and London; but only a few.)

My take on the evening was that it was a hugely constructive get-together, attended by eight people (including me) representing Living Streets (national and local groups), the Royal National Institute of Blind People, the London Cycling Campaign. Having a wheelchair user at the table was particularly helpful. We started by trying to clarify pedestrians' concerns about 'floating bus stops' (and the implications of the sketch above, in particular), but quickly moved on to shared aspirations for street design in general, and then set about trying to establish principles to help guide 'floating bus stop' design in the UK.

In doing this, I ran through a variety of slides showing existing layouts in similar situations from other European countries and Britain, so that we could discuss what seemed to us to be good and bad ideas in different contexts. Although it gave the group a rather sad insight as to how I spend my holidays and spare time, the slides were valuable in enabling the pros and cons of different layouts to be debated. One thing we quickly realised was that the 'floating bus stop' conundrum is in fact a subset of a broader design challenge: what to do when a cycle tracks pass through areas that are also a focus of pedestrian activity; as, for example, outside railway stations or where people stand while waiting to cross at Pelicans. (The photos below help to illustrate.)



Where the cycle track meets the waiting area for a pelican crossing on Brighton prom.



A cycle track awash with pedestrians outside Kingston Station in the morning peak

The meeting was scheduled to last an hour and a half, but we happily spent much longer working our way forward in a positive and, as I said, constructive atmosphere. There was no formal note of the meeting but, unless I'm gravely mistaken, the following could reasonably be said in summary of our deliberations.

- There was strong in-principle support for the introduction of cycle infrastructure, including protected cycle tracks, that is likely to encourage mass cycling.
- It was recognised that the introduction of cycle tracks that are neither conventional carriageway nor footway, and relatively unfamiliar on British streets, will inevitably be found confusing by some users (especially pedestrians), at least at first.
- Design should therefore generally seek to differentiate clearly between footways and cycleways. This is to minimise the likelihood both of collisions and of the perception by pedestrians that cycling on cycle tracks is 'pavement cycling'.
- Implementing protected cycle tracks (facilities that are separated from the vehicle carriageway but immediately adjacent to it) in complex urban streets is bound to give rise to the potential for conflict with pedestrians in certain locations/types of location (e.g. at bus stops, especially the busier ones)
- The default option in such circumstances must be to address the design challenge presented, not to avoid it by seeking to divert cyclists into the traffic carriageway (where the consequences of any conflicts are potentially much more serious).
- Locations of potential conflict between pedestrians and cyclists can be considered like junctions, with relative priorities designated, and designed for, on a site-specific basis, according to assessments of relative numbers and proportions of pedestrians and cyclists, the space available, and the complexity of local pedestrian activity patterns.
- While the purpose of better cycle tracks is to make cycling be and seem both safer and more convenient, the existence of a cycle track does not mean there will be unbroken priority for cycle movement along it. Though breaks in cycle priority should be minimised, yielding to pedestrians will be appropriate in some locations, and design should both encourage and enable cyclists to yield as necessary.
- Generally, design should encourage mutual awareness (and indeed what a leading cycling campaigner recently termed 'mutual generosity') on the part of both groups of users – people on bikes and people on foot – and make plain the relative priorities for each in any given location.

For the present, I leave you with a photo I took in France. I think it's appropriate.



JOHN DALES | URBAN MOVEMENT

12 CAR PARKING

CYCLING EMBASSY OF DENMARK'S GUIDANCE FOR LAYING OUT PARKING ALONG CYCLE TRACKS

If necessary, a 1m wide longitudinal island should be placed between cycle tracks and on-street parking, a kerb isn't necessary between the track and the island. Alternatively the cycle track can be widened by an additional 1m.

NACTO DESIGN GUIDELINES GUIDANCE FOR LAYING OUT PARKING ALONG CYCLE TRACKS

A 0.1m solid white line should be used between parking and cycle lanes, and the lane should be at least 1.8m wide.



TRAFFIC LANE

PARKING

BUFFER STRIP



CYCLE LANE

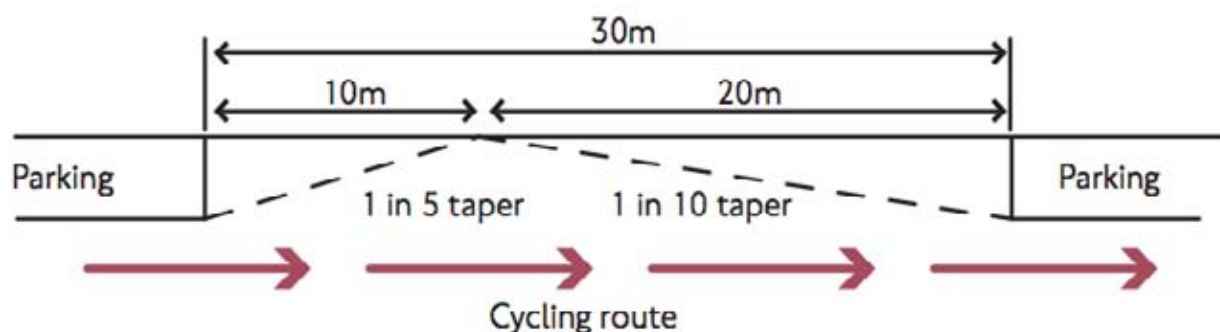
Running Parking bays inbetween traffic lanes and the cycle facility gives cyclists protection from moving vehicles. However, a buffer strip of some sort should be included in order to stop cyclists getting hit by opening car doors.

LONDON CYCLE DESIGN STANDARDS GUIDANCE FOR LAYING OUT PARKING ALONG CYCLE TRACKS

Removal or re-location of parking to a side road may be the best solutions for cyclists. If not, an advisory lane should be run alongside the parking bays with a gap of between 0.5-1m.

If there is parking on a route where cycle lanes are proposed then measures should be taken to provide a satisfactory situation. Removal or relocation of the parking to a side-road or into a specially constructed bay may be the best option for cyclists. The normal solution will be to run an advisory cycle lane on the outside of marked parking bays. With either constructed or marked bays sufficient clearance should be created so that cyclists are not unnecessarily endangered by the opening of vehicle doors. This can be achieved by leaving a gap of 0.5-1.0m between the inside of the cycle lane and the edge of the parking bay, giving adequate entry and exit tapers.

Where there are short gaps between parking bays, including at junctions, then the lane should maintain its position in the road rather than zigzag back to the kerb-line. A maximum distance of about 30-35m is appropriate for this (as shown on the diagram below). The diagram shows the normal route that a cyclist would take where there is a gap in the parking. 1:5 exit tapers and 1:10 entry tapers are normally appropriate, although as this will depend on cyclists' individual speeds, gradients and other conditions may need to be assessed.



13 FILTERED PERMABILITY

CYCLING ENGLAND

Design Portfolio - A.05 Exemptions to TROs

Cyclists benefit greatly when given exemption from the requirements of traffic regulation orders (TROs) that create road closures, one-way streets, turning bans and vehicle restricted areas. Exemption will invariably provide advantage and permeability by shortening journey time and distance cycled as well as improving accessibility. Where such orders result in a reduction in the volume and speed of motor traffic this can encourage more cycling through the creation of safer and more pleasant cycling conditions on the roads affected. If cyclists are not given exemption from these types of TRO, it will usually involve them in a frustrating detour which will invariably be more heavily trafficked and hazardous than the route the TRO has denied them. This can be a serious deterrent to cycling. In addition, it may also result in some cyclists ignoring the TRO and following their desired route without the protection of formal provision.

Cyclists should therefore be exempted from all such orders as a matter of course unless there are overriding safety considerations which preclude it. Providing an exemption for cyclists when a TRO is first introduced is far easier and less costly than adding the exemption at a later date. Within the 'core, low speed urban area' at the heart of towns and cities the exemption should generally be the norm. On higher speed/volume roads such as inner ring roads, main radials etc there will need to be a more considered approach where the desired movement might be offered via an alternative such as a toucan crossing for example. A cycle audit of all proposed TROs will help identify the best approach.

ROAD CLOSURES

Road closures, and similar measures such as bus gates, act as very effective traffic-calming devices because they remove through motor traffic and thus prevent rat-running. Where a road is to be physically closed to motor vehicles, an exemption and a cycle gap in the closure should be provided. These should be a minimum of 1.5m wide to allow tandems, trailers and electric wheelchairs to pass through with good visibility of adjacent roads and pedestrians on the footway. Gaps positioned in the centre of closure are less likely to be blocked by motor vehicles and any kerbs leading into them should be placed at a radius of curvature suitable for cycle use. Existing road closures where no such features have been provided should be reviewed, and wherever possible re-opened for cycle use.

MANUAL FOR STREETS:

6.4.2 Cycle access should always be considered on links between street networks which are not available to motor traffic. If an existing street is closed off, it should generally remain open to pedestrians and cyclists.

Care needs to be taken to ensure that parked vehicles do not obstruct openings created for cyclists at road closures. In some instances, such as town centres, this may be addressed by the introduction of parking restrictions but these may prove difficult to enforce. In these circumstances physical measures such as build outs, cycle logos or hatching may be more effective. If bollards are used to prevent motor vehicles from travelling through the closure, the gaps between them should be at least 1.5m wide. Bollards directly next to cycle gaps should be made conspicuous to all users, including pedestrians who might also choose to use the gap. Another way of effecting the closure is to place bollards across the full road width. With more than one gap to choose from, cyclists are less likely to be obstructed by parked vehicles.

BANNED TURNS

Cyclists should generally be exempt from banned turning movements unless specific safety concerns dictate otherwise. The order giving effect to the ban will need to exempt cyclists. An 'Except cycles' plate to diagram 954.4 should be placed underneath the appropriate regulatory sign (usually diagram 612 No right turn or 613 No left turn). It may be necessary to provide traffic islands with bollards accompanied by appropriate road markings and signs to protect cyclists waiting to make the turning manoeuvre.



ROADS CLOSED TO VEHICULAR TRAFFIC TO CREATE CYCLE ONLY STREETS USING BOLLARDS (ABOVE) AND TREES (BELOW) | HACKNEY



14 ACCESSORIES

PUBLIC CYCLE PUMP | LONDON



PUBLIC CYCLE WORKSHOP FACILITIES | USA





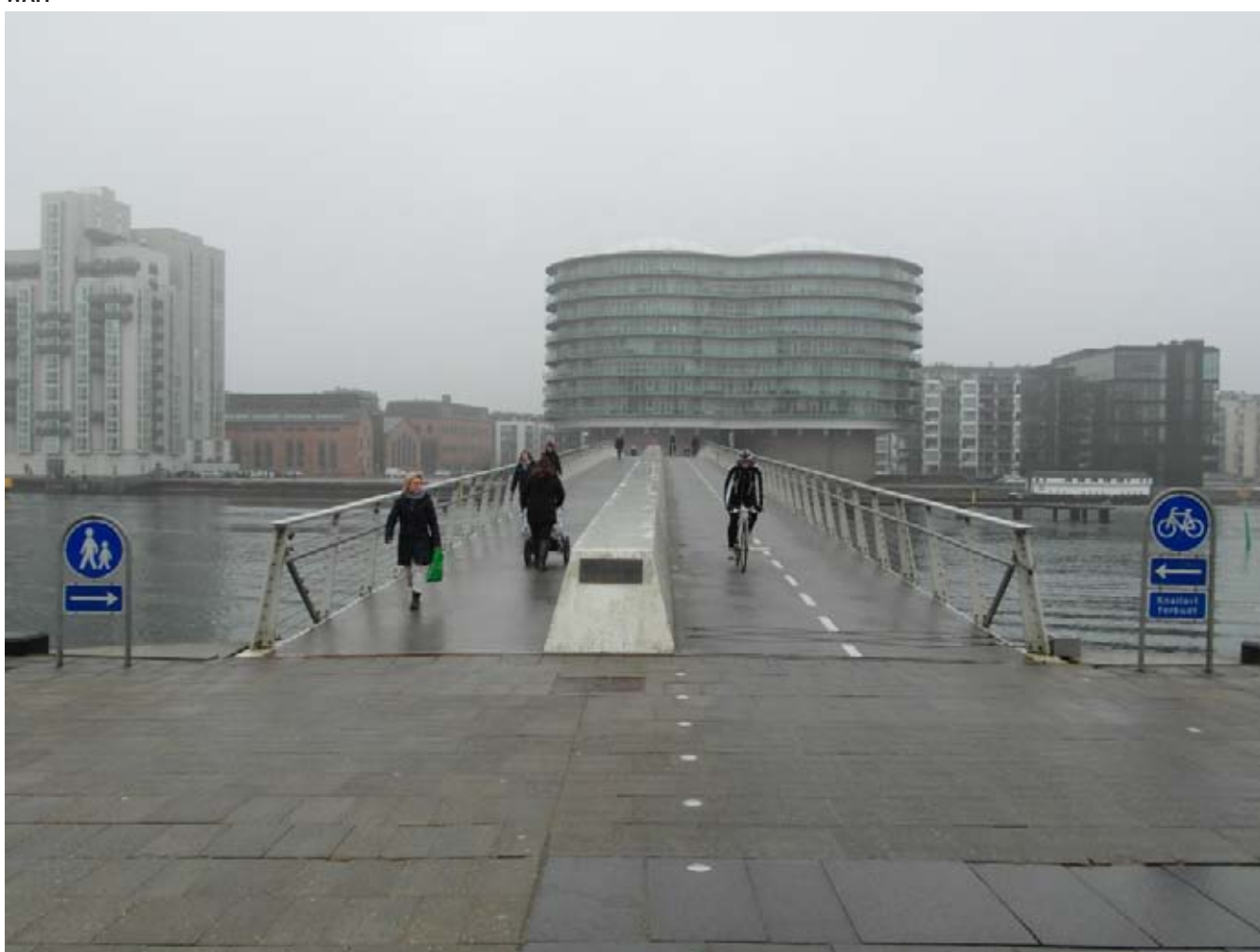
'PLANTLOCK' CYCLE STANDS / PLANTERS ARE BECOMING COMMON SIGHT THROUGHOUT LONDON



TEMPORARY CYCLE PARKING THROUGHOUT LONDON HIGHLIGHTS THE EFFICIENCY OF CYCLE PARKING OVER VEHICULAR



BINS ALONG CYCLE ROUTES ANGLED TO HELP CYCLISTS + FOOT STANDS AT LIGHTS OFFER CYCLISTS A LITTLE COMFORT WHILE THEY WAIT



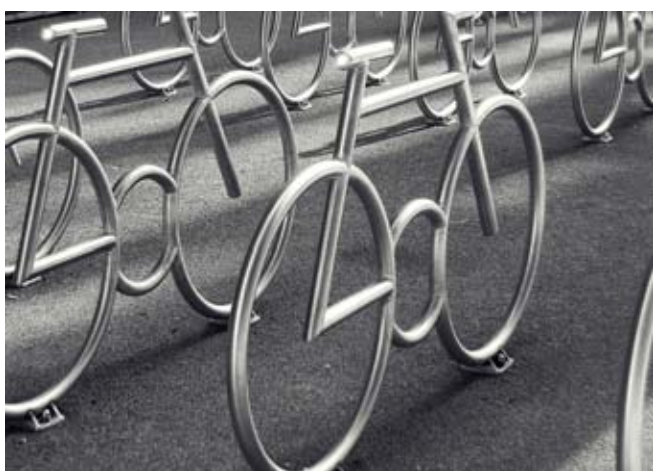
CYCLE + PEDESTRIAN ONLY BRIDGES PROMOTE CYCLING AND WALKING



A BIKE 'ESCALATOR' HELPS PEOPLE GET THEIR BIKES UP STAIRS....POSSIBLY A LITTLE HEAVY HANDED



SADDLE COVERS ATTACHED TO BIKE STANDS



ELEGANT CYCLE PARKING CAN CREATE A PIECE OF PUBLIC ART AS WELL



CYCLING + PEDESTRIAN TRAFFIC LIGHTS | COPENHAGEN



BIKE HUB | EALING

ENSURE DRAINAGE GRATES ARE LAID FLUSH AND MAINTAINED ON CYCLE LANES. IF ON-CARRIAGEWAY DRAINAGE GRATES ARE USED THE 'STRIPES' SHOULD BE LAID PERPENDICULAR TO THE KERB OR THEY SHOULD BE MADE UP OF A GRID.



POORLY LAID AND MAINTAINED GRATES, AND ONES LAID PARALLEL TO THE KERB CAN BRING CYCLISTS OFF THEIR BIKES



ON CYCLE TRACKS ALTERNATIVE DRAINAGE SOLUTIONS SHOULD BE INVESTIGATED TO HELP CREATE THE SMOOTHEST RIDING SURFACE POSSIBLE



GRATES LAID PERPENDICULAR TO THE KERB ARE CONSIDERABLY SAFER FOR CYCLISTS



AN AUTOMATED CYCLE COUNTER IN COPENHAGEN, PARTLY OBSCURED BY AN URBAN MOVEMENT FACT-FINDING MISSION.

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