



# Principles of provision for safe cycling

Separating cycle and motor traffic on fast and busy roads

A collection of cycle design principles from around the world

27 August 2014

- to include reference to the Dutch CROW manual

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## Introduction: Providing for cycling

What type of cycling facility to provide should be governed by understanding the prevailing road traffic conditions: **volume** and **speed**. The two main provisions with dedicated cycle space (hence excluding un-delineated shared spaces) are the cycle lanes (white line on the road) and the cycle path (physically separated off the carriageway). Shown here:

**Figure 1:** cycle lane



**Figure 2:** cycle path/track



By determining the traffic volume and speed (taking into account future plans and development) a design decision can be reached for cycle provision. Of course, this could also be done vice versa: depending on what cycle facility is currently available, volume and/or speed are adjusted.



### **What's the 85%ile speed?**

The 85%ile means that 85% of all drivers drive within that **speed** envelope. It is site-specific. On a 20mph street, the 85%ile may well be 25mph or more (rat run). The 85%ile can only be established by actual on-site speed measurement. Enforcement or engineering design methods could be considered to lower the actual speed, although engineering / network planning methods are more durable.

### **What's vph or vpd?**

The units 'vehicle per hour' or 'vehicle per day' are used to describe traffic **volume**. A factor of 10 is typically applied to scale down the daily volume to the hourly volume, hence taking into account peaks during the day (rush hours).



## Examples of cycle provision

Using the volume-speed matrices from different design guides (see appendix) the following three examples will help to understand the principles of cycling provision.

### Example 1 – quiet residential access road

<b>Input</b>	Volume = 1,000 vpd (100 vph) Speed 85%ile = 20mph = 30kph (low speed limit observed by drivers)												
<b>Output</b>	<table> <tr> <td>UK CID</td> <td>no cycle provision needed</td> </tr> <tr> <td>Dutch CROW</td> <td>combined traffic, or lane or cycle street</td> </tr> <tr> <td>UK Essex</td> <td>shared quiet road / cycle lane</td> </tr> <tr> <td>German</td> <td>mixed with car traffic</td> </tr> <tr> <td>Danish</td> <td>mixed traffic</td> </tr> <tr> <td>Scotland</td> <td>shared road facility</td> </tr> </table>	UK CID	no cycle provision needed	Dutch CROW	combined traffic, or lane or cycle street	UK Essex	shared quiet road / cycle lane	German	mixed with car traffic	Danish	mixed traffic	Scotland	shared road facility
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Scotland	shared road facility												

Example 1 illustrates that in calmer traffic condition (not too many cars, low speeds) no cycle facility may be required, and drivers and cyclists can share the same space.

Note, the Dutch CROW matrix uses the most distinguished decision tree, splitting into road categories and cycleway types.

(cont)



## Example 2 – busy local access road with rat-run tendencies

**Input**            Volume = 4,000 vpd (400 vph)  
                       Speed 85%ile = 25mph = 40kph (speed limit 20mph)

*If network management (like mode filtering to lower speed and volume) will not be used then...*

<b>Output</b>	UK CID	cycle lanes may be appropriate
	Dutch CROW	cycle lane or track
	UK Essex	cycle lane / traffic calm
	German	mixed with car traffic
	Danish	cycle lane
	Scotland	cycle lane

## Example 3 – district access road

**Input**            Volume = over 5,000 vpd (500 vph)  
                       Speed 85%ile = 45mph or 70kph

<b>Output</b>	UK CID	cycle tracks
	Dutch CROW	cycle tracks
	UK Essex	segregated cycle tracks/paths
	German	cycle lane or cycle path
	Danish	cycle track with dividing verge
	Scotland	segregated cycle facility



## Appendix A

### Speed volume matrices

- UK - Cycle Infrastructure Design, LTN 2/08
- Netherlands CROW
- UK EssexCounty, from Sign up for the Bike, 1996
- German
- Danish
- Scotland



[UK] Cycle Infrastructure Design Guide, Page 13

**Table 1.3 Approximate guide to type of provision**

Traffic flow	85th percentile speeds			
	<20 mph	20–30 mph	30–40 mph	>40 mph
<1,500 vpd, or <150 vph				Cycle lanes or tracks
1,500–3,000 vpd, or 150–300 vph			Cycle lanes or tracks	Cycle lanes or tracks
3,000–8,000 vpd, or 300–800 vph	Cycle lanes may be appropriate	Cycle lanes may be appropriate	Cycle lanes or tracks	Cycle tracks
8,000–10,000 vpd , or 800–1,000 vph	Cycle lanes	Cycle lanes	Cycle lanes or tracks	Cycle tracks
>10,000 vpd	Cycle lanes or tracks	Cycle lanes or tracks	Cycle lanes or tracks	Cycle tracks

**Notes:**

- 1 vpd = number of motor vehicles in typical 24-hour weekday.
- 2 vph = number of motor vehicles in typical morning peak hour.
- 3 Where traffic speeds/flows are low, the designer should assume a default position of no signs/markings specifically for cyclists. However, there may be situations where it is appropriate to indicate the cycle route using cycle symbol markings to diagram 1057 with advisory route signs to diagram 967.
- 4 Cycle lanes used in the higher speed/flow situations should provide good separation between cyclists and motorists. Wide cycle lanes or buffer zones can help here.
- 5 Where cycle lanes or tracks are shown in the table, cycle lanes should be considered first. In general, cycle tracks should only be considered if cycle lanes cannot be made to work.
- 6 In congested areas cycle lanes can be useful even when traffic speeds/flows are low.



[Netherlands] CROW, NL

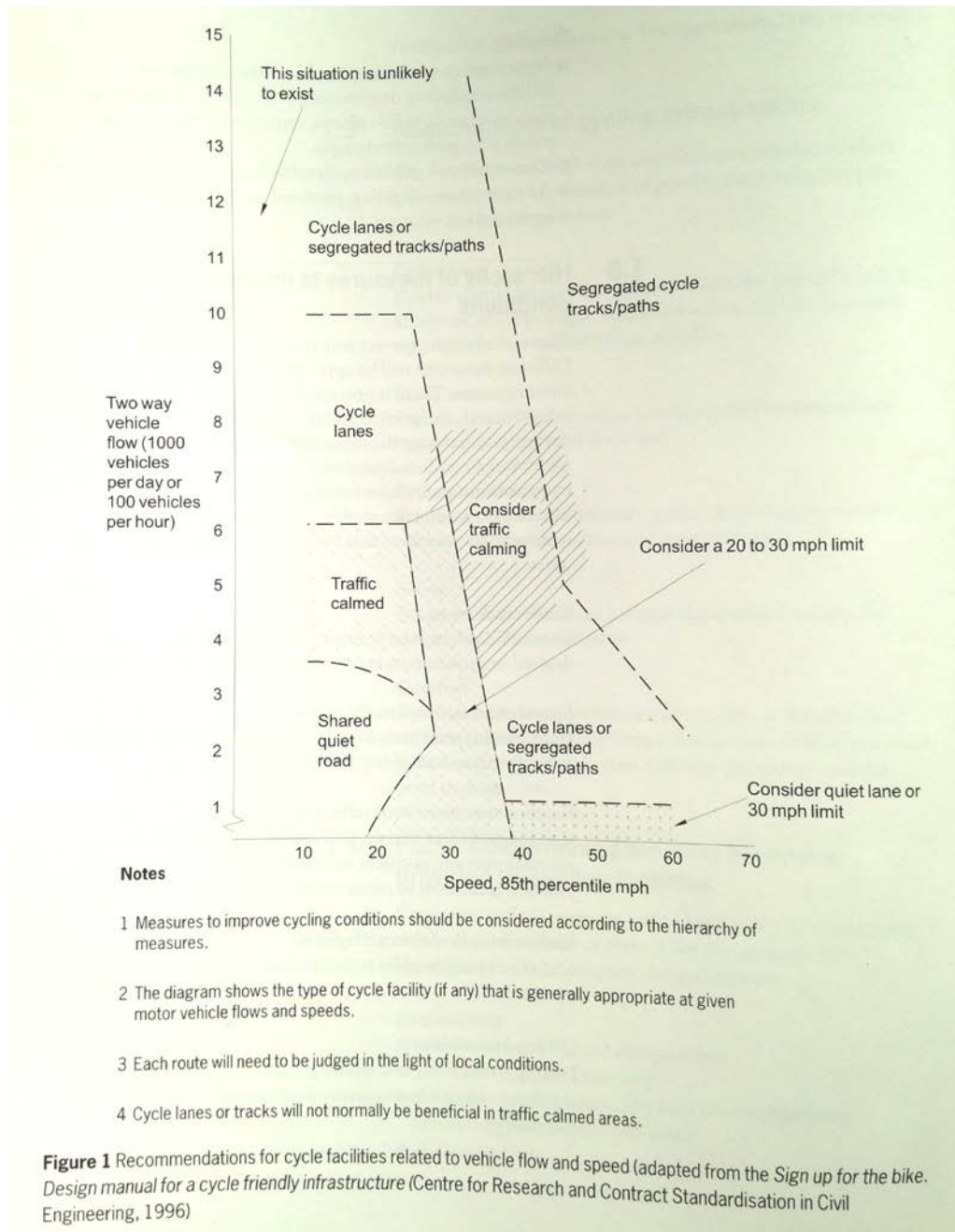
Table 14. Option diagram for road sections inside the built-up area

Road category	Max. speed of motorised traffic (km/h)		Motorised traffic intensity (pcu/day)	Cycle network category		
				basic network ( $I_{\text{bicycle}} > \text{work } 750/\text{day}$ )	cycle route ( $I_{\text{bicycle}} 500-2500/\text{day}$ )	main cycle route ( $I_{\text{bicycle}} > 2000/\text{day}$ )
Estate access road	n/a		0	solitary track		
	walking pace or 30 km/h		1 - 2.500	combined traffic		cycle street or cycle lane (with right of way)
			2.000 - 5.000			
		> 4.000	cycle lane or cycle track			
District access road	50 km/h	2x1 lanes	irrelevant	cycle track or parallel road		
		2x2 lanes				
	70 km/h					



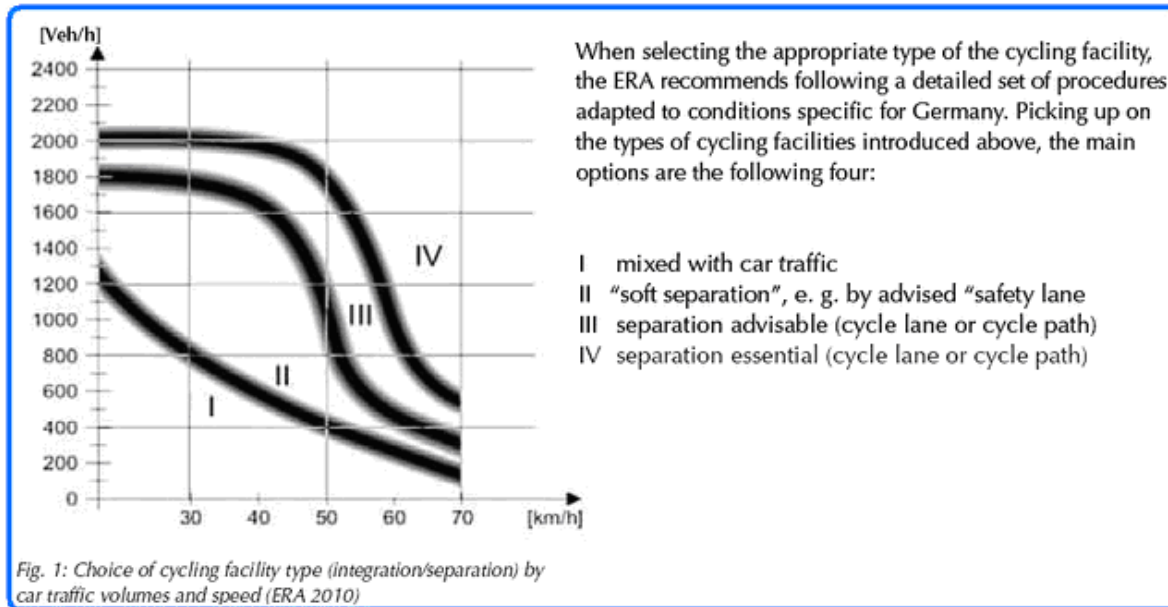


[UK, Essex] Essex County Council, *Designing for Cyclists*, page 6, matrix adapted from *Sign up for the Bike*, 1996



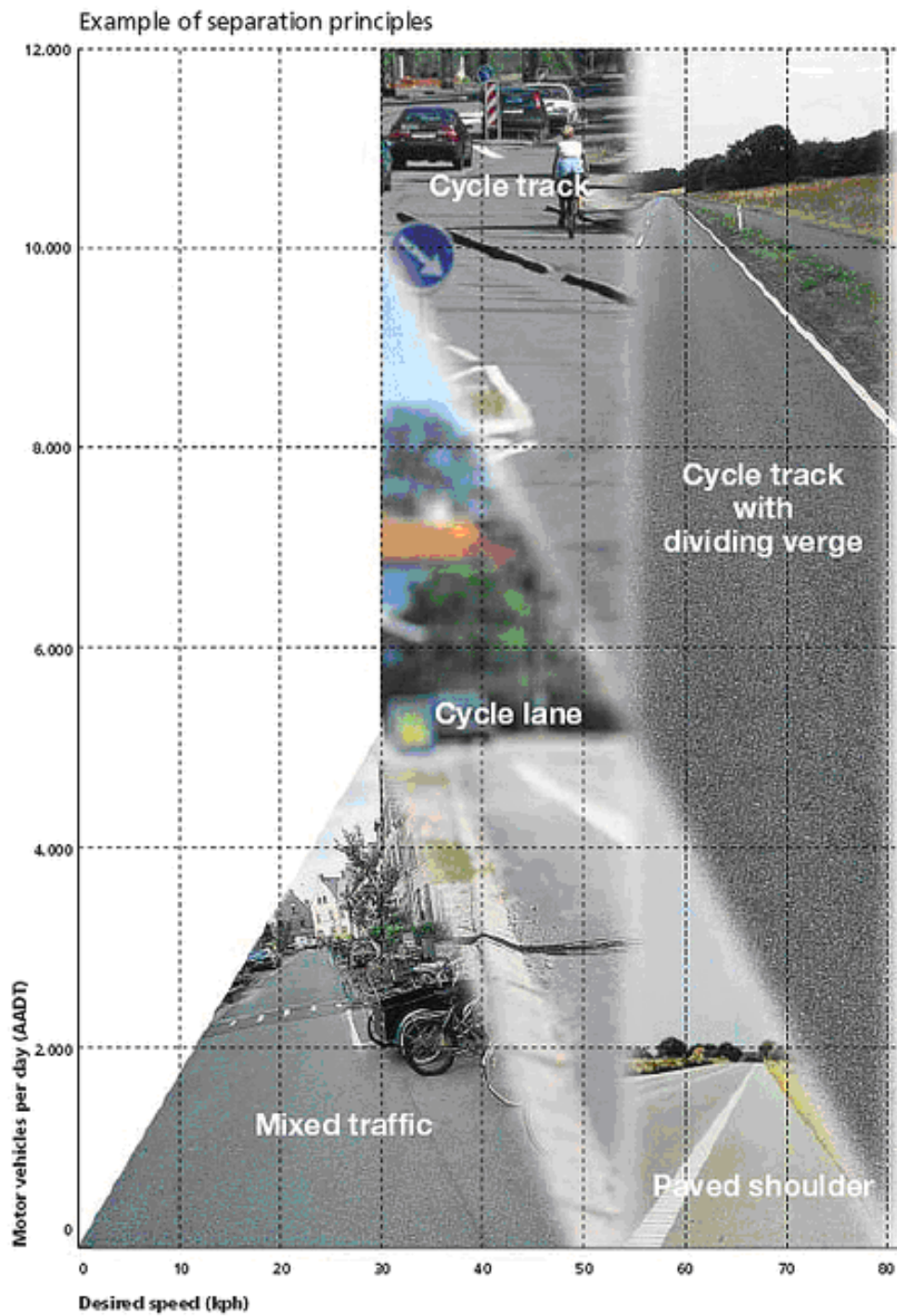


[GER] Cycling Expertise Germany I-1/2010 from [Fahrradportal > Projects > Cycling Expertise](#)





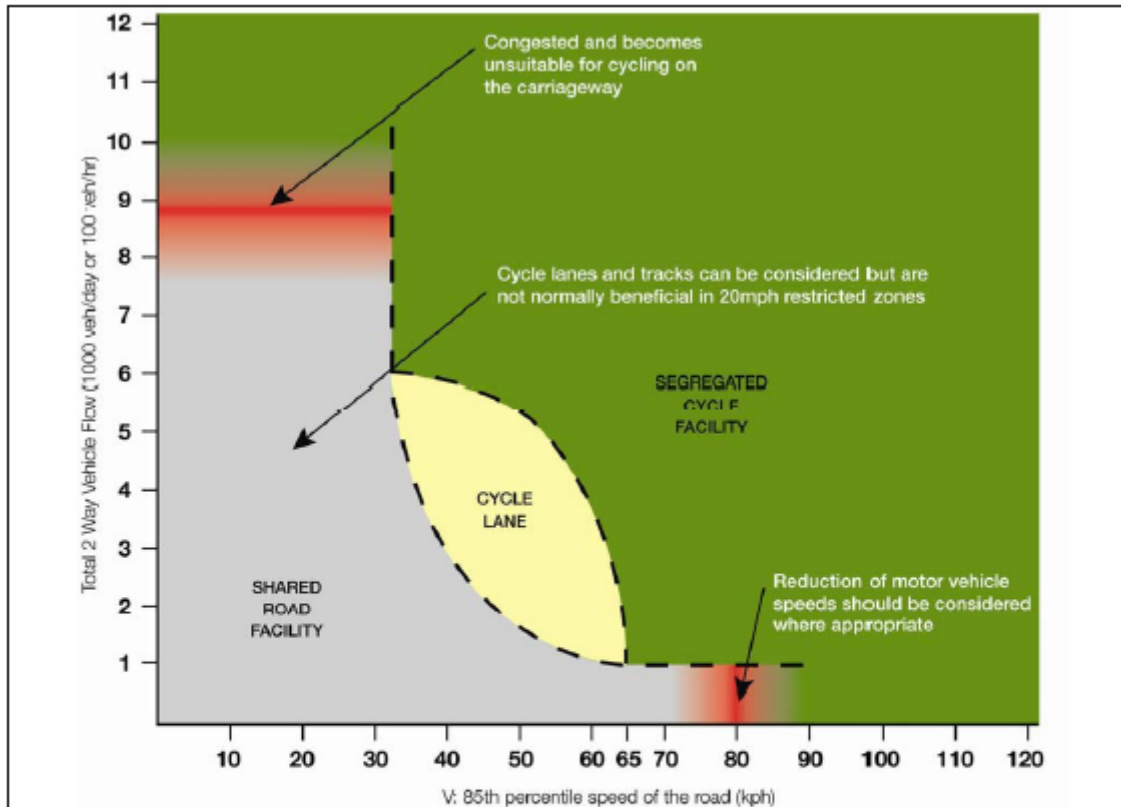
[DK] [Planning of traffic areas](#), graph: page 53





[UK southeast Scotland] Cycling Infrastructure, design guidance and best practice

**Diagram 2.3 Link Specification Criteria<sup>1</sup>**



**Points to note:**

- In some areas there may be considerable recreational cycling at weekends, but little or no flow on weekdays. In these areas average daily measurements should be calculated on the basis of flows taken over not fewer than 4 July/August weekends, to provide the average maximum recreational flow.
- At an HGV content greater than 15% of the total flow a segregated cycle facility is recommended due to the potential increase in danger to the cyclist.
- On an urban road with frequent side road junctions, such as every 200m, an off carriageway segregated facility (especially a converted footway) loses most of its advantages. The benefit of a traffic-free cycle track is counteracted by cyclists having to be alert at each junction. In such circumstances an on-road cycle lane, properly protected by waiting and loading restrictions, may be more beneficial.