1. The philosophy behind ADONIS

ADONIS stands for **A**nalysis and **D**evelopment **o**f **N**ew **I**nsights into **S**ubstitution of Short Car Trips by Cycling and Walking. As a component of this European project, this report, including the annex “Comparison of cities with different shares of walking and cycling”, presents a *catalogue* of measures for pedestrians and cyclists. This catalogue aims at giving guidelines for measures to be implemented in large and medium-sized cities around Europe, given their needs and possibilities for stimulating cycling and walking, and thus reduce the number of short trips by car.

The authors of this report started by looking at new and promising measures being taking in Amsterdam, Barcelona, Copenhagen and Brussels respectively. The authors were ADONIS partners from the Netherlands (SWOV), Spain (INTRA), Denmark (RD concerning cyclist measures and DTU concerning pedestrian measures) and Belgium (LV). Next, other cities in the Netherlands, Switzerland, Spain, Denmark and Belgium were studied.

Each measure accepted for the catalogue was described according to a certain standardised format by the partner who had proposed the measure to be included in the catalogue.

This report describes the contents of the catalogue and how to use the catalogue. This information should be combined with the results in Annex 1: ‘Comparison of cities with different shares of walking and cycling’ indicating how mobility policy and investments affect the share of trips on foot and by bicycle in 26 European cities. SWOV has been responsible for the chapters on how to use the catalogue (Chapter 1-4 and 7) and Chapter 6 (cyclist measures) and INTRA has been responsible for Chapter 5 (pedestrian measures) and Annex 1 (Comparison of cities based on the city survey).

Developing a combined use of measures to promote both walking and cycling, expresses a philosophy that emphasises the minimising of the use of measures that would negatively affect the “other group”, the ongoing considering of each group’s interests, and the serving of each group’s interests whenever possible.

A catalogue like this will never be really complete; other measures are conceivable, and there is more to report about each measure. The main purpose of this description of how to use the catalogue is to stimulate road authorities to prime the creative process intended to keep looking for good solutions.

Furthermore, it is assumed that only when people have good facilities they will use other means than the car for short trips. Naturally, just having good facilities is not enough; people have other reasons for taking the car instead of cycling or walking. Obviously, therefore, it is necessary to accompany this project with another one (WALCYNG) involved in developing a marketing strategy (based on the wishes and convictions of target groups) for developing communications intended to replace short car trips with cycling and walking.

2. Approach and methodology

For cycling measures, certain international catalogues have been published. For pedestrians, no comprehensive work yet exists although some starts have been made in that direction by the FEPA (1995) in English; FHWA (1989) in English; the Dutch Pedestrians Association (VBV, 1993) in Dutch and the Austrian organisation VCÖ (1993) in German. Paragraph 2.1 describes the most important catalogues/manuals.

Which measures are presented and which not, what is included and for whom the ADONIS catalogue has been prepared, can be found in paragraph 2.2.

2.1 Review of existing catalogues and manuals

The existing catalogues and manuals are organised in various ways. This paragraph gives a short description of the most important catalogues/manuals.

Pedestrian catalogues/manuals

The Austrian pedestrian catalogue (VCÖ, 1993) deals successively with the Pedestrian (characteristics, needs, disabilities, emotions), Criteria for Planning (such as “the shortest path”), Designing and Dimensions, Crossing Measures, Relationship with Cyclists and Public Transport, Elements Related to Comfort (protection from rain, landscaping, etc.), and Rules and Regulations.

The Dutch pedestrian catalogue (VBV, 1993) deals first with several principles that determine “practical value”, “perceived value”, and “future value”. Discussed under the first category are accessibility, ease of walking, ease of road crossing. Addressed by the second category are safety, and attractiveness. “Future value” considers the changing composition of the population and changes in behaviour. Next to be addressed are spatial structure and facilities at the street level. This catalogue concludes with supportive measures such as information campaigns, education, maintenance, and the control of slippery conditions.

A comprehensive, but non-European, pedestrian catalogue has been published in the United States of America (FHWA, 1989). This can be considered as a real design manual. Information about data collection methods are presented as well as the planning and design of footpaths, crossings, and pedestrian zones.

Bicycle catalogues/manuals

The Dutch cycling catalogue (CROW, 1993); which is available in English, German, and Dutch versions; is focused mainly on technical measures. It is organised as follows: Design as Process, Design of a Network, Road Sections, Road Surface, Intersections, Cyclists and Speed Inhibitors, Cyclists and Unlawful Parkers, Bicycle Storage Facilities, Temporary Measures, Furnishing Cycle Routes, and Assessment of Cycling Infrastructure.

The German cycling catalogue (FGSV, 1996), which focuses on infrastructure measures, deals with legal regulations and design fundamentals. Main items are planning and design of cycling networks, road sections as a part of different road types and junctions of various kinds. Last to be addressed are bicycle storage facilities and technical prescriptions for realising cycling facilities.

The Dutch ASVV (1996) distinguishes Basic Information (including documentation and legal regulations), Methodology (including analysis methods and resources for designing), Facilities (for traffic circulation, technical traffic facilities for special categories and for mixed traffic, and measures at the level of traffic regulations), and Special designs (technical designs, facilities for road works, and the management and maintenance of roads).

Concluding remarks

It seems as if cycling organisations can stand up for the interests of cyclists better than the pedestrian organisations can stand up for the interests of pedestrians. For this reason, cycling measures are sometimes not relevant to the needs of pedestrians and may even be unfavourable.

Each of these types of organisation has its advantages. In our opinion, providing road authorities with a wide variety of types of organisation is of major importance in assisting them to make a selection appropriate for their requirements, and, if they have no specific requirements, to introduce them to some ideas.

2.2 The ADONIS catalogue

Which measures are presented?

In general, two kinds of measures are presented: technical and non-technical measures. The technical measures include the facilities for moving along road sections and within areas, for crossing and for storing, waiting and resting. The non-technical measures comprise transport policy plans, education and public information, and organisational facilities.

Addressed here are 71 technical measures and 31 non-technical measures (see table 1 below).

	Technical	Non-technical	Total
Pedestrians	33	9	42
Cyclists	38	22	60
Total	71	31	102

Table 1. ***Numbers of measures discussed***

The catalogue places a different accent on the descriptions of cycling measures than on those for pedestrians. The part dedicated to pedestrians is more like a catalogue with an emphasis on individual measures. This was done because there was as yet no catalogue written in English.

In the bicycle section, the main emphasis is on creating a stimulating effect. This is why

solutions consisting of a number of measures are so frequently described. Both cases, however, focus on interesting or new measures. Traffic authorities already have experience with the many traditional measures; this report is meant to be attention-getting and stimulating. More can be expected, thus, from these somewhat more striking examples.

The facilities aim to attract people from car driving to cycling and walking, but at the same time the facilities will be beneficial to people who are already cycling and walking.

Also important are the criteria for selection:
1) comfort: is the solution attractive and does the solution make the trip shorter or faster?
2) does the measure stimulate walking or cycling?
3) is the measure cost effective?

These criteria are subject to the constraint that each measure should be safe (concerning both road safety and social safety) and at least be safer than the existing situation without the measure.

The selected measures are examples of good practice. However, more measures can be part of this good practice. But the catalogue does not claim to be encyclopaedic in this respect.

Which measures are not presented?

This catalogue assumes that a municipality has already allowed sufficient space for cyclists and pedestrians in its city planning or restructuring, and that decisions have already been made in regard to the locations for new cycle and pedestrian routes. Once this has been established, individual measures, such as the ones presented here, can be considered.

The same applies to public transport facilities. Walking and cycling are often used to cover the distances previous and subsequent to the routes covered by public transport. This catalogue is limited to the covering of these supplementary distances. Furthermore, effective public transport does not usually contribute to a shift from use of the car to cycling and walking. On the contrary, much public transport replaces bicycle and walking trips.

Measures which can be considered as “bad practices” have been excluded. This category of measures does not fit to the three criteria (comfort, stimulus, cost effective) and/or is not considered as safe measures.

What is included?

Each description of a measure is accompanied by illustrations - photos, diagrams of a lay-out design, or other road elements - as well as illustrations of public information material. Infrastructure measures are sometimes provided with dimensions as well.

Next, the advantages and disadvantages of the measures in terms of comfort, costs, road safety, and social safety are described in as much detail as possible. Also discussed are the advantages and disadvantages for road users other than pedestrians and cyclists. If possible, a cost estimate is provided.

Finally, the names of publications or organisations are listed as sources for more information.

For whom is this catalogue prepared?

The catalogue is intended for local traffic authorities, particularly for those who create designs for the construction or improvement of traffic facilities, and for those who wish to influence the use of these facilities. In most cases, this will make the translation of this publication necessary; this will be the task of national governments.

Use of illustrations and text

If a source accompanies an illustration, it should be mentioned when using the illustration. If no source is given, mention of this EU publication should be made. No limits exist as to how often the text can be used and translated, provided that mention is made of the source.

3. Special regulations regarding pedestrian and cyclist facilities

Some of the four countries have special regulations in force for pedestrian and cyclist facilities, a fact which has consequences for the use of this catalogue. One example is how the Netherlands strives to give cyclists broad cycle tracks and cycle lanes. This measure is partially determined by the fact that in the Netherlands two cyclists are allowed to ride side by side. It is always important, therefore, to involve the regulations in a certain country when choosing measures. In addition to the national laws and regulations, there are also European regulations (the Vienna Agreement and the Geneva Convention). Not every country has ratified these agreements, and every country can also apply the rules in its own way. Much of the information in this chapter comes from a German study (BASt, 1997).

3.1. Concerning pedestrian facilities

Use of the road

- Use of footpaths

Use of footpaths is obligatory in all countries. In Barcelona, cyclists as well as roller skaters can make use of the footpath. In the Netherlands and in Denmark roller skaters are permitted only on the footpath and not on the carriageway. In Belgium roller skaters are considered as pedestrians and admitted on the footpath only.

In Denmark, two wheels of a passenger car may be parked on the footpath if this does not imply danger for pedestrians on the footpath.

All countries have signs for required footpaths; Denmark also has a sign for recommended footpaths.

Denmark has a sign that indicates that a road is intended for *combined use* by pedestrians, people on horseback, and cyclists.

- The place for users of wheelchairs

In general, those in wheelchairs, whether or not they are motorised, are seen as pedestrians and for this reason must make use of the footpath. In Spain, Belgium and the Netherlands, however, they may also make use of the carriageway provided that they observe the rules for vehicles.

- The use of the carriageway

If no footpath exists, pedestrians use the carriageway. The Netherlands is the only country not having separate rules for this. In Spain, pedestrians must walk single file under conditions of poor visibility and heavy traffic. Outside of urban areas, pedestrians must walk on the left-hand side of the carriageway. Walking along these carriageways at night also requires carrying a lamp or reflector visible from a distance of 150 metres. In Belgium and in Denmark, it is also required to walk on the left when a footpath is lacking. Additionally, Belgium has a regulation stating that a motorised vehicle must keep a distance of at least 1 metre from pedestrians when no footpath is present. If this is impossible, slow driving is required.

- Pedestrian precinct
Some countries have a sign to indicate a pedestrian zone (the Netherlands, Denmark), while others do not (Spain).

- Residential areas
Another possibility are special types of residential areas. A common type is the 30km/h zone. But other types can have more restrictions for motor vehicles than only the driving speed. Here, walking and playing are allowed to take place on the carriageway. Pedestrians have the right of way. Cars are not allowed to (The Netherlands) or are recommended not to (Denmark) drive faster than 15 or 20 km/h, or in other words very slowly. In Belgium and the Netherlands, these areas are known as a "*woonerf*".

Spain does not distinguish residential areas as such.

Crossing

- Crossing in general
In Spain and Denmark, crossing the street is not allowed in the vicinity of a pedestrian crossing or a regulated pedestrian crossing. In Belgium, the distance is 30 metres. In Denmark, use must be made of a footbridge or underpass if nearby and if possible. Denmark also has signs for *recommended* footbridges and underpasses. The Netherlands has no such regulation. In Spain, crossing must take place as quickly as possible and at right angles to the curb; in Denmark, "without delay". No such rules apply in the Netherlands.

In the Netherlands drivers who turn into an intersecting road have to give priority to pedestrians who are crossing this road.

In Spain, cars may not park at pedestrian crossings; in the Netherlands, Belgium, and Denmark, cars are not allowed to park on these crossings and also not within a distance of five metres to the edge of the crossing.

- Crossing at zebras
In all countries, pedestrians have the right of way over other traffic on zebras. In the Netherlands and Belgium, other traffic must stop even if the pedestrian shows any sign of wishing to cross. In Denmark zebra crossings are also used at signalised junctions.

- Bus stop next to cycle track
If a bus stop is next to a cycle track, without any waiting area between the bus stop and the cycle track, cyclist must stop for passengers entering or exiting a bus.

- Pedestrian lights
In Spain, the Netherlands and Belgium, the blinking green that follows a green light means crossing is still allowed. Denmark does not have blinking green pedestrian lights.

- Exit construction
In Denmark, pedestrians have the right of way over other traffic when they cross on a continuous (elevated) footpath. This is also the case in the Netherlands, at least if a special lay-out is used as well.

3.2. Concerning cycle facilities

Use of the road

- Use of cycle-tracks
In most countries, cyclists have to use the cycle track or cycle path. In the Netherlands, this is not necessarily so when the sign "non-compulsory cycle path" is used. In Spain, the cycle track can be ridden in both directions. In the Netherlands and in Belgium, this can be done only when indicated. Denmark has a separate sign for a cycle track offering two-way traffic.

- One-way traffic
In the Netherlands, Belgium and Denmark, cycling against one-way traffic on the road is permitted if this is indicated by a secondary sign underneath. In Spain, this is not allowed.

- Children
In some countries, children must cycle on the pavement; in Denmark this is only allowed for children until the age of six, and in Belgium cyclists younger than 9 years are permitted on the footpath. In the Netherlands children must cycle on the cycle track or the carriageway.

Rules of behaviour

- Passengers
In Spain, passengers (including children) are not allowed on bicycles. Nevertheless, this is done anyway, and child seats are available everywhere. In Denmark, children older than five years of age can no longer be taken as passenger on the bicycle. In the Netherlands, children younger than nine may ride along provided they use a child seat; the number of children permitted per bicycle is unlimited. Older passengers (nine years or older) may also be taken along in the Netherlands, but no more than one per bicycle.

- Riding side by side
Cycling side by side is permitted in the Netherlands, Belgium and Denmark but not in Spain.

- Speed limits
In Spain, cyclists may not ride faster than 40 km/h outside urban areas. Inside urban areas, the general speed limits apply. In the Netherlands and Denmark, speed limits apply only to motorised vehicles.

- Hands on the handlebars
In Spain and in Denmark, the rule is to keep at least one hand on the handlebars. The Netherlands has no such rule.

- Passing
In Spain, a cyclist may pass another vehicle only on the left and only if passing takes no longer than 15 seconds or 200 metres. In the Netherlands, cyclists may pass vehicles on the right. Mopeds and cyclists must be passed on the left.

- Right of way
In all countries, cyclists have the right of way over all traffic coming from the left. Only in the Netherlands do cyclists have the right of way only over cyclists and mopeds coming from the left.

Intersections

- Indicating turns
In most countries, cyclists have to use hand signals to indicate right and left turns. This requirement does not exist in Spain.

- Left turns
In the Netherlands and Belgium, cyclists wishing to turn left may take a position next to the road axis before turning (direct left turn, *see Figure 1*). In Spain and Denmark, cyclists must first cross the intersection at which they have arrived, and then turn left to cross the second intersection (indirect left turn, see *Figure 1*). In Denmark, the cyclist does not have to wait for the green light to make the second crossing.

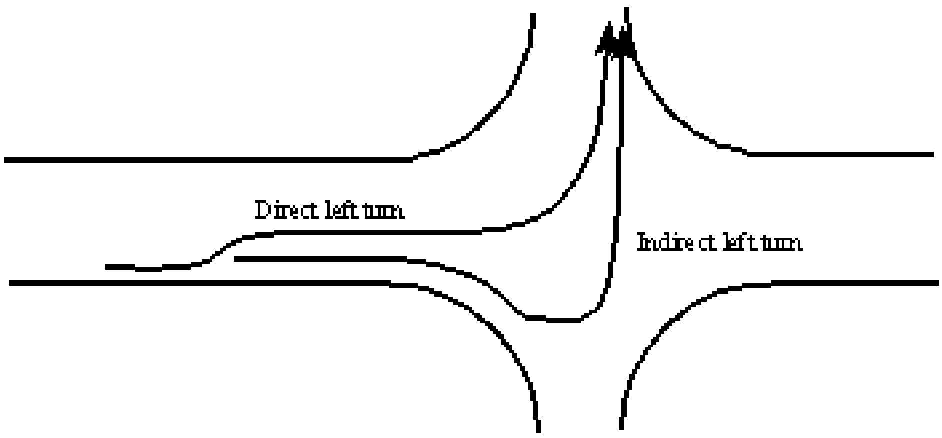

Figure 1. ***Cyclists turning left at intersections***

- Traffic signals
In the Netherlands, cyclists are sometimes allowed to turn right on red. If so, this is indicated by signs.

Miscellaneous

- Being passed by motorised vehicles
In Spain and Belgium, a driver of a motorised vehicle must allow a distance of at least 1.5 metres or 1 metre respectively when passing a cyclist.

4. How to use the catalogue

Road authorities can have many different questions when wanting to take measures to encourage cycling and walking. They may wonder which regulations will provide the strongest motivation to cut back on short car trips, or they may wonder what can be improved in regard to the infrastructure.

In the first case, classifying the measures according to their level of “firmness” - from very strong to very weak - is necessary. The level of firmness is determined by the quality of the knowledge about the measure, preferably gained by (accident) evaluation studies or other types of research.

In the second case, making a distinction between infrastructure and non-infrastructure is most useful. And, obviously, both questions can be posed simultaneously. Therefore both criteria will be used for classification.

In this set of directions, several possible classification criteria will be applied to the measures while always implying a different presentation of the question. Although the classification used in the catalogue may be the most obvious one, it is certainly not the only one possible, as we shall see. For this reason, various systems of selection will be offered.

Combinations of measures appear to have more benefits than measures which stand-alone. However, hardly any evidence could be found about successful combinations. In order to differentiate between the current practice in cities (density of facilities for cyclists and pedestrians, share of bicycle traffic in modal split) different packages of measures were set up.

Cyclist-pedestrian
The first classification involves the question of whether predominantly cycling or walking is to be encouraged. This classification will be used in all further sub classifications.

Infrastructure - non-infrastructure
This classification is handy when construction, improvement or maintenance of roads is being discussed, or just when all kinds of attendant measures are being discussed. These measures can be found by using table 2.

Firmness
In Dutch criteria for roads inside urban areas, an attempt is made to classify these criteria according to their firmness. (SWOV, 1994). The facilities described are classified into one of the following categories:

regulations	which have to be obeyed;
guidelines	which can be deviated from but only with good reason;
recommendations	which are deemed preferable since they are assumed to lead to favourable results;
suggestions	which are expected to have a good result;
possibilities	which are only supposed to have a good result.

As much as possible, the ADONIS catalogue has selected measures not only according to their expected contribution to comfort and safety, but also according to how new and interesting they are. Naturally, it is still too early to order the introduction of these new measures, because our experience with them is still too limited. For this reason, regulations and guidelines are included together. By doing this, however, there are few measures to classify.

The categories entitled *suggestions* and *possibilities* are taken together; the difference between "expected" and "supposed" is often very small.

Table 2 shows the classification, separated into pedestrians and cyclists, and subdivided according to infrastructure and non-infrastructure.

		Regulations and guidelines	Recommendations	Suggestions and possibilities
Pedestrians	Infrastructure	P-6, P-10, P-17, P-25, P- 32	P-1, P-2, P-3, P-4, P-5, P-7, P-8, P-12, P-13, P-20, P-23, P-26, P-27, P-31, P-33	P-30
	Non-infrastructure	P-9, P-16, P-34, P-36	P-35, P-37a, P-37b	P-11, P-14, P-15, P-18, P-19, P-22, P-24, P-28, P-29, P-38, P-39, P-40, P-41a, P-41b, P-42
Cyclists	Infrastructure		C-02, C-06, C-07, C-08, C-10, C-14, C-16, C-21, C-22, C-23, C-24, C-25, C-26, C-27, C-28, C-30, C-32	C-04, C-05, C-09, C-11, C-12, C-13, C-18, C-20, C-29
	Non-infrastructure		C-01a, C-01b, C-5a, C-15b, C-17a, -17b, C-19, C-31, C-37a, C-37b, C-41, C-43, C-44, C-46, C-51a, C-51b, C-53, C-55, C-60, C-61	C-38, C-39, C-40, C-42, C-45, C-48, C-49, C-50, C-52, C-54, C-56, C-57, C-58, C-59

Table 2. ***Level of the firmness of each measure***

Vulnerable road users

Certain measures are especially beneficial for vulnerable road users. We can distinguish between disabled (especially those with visual or physical disabilities), children, and the elderly. Table 3 shows this classification.

		Visually disabled	Physically disabled	Children	Elderly
Pedestrians	Infrastructure	P-05, P-08	P-23	P-13	P-08, P-31
	Non-infrastructure	-	P-29	P-28, P-39, P-41a, P-41b, P-42	-
Cyclists	Infrastructure	-	-	-	-
	Non-infrastructure	-	-	C-45, C-52, C-58	-

Table 3. ***Measures to benefit vulnerable road users.***

A simple subdivision of infrastructural measures

Infrastructural measures can involve road sections, crossings, or other aspects of the infra-structure. Table 4 shows this classification for pedestrians and cyclists.

	Road sections	Junctions (and crossings)	Other
Pedestrians	P-02, P-04, P-06, P-07, P-13, P-32, P-33	P-16, P-17, P-20, P-23, P-25, P-26, P-27, P-30	P-01, P-03, P-05, P-08, P-09, P-10, P-12, P-31
Cyclists	C-01a, C-01b, C-04, C-05, C-06, C-07, C-08, C-10, C-11, C-12, C-13, C-14, C-17a, C-17b, C-18	C-19, C-20, C-21, C-22, C-23, C-24, C-25, C-26, C-27, C-28, C-29, C-30, C-31, C-32	C-02, C-09, C-10, C-33a, C-33b, C-34a, C-34b, C-36, C-38

Table 4. ***Infrastructural measures classified according to location and other factors.***

Detailed subdivision of infrastructural measures

Most infrastructural measures are aimed at diminishing the negative effects of conflicts between pedestrians and motorised traffic, or cyclists and motorised traffic. They accomplish their goals either by separating the different types of road users, or by reducing their differences in speeds. This can either reduce the travel time for cyclists and pedestrians (because of less physical hindrance resulting in higher speed and/or less waiting time) or can contribute to safety and comfort.

The measures can involve a whole network, a route (a string of road sections and junctions), or only one road section or junction. The measure can also be classified according to the most important characteristics for cyclists and pedestrians. Quick refers to minimising travel time for cyclists and pedestrians; Safe refers to minimising accident risk; and Comfortable refers to maximising the physical or mental well-being of cyclists and pedestrians.

This classification is three-dimensional and can be conceived of as illustrated in table 5. This classification involves no mutually exclusive characteristics; a single measure may increase both made in a route. To emphasise the most important characteristics of each measure, however, we have placed each measure in a single box in table 5. safety and comfort. An improvement made to a junction can also be part of the improvement.

			Kind of location where measure will be taken		
Bicycle-car or pedestrian-car conflicts	Most important characteristic of the measure		Network	Route	Road section or junction
Physical or visual separation of bicycle-car or pedestrian-car	Quick	Cyc.		C-02	C-04, C-08, C-21, C-23, C-31
		Ped.			P-15, P-19, P-21, P-22, P-30
	Safe	Cyc.			C-06, C-07, C-10, C-11, C-14, C-18, C-19, C-20, C-22, C-24, C-25, C-27, C-28, C-29, C-30, C-32
		Ped.			P-01, P-03, P-04, P-06, P-07, P-10, P-12, P-13, P-16
	Comfortable	Cyc.			C-12, C-13
Small differences in speeds between bicycle-car or pedestrian-car	Quick	Cyc.			C-01a, C-01b, C-17a, C-17b
	Safe	Cyc.		C-16	C-05, C-09, C-26
		Ped.			P-02, P-14, P-17, P-25, P-27, P-32
	Comfortable	-			

Table 5. ***Infrastructural measures*.**

Simple subdivision of non-infrastructural measures

Table 6 classifies non-infrastructural measures as follows: rules and regulations, fiscal and financial measures, administrative organisation, information, increasing awareness, measures for public transport, education, signalling and signs, detection systems, and reducing car trips.

Measures	Pedestrians	Cyclists
Rules and regulations	P-36	C-01a, C-01b, C-17a, C-17b, C-19, C- 31
Fiscal and financial measures	-	-
Policy or implementation plan	P-35, P- 36, P- 37a, P-37b	C-41, C-43, C-44
Administrative organisation	-	C-54, C-55, C-57, C-60, C-61
Information	P-40	C-46, C-49, C-50
Increasing awareness	P-20	C-45, C-48, (C-50), C-51a, C-51b, C-52, C-56
Public transport	P-32, P-33, P-38	C-35, C-37a, C-37b, C-53
Education	P-39, P- 42	C-58
Signalling and signs	P-09, P-14, P-16, P-18, P-19, P-22, P-24	C-03, C-15a, C-15b
Detection systems	P-15, P- 21, P-28, P-29	C-21, C-23
Reducing car trips	P-11	C-39, C-40, C-42, C-59

Table 6. ***Various kinds of non-infrastructural pedestrian and cyclist measures*.**

Detailed subdivision of non-infrastructural measures

Non-infrastructural measures can involve part or all of a municipality, a location or area, or be directed towards a target group. The intent of the measure can be to affect transport policy in general or to encourage cycling and walking in particular. It can involve technical facilities or other facilities. It can involve providing education and information. And, it can be about organisational measures.

These categories have a two-dimensional structure and are not mutually exclusive, as illustrated in table 7.

		Transport policy	Bicycle/ Pedestrian policy	Technical facilities	Other facilities	Education and public information	Organisation
General (part or all of a municipality)	Cyc.	C-35, C-37a, C-37b, C-50, C-53	C-01a, C- 01b, C-17a, C-17b, C-19, C-31, C-43, C-54, C-60	C-33a, C-33b, C-34a, C-34b, C-36, C-38, C-40, C-42	C-03, C-15a, C-15b, C-44, C-55, C-61	C-46, C-49, C-51a, C-51b	C-57
	Ped.	P-35, P-36	P-37a, P-37b	P-20, P-38	P-09	P-40	
Aimed at a location or one area	Cyc.			C-21, C-23			
	Ped.			P-11	P-14		
Aimed at a target group	Cyc.	C-41, C-56		C-39		C-45, C-48, C-52, C-58	C-59
	Ped.			P-28, P-29, P-33	P-05, P-08, P-31, P-41a, P-41b	P-39, P-42	

Table 7. ***Non-infrastructural measures*.**

Classification according to the effect of a measure intended for cyclists on pedestrians, and vice versa

In daily practice, measures are often taken for one type of road user, e.g. a pedestrian precinct for pedestrians. Each measure has its direct and indirect effects. And both types of effects can be positive and negative. So in case of a pedestrian precinct, the positive direct effect is a better environment for pedestrians. But the negative direct effect is that cyclists and other road users have to make detours. A positive indirect effect can be that shopkeepers will get more customers.

All measures for cyclists have been scanned on the direct positive and negative effects on pedestrians; the effect can also be neutral, see table 8. In the same way, this scanning has been done for the effects of measures for pedestrians on cyclists (table 9).

	Effect of the cyclist measures on walking		
	Positive	Neutral	Negative
Measure for cyclists	C-04, C-08, C-09, C-10, C-16, C-20, C-26, C-48, C-50, C-51a, C-51b	C-02, C-03, C-05, C-06, C-07, C-11, C-12, C-15a, C-15b, C-17a, C-17b, C-18, C-21, C-22, C-23, C-24, C-25, C-27, C-28, C-29, C-30, C-32, C-33a, C-33b, C-34a, C-34b, C-35, C-36, C-37a, C-37b, C-38, C-39, C-40, C-41, C-42, C-43, C-44, C-46, C-49, C-52, C-54, C-55, C-56, C-57, C-58, C-60, C-61	C-01a, C-01b, C-13, C-14, C-19, C-31, C-45, C-53, C-59

Table 8. ***Effect of a measure meant for cyclists on pedestrians***

	Effect of pedestrian measures on cycling		
	Positive	Neutral	Negative
Measure for pedestrians	P-14, P-34, P-36	P-01, P-02, P-03, P-04, P-05, P-06, P-08, P-09, P-10, P-11, P-15, P-16, P-17, P-18, P-19, P-20, P-21, P-22, P-23, P-24, P-25, P-26, P-28, P-29, P-30, P-31, P-32, P-33, P-35, P-37a, P-37b, P-38, P-39, P-41, P-41b, P-42	P-07, P-12, P-13, P-27

Table 9. ***Effect of a measure meant for pedestrians on cyclists***

Classification according to both current density of facilities for cyclists/ pedestrians and current modal split

Municipalities and regions differ in the degree to which they provide good facilities for pedestrians and cyclists. They also differ in the number of trips made by cycling and walking. Both considerations are important when choosing measures.

If neither policy nor facilities yet exist, a start can be made with elementary measures such as the construction of footpaths.

If an intensive policy or a high density of facilities already exists, and the percentage of cycling or walking is high, somewhat more advanced measures can be contemplated to improve the situation even more. In this case, such measures can be considered as detectors for pedestrians. We assume that the degree of density of facilities is proportional to the share of cycling or walking in the modal split (see Annex 1: ‘Comparison of cities with different shares of walking and cycling’).

We have illustrated this assumption in table 10. The share in modal split is on the horizontal axis and the density of facilities on the vertical axis. Three areas have been distinguished in this table:

- area 1 with low density of facilities and small share of cycling or walking
- area 2 with medium density of facilities and medium share of cycling or walking

- area 3 with high density of facilities and large share of cycling or walking.

Example: Barcelona has many facilities for pedestrians and a high degree of walking, so this city is in area 3, but at the same time the number of facilities for cyclists is low as well as the degree of cycling (area 1).

For each area we have selected a package of measures for cyclists and pedestrians:

Cyclists:

Area 1: C-01a, C-01b, C-12, C-13, C-15a, C-15b, C-33b, C-34b, C-43, C-45, C-46, C-50, C-51a, C-51b, C-58

Area 2: C-01a, C-01b, C-04, C-05, C-06, C-09, C-11, C-12, C-14, C-15a, C-15b, C-16,
C-17a, C-17b, C-18, C-20, C-26, C-29, C-33a, C-34a, C-34b, C-35, C-36, C-37b, C-39, C-40, C-41, C-42, C-44, C-45, C-46, C-48, C-49, C-51a, C-51b, C-52, C-53, C-54, C-55, C-56, C-57, C-58, C-61

Area 3: C-01a, C-01b, C-02, C-04, C-05, C-06, C-07, C-08, C-09, C-10, C-11, C-14, C-16, C-17a, C-17b, C-18, C-19, C-20, C-21, C-22, C-23, C-24, C-25, C-26, C-27, C-28, C-29, C-30, C-31, C-32, C-33a, C-34a, C-35, C-36, C-37a, C-37b, C-38, C-39, C-40, C-41, C-42, C-44, C-48, C-49, C-52, C-53, C-54, C-55, C-56, C-59, C-60, C-61

A measure can belong to more than one area.

Pedestrians:

Area 1: P-03, P-06, P-10, P-14, P-37a

Area 2: P-01, P-02, P-04, P-07, P-09, P-10, P-13, P-14, P-17, P-18, P-19, P-20, P-23, P-26, P-27, P-33, P-34, P-35, P-36, P-37a, P-37b

Area 3: P-02, P-04, P-05, P-08, P-09, P-11, P-12, P-13, P-15, P-17, P-19, P-20, P-21, P-23, P-24, P-25, P-26, P-27, P-28, P-29, P-30, P-31, P-32, P-34, P-35, P-36, P-37b, P-38, P-39, P-40, P-41a, P-41b, P-42

A measure can belong to more than one area.

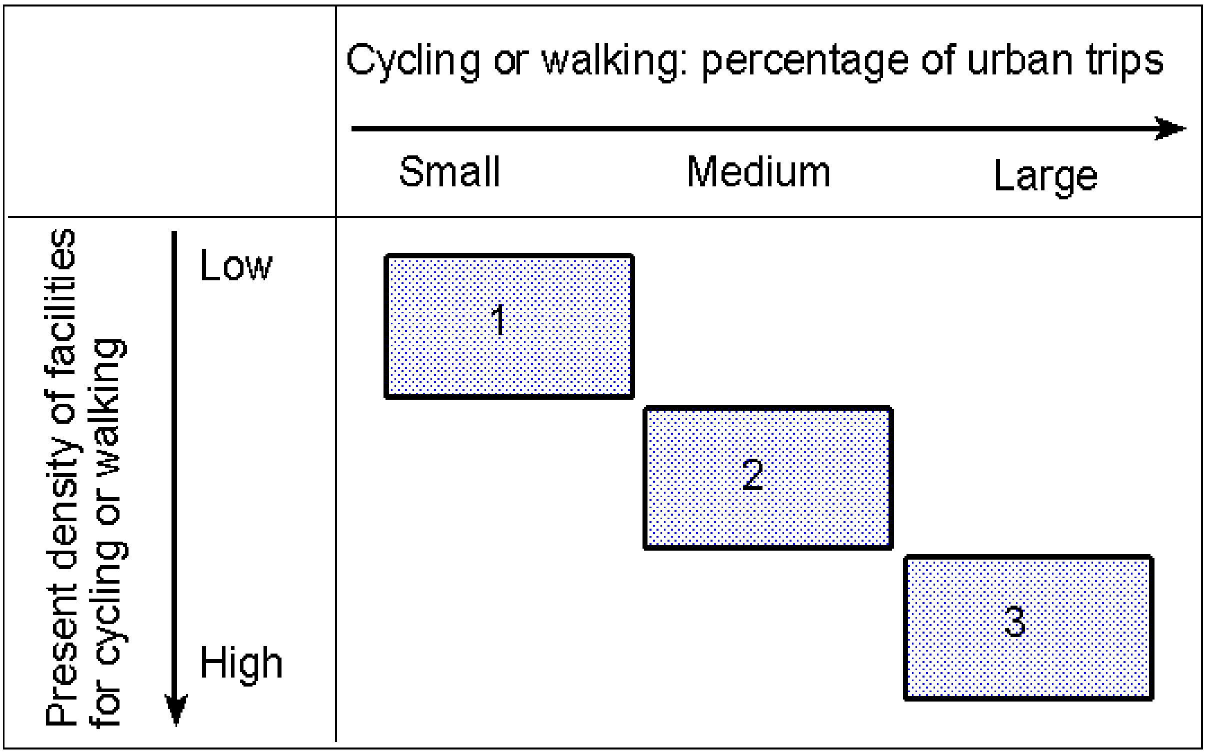

Table 10. ***Choosing a package of measures*.**

5. Catalogue of good practice to promote *walking*

Facilities for moving along road sections

P-1 Bollards on the pavement

Place: Barcelona (Spain) **Year of implementation:** 1991

Description

These elements are installed to preserve pedestrian zones from the invasion of vehicles. They prevent vehicles (especially commercial ones) from partly parking on this zones and improve pedestrians' mobility. The physical impossibility to occupy this space is the most effective measure in this fight for pedestrians' space.

The most common problem is the one caused by delivery vehicles: since they only stay for a few minutes, they do not consider the fact of occupying pedestrians' space as being a serious problem.

Dimensions

In the catalogue of elements of the Council of Barcelona, there are up to 5 different models of bollards. Dimensions vary from 270 to 310 mm of diameter and from 670 to 890 mm high.

Different aspects for pedestrians

Positive

Greater comfort and safety in displacements on foot, since vehicles hindering passage and being able to cause damage to the most fragile road users are cleaned off from pedestrian zones. Continuity is provided to displacements without the need that pedestrians go off the sidewalk to avoid an obstacle on it.

Bollards on the pedestrian pavement, Barcelona

Negative

A negative aspect is the occupation of the pedestrian space with fix elements. That is the reason why it is so important to calibrate the need of their installation. It is important not to use them indiscriminately, but only when its installation causes less discomfort than the real occupation of vehicles on this space.

Another negative aspect is the problem it yields to visually disabled people. Because of that, the colour should be as contrasting to the paving stones as possible.

Different aspects for non-pedestrians

Positive

It also supposes an improvement on fluidity for the rest of the vehicles. Badly parked vehicles are a nuisance for wheeled circulation since they occupy a part of the road.

Other comments

Initial reactions about this sort of measures are usually negative on the part of distributors and dealers, but once they assume them, they are commonly accepted as an improvement for all road users.

When these measures are implanted in eminently commercial areas, it is convenient to provide a space for loading-unloading to make delivery easy in the area.

Difficulties to walk

Cost of the measure

Models of Bollards:

Reference: *Ciutat Vella*: 108 ECU/u
Reference: *Via Julia*: 77 ECU/u
Reference: *Barcelona*: 66 ECU/u

Supplier: Fundición Colomer, SA. C. Altimira, 5-7, Pol. Ind. Santiga
08210 Barberà del Vallès (Spain). Tel. +34 3 719 08 52 Fax. +34 3 718 78 88

Contact person

- Municipality of Barcelona. Mr. Julio García. Tel: +34 3 402 34 05. Fax: +34 3 402 34 18

P-2 Elimination of pavements in streets with limited car traffic

Place: Brugge (Belgium) **Year of implementation:** 1980's

Description

The city of Brugge eliminates footpaths systematically in inner city streets with low traffic intensity. The main condition is a traffic intensity of less than a hundred vehicles per hour.

In other cases the height of the footpath is lowered over the full length to facilitate the access of all crossing pedestrians, and especially for wheel chair users.

Mechelen

Dimensions

Usual surface width before the adaptation in case of elimination of a footpath: footpath 1.20 - 1.40 m, carriageway 2.80 - 3.00 m. Usual surface width of other inner town streets 6 - 10 m

Different aspects for pedestrians

Positive

- No accidents have occurred on the reconstructed streets so far, a sign of good traffic safety
- More space is given to pedestrians, who can use the full street width.

Negative

- Social insecurity might be created since no reserved space for pedestrians is available anymore. However, no complaints have reached us so far.

Cost of the measures

Since, in the city of Brugge, elimination of footpaths is undertaken only in case of a general road reconstruction, no specific cost is required. Lowering of footpaths is usually undertaken in some circumstances. In case of lowering as an action on itself, cost of 20.000 - 30.000 BEF for each lowering is required.

Contact person

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P-3 Environmentally adapted through roads

Place: Denmark **Year of implementation:** 1984

Description

Since the late seventies Environmentally Adapted Through Roads have been established in several towns in Denmark.

The concept of environmentally adapted through roads is a traffic conversion by which a through town highway is changed with a view to the needs of the environment and light traffic.

The reduced width of the carriageway lowers speeds and the granite-set band functions as a waiting zone for left-turning cars. /7, p. 127/.

Traffic safety and a sense of security are improved, the barrier effect reduced, and the visual appearance of the road ameliorated.

The improvements are to be achieved first and foremost by reducing car speeds but also by establishing paths for cyclists, and improving the conditions for crossing pedestrians. The vulnerable road users share of the road area should be increased, and great importance should be attached to the prevention of road accidents.

Environmental adaptation needs that motor traffic is carried through at a somewhat lower standard; first and foremost speed will have to be reduced and secondly motor traffic will be given less space.

Constituent elements relating to road design such as traffic islands and bicycle paths, staggering and narrowing of carriageways, raised carriageway levels and changed road surfaces, but also planting, lighting etc. can be established to reduce speed and/or allocate space. Individual elements can be combined to form design solutions such as pre-warnings, gates, path-crossings, intersections, roundabouts and speed reducing measures.

The path crossing and speed reducers function as intended. /7, p. 134/

.

After the construction of Environmentally Adapted Through Roads in three towns in the 1980´s, the Danish Road Directorate made an analysis in depth of the consequences of those measures through interviews to road-users and inhabitants. /6/; /42/.

Different aspects for pedestrians

Positive

- After the implementation of environmentally adapted through roads, the average speed of motor vehicles has fallen by 18%. This also means that on average it will take 13.5 seconds longer to drive one kilometre through a town. /41/

Speed reduction lowers the barrier effect of the road. /7, p. 25/.

- The amount of injuries is expected to decrease by 45-67%, compared to the expected numbers if there had been no rebuilding. /42/.
- The noise level is expect to fall by 1-2 dB(A). /42/.
- In general terms, the number of vulnerable road users along main roads increased markedly.
- Interviews in the three cities showed that the proportion of pedestrians and cyclists feeling unsafe has fallen, e.g. in the town of Skaerbaek, the proportion of unsafe pedestrians has fallen from 43% to 14%, and the number of insecure cyclists is down from 56% to 17%. Concurrent with this, a very large proportion of the questionnaire respondents expressed that they feel safer on the main road now than before the conversion, especially when cycling. /6/.
- In one of the cities, the number of people using the street area doubled after the reconstruction, which can be taken to mean that the rebuilding makes the street area more attractive for vulnerable road users. /42/.
- Questionnaires in three of the cities showed that, in general, the inhabitants are satisfied with the rebuilding. They believe that the appearance of the town has improved, the number of cars and their speed is more acceptable and that it is safer to walk around. /42/.

Different aspects for non-pedestrians

Negative

Motor vehicles have to reduce their speed through the town because of the measures. On average, the delay is 13.5 seconds per kilometre driven through the town. /41/. A study carried out before and after the implementation of these measures in three of the cities showed that the amount of single accidents increased, mainly implying collision accidents with refuges, signs and signal posts. Several of these accidents happened at night and were caused by too high speeds and sometimes also alcohol. /42/.

Other comments

Since the late 1970's, environmentally Adapted Through Roads have been implemented in more than 28 towns in Denmark. A report by the Danish Road Directorate from 1996 /42/ showed that it would be a good idea to establish environmentally adapted through roads in ca. 200 more villages. The total price for the rebuilding would be app. 206,000,000 ECU but it would reduce the amount of injuries by approx. 200 per year. Furthermore, the amount of noise polluted homes in these towns would be reduced by approx. 40%.

To ensure that solutions satisfy local wishes as much as possible, municipality, local groups and inhabitants are being involved in the planning process. After finishing the rebuilding, inhabitants and road users are informed how to use the different measures in a correct way.

Cost of the measures

The cost is approx. 550,000 ECU per kilometre of reconstructed road. /42/.

Contact person

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P-4 Extension of pavement or playground

Place: Amsterdam (Netherlands) **Year of implementation:** 1992

Description

Pre-schoolers need room to play outdoors. When no playgrounds close to home are available, simple provisions are possible. Part of the pavement can be changed to a simple playground, with equipment to play on and benches, since benches stimulate supervision.

Playground in Amsterdam

Other safety measures are:

- a fence with vertical bars to prevent climbing
- extension of the pavement to increase distance to traffic
- rubber paving stones under the equipment

This kind of provisions are also found at nurseries and schools without playgrounds.

Different aspects for pedestrians

Positive

- Playgrounds offer the opportunity for social, emotional, cognitive and physical development. Densely built neighbourhoods offer few opportunities for outdoor play. Making use of the pavement can be a solution.
- Pre-schoolers need supervision. This simple playground is close to home. Grown-ups can use the benches.
- Safe design is guaranteed.

Extension of pavement

Contact person

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P-5 Guiding lines for blind pedestrians

Place: Brugge (Belgium) **Year of implementation:** Several

Description

Both wheel chair users and blind people get special attention from the city. Especially a major school for blind people in the inner town brings an important flow of blind pedestrians on some streets.

When inner town streets are reconstructed, no difference of level is provided between the pavement and the car lane. This improves the accessibility for wheel chair users, but worsens the situation for the blind, who use to follow the border of the pavement with their stick. In order to resolve this problem, a guidance line will systematically be integrated in the pavement. In front of major road crossing, flexible tiles are put in the pavement in order to warn the blind of the crossing.

Different aspects for pedestrians

Positive

- When there is no difference of level between the pavement and the general traffic lane within the road surface, leaving the pavement is easier for all pedestrians
- The cost-effectiveness is high.

Brugge

Negative

- The lack of any difference of level is a disadvantage for blind pedestrians who tend to follow the border of the pavement with their sticks. This problem is solved by guiding lines (different profile) on the pavement.
- The lack of any difference of level facilitates the incorrect use as a parking space by car drivers.

Other comments

Some pedestrians say the pavement is too slippery.

Contact person

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P-6 Pavements and paths

Place: Copenhagen (Denmark) **Year of implementation:** Several

Description

The city of Copenhagen has a very extensive network of pedestrian pavements and paths in parks. Pavements are to be found alongside virtually every street and - except for a few special cases - alongside both sides of the street. Pavements are 2.5 metres wide, when street narrowness does not make it impossible.

In relation to this, road standards (recommendations in Urban Traffic Areas, part 0) state that in streets where pedestrian traffic is expected, pavements should be provided, except for streets which are play-areas (woonerfs) or other local streets with only insignificant and slowly moving car traffic.

Road Standards (recommendations in Urban Traffic Areas, part 3) mention widths of 1.5 m minimum, and 1.0 m absolute minimum, when passing singular hindrance (stairs to buildings, light or signal poles, bicycle stands). If pavements are on a common level for bicycles and pedestrians, the pedestrian part can be as narrow as 1.0 m (normal 1.3 m), but only when very few pedestrians and cyclists use it. A normal pavement is 2.5 m, which is also a practical minimum width alongside shop frontages.

The longitudinal gradient should be less than 5%, and the cross sectional gradient for water run-off less than 2.5%. The maximum difference of level at shop entrance should be 3.5 cm, and likewise for curb height at crossings used by pedestrians. The evenness criterion normally used is 2.5 cm (an inch), so that flagstones or stone-sets have to show protuberances of this magnitude to get a liability claim acknowledged in the case of a pedestrian falling.

Median divider on Oesterbrogade

Paths in parks will follow the same width guidelines, but will much more often be made with a gravel covering. Cycling is normally not allowed on them.

Median pavement

Apart from pavements at the sides of the road, there are also some other important parts of the pedestrian network, such as side verges between carriageways and cycle tracks and a wide median divider, made suitable for pedestrians. Whereas verges and dividers are often made deliberately inaccessible on country roads and arteries by fences, guide rails, big “stumbling stones” etc., in urban streets they may constitute very valuable “stepping stones” on an otherwise very wide and confusing crossing.

The city of Copenhagen introduced the first median, longitudinal, pedestrian pavement on the Oesterbrogade in 1976, in conjunction with a major traffic calming project in 1971-1977. The Oesterbrogade, a major artery and shopping street, was 6 lanes wide from cycle track curb to cycle track curb, with parking on both sides and heavy traffic. Without any clear lane markings, the extremely wide carriageway was very difficult to cross, even with a zebra crossing. Two pedestrian underpasses had already been introduced, but with very limited success. The new median divider with stone-sets covering 2 m wide has met all expectations and reduced the number of accidents in pedestrian crossings. Therefore, this new feature has received official recognition and found its way into many traffic calming schemes, especially those called: “Environmentally Adapted Through Road” .

Road Standards (recommendations in Urban Traffic Areas, part 3) say: On roads with medium (50-60 km/h) and low (30-40 km/h) speed regimes, a longitudinal pavement of 2 m width (both normal and minimum width) may be introduced. If there is both a cycle track and curb parking, there should also be a verge of 0.8-1.0 m between them, in order both to form a stepping point for pedestrians starting or ending a longer crossing, and to prevent cyclists from colliding with car doors.

Finally, on streets of high (70-80 km/h) speed regime it is also possible to have a median divider, but this is not made for pedestrians, and should not encourage them to cross. If it does, drivers will probably have to lower the speed.

You may walk along the median pavement (e.g. to find a better place or time to finalise crossing manoeuvre), but this pavement is not a mandatory facility. (Road Traffic Act).

Different aspects for pedestrians

Positive

Organisations for the blind and partially sighted people are very content with the typical and traditional pedestrian pavement in Copenhagen (two lines of concrete flagstones, with one line of stone-sets in between), because it is comparatively easy to use as a pavement with guiding-line.

Other comments

According to the Road Act, roads and streets are divided into private and public. One of the differences is that, whereas property owners are responsible for cleaning pavements in both cases, the municipality (or county, or state on higher class roads) has to maintain and repair the road on public ones.

Cleaning is understood as the removal of dead leaves, ice, snow and all other types of dirt on the pavement. A liability will rest with the one responsible for the cleaning or the one responsible for the maintenance, most often in cases when someone has fallen because of ice, snow or unevenness. For unevenness, a limit of an inch (2.5 cm) is mentioned, but for a compensation to be paid it is also of importance to know whether any negligence has been shown by the party responsible for the maintenance. No one can be held responsible for a very recent deformation of the pavement (e.g. made by a delivery lorry), the existence of which one cannot be supposed to know in time.

The city of Copenhagen uses a system of regular monitoring of the quality of surfaces and cleaning. Both for its own surfaces and “to control the control” of those which are the responsibility of private property owners.

In Mechelen (Belgium), a city regulation imposes the same minimum width for pavements as in Copenhagen (2.5 m). In case of reconstruction of the roads, this standard is taken into account. Objects on the pavement, such as terraces, shop booths, etc. have to respect this minimum space for pedestrians.

Contact person

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  Fax: +45 33 66 71 03

P-7 Pedestrian precinct improvement

Place: Aarhus (Denmark) **Year of implementation:** 1996

Description

An important element in the planning of the pedestrian precinct in the city of Aarhus is the decision to reopen a stretch of the rivulet Aarhus, thereby reverting an earlier planning, which closed the river with concrete walls and a cover and used the space as a major street break-through.

Aarhus, the second largest Danish city, with 280,000 inhabitants, is sometimes called "the smallest metropolis in the world" with characteristic local pride and modesty. The central area plan, issued in 1994, has, among other items, an ambitious scheme to reopen the whole inner-town section of the river.

As a test of this idea, a section of approx. 130 metres at the core of the pedestrian district was opened in 1995. It met with tremendous acclaim from the citizens, quickly establishing itself as the most popular and most recreational locality in the large net of pedestrian streets.

This confirms the basic idea that the stream of water and its historical implications as the origin - as an important ford - of the city development in the middle ages, indeed constitutes a major asset, although the framework of the now uncovered stream are necessarily new, and very technical, concrete retaining walls.

The newly opened section has been appropriately named after the original ford: "Vadestedet" ("the place to wade"). An allusion to the name is found in the name of the street leading to the ford from the North: Immervad.

In the 1930's, the smell from the river and the increasing traffic demand led to a covering of the river, right from its entry into the central city at Christiansgade, to its outlet into the harbour nearly 1 km further downstream.

Aarhus Aa (Aarhus river) where it is still covered

The new wide street, The River Boulevard (Aaboulevarden), did get an important function as thoroughfare from the harbour to the West, as inner town distributor and as a parking avenue.

With the progressing inner town traffic calming and the growth in environmental awareness, a rising demand was voiced to see the familiar - and now much cleaner - water again.

At the time of the reopening of the river, the two main squares, the Little Square and the Great Square, were also pedestrianized, and thus together with the above mentioned street Immervad, and the closure of the Aaboulevarden, a very large part of the car traffic circulation system was dismantled, confirming the decision in the city council to follow the advanced new inner-city traffic plan.

Different aspects for pedestrians

Positive

The slowly moving water surface constitutes in itself, as known in all historical cities, a recreational focus point of great significance, and still greater when the open stream can be followed one day over the whole length.

The decision to expand the pedestrian precinct to such a big surface - with only very limited car traffic - secures a near-silent, pedestrian (and cycling) environment of a quite different character than ordinary noisy and smelly busy centre streets. Here one can talk, watch open-air theatre and listen to music, let children run nearly freely etc.

Altogether, a large increase in walking is to be expected.

Aarhus River where it is reopened

Different aspects for non-pedestrians

Negative

Through traffic and goods traffic are somewhat impeded by the Aaboulevarden having been taking out of the street network.

Cost of the measures

Price of the opening-up of the present section of the river: approximately 1.5 million ECU.

Contact person

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  Tel: +45 89 40 44 01. Fax: +45 89 40 44 40

P-8 Routes for disabled people

Place: Fredericia and Copenhagen (Denmark) **Year of implementation:** Fredericia 1989-92
Copenhagen 1993-94

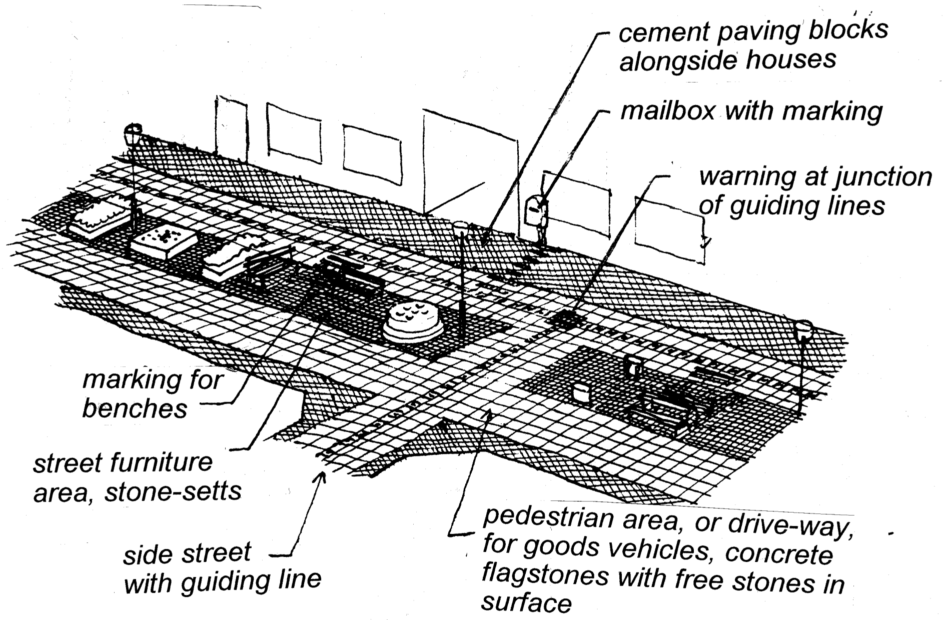
Description

All Danish cities are gradually improving the accessibility for disabled people to important buildings and terminals, to roads and paths, and to public transport. The Danish Parliament issued a statement concerning the mobility and the integration of disabled people in general social life, and various guidelines were issued. /3/; /8/; /10/.

Fredericia
The city of Fredericia (47,000 inhabitants) constructed a special route for disabled people, primarily for the needs of disabled people's mobility (wheelchair users, and people walking with some difficulty), blind, and partially sighted, thereby increasing accessibility and comfort for all pedestrians. The project in Fredericia was termed "The Route For Everybody" and it was managed and monitored by the municipality, by the Danish Road Directorate and by a consultant, in the years 1989-1992, as reported in /8/.

The basic objectives of the pedestrian route are to provide all pedestrians with roomy (cross section, sufficient clear width), even (evenness of surface, no high curbs) and direct connections to important destinations. This being obtained, a couple of key connections were also provided with a median guiding-line, to enable partially-sighted people and blind people to follow the route.

The outstanding feature is thus the guiding-line, whose length in all is approximately 6.5 km. The line constitutes the median of the free cross-section part of the pedestrian pavement, and thereby the less encroached part by shop exhibitions, street furniture, signing and lampposts, trees, etc. At the outset it was a red, broken line, 5 cm wide, and 2 mm in thickness, but after some experience in practice, the line was converted into a line of special concrete pavement blocks each with a small, protruding, rounded, tactile element in the surface.



As special elements along the guiding line, there were set tactile warnings in the shape of rectangles of stone-sets. Rubber tiles were first used for this purpose, but were taken out, as they were too easily deformed.

Pedestrian street, Fredericia

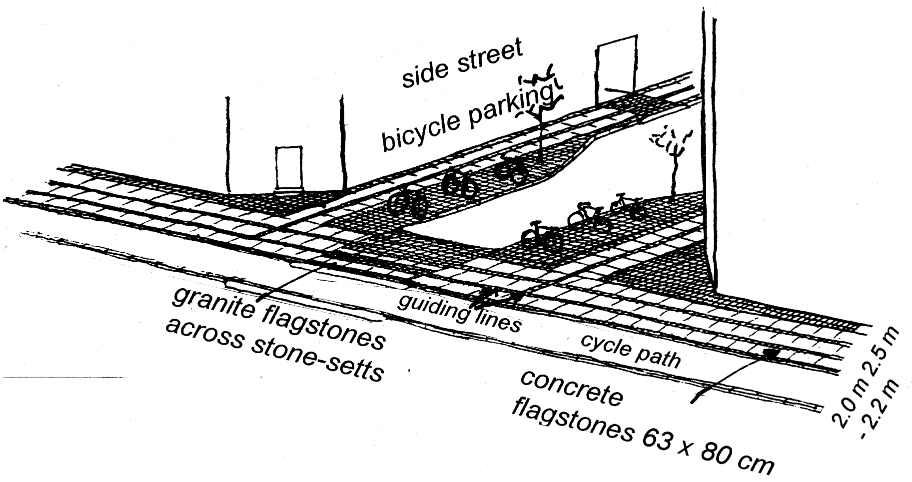
Warning elements are meant to signal side-elements (e.g. mail box, benches, other goals attainable by a deviating course, the roadway crossing ahead, a change in the main route course etc.). Moreover, areas with plants, benches, fountains and flower-pots are marked by having a uniform covering of stone-sets. This divides pedestrian streets with a guiding-line basically into four surface types:

- concrete flagstones with free tactile stones in the top surface, and concrete blocks with a guiding-line element (called *Fredericia stones*): disabled people's route
- same flagstones, no guiding-line: pedestrian route
- areas covered with stone-sets: zones for benches, street furniture and the like.
- asphalt covered: areas for car access, basically.

The construction of the disabled people's route coincides with a major traffic calming project in the central town, also facilitating pedestrian safety and access (e.g. evenness of levels at crossings). Changes in safety because of the combined introduction of route and traffic calming are not known. /33/.

Copenhagen

The city of Copenhagen (480.000 inhabitants) also constructed a route, which takes difficulties for disabled people into account. The project aims at the reconstruction of the major arterial Noerrebrogade, a street which, for a number of years ago, has been successively converted into a shopping street with emphasis on the needs of cyclists, pedestrians and public transport, with diversion of car traffic to parallel arteries.



Route for disabled people on the pavement, Copenhagen

The special point in the Noerrebrogade project (the distance of the route is nearly 3 km), compared to the above mentioned in Fredericia, is that Copenhagen has as a guiding-line a feature already existing: a stone-set line between flagstones, a standard feature of all traditional pedestrian pavements in Denmark. Thus to make it work for blind people, it has to be rearranged or enhance this particular feature, so that it is recognisable.

The elements used are: granite flagstones across stone-sets at side road junctions in continuation of concrete flagstones on pedestrian pavements (mainly for wheelchair users comfort), less cross section gradient and better evenness of surface, in-pavement and on-carriageway ramps at all crossings for pedestrians (leaving only 2 cm of the original curb line height difference), securing continuous guiding-lines, and better junctions with side-road pedestrian pavements.

Bus stop in Noerrebrogade

At bus stops a new arrangement has been introduced, which facilitates the movement from the pedestrian pavement to the bus door, and secures a wide “extra pavement” to step down on or board from. Measures can be seen on the accompanying sketch.

Different aspects for pedestrians

Positive

Fredericia
Questionnaires to local institutions and to recipients of a pensioners’ newspaper and interviews with users gave some ambiguous results. But some key target groups as partially sighted, blind people and wheelchair users, and institutions representing these groups are very content with the new route. Evenness of surfaces and the guiding-line are features getting positive responses. Actual users are content. Some respondents mention more frequent out of-door travelling. /33/.

Negative

Fredericia
A number of blind people refer to difficulties in following the new guiding line. More natural lines as a traditional curb or a border-line to grass or gravel were regarded as more easy. Maybe different features of surfaces and messages along the guiding-line are too complicated. /33/.

Different aspects for non-pedestrians

Positive

Fredericia
75% of the respondents to a shop-keeper questionnaire were positive towards the project “the Route for Everyone”. 10% held the opinion that the route had a positive influence on business. More were for inner-town traffic calming (50%) than against (20%). /33/.

The same tendency, but much less response, was found in a questionnaire to all households along the guiding-line route. Over half of the respondents answered that they were positive to “the Route for Everyone”, while only few were negatively disposed. /33/.

Other comments

User groups, which seem to benefit from the new lay-outs in Fredericia, are smaller than anticipated. Information, time and running-in of new features may give better responses.

Traffic counting in the municipality of Fredericia gives no clear answer to the changes in use of the sections of “the Route for Everybody”, neither disabled people, nor non-disabled, light road users.

Contact people

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  Tel: +45 33 66 33 66. Fax: +45 33 66 71 03

P-9 Direction signing for pedestrians

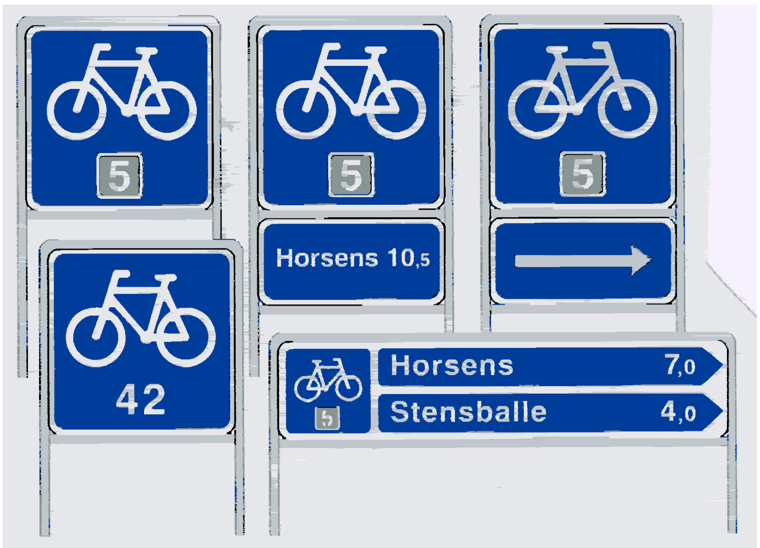
Place: Denmark and Belgium **Year of implementation:** Several

Description

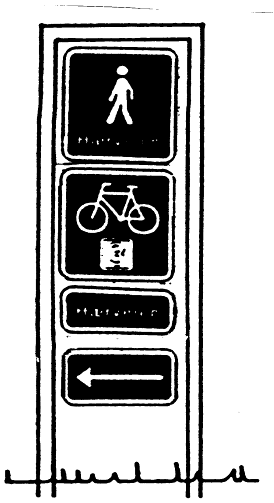
The only official Road Standard system for direction signing addressed to vulnerable road users in Denmark was introduced as a cycle route system. It was meant to include pedestrians but it does not show pedestrian symbols on the signs.

This signing was introduced some years ago for the National Cycle Route System (10 National Routes). The counties introduced them with amazing speed, so that on May 16th 1993, the official inauguration day, 10 routes and their signing were in place, covering 3,300 km.

But there are also pedestrian routes with no cycling allowed. And on some sections, pedestrian and cycle routes follow first the same facility, and then part, because good routes for pedestrians have a more winding alignment, and follow the national landscape closer.

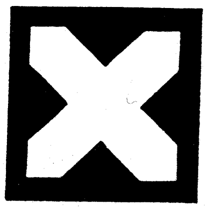


This implies that the pedestrian symbol has to be added to the cycle symbol where both paths are joined, or the wanderer could get lost. Since maybe in the end, both symbols will have to be shown together on the majority of routes, new designs and numbering systems will have to be considered.



Pedestrian and cycle signing throughout part of the long-distance route. Signs are blue with white symbols

There also exists a European system for long distance walkers (wanderers, trekkers or even pilgrims). These routes are very unobtrusive in their marking, showing only small signs on tree trunks etc. like St. Andrew's cross shown here.



St. Andrews cross, the colours are white and black

Another system was introduced in the 1930's in the Greater Copenhagen Area, still existent in Copenhagen parks and surrounding open land. As part of an effort to secure excursion areas and healthy leisure time activities for a growing metropolis, a large network was drawn up, and partly made real in the pre-war years. This lead ultimately to a co-operation between many authorities, who then took up a real regional planning after the war (The Finger Plan 1947).

Signalling for pedestrians is posted in the Kortrijk inner city. The signs are mainly directed towards places of touristic interest, such as monuments, museums, etc.

Kortrijk, Belgium

Contact person

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P-10 Squares and open spaces

Place: Copenhagen (Denmark) **Year of implementation:** Several

Description

The pedestrianization of the medieval streets in Copenhagen limited car traffic to some extent, but squares and open places were still much dominated by parked cars. Since the latest major street pedestrianization (1973), a big effort has been undertaken by the city technical departments, freeing square after square for car parking, relaying the surface (generally from asphalt to flagstones or stone sets) and renewing street furniture. City-wide, almost 25 squares have been converted to pedestrian use, most of these in the inner area (between the ring of lakes and the harbour, being the most interesting of them in the medieval city -ca. 10 squares- some of them very small). At the same time, parking fees and parking surveillance have been largely increased, but no compensatory parking area has been laid out, corresponding to the areas taken away. The highest fees app. 20 DKK per hour (app. 2.8 ECU) in the innermost areas, should provide a financial background for future private enterprises establishing parking garages underground or in parking-houses

Dimensions

Squares are all shapes and sizes. Of approximately 100,000 sq. metres now pedestrianized, squares are app. 60% and streets 40%.

Figures show that pedestrian flow in itself is hardly changing from year to year, but pedestrians in open spaces, recreational activities there, and for instance the number of café chairs, have increased enormously.

Vesterbros Torv (Vesterbros Square), one of the 25 squares converted to pedestrian area, within the last 25 years

Different aspects for pedestrians

Positive

Car-free squares offer pedestrians a number of advantages in safety, comfort, directness, continuity, attractiveness etc.

Negative

As for pedestrian streets, one of the disadvantages is a somehow smaller accessibility to the different modes of transport in general, especially for disabled people. In larger squares, partially sighted pedestrians can experience problems with orientation. On some occasions, a tangible orientation line has been provided (in granite flagstones).

Different aspects for non-pedestrians

Positive

Clearance of squares (of parking metres, curb divisions between parking bays, some lampposts etc.) gives the future use of squares a unique flexibility, offering generally a very good access for cyclists and goods delivery. It also gives room for exhibitions, markets, meetings, performances etc., like the square's or market place's function has always been down through history.

Negative

Car access is more difficult, implying even more problems for goods delivery.

Other comments

The development of Copenhagen pedestrian streets and pedestrianized squares has been followed in considerable detail by a team of architecture researchers, specialising in the design and use of public open space in the city. Over a period of 34 years (1962-1996) they have kept account of sq. metres, number of people and activities. These years have seen a gradual conversion of the medieval town from a major commercial centre with offices and wholesale firms, to a more cultural and historical centre, with many visitors, and much fewer people going to work.

The increasing number of people in squares, standing, sitting, talking and café-ing, is surely a major cultural change, and is regarded by the architects-researchers as a major victory for city life in general.

Enghave Plads (Enghave Square), stone sculpture

Contact person

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Facilities for moving in areas

P-11 Access control for motorised traffic

Place: Barcelona (Spain) and Namur (Belgium) **Year of implementation:** 1992-1996

Description

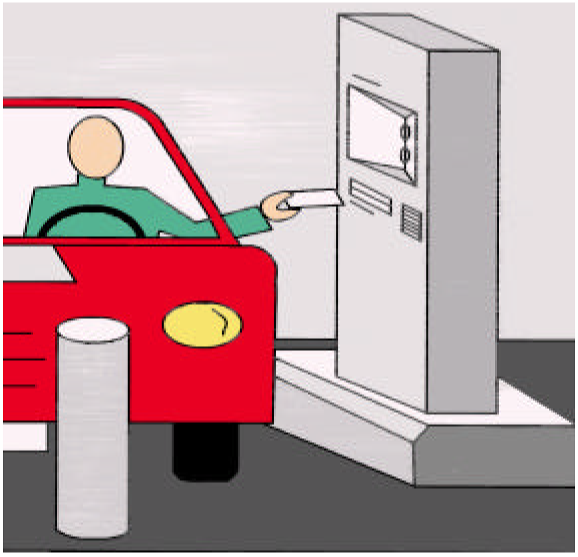
Example from Barcelona (Spain)

The City Council of Barcelona designed a Mobility Plan in Ciutat Vella (the old quarter of the city), which foresees the creation of zones with pedestrian priority to foment natural mobility (on foot, by bicycle...) and progressively limit the access in the quarter of passing-through vehicles during the most conflictive hours. The first zone which came into operation is limited by the following streets: Princesa, Via Laietana and Passeig Isabell II.

The priority zone for pedestrians limits the circulation in this area. Only residents with vehicles registered in the quarter and authorised vehicles are allowed to enter the quarter. During the hours of vehicle regulation, speed will not exceed 10 km/hour and access will be exclusively made through the 2 gates. Some retractable posts, placed in the marked streets, prohibit the entry of non-accredited vehicles.

Signal at the entrance of La Ribera, Barcelona

The way out will be through the places marked in the drawing. Without the need of any card, some sensors installed on the floor will automatically lower the posts, letting any vehicle to abandon the zone. No follow-up study has been made to analyse the consequences (safety, less noise, etc.) of this traffic restriction.



Access control system

Example from Namur (Belgium)

The main shopping area in Namur was recently pedestrianized. Only neighbours can enter the area by car. To avoid the abuse of this exception, the access to the area is secured by poles, posted on every entrance to the quarter. Inhabitants receive a badge with which they can sink the poles temporarily.

The area is opened a few hours daily for goods delivery. On special request, a temporarily authorisation is granted (e.g. for removals).

Until now, the measure has proved to be successful. Only a few abuses have been noticed.

Streets in the area are almost all less than 6 m. wide.

Namur

Different aspects for pedestrians

Positive

- Low speed area which, in theory, should have a positive effect on safety. This has not been proved, as any follow-up study on the project has been carried out.
- Car traffic is reduced to a minimum level and attractivity for pedestrians is significantly increased.

Negative

In the case of Namur, social safety might be lower at night, since no traffic is allowed at night either.

Different aspects for non-pedestrians

Positive

Priority also for cyclists.

Negative

- Restricted access to the zone for cars and other motorised traffic.
- The area can not be used for through traffic.
- Car drivers might be locked up in the area if they enter during the daily opening hours and they want to get out afterwards.

Different aspects for non-pedestrians

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P-12 Extension of pedestrian areas in city centres

Place: Gent (Belgium) **Year of implementation:** Several

Description

The pedestrian area in the city centre of Gent is steadily enlarged. This concerns mainly the shopping area.

Special attention is given to the links between the different pedestrian areas in non-pedestrianized streets, which are often traffic calmed. In these streets, walking routes are considered as a whole.

For the other quarters, traffic liveableness plans are being designed. In 1996, the city budget provided 188 million BEF (about 4,7 million ECU) for pavements. Small piles are introduced in order to keep cars off the pavement.

Many other cities in Belgium steadily extend their pedestrian areas.

Different aspects for pedestrians

Positive

- The extension of the pedestrian area increases both safety and attractiveness for pedestrians in the inner town.
- The fact that pedestrian routes are considered as a whole (including non-pedestrianized streets) is especially increasing the attractiveness of walking in the city centre.

Negative

- Together with the introduction or extension of the pedestrian areas, car pressure moves out towards the immediate surrounding quarters, often more densely populated than the city centre itself.

Different aspects for non-pedestrians

Negative

- As far as cyclists are not allowed into pedestrian areas (which is the case in the city of Gent until now), the extension of pedestrian areas means an increase of trip length for cyclists.

Cost of the measure

The city budget provided for 1996 about 4,7 million ECU for pavements.

Contact person

- City of Gent. Mr. E. Stubbe. Cyclist officer. Tel: +32 9 266 77 60. Fax: +32 9 266 77 99

P-13 Play street

Place: Amsterdam, Born (Netherlands) **Year of implementation:** Several

Description

- Play streets are parts of a street closed for all traffic and equipped as playing areas for children.
- They offer the opportunity to off-street play, and prevent in-street play.
- This is still further promoted by equipment to play on and furniture.
- Furnished with benches, they offer the opportunity for adult supervision.
- Special care is taken to prevent children from dashing out by running or riding (fences).
  Traffic around the ing area is limited in speed by all kind of measures.

Different aspects for pedestrians

Positive

- Good play streets, close to home, keep children away from streets.
- Children feel safe playing under close supervision of parents. Parents also prefer to be able to supervise and call upon their children. /26/.

Play street in Amsterdam

Other comments

In Born (Netherlands) more simple forms of closed streets are found. Streets along schools or playing grounds are closed off at one or two points with removable bollards. Bollards at one point hinder through traffic; at two points all motorised traffic. The municipality starts with an experimental period by placing concrete flower tubs. In the meantime, local residents are consulted to get public support. The final measurement is very cheap: 500 ECU per closing off. Bollards are removable for emergency vehicles.

Play street in Amsterdam: traffic calming measures

Contact person

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P-14 Speed reducing measures for traffic in general

Place: Brugge (Belgium) **Year of implementation:** 1992

Description

Since 1992, the whole inner city of Brugge has been converted into a “zone 30” area. It consists of an area with a diameter of about 2 km, clearly limited by the medieval boundaries. The 30 km/h limit was imposed together with a series of measures to decrease car use and to promote bike and public transport. The introduction was accompanied by an important information campaign.

Many other cities introduced “zone 30”, either in the inner city, either in small residential areas in the surrounding quarters or in the suburbs. The city of Brugge is the only city where the whole inner town has been converted.

Dimensions

Most streets are narrow (less than 9 m from wall to wall), but this is not a general rule.

Different aspects for pedestrians

Positive

Safety is obviously increased for pedestrians, both objectively and subjectively.

Cost effectiveness was very high for the “zone 30” as such, since only traffic signs had to be posted at the gates of the inner city. However, the accompanying measures were more expensive: the city paid for more public transport and did an extended public awareness campaign.

Brugge

Different aspects for non pedestrians

Positive

Safety is increased for cyclists as well, both objectively and subjectively.

Other comments

According to national traffic regulations, introduction of a “zone 30” is only possible if the road layout is adapted. An exception was assumed for the city of Brugge.

Contact person

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Facilities for crossing

P-15 Detection of waiting pedestrians

Place: Heemstede, Heilo (Netherlands) **Year of implementation:** 1991

Description

The function of the detector is to detect a pedestrian waiting at an intersection. This system replaces the push button. At least two kinds of detectors are available: active infrared detectors and detection mats. When the pedestrian is detected, a wait lamp is activated so that the pedestrian knows that the call is set. Sometimes the detector is used to confirm the information from the push button. /23/; /24/.

When the pedestrian leaves the detection zone before the signal turns green, the call is cancelled, and no green follows. Provisions are taken that the detection function stops after a certain time interval, e.g. 4 minutes, so that objects remaining in the detection zone are not longer detected. The detectors can be used at intersections or at mid-block crossings.

This kind of detectors are sometimes combined with detectors for crossing pedestrians. This system is known under the name of Pussycats (France, the Netherlands) or Puffin (UK).

Dimensions

All detectors have their own characteristics. The following are based on experience with the AKD-unit (active infrared detector, Microsense Systems, UK), and the detection mat (ECM, France). A detection board is mounted somewhere between the detector and the controller.

<u>Infrared detector:</u>

- The infrared unit is designed to be mounted on the primary signal head top support bracket (some 3.5 m high) with the sensing aperture facing the footpath to where pedestrians will be standing. When correctly aligned, the zone of detection covers the nominal range of 3 m from the pole along the curb and 0.5 m wide.
- The detection field of this detector is rectangular. It is advisable to indicate this field on the footpath.
- The lens of the AKD detector should be cleaned whenever traffic signal lenses are cleaned, or every six months, whichever is sooner.
- The AKD contains no user serviceable parts.

Microsense detectors

<u>Mat:</u>

- The mat is a ground sensor which detects any weight over 20 kg.
- The length is from 160 to 190 cm and the width, 48 cm. The mat contains 5 or 6 independent sensors.
- To prevent detection of pedestrians who continue walking, a delay can be adjusted e.g. to 1 second.
- To prevent detection of objects remaining on the mat (e.g. a wheel of a car) an inhibition time associated with each sensor can be adjusted.
- The mat asks for a level and smooth foundation.

Different aspects for pedestrians

Positive

When pedestrians understand how the detectors operate, increased comfort can be experienced. No push button is needed.

Many pedestrians arriving on red use a push button, but start crossing before the signal turns green. (15% detected in one investigation). The gained time by cancelled calls can be used to give more frequent or faster pedestrian phases.

Pedestrian detector mat in Heemstede

Different aspects for non pedestrians

Positive

Drivers and riders are not confronted with an empty crossing while waiting for red. When no pedestrians are present, calls are cancelled.

Cost of the measure

The price of the infrared detector is about 500 ECU. Installation costs: about 4 hours when new traffic lights are being installed. The detector mat costs about 1250 ECU. Installation takes more time, even if it is part of a reconstruction.

Contact person

Infrared detectors:

- City of Amersfoort. Nettenbouw bv. P.O. Box 725, 3800 AS Amersfoort, The Netherlands. Tel:. +31 334502211. Fax: +31 4559812
- City of Haarlem. Nederland Haarlem bv. P.O. Box 665, 2003 RR Haarlem, The Netherlands. Tel: +31 235189191. Fax: +31 235324303
- City of Alkmaar. Ko Hartog. P.O. Box 2004, 1801 EA Alkmaar, The Netherlands. Tel: +31 725333310. Fax: +31 725337064
- Microsense Systems Limited. Fleming House, Fleming Close, Segensworth, Fareham, Hampshire. P.O. Box 15 5SB, UK. Tel: +44 489589022. Fax: +44 489575616

Detection mats:

- Traffic 2000. 3 The Quadrant, Richmond, Surrey TW9 1BP, England. Tel: +44 819486736. Fax: +44 813320813
- Electronique Control Mesure (ECM), 4 Rue du Bois Chêne-le-Loup. 54500 Vandoevre-les-Nancy. France. Tel: +33 83442413. Fax: +33 83443797

P-16 Pedestrian and signalised intersections

Place: Denmark **Year of implementation:** Unknown

Description

Signalling should be provided in any intersection, but especially in large ones. When signalling pedestrian crossings, pedestrians should not be given less than 6 seconds of green time, regardless of the size of the intersection (regarding comfort, pedestrian's green time should not be less than 8-10 sec). For calculations of green time, the Danish road standards for signals recommend to take into account a speed for pedestrians of 1.5 m/s.

Signalised pedestrian crossings in Denmark are generally marked as zebra crossings.

1) Early green for pedestrians

Pedestrian traffic lights are basically used to give pedestrians leading green. Leading green implies that pedestrians get the green light before vehicles, and thereby reach the intersection *before* vehicles get their green light. The idea behind giving pedestrians leading green is to increase pedestrians' visibility, especially for right turning vehicles, when both start after a red light.

Signalised intersection with early green for pedestrians

This measure is intended to reduce the number of accidents between pedestrians and vehicles turning right, which occur when the parties start after having been stopped at a red light

2) Detected pedestrian crossings with and without acoustic signals

In vehicle actuated intersections, the arrival of vehicles in the various incoming lanes controls the duration of the green light signal. Traffic control is used especially in places where the arrival distribution of traffic is random, i.e. in places where there are no other traffic signals nearby that send vehicles in groups to the intersection in question. The advantage of vehicle actuated signals is that green time is always adapted to the current need. In principle, this ensures that road users will not get a red light unless there is traffic in the crosswise direction. Denmark has ca. 2700 signal installations, 1500 of which are vehicle actuated. /20/.

Vehicle actuation of traffic signals by cars takes place using detectors drilled into the asphalt or placed in the road before it is furnished with hard covering. Bicycles can be detected either by detectors similar to those used for cars, or similar to pedestrians' (manually by push button). The problem for pedestrians in traffic controlled intersections is that they are detected manually by a push button. If pedestrians are not attentive to the fact that the intersection is traffic actuated and that pedestrians themselves have to indicate their arrival by pressing a push button, unnecessary waiting time can arise, and pedestrians can become so impatient that they cross at a red light.

The pedestrian detector consists of a push button placed on the pedestrian signal post, and a lamp that turns on when the signal is operated. As an extra measure for vision-impaired people, the so called acoustic signals can be established so that blind people can hear when the signal changes and thereby can know when they have a green light. Acoustic signals are especially important in detected intersections, since pedestrians cannot always be sure that the pedestrian signal is synchronised with the vehicle actuated signal. To ensure that acoustic signals do not bother the surroundings, their sound levels can be automatically adjusted to fit background noise.

3) Divided pedestrian phases
In signalised crossings with a traffic refuge, pedestrian phases can either be identical for the whole crossing, or one can vary pedestrians green and red phase in the two carriageways. The purpose of this measure is to give green light to pedestrians for as long as possible, and thereby decrease possible waiting times. To highlight that the pedestrian crossing consists of two independent crossings with their own regulation, crossing over half of the carriage way, where cars leave the intersection, can be pulled back from the intersection, approximately 3-5 m.

Different aspects for pedestrians

Positive

1) The idea behind leading green is to increase pedestrians' visibility, especially for right turning vehicles, when both start after stopping at a red light. Leading green gives pedestrians waiting in the intersection the opportunity to cross it right turning vehicles at the beginning of the green light period.

There are no Danish studies on the effect of leading green for pedestrians. It is possible that leading green reduces the number of accidents involving right turning vehicles and pedestrians at the beginning of the green light period.

3) In general terms, divided signal phases in general reduce the percentage of pedestrians crossing on red by 10%.

A Danish study showed that it cannot be decided for sure whether dividing pedestrian phases reduces or increases the number of accidents.

Traffic refuges give pedestrians the possibility to cross the carriageway in two or more stages.

Little or no staggering of the pedestrian signal phases in divided crossings reduces the risk of pedestrians mistaking the signals. /34/.

Negative

1) Pedestrians arriving during the green phase are not better off with leading green.

2) Pedestrians often get a longer waiting time in traffic actuated intersections because they have to indicate their arrival by pressing a push button. Not all pedestrians notice the push button upon arrival, and therefore, their waiting time is increased. A case study showed that 80% of pedestrians actuated the push button directly upon arrival, while the remaining 20% waited an average of 13 seconds after arriving, before they discovered the detecting button. /19/.

3) The displacement of pedestrian phases can be confusing to pedestrians. 16% of pedestrian accidents are caused by pedestrians mistaking the signals at divided pedestrian phases. /34/.

The presence of traffic refuges increases the number of pedestrians crossing on red. /34/.

General
A study showed that pedestrians are more careful in intersections without traffic signals, than they are in signalised intersections. This suggests that pedestrians often walk blindly in signalised crossings without being attentive to surrounding traffic. /34/.

Different aspects for non-pedestrians

Positive

Pedestrian zebra crossings indicate clearly to vehicles which area of the street pedestrians are expected to cross.

1) Leading green increases the attentiveness towards pedestrians of right turning car drivers.

Especially in intersections where there are problems with overview, leading green can contribute to making visible the pedestrians who start at a red light.

2) Traffic actuated systems minimise the waiting time especially for cars.

Negative

In Germany, zebra crossings are only used in non-signalised intersections. The reason is that zebra markings indicate that vehicles have to give way to crossing pedestrians. In signalised intersections, traffic is only controlled by signals. Germans found out that zebra markings can confuse vehicle drivers, and therefor their signalised pedestrian areas are marked with two narrow broken white lines.

1) Leading green for pedestrians decreases the capacity of the intersection in terms of the flow of traffic per cycle time.

Contact person

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P-17 Exit constructions

Place: Amsterdam (Netherlands) **Year of implementation:** Unknown

Description

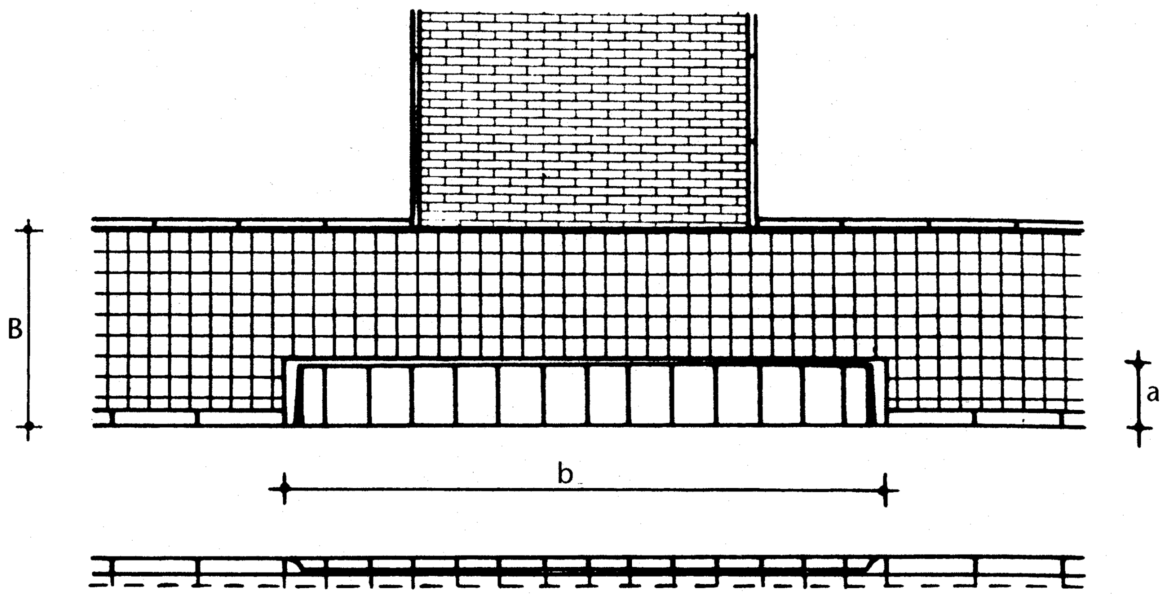
Motorised traffic and bicycles have frequently access to premises, garages and parking lots via a so called *exit construction*. This same construction can be used in an intersection, to connect streets, etc. /2/.

The construction implies that all road users, pedestrians too, have right of way over entering and leaving traffic. /5/.

Exit construction in Amsterdam-Zuid

This construction is only allowed when function and construction are clear. The access destination must be restricted e.g. a 30 km zone, a woonerf, or a residential street. The construction is characterised by a pavement (and eventually bicycle path) that continues at the same level, with the same colour and paving stones. The slope to the street, at two sides, is executed with a special, recognisable sort of concrete blocks.

Dimensions



Exit construction. (ASVV, 1996, p. 854)
Only applicable when B > 1.0 m
a = 0.8 m b = variable

Different aspects for pedestrians

Positive

- The construction is expensive, and safety gains are unknown.
- Combination of priority for pedestrian and decreased speed of vehicles probably makes this crossing safer than without exit-construction.

Negative

- The priority situation is unknown to some pedestrians and drivers, which can lead to unpleasant uncertainty.

Different aspects for non-pedestrians

Positive

- Increase in safety is expected.

Negative

- The sloped blocks are unpleasant for bicyclists.

Other information enclosed

Exit construction: details

Contact person

- City of Ede. C.R.O.W. P.O.Box 37, 6710 BA Ede, The Netherlands.
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P-18 Extended crossing time for pedestrians in light-controlled intersections

Place: Mechelen (Netherlands) **Year of implementation:** Unknown

Description

On the major walking route in the city of Mechelen, traffic lights on a busy intersection have been adapted on demand of the city. These traffic lights are situated on the walking route between the railway station and the city centre. The measure was introduced after complaints by pedestrians because of long waiting times and too short crossing times.

Green phases for pedestrians were extended, ensuring that pedestrians can cross in one green phase.

Dimensions

Traffic lights are situated on the inner town ring road, which has a width of 7 lanes (2+2+3).

Different aspects for pedestrians

Positive

- The measure has reduced the waiting time, increasing the attractiveness of walking.
- Traffic safety has increased as well, since in case of insufficient crossing time, pedestrians tend to cross with red traffic lights.

Different aspects for non pedestrians

Negative

The general traffic flow (cars and bicycles) on the main road is interrupted for longer times (according to increased crossing times for pedestrians). This might cause extended waiting time (cars and cycles) or extra congestion (for cars)

Cost of the measure

No additional costs

Contact person

- City of Mechelen. Mr. J. Vandamme. Ciclist officer. Tel: +32 15 29 75 29. Fax: +32 15 29 75 15

P-19 Pedestrian flashing yellow

Place: Zandvoort (Netherlands) **Year of implementation:** 1992

Description

The Dutch traffic law permits to replace pedestrian red by flashing yellow. Traffic lights giving the possibility to ask for green, the meaning of flashing yellow is that one can cross on one's own risk, but one can also ask for pedestrian green by pushing the button. Priority must be given to all other traffic, included parallel turning traffic. /14/; /22/.

This flashing yellow light for pedestrians is considered as an alternative on some junctions to prevent pedestrians ignoring red traffic lights and crossing the road without waiting for their turn. When the junction is controlled by traffic lights, pedestrians consider the waiting time as being too long. They also get bored to wait when they consider that it is possible to cross safely.

Dimensions

The red circular lamp signal being extinguished, it was replaced by a yellow signal in the shape of a triangle surrounding a yellow exclamation mark, which flashes between 40 and 60 times per minute.

Different aspects for pedestrians

Positive

- The number of pedestrians not using green is doubling. This means that many pedestrians prefer the use of flashing yellow.
- No alarming situations (conflicts with other road users) have been observed after the introduction of flashing yellow.

Negative

- The use of pedestrian green is safer than not using it. A decrease in safety can be expected in the long run, especially for young children and disabled pedestrians.
- 3% of accompanied children violate red. 18% of accompanied children make use of flashing yellow. This means that young children are learning to use flashing yellow. However, this can lead to unsafe situations because young children cannot make safe crossing decisions.

Different aspects for non-pedestrians

Positive

- Pedestrians often use the push button, but cross before getting green. When this happens, traffic has to wait for an empty crossing. This can irritate them and stimulate them to violate red. Flashing yellow can be expected to lead to a minor use of the push button, and fewer unused calls for green.

- It can be expected that fewer calls also lead to less waiting time for traffic.

Pedestrian flashing yellow in Zandvoort

Other comments

The use of flashing yellow is not recommended in those places with a high presence of children, elderly and disabled pedestrians, and in complicated situations (more than two lanes) and in situations with high-speed traffic.

It is recommended in other situations, especially where red light violation is high.

Contact person

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P-20 Accent illumination of pedestrian crossings

Place: Denmark and Gent/Brugge/Genk (Belgium) **Year of implementation:** Several

Description

The Copenhagen System (Denmark)

The Copenhagen System consists of non-signalised pedestrian crossings. The Copenhagen system was mainly introduced to improve light conditions at zebra crossings in darkness, and thereby reduce the number of accidents involving motor vehicles and crossing pedestrians.

The Copenhagen System used in intersections with a traffic refuge

The system consists of markings with yellow flashes (also called Toronto flashes) and inwardly lit boards for pedestrian crossings, as well as special illumination with 1000W lamps suspended 6 m above the carriageway.

The Copenhagen system has two essential properties: a special warning for moving traffic, in the shape of yellow flashes both day and night, and a special lighting at dark, the strength of which is regulated according to the surroundings, so that the crossing stands out contrasting with the environment. /15/.

Zebra crossing with traffic refuges

Non-signalised zebra crossings can be designed in many different ways. They can be designed in junctions or on stretches, with or without refuges, on stretches with one or two lanes in each direction, and with or without lighting etc.

Non-signalised crossings can also be designed without zebra markings. At some T-junctions or on stretches, the only element indicating possible crossing pedestrians can be a central traffic island. At side roads, vehicles from the side road are regulated by “Give way” markings indicating that they have to give way to both pedestrians as well as to vehicles from the main road. In general, vehicles always have to take consideration to crossing pedestrians.

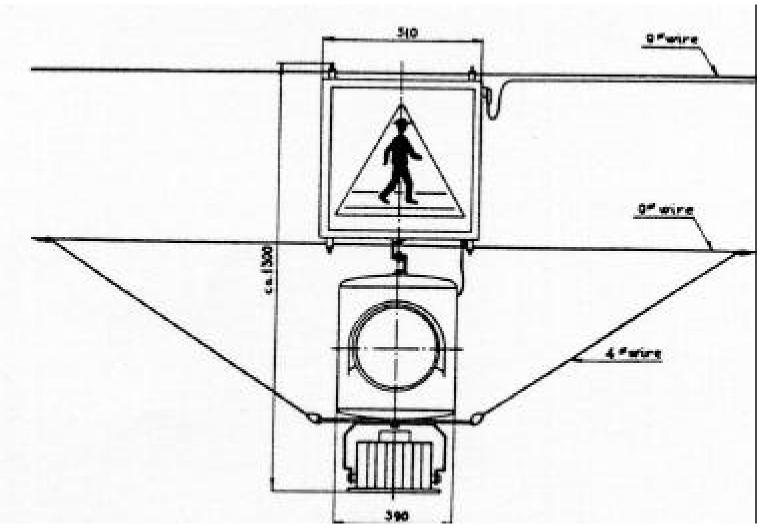
Example from Genk/Kortrijk (Belgium)

Some cities use accent illumination as part of a program to increase safety in pedestrian crossings. This is especially the case of some pedestrian crossings near schools. Until now, in the city of Kortrijk about 20 pedestrian crossings have been equipped with accent illumination. The plan is to equip all crossings with accent illumination when reconstructing major roads.

In the city of Genk, flashing lights are added in order to warn car drivers.

Kortrijk

Dimensions



Drawing of the Copenhagen System /15, p. 25/

Different aspects for pedestrians

Positive

Based on data from 1968, it was estimated that, compared to signalised intersections, pedestrian accidents in zebra crossings at night decreased by 1/3 thanks to the Copenhagen System. /15/.

The lighting of the Copenhagen System makes it possible for pedestrians to see that there is a pedestrian crossing nearby.

Accent illumination increases visibility and, consequently, safety. Subjective safety is also increased and the cost effectiveness is relatively good.

Ordinary zebra crossings on stretches with one lane in each direction combined with a traffic refuge gives pedestrians the possibility to cross the carriageway in two stages.

The Danish Road Traffic Act obligates vehicles to hold back for crossing pedestrians in zebra crossing.

Negative

Foreign research studies have shown that non-signalised zebra crossings do not seem to have any effect on safety. However, research has shown that it is more dangerous to cross the street just next to a pedestrian crossing than in the crossing itself.

Ordinary zebra crossings on stretches with two lanes in each direction combined with a traffic refuge will probably be very dangerous for crossing pedestrians because it can be difficult for both pedestrians and vehicles to see each other when crossing/passing the carriageway.

Different aspects for non-pedestrians

Positive

The special illumination and the light flashes in the Copenhagen system makes it easier to see a pedestrian crossing, especially in darkness.

In ordinary zebra crossings, marking makes vehicle drivers aware of the fact that crossing pedestrian can be expected and, therefore, to slow down.

Other comments

In 1968, the Copenhagen System could be found in 170 crossings..

The share of accidents is smaller in the Copenhagen System than in signalised intersections. However, it should be considered that pedestrians are generally more attentive to motor vehicles in non-signalised intersections than in signalised intersections. /15/.

Cost of the measure

The Copenhagen System costs approx. 13,700 ECU.

The illumination recently installed by the city of Kortrijk costs about 3,750 ECU for one pedestrian crossing.

Contact person

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P-21 Infrared detector for crossing pedestrians

Place: Heemstede, Heilo (Netherlands) **Year of implementation:** 1991

Description

The function of the unit is to detect the passage of pedestrians through a defined zone. This information can be used to extend the pedestrian phase. It is recommended not to extend the pedestrian green stage, but only the clearance time following this green stage. Late starting pedestrians (single, or large groups) and slow pedestrians are detected. /23/; /24/.

Most algorithms of traffic controllers calculate the pedestrian phase on basis of the green stage plus a certain clearance time, taking into account the width of the crossing, the distance from waiting vehicles to the pedestrian crossing, and the speed of rather slow pedestrians (0.8 m/s).

With detectors, the calculation of green and clearance time can be based on fast pedestrians (1m/s or a bit more), and the clearance time can be extended to a certain maximum when a late or slow pedestrian is detected.

The detectors can be used at intersections or at mid-block crossings.

Pedestrian infrared detectors in Heemstede

Dimensions

All detectors have their own characteristics. The following are based on experience with the MIPC-unit (Microsense Systems, UK).

- This unit is designed to be mounted on the primary signal head top support bracket (some 4 m high) with the sensing aperture facing towards the road which pedestrians will be crossing. When correctly aligned, the zone of detection covers the nominal range of 1-7 metres from the edge of the pavement and 2 meters wide along the length of the road.
- Units are normally installed in pairs on opposite sides of the road to give improved coverage throughout a larger zone.
- In order to function correctly, units must always have a clear line of sight to the extremes of the detection zone.

Close-up of light head and detector

- The detection field of this detector is rectangular.
- The minimum speed of the object to be detected has to be less than 0.5 m/s.
- The lens of the MICP detector should be cleaned when traffic signal lenses are cleaned, or every six months, whichever is sooner.
- The MICP contains no user-actuated parts.

Different aspects for pedestrians

Positive

- When pedestrians understand how the detector operates, increased comfort can be experienced.
- Slow and late pedestrians are not confronted with starting vehicles.
- The gained time can be used to give more frequent or faster pedestrian phases.
- Very slow pedestrians, too afraid to make use of the crossing, could be convinced that this crossing is completely adapted to their limited capabilities.
- About 20% of the duration of the pedestrian phase can be gained.
- The price of the detector is about 500 ECU. Installation takes some hours.
- The extended red clearance time proves to be very safe when the maximum clearance time is correctly adjusted. Pedestrians who start on green, all finish in time. This is particularly important for vulnerable road users: those aged over 60 and pedestrians under special circumstances.

Different aspects for non-pedestrians

Positive

- Because of the shorter average of the pedestrian phase, drivers and riders are not confronted with an empty crossing while waiting for green.
- At the onset of green, drivers are not confronted with slow pedestrians still crossing.
- Dangerous situations, confrontations between pedestrians and drivers, are diminished.

Other comments

Many manufacturers deliver detectors, passive infrared, but also radar-detectors. The detection field is sometimes much larger. Most detection fields are elliptical. This can lead to false alarms.

The boundaries of the detection field are not sharp, but care must be taken that pedestrians cross within the lines. This asks for good information or installation of guard-rails.

Cost of the measure

Price of detectors: about 500 ECU per detector.
Installation costs: about 4 hours when new traffic lights are being installed.

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P-22 Lower pedestrian delay in light-controlled crossings

Place: Barcelona (Spain) **Year of implementation:** Unknown

Description

Most of the assumptions when optimising light-signal settings are based on the capacity and delay theories for car drivers in isolated intersections. Results show an important rise in driver delay, when demand approaches capacity. Capacity is mainly related to dead seconds (amber and red-red) within the cycle: the longer the cycle, the less relative loss of capacity. Pedestrian demand has only been taken into account when calculating minimum green times for pedestrians crossing each carriageway.

A research work on the influence of platoons in the optimisation of signal settings, working with a network of signals and green waves, enables the definition, within the ADONIS project, of a formula for the calculation of the delay suffered by drivers related to cycle length and turning vehicles.

In normal traffic demand conditions, without any restraint in capacity, it is not totally clear if the driver delay rises or decreases with the cycle length. It seems that each combination with different composition of flows may give different result.

From the first combination examples, little influence in the delay to drivers due to changes in cycle length (positive and negative) has been found.

On the other hand, and initially based in the assumption of random arrivals for pedestrians in the start point of the pedestrian crossing, it is evident that pedestrians' delay increases directly proportional with the cycle length, or more precise, with the duration of the red phase.

The mean pedestrians' delay in a light signal with 50 % of red and of green is 1/4 of the red phase, which is to say 12.25 s in a 90 s cycle and 7.5 s in a 60 s cycle.

The delay can be translated to change in commercial speed for pedestrians in, for instance, a 100 m trip including a signal, as it generally happens in the Municipality of Barcelona.

Let's take some general values based on a pedestrian in a standard intersection and taking into account some different physical and regulation constants:

- Distance between traffic lights: 100 m
- Regulation cycle: 90 s
- Distribution of red/green, effective for pedestrians: 50%
- Pedestrian's speed: 1 m/s
- Volume of pedestrians: 400 people/hour
- Pedestrians reach the crossing at random
- All the considered pedestrians go straight on

Half the pedestrians cross the intersection without waiting. The other half, having arrived at random, wait half the duration of red: 1/2 x 90 x 1/2: 22.5. Consequently, waiting time for pedestrians is 1/8 of the cycle, being in this case, 11.25 (14%).
Without any traffic light, a section of 100 m is done in 100 s. However, following the data given, it takes between 100 and 122.5 s, with an average of 111.25 s. Because of the traffic light, pedestrians in this example waste an hour and fifteen minutes per hour.

If a cycle of 90 s is reduced to 50 s, the following effects on pedestrians can be experienced:

- Mean waiting time: 6.25 s
- Time saving: 5 s per pedestrian
- The delay is reduced in 44%.

Pedestrians' commercial speed, for a section of 100 m and considering two different cycles, is the following:

	Cycle of 90 s		Cycle of 50 s		Improvement in %
	time	speed	time	speed	
all pedestrians	111.25	3.2 km/h	106.25	3.4 km/h	5.5%
waiting pedestrians	122.5	2.9 km/h	112.5	3.2 km/h	7.3%

Pedestrians waiting in a crossing with a cycle of 90 s, experience a delay of the 22.5%.

With this basic valuation, and without taking into account possible drivers' delays, saving in waiting time and speed for pedestrians can be of about 5%, without considering other improvements to be reached, for instance, through green waves.

A clear minor delay for pedestrians and a rise in commercial speed may have important influence in modal choice, especially for short trips. The minor delay will decrease the temptation to cross on red and give pedestrians better safety conditions.

The work carried out in Barcelona defined an index of the following type, to decide upon cycle lenghts:

$$\text{Cycle}_{\text{optimum}} = \text{Min. } f(A * Ac^{P} + B * DC^{D})$$

DC^n = Delay caused by cycle C with demand of P = pedestrians and D = drivers.
A = Weight given to pedestrians:
- 1: normal situation
- 1.5: commercial streets, markets, etc.
- 2: access to public transport
- 2.5: access to schols, rest-homes for old people, etc.

B = weight given to car drivers:
- 0.5: local streets
- 1: normal streets
- 1.3: arterials; internal
- 1.5: radial access roads to town

Other information enclosed

At present, the following parameters for delay calculations and for later evaluations are being measured:

- Pedestrian speed variation over a street length in Barcelona.
- Pedestrian arrivals to waiting points to cross in a dense light-controlled area.
- Pedestrians cross on red and in which part of the red phase in relation to driver arrivals.
- Pedestrian and driver volumes on crossing movement in a major group of intersections in the city centre.

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P-23 Lowered kerbstone in intersections

Place: Barcelona (Spain) **Year of implementation:** 1990

Description

In 1990-91 it began the installation of this element in the city centre of Barcelona. It was one of the first procedures for the adaptation of the city to all conditions in mobility, which meant the first step for a long-term plan of accessibility.

It is a ramp made of granite for the passage of pedestrians, which has a maximal gradient of 12% and a width of 3.2 m of passing length. The width can be variable as the ramp is made with modules of 0.4 m. On the pavement, facing the pedestrian crossing, a fluted pavement is installed, different to that of the rest of the pavement, to indicate the existence of the pedestrian crossing to blind people.

This element enables the elimination of kerbs, which hinder the mobility of people in wheelchairs, and does not require the presence of other people helping disabled people to overcome the obstacle.

The final objective is the creation of accessible itineraries for everyone and not only islands in the city. The autonomy of disabled people contributes to their own development .

Pedestrians' mobility was also improved through an urban normative on the placement of urban elements (traffic lights, wastepapers, road signs, etc).

Pedestrian crossing, Barcelona

Dimensions

Crossings are made of platforms of 0.4 m x 1.2 m to adapt their size to crossings with different dimensions

Gual 120 (name given to this element) is placed on pavements wider than 2.60 m. There exists a model for pavements wider than 2.40 m with the same gradient but with pieces of 1 m instead of 1.2 m.

Different aspects for pedestrians

Positive

It increases safety, since sudden changes of level in itineraries are eliminated. It allows the suppression of barriers and the continuity of itineraries for people with reduced mobility, increasing their level of personal autonomy.

Other comments

In November 1996 the Town Council of Barcelona approved the *Plan of Accessibility of Barcelona*. The objective of this plan was to improve the accessibility in the city for pedestrians, with procedures to be carried on during the next 10 years: installation of ramps, enlargement of pavements, etc.

For this plan, it has been made an inventory of urban elements (more than 248,000) and of public buildings (about 580).

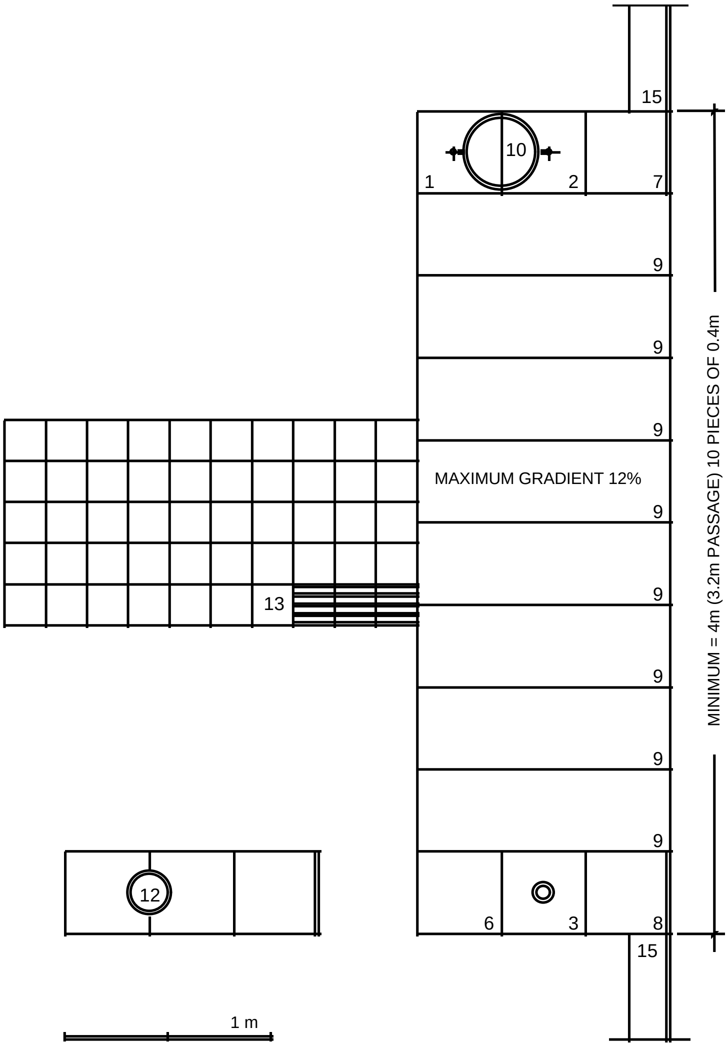
Pavement adapted for blind people indicating the location of a zebra crossing

Cost of the measure

219 ECU/lineal metre + VAT

Technical card of GUAL 120

1 2 Piece of granite of 40x40x15. Flamed surface. Perforation for litter-bin of D=45mm. Placed on an invert of concrete.
3 Piece of granite of 40x40x15. Flamed surface. Perforation for traffic light pole of D=120mm in the middle of the piece. Placed on an invert of concrete.
4 5 Piece of granite of 40x40x15. Flamed surface. Perforation for lighting post (with traffic light included) D=230mm centred in one side of the piece. Placed on an invert of concrete.
6 Piece of granite of 40x40x15. Flamed surface. Without perforation. Placed on an invert of concrete.
7 8 Piece of granite of 40x40x23. Flamed surface. Rounded vertical edge of R=20mm. Placed on an invert of concrete.
9 Piece of granite of 40x121, 8x6 with flamed surface. Adjusted with the pavement from the sidewalk and the road. Maximum gradient 12%. Placed on an invert of concrete.
10 Standard litter-bin fixed in 1 and 2. Distance between the axis of the vertical supports 43.5 cm. D-holes=45mm.
11 Traffic light pole made of fibre-glass fixed in 3.
12 Lighting post (with traffic light included) fixed in 4 and 5. Fixed in the invert of concrete under 4 and 5.
13 Band of grooved concrete slab centred with the kerbstone. A=100 cm
14 Concrete slab
15 Kerb of granite



Cost of the measure

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P-24 Pedestrian light on the near side of the crossing

Place: Heemstede (Netherlands) **Year of implementation:** 1991

Description

The pedestrian light is positioned on the near side of the crossing, in such a way that pedestrians cannot see it while crossing.

Dimensions

Pedestrian light on the near side of the crossing, in Heemstede

- The signal head must not be placed too high, to ensure that short pedestrians can also see the light. However, if it is placed too low, pedestrians sometimes block each other's view. Netherlands Haarlem, a Dutch manufacturer, developed a signal head with light over 180 degrees, so that a group of pedestrians could see it from different directions.
- A lower auxiliary signal head can be added to a higher placed signal head.
- If a second light is placed on an island in the centre of a crossing, people can be confused, thinking that the second light is their signal. In that case, part of the 180 degree angle of the second signal head can be covered, so that it is no longer visible to pedestrians watching the first signal.
- Signal heads are preferably positioned to face oncoming traffic.
- Addition of an audible signal, indicating the green phase, is preferred because the short green is not always detected.
- The duration of the green signal can be shortened to 6 or 8 seconds. Green is only a start signal. Large groups of pedestrians make a longer green time necessary.

Different aspects for pedestrians

Positive

- Pedestrians are closer to the light head, which is positive especially for partially sighted people.
- The short green phase causes a time-gain only when the width of the crossing is large. This gain can be used to give more frequent green to pedestrians.
- Passing vehicles cannot see the pedestrian light, and this can prevent aggressive behaviour towards pedestrians crossing on red.
- No change is expected in the proper use of a crossing equipped with this kind of light.
- No extra costs have to be made. Small gains in time and in safety can be expected.
- Partially sighted pedestrians can feel greater confidence.
- Pedestrians are not confronted with a red light while crossing.
- Short green makes crossing in groups easier and safer.

- The position of the light head to face oncoming traffic could increase the attention to this traffic, so that pedestrians start crossing in a safer way.
- Attention is not drawn to the light across the street, and thus free to traffic.

Negative

- Part of the pedestrians complain that they cannot see the light while crossing.
- Pedestrians more frequently arrive on red, because the green phase is shorter.
- The short green.
- No negative effects are expected on use.

Other comments

This kind of detectors are sometimes combined with detectors for crossing pedestrians. The combination of both systems is known as Pussycat or Puffin system.

Other information enclosed

Pedestrian's opinion on the alternative 'Maastricht' crossing

The alternative layout for pedestrian crossings, the 'Maastricht design', where the light is positioned on the near side of the crossing, is under discussion. One of the arguments against the introduction of this alternative is the supposed resistance felt by pedestrians, a resistance which has not been expressed so much through complaints lodged with the road planning authorities, but rather through several polls held amongst pedestrians on the street. /25/.

The C.R.O.W. working group for pedestrian engineering facilities wished to know if this perceived resistance should be taken into account in the recommendation.

The C.R.O.W. asked the SWOV to conduct a study amongst users of the 'Maastricht' crossing, in order to investigate the presence of resistance and if so, whether such resistance can be overcome through informative campaigns.

The SWOV questioned 200 pedestrians at 29 crossings with the Maastricht design, at 9 locations, in two municipalities.

First, people were asked to state the main differences between a standard crossing and the 'Maastricht crossing'; then their preference was asked and finally a comment about perceived safety was requested. The background to the response in favour of one or the other layout was questioned. Subsequently, the opinion about a number of characteristics associated with the new layout was requested. Some information was given to respondents regarding possible principal advantages: time won with a short green interval, better visibility for the partially sighted and loss of the fright response amongst the elderly when they are confronted by a red light while crossing. Subsequently, the interviewee's preference and safety assessment was once again requested. In this way, it was attempted to obtain an insight into the nature of possible resistance, and it was studied whether information about the advantages of the new design would be able to alleviate resistance.

The first striking result was that less than half of those interviewed were able to cite the actual main distinguishing characteristic: the change in position of the pedestrian light. Exposure to the system did not influence this response.

The second most important result was that there did not seem to be great resistance to the new design, to the contrary: 32% preferred this layout, 22% preferred the old layout and 44% demonstrated no preference. The safety assessment, which is strongly related to preference, did not favour either of the two systems: 27%, 29% and 44% respectively. Neither was this anticipated, in view of the previous study results. People who have used the crossing for a period of over one year, at least once a week, preferred the new system.

The advantages and disadvantages mentioned by people with preference for one of the two systems related both to the characteristics specific to the system and to characteristics which can also be found elsewhere. Relevant advantages quoted in particular were that the light is better visible and that it is more suitable for elderly and partially sighted people. Further advantages mentioned included the presence of a push button to request a green light and the presence of a sound signal. The primary disadvantages mentioned were the lack of a pedestrian light in the opposite side of the road, uncertainty when the traffic starts to move and inability to see the light turning red, so that pedestrians are unsure whether they need to hurry or not.

Those in support of the ‘Maastricht design’ mentioned more advantages than opponents were able to mention disadvantages.

When asked about all types of positive characteristics of the new layout, people confirmed that they are given sufficient time to cross in this situation, that the partially sighted are better able to see the light and that the sound signal clearly indicates that the light has switched to green.

People did not agree in the fact that they feel safer while crossing. With regard to negative characteristics, people reiterated that they have more crossing time with the old system, that they do not know when traffic starts to move and that they are more inclined to cross on red with the new system. They denied that the traffic starts moving as soon as the sound signal stops and that two systems operating in parallel would be confusing. The inconsistency in the remarks: ‘sufficient time to cross’ and ‘more crossing time with the old system’ could largely be explained by the fact that these remarks were given by different respondents. A large number of opinions were obtained related to personal preference and safety assessment.

The information given during the interview and the three above mentioned advantages did not lead to a shift in preference or in the safety assessment.

A comparison with previous studies supports the assumption that resistance is primarily seen with a change to the existing situation, while there is less resistance to introductions at locations where the crossing was not yet controlled.

It was also found that only 35% of pedestrians cross only on green, and that half of those crossing on red first press the request button. It is recommended that when assessing the ‘Maastricht design’, the resistance expressed by pedestrians should not be taken into account, and neither should a possible variation in uniformity.

Attention is asked - with respect to the realisation and information campaigns - to give pedestrians the option to request green, for sound signals and for sufficient crossing time, if possible by using detectors for crossing pedestrians. It is again emphasised that unnecessary request for a green light should be avoided, again through the use of detector systems.

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P-25 One-lane roundabouts

Place: Netherlands **Year of implementation:** Unknown

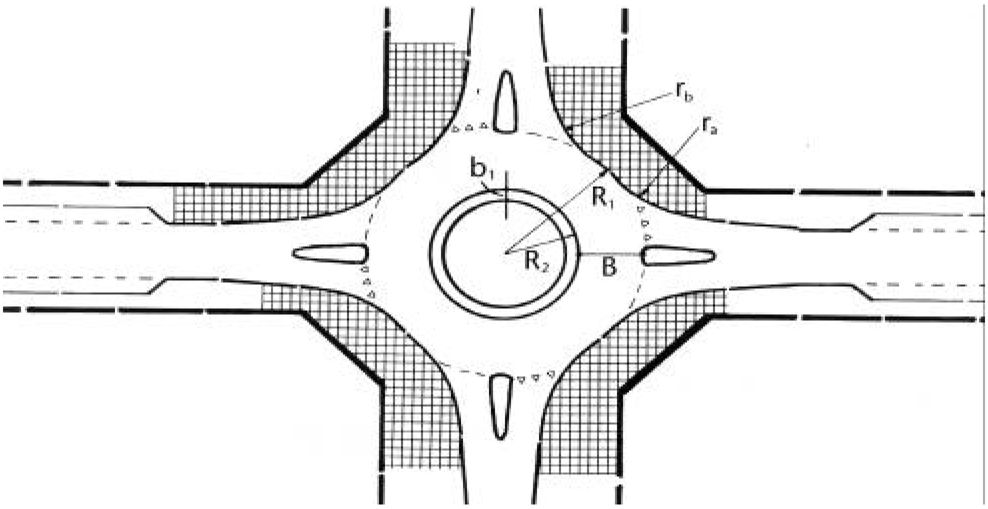
Description

This "new style" roundabout is designed as a more or less circular square with a central area, which cannot be traversed, and at least three connecting roads. All traffic in the roundabout may only drive in a prescribed direction. This kind of roundabouts tend to be small plazas with a single lane circling the centre and on the access and exit roads. This characteristic ensures that speed is limited, without excessively restricting manoeuvring potential.

One lane roundabout in Enschede

The most important characteristic is that approaching traffic must give way to traffic in the roundabout. There exists different forms of one-lane roundabouts: with separate cycle paths, bicycle tracks on the roundabout, or no specific bicycle facilities. Pedestrian crossings can be implemented with zebra, which gives right of way over all traffic, or without zebra, which only gives right of way over the traffic leaving the roundabout. /5/; /21/; /32/; /44/.

Dimensions



One-lane roundabout (source: ASVV, 1996)

Measurements:

R1 = 12.50 to 20.00 m.
R2 = 6.50 to 15.00 m.
ra = 10.00 m. b1 = 1.50 (1.00) m.

rb = 15.00 m. (with middle island)
rb = 20.00 m. (without middle island)
B = 5.00 to 6.00 m. (dependent on R1 and R2)

Different aspects for pedestrians

Positive

- Surveyable crossing situation.
- Priority over vehicles coming from more directions than in a normal intersection.
- Strong reduction of accidents, and no extra costs for pavements or pedestrians lights result in great cost-effectiveness.
- More than 80% reduction of injured pedestrians.

Different aspects for non-pedestrians

Positive

- Relatively high capacity.
- The strong reduction in accidents guarantee high cost-effectiveness.

Two other considerations:
- The construction of a roundabout is not more expensive than that of a normal intersection, and cheaper than a light-controlled intersection.
- A reduction of 47% in the number of accidents, and 71% in the number of victims.

Negative

- Small R1 and R2 makes manoeuvring difficult for heavy traffic.

Other comments

Ir. L.G.H. Fortuijn (personal communication) has estimated the costs-effectiveness of roundabouts outside build-up areas. Invested costs per year per roundabout: 9.400 ECU. Saved accident costs per year per roundabout: 28.200 ECU. Netto returns: 18.800 ECU per roundabout and year.

Some one-lane roundabouts lead pedestrian pavements outside the roundabout, at a certain distance, in such a way that pedestrians are confronted with normal crossings, and thus have no priority. Moreover, the pedestrian must take an uncomfortable detour, which is not recommended.

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P-26 Reduction of the intersection surface

Place: Brussels (Belgium) **Year of implementation:** Several

Description

In case of reconstruction of intersections (or road sections), the surface of the intersection is systematically reduced. Car parking space is often eliminated in the immediate surroundings (until 5 m) of the intersection by widening the pavement. By that, the average crossing time of crossing pedestrians is significantly decreased.

Dimensions

Car parking space is eliminated until 5 m from the intersection.

Different aspects for pedestrians

Positive

Since the crossing time for pedestrians is significantly decreased, pedestrians' safety increases.

Different aspects for non-pedestrians

Positive

Safety increases for other users as well, especially for cyclists, but also for car drivers.

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P-27 Speed reducing measures near intersections

Place: Gent/Brugge/Genk (Belgium) **Year of implementation:** Several

Description

Many Belgian cities have programs to increase safety on pedestrian crossings near school entrances. Most cities use plateaux to decrease the speed of car traffic.

In the city of Gent, speed reducing measures are generally introduced when a road is reconstructed. These consist of an enlargement of pavements and accent illumination. Beside this general policy, a school environment safety program is followed in order to increase safety on crossings near school exits. The latter is done through speed reducing measures and parking restrictions (e.g. parking is forbidden in front of school gates).

Brugge

In the city of Brugge, often called “omega profiles” are posted along the nearby street in order to prevent school children from crossing outside the plateau zone.

In the city of Genk, the safety of the infrastructure is improved by narrowing the road (especially in main roads) at the pedestrian crossings. Special attention is given to school surroundings. Punctual illumination of the zebra crossings and flashing lights improve the visibility of crossing school children by car drivers. Infrastructural measures are implemented together with other measures, such as authorised traffic guards (see separate chapter).

Dimensions

Dimensions very strongly according to local circumstances. In an example case of Genk, a road was narrowed to a width from 5 m instead of the previous 6 m for two lanes.

Different aspects for pedestrians

Positive

- The given measures are certainly improving safety for pedestrians in home to school traffic.
- Narrowing the road diminishes road crossing time and improves security. It also prevents cars from parking on crossings.
- Forbidding parking in front of school gates increases visibility and, consequently, safety.

Negative

- The cost effectiveness is rather low, since the speed reducing measures require the reconstruction of roads.
- Traffic safety problems in home to school traffic do not only include the immediate school surroundings. The other parts of the trip must not be neglected.

Different aspects for non-pedestrians

Positive

An increase in traffic safety near school entrances through speed reducing measures and parking restrictions also improves safety for cyclists.

Contact person

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P-28 Teachers' access to increased green light time

Place: Denmark **Year of implementation:** Unknown

Description

In large light-controlled intersections, it is often impossible to cross the road in one cycle-time without having to stop at the traffic refuge in the middle of the road. This is a problem, especially for kindergarten classes and classes of young children, whose crossing of the road is a lengthy and slow process. As a result, children have to stop at the traffic refuge which is often too narrow. This problem usually occurs only a few times a day when children go to and from e.g. school, playground, or swimming club.

Instead of limiting the green time for motor vehicles in each cycle-time, a special program has been chosen, which only comes into effect when necessary. This program prolongs the green time for pedestrians for exactly the specific cycle-time needed. A key-box, which is placed on a signal post on each side of the road or near the pavement. Kindergarten and school teachers are given a special key to be used in the key-box to initiate the special program, which starts with a white control light in the signal-box to inform that the special program has started. The signal then changes in the following cycle-time with an increase in the pedestrians' green time by a given number of seconds, which is taken from the green time in the cross-wise direction. Six seconds before the pedestrian signal changes from red to green, the white control light switches off, which signals that children should get ready to cross. Children can then cross the road at their own slow pace and can reach the other side of the street in the same cycle-time. The special program works only during the day; however, not during rush-hour traffic

Different aspects for pedestrians

Positive

It is more comfortable and safer for kindergarten and school classes to cross the road without the need to hurry up.

Different aspects for non-pedestrians

Negative

Green time for motor vehicles is decreased. However this only happens a few times a day, and only when necessary.

Other comments

The so called "teachers' access" is implemented in 10-15 different places in Copenhagen.

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P-29 Electronic sender for disabled pedestrians

Place: Enschede (Netherlands) **Year of implementation:** Unknown

Description

Disabled and elderly pedestrians are given an electronic sender, which they can use at home in case of emergency.

However, one of the most remarkable advantages of this electronic sender is that it can also be used to influence the controller of a pedestrian crossing, doubling the pedestrian green and increasing 30% of clearance time.

Light heads are equipped with a receiver, and the controller processes the information.

When the system is activated, the light head emits an acoustic signal, which prevents conflicting turning traffic: all other lights turn on red. A red control light on the sender confirms proper operation.

The sender is given on loan to elderly and disabled people, permanently, or on request each time one goes for a walk.

32 intersections in Enschede are equipped with this possibility. 150 senders are in use: some by individuals, most by rest-homes for the elderly or disabled.

Repair and replacing of batteries are done by the supplier.

Brochure on the pedestrian electronic sender

Different aspects for pedestrians

Positive

- Users are extremely content with this system.
- Subjective safety is largely increased. More than 60 % would not cross intersections when no sender is available.
- Once the sender is available (emergency signaller), no extra costs are needed.
- Very few conflicts are reported while crossing with the sender.

Different aspects for non-pedestrians

Positive

Less conflicts, because slow pedestrians leave crossings before the light turns green for vehicles.

Negative

Longer waiting times

Dimensions

The sender is a small box (size of a matchbox) with a button, which is generally worn around the neck.

Other comments

A small questionnaire survey showed positive results. /13/.

Cost of the measure

Price of the sender: 225 ECU
Price of the receiver: 350 ECU (8 per intersection: 2,800 ECU)
Cable and installation: about 3,000 ECU (4 crossings)

All prices excluded 18 % VAT.

Contact person

- Delivery and installation: Peek Traffic. Mr. H. van Ingen, P.O. Box 987, 1200 AZ Hilversum, The Netherlands. Tel: +31 356891753. Fax: +31 0356891850
- Information: City of Enschede: Bouw-en milieudienst Gemeente Enschede. Mr. G. Spaan. P.O. Box 172, 7500 AD Enschede, The Netherlands. Tel: +31 534815535. Fax:+31 534815111
- Ministry of Transport, Public Works and Water Management. Publi Information. P.O. Box 20901, 2500 EX Den Haag, The Netherlands. Tel: +31 703517118. Fax: +31 703516868
- C.R.O.W. P.O. Box 37, 6710 BA Ede, The Netherlands. Tel: +31 318620410. Fax: +31 318621112

P-30 Pedestrian underpass/footbridge

Place: Mont-ras and Barcelona (Spain) **Year of implementation:** 1995

Description

Pedestrian underpass in Mont-ras (Spain)

The aim of this measure is to improve the accessibility between two parts of a quarter divided by a big infrastructure. In this case, the permeability of the barrier is vital since there is a hospital in one of the sides.

In order to favour the use of the footbridge, a transparent elevator has been installed. The fact of being transparent enables the user to enter the elevator knowing if there is someone inside, which guarantees a higher degree of safety.

Different aspects for pedestrians

Positive

The installation of the elevator reduces distances and the effort to climb stairs and ramps.

Moreover, the possibility to see the interior of the elevator increases users' safety. In different studies carried on by INTRA, it has been verified the inefficiency of measures which improve accessibility without taking safety into account, as for instance badly lighted pedestrian underpasses in roads and train stations.

Negative

Footbridges tend to increase distances in comparison to passages at the same level of the street, but the elevator tries to reduce them. Moreover, speed in this road generates an important danger and traffic lights would not be adequate to cross the road.

Closed spaces are always somehow refused, but the negative impact is less important than the number of people to whom access is facilitated.

Moreover, since it is a mechanic element, it can break down, which is impossible in stairs and ramps.

Access to the vestibule of a metro stop - Line III - in Barcelona (Spain)

Different aspects for non-pedestrians

Positive

As it is easy to have access to the footbridge, some of the users are dissuaded from directly crossing the road, which gives safety to the drivers that use the infrastructure.

Other comments

The only inconvenience is the need of a more expensive up-keep. Since the elevator has its walls made of glass, dirtiness is more visible than in a conventional elevator.

If this aspect is not taken into account, it can dissuade people from using it.

Other information enclosed

This kind of elevator has also been installed in the new accesses to some urban train stations in Barcelona (Gran Vía, Paralelo, Sagrada Familia, Provença, etc).

Contact person

- City of Barcelona. Mr. Ole Thorson. INTRA, S.L. Tel: +34 3 301 37 78. Fax: +34 3 301 19 22

Facilities for resting or waiting

P-31 Benches and rest poles

Place: Netherlands **Year of implementation:** Several

Description

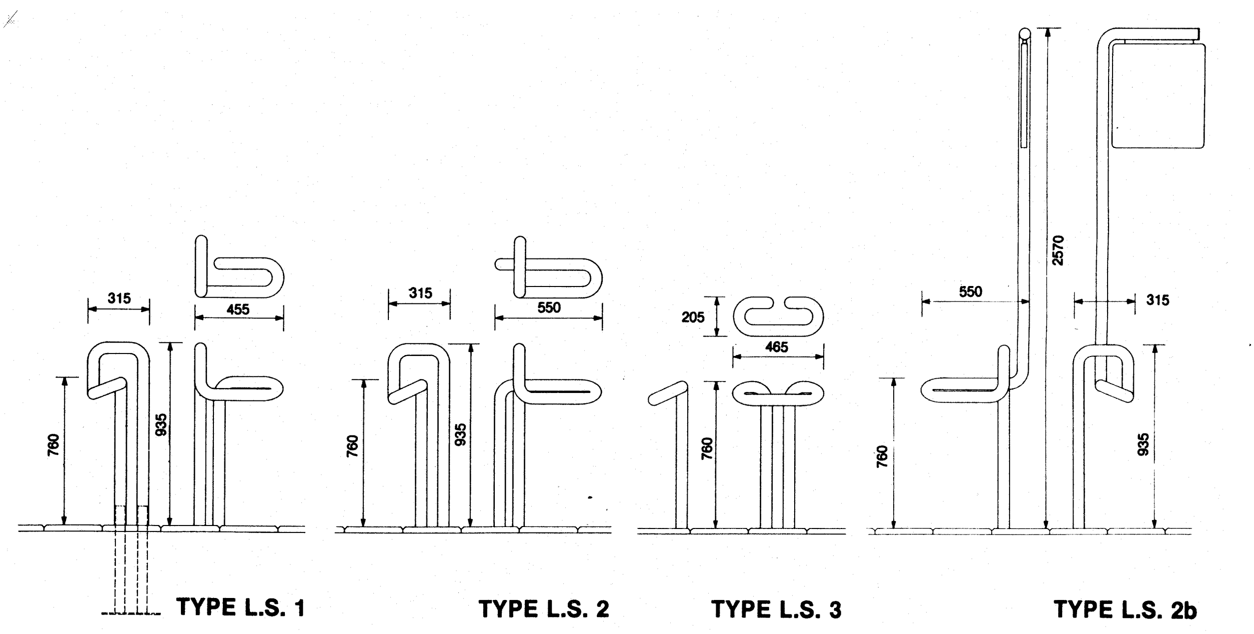
Benches and rest poles along a pedestrian route provide places to rest, especially for elderly people. This elements increase people's radius of action. Rest poles have the advantage that rest is provided without many necessary movements (sitting and standing), which is difficult for some elderly and disabled people.

Benches can also be used for recreation and for supervision of children. Benches are used at public transport stops.

Example of rest poles

Dimensions

The recommended maximum distance between benches along a pedestrian route is 200 meters. The recommended minimal height of the seat is about 60 cm. Next to the bench, room is left for a wheelchair (90 x 120 cm). Benches at stops must be rain-proof.



Different forms of rest poles. (Type L.S.2b is used at bust stops).

Different aspects for pedestrians

Positive

- Benches and rest poles provide people who lack stamina and disabled people the opportunity to use public space more often and to cover longer distances on foot.
- Benches are sometimes sponsored by companies or organisations. This increases its cost-effectiveness.

Cost of the measures

Price (excluded VAT):

Type L.S. 1: 125 ECU
Type L.S. 2: 140 ECU
Type L.S. 3: 145 ECU

Installation cost about 50 ECU.

Contact person

- City of Nunspeet. Mr. Jan Kuipers. Industrieweg 20, P.O. Box 5, 8070 AA Nunspeet, The Netherlands. Tel: +31 0341252944

P-32 Designs for bus stops

Place: Copenhagen/Frederiksberg (Denmark) **Year of implementation:** 1992-1993

Description and dimensions

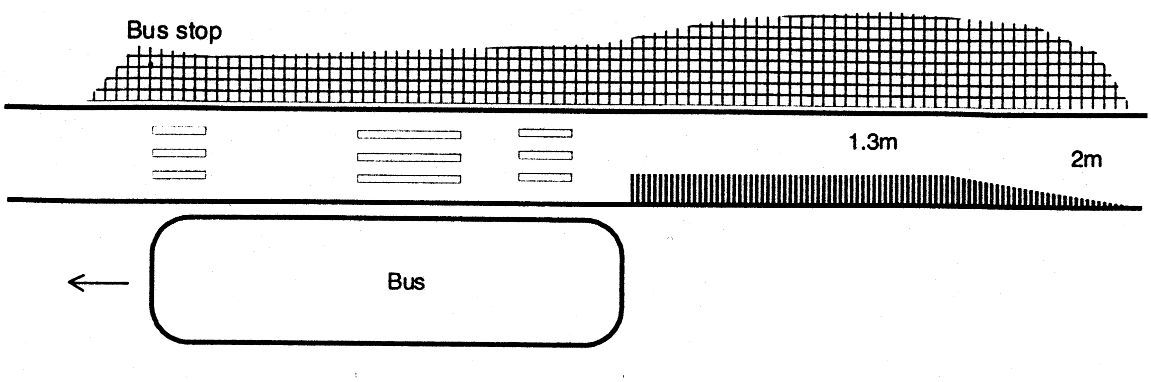
In order to reduce conflicts between bus passengers and cyclists at bus stops in urban areas, the Danish Road Directorate has made a study of three new designs of cycle paths at bus stops on stretches where boarding and alighting from buses is done directly from the cycle path.

Most of the accidents occurring at bus stops without passenger islands involve alighting passengers. This is probably due to the fact that the parties cannot see each other while passengers are still in the bus. However, if there is a passenger island from which the passengers can board and alight, both parties will have sufficient time to see each other and, thus, to react.

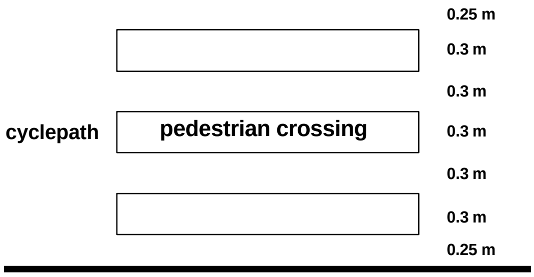
In Denmark, there are two different traffic “giving way” rules at bus stops. Where there are no traffic islands between the cycle path and the bus stop, cyclists have to give way to boarding and alighting passengers. However, if there is a traffic island between the cycle path and the bus stop, it is the pedestrian/passenger who has to give way to cyclists.

The 3 new designs of cycle paths at bus stops were designed and tested on the assumption that conflicts between bus passengers and cyclists could be reduced by making the conflict area visible at bus stops and, if possible, by clarifying which party must give way.

Design 1. Pedestrian crossing combined with profiled marking
The design comprises 3 areas, each of which has 3 strips painted across the cycle path. These areas resemble pedestrian crossings and are positioned in front of the doors of the bus. The areas are designed in this way in order to increase awareness between cyclists and bus passengers and to guide alighting bus passengers across the cycle path at right angles to the path. A broad profiled marking is also added on the off-side of the cycle path, in the form of narrow lateral strips.

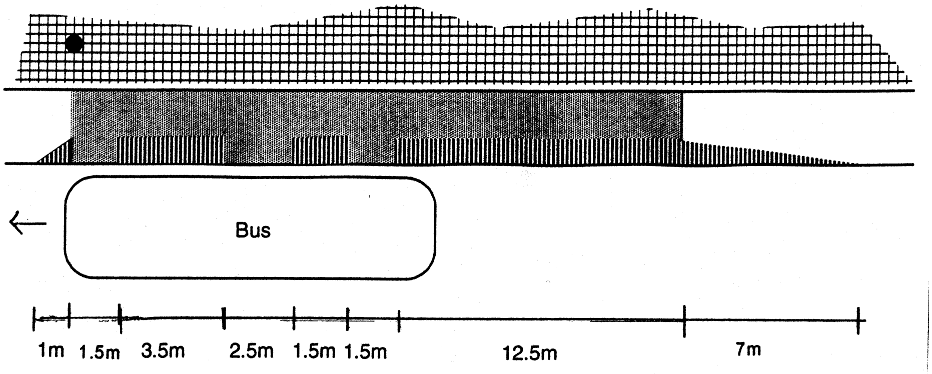


A 0.5 m broad profiled marking is also added on the off-side of the cycle path towards the vehicle lane. The profiled marking is also added to the cycle path as narrow lateral strips, with a breadth of 5 cm and a height of 0.8 cm, in white thermoplastic material. /12, p. 66/.



Dimensions of pedestrian crossings for a 2 m broad cycle path /12, p.66/.

Design 2. Profiled marking on the off-side of the cycle area
The design is composed of a 0.5 m broad profiled strip laying along the off-side of the cycle path. The strip has the visual effect of reducing the width of the cycle path and is also physically uncomfortable when ridden over, in order to discourage cyclists from doing so. Such a clearly noticeable strip is expected to reduce cyclists' speed while clarifying conflict areas. Apart from these effects, it also gives alighting bus passengers a small free-area on which to descend. The profiled strip is designed in the form of narrow lateral strips on the kerb. The remainder of the conflict area is painted in white.



The design is composed of a 0.5 m broad profiled strip laying along the off-side of the cycle path. The profiled strip is made of white thermoplastic material in the form of narrow lateral strips on the kerb, with a width of 5 cm and a height of 8 mm. The remainder of the conflict area is painted in white /12, p.68/.

Design 3. Painted pattern with a visual brake
The design is composed of a painted area on the cycle path around the bus stop, supplemented with a 6 m warning area. The warning area comprises a number of painted areas, whose lengths become shorter as cyclists approach the conflict area. It is expected to impel cyclists to reduce speed. Cycling on the painted strips is designed to cause no physical discomfort for the cyclists in the form of rumbling, while its coefficient of friction is the same as that on the surface of the rest of the cycle path. /12/.

The design is composed of a painted area of the cycle path around the bus stop, supplemented with a 6 m warning area /12, p. 70/.

Different aspects for pedestrians

Positive

Pedestrian-friendly:
Design 1
The pedestrian crossing makes it easy for pedestrians to see where they are supposed to cross the cycle path. It also makes cyclists more aware of bus passengers crossing the cycle path to and from the bus.

Pedestrian safety:
Overall, it can be concluded that the new designs for the cycle area at bus stops bring about a change in behaviour, which is expected to increase road safety. There is a tendency for the pedestrian crossing design to give better results than the two other designs.

The following conclusions can be drawn from behavioural studies:

- The proportion of cyclists who wait and give bus passengers the right of way remains the same for all 3 designs.

- The number of serious conflicts drops significantly at bus stops with painted patterns (design 3). The number of serious conflicts was and still is very small at the two other bus stops.
- None of the designs needed a significant modification in bus passengers' behaviour.
- All 3 designs showed a reduction in the average minimum speed of cyclists where there is a bus stop. However, there is a tendency for pedestrian crossings to result in the most significant reduction in speed, followed by profiled strips.
- The new designs resulted in an increase in the distance between cyclists' reaction point and the nearest conflict point. The number of cyclists who did not react also dropped. Also in this respect, pedestrian crossings give a slightly better result than the other two designs.
- Only designs that include a profile strip increased the distance between cyclists and passengers alighting from buses. The distance increased by an average of 0.3 m. /12/.

Negative

Design 1
It can be argued that zebra-like design can lead to misunderstandings, as the zebra is not supposed to be used as such in the absence of a bus.

Again it can be argued that some cyclists would claim that this design does provide areas for bus passengers to step down on. But these areas are much too narrow to fulfil the purpose mentioned in the give-way rules.

Different aspects for non-pedestrians

Positive

All 3 designs helped cyclists to become more aware of conflict areas.

The design of bus stops has had no effect in decreasing the speed of cyclists unless buses and/or bus passengers are present. /12/.

Negative

Designs with profiled strips can be unpleasant for cyclists to pass over.

Other comments

Degree of implementation:

- Design 1 was implemented in 1996 at about 90 bus stops in the city of Randers
- Design 2 is commonly used in Frederiksberg (Copenhagen) and in several other cities in Denmark.
- Design 3 is, as far as we know, only implemented in Frederiksberg.

Cost of the measure

Bus stop: app. 700 ECU per bus stop. /12/.

Contact person

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P-33 Level access to public transport

Place: Barcelona (Spain) **Year of implementation:** 1990

Description

The need to use all road space has moved cities to create more or less sophisticated systems which enable public transport users to have access to vehicles comfortably. Bus stops on pavements next to parking lines need to reserve some space for buses to approach and leave the stop.

The platform has been installed in some streets of Barcelona where buses could not reach the pavement and, therefor, passengers had to descend to the road to take the bus. This proceeding is especially important for elderly people or for those people with reduced mobility. The installation of platforms is essential in those lines where buses have low platforms for wheelchairs, prams, etc.

Bus stop with a platform in Barcelona

Dimensions

The reserved space needed by a 12 m-long bus is of about 20 m. With this platform, the space reserved next to the stop can be reduced to those 12 m. People getting on/off the bus will do it from/on the platform.

Different aspects for pedestrians

Positive

The platform improves passengers' comfort, as they can continue straight out. Without any platform, they have to step down to the pavement to get on the bus.

Different aspects for non-pedestrians

Positive

The platform marks physically the space reserved to the bus stop and prevents other vehicles from taking up this space.

Contact person

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Transport and pedestrian policy

P-34 Legal responsibility of local authorities

Place: Netherlands **Year of implementation:** 1993

Description

On the 1st January 1993, a new Civil Code became effective in The Netherlands. The new laws laid down in this code changed the relationship between the government as road authority, and the road user. The change was mainly concerned with the responsibility of the road authority for the damage or injuries that road users suffer as a result of the road condition and the road equipment. /4/; /9/.

Previously, the person who suffered damage or injury was required to prove: (a) that the damage or injury had occurred and (b) that this had occurred as a result of the road authority's negligence. This meant that a connection had to exist between this negligence and the damage or injury. Furthermore, the road user had to prove that the road authority was to blame for this negligence. In the final analysis, the road authority had to assume a normal degree of caution from the road user.

The new law determined that the road authority is responsible for the defects in the road and its equipment, as well as the resulting damage or injury (strict liability in insurance law terms). Although road users no longer have to prove that the road authority is to blame for the damage or injury, they must show that the road was defective and that the defect was the cause of the accident. The road authority cannot assume that the road user is always observant and cautious. This is different from the Danish law, since it is the first requirement in the traffic rules.

This new law is important for pedestrians. They may expect from the road authority that the road is properly maintained, and the road authority knows that it is a risk if such is not the case. However, if a defect occurs despite reasonable maintenance, which can happen when a road suddenly settles, the road authority is still liable for any resulting damage or injury. This situation may result in road authorities going so far as to start considering defects that do not show up during normal inspection and maintenance.

Different aspects for pedestrians

Positive

- Pedestrians can expect good roads, concerning the road itself, and the road equipment. This enhances safety.
- When harm or damage occurs, the pedestrian can ask for charges from the road maintenance authority.

Contact person

- City of Den Haag. Ministry of Transport, Public Works and Water Management. Public Information. P.O. Box 20901, 2500 EX Den Haag, The Netherlands. Tel: +31 703517118. Fax: +31 703516868

P-35 Government-supported local action plans (DK)

Place: Aarhus (Denmark) **Year of implementation:** 1993

Description

The main principle in the Danish financing of roads and paths is one of decentralisation: each of the levels of road authorities (the Road Directorate on behalf of the state, the counties and the municipalities) receive taxes and pay for their own roads. Mixed financing, e.g. between the State and a county is possible, but seems to be very infrequent.

However, in cases where the state wants a new policy to be implemented, like in the present movement towards a more sustainable transport, state subsidies can be provided, also for the facilities owned by the county or municipality. In these cases, money is set aside in the yearly fiscal budget negotiations, in a special fund. One of the first government actions was to make subsidies for cycle paths available, first for cycle tracks along national roads, and secondly for experimental cycle routes in towns.

For the last ten years, the Danish national authorities have issued a number of traffic safety and traffic environmental action plans, aiming at ambitious goals for safer and more sustainable transport in the future. Some of the actions have already been made real, but there is considerable discussion or problems with the realisation of other parts.

In the most recent plan among these, the so-called "Traffic 2005", issued by the government in Dec. 1993 (encompassing both traffic safety and traffic environment), short car trips are recommended to be transferred to other modes like public transport, cycling and walking.

One of the national objectives is to double the public transport person-kilometres, another is a transfer to cycling and walking of 1/3 of all car trips shorter than 3 km. This latter figure corresponds to 4% of all car passenger-km performed now (or rather in 1988, the base year of calculations), and it would increase bicycle traffic with 1/3. However, there are no specific figures mentioned concerning the corresponding increases in walking. Obviously, the 50% increase in the kilometres travelled by public transport would also lead to massive increases in the amount of walking. So the future amount of walking to be made real/planned for is not clearly specified at present.

To establish best practice examples for all these transfers from one mode to another, the government has initiated some subsidy arrangements, especially two governmental funds, to which money is allocated by the yearly fiscal act. Their goals are much alike, and also their target groups, as both tend to support actions in municipalities, like a noise abatement project, a project to increase traffic safety or accessibility or the like.

One program package is called “Traffic and Environment Fund” (Ministry of Environment & Energy) and another “Traffic Fund” (Ministry of Transport). Money will be available on a 50-50 shared basis with the local community.

To further national goals, make better information available to other municipalities and secure that projects are firmly anchored in a local planning effort, and not just separate, singular, subsidy seeking projects, the ministries involved advise municipalities to prepare a "traffic and environment local action plan", as an amendment to their municipal plan. (Municipal plans are mandatory, local action plans are just recommended). Sometimes these local plans are seen in an even wider context under the UN so-called "Agenda 21" heading.

Monitoring traffic changes and reporting of results are among the general conditions to obtain a subsidy. But the level of monitoring varies considerably. So it can be difficult now, after 5 years of running programs, to sum up general experiences. Conclusions on "how to get more environmental improvements or safety for your money" are still open to discussion, and in general terms we have been "moving more kerbstones than modal split percentages".

In the city of Aarhus, with 280,000 inhabitants, the traffic and environment planning initiative is coinciding in time with two local planning documents, a traffic and environment action plan from 1993 and a central area traffic plan from 1994, both to be regarded as amendments to the municipal plan 1993-2005. The traffic and environment action plan from 1993 is closely following the national goals concerning plans of this type.

Aarhus is known for its large inner-town on a sloping coastland, separated from/ connected to the sea by a large harbour area, with woodland on the coast to the North and the South. A very efficient 2 x 3 lane or 2 x 2 lane ring street forms the boundary of the inner town. The central area is much smaller than the inner town, approximately one tenth of the area. Motorised traffic and bicycles have frequently access to premises, garages and parking lots via a so called exit-construction.

The bicycle ring, Aarhus (Denmark)

The traffic plan contains the following elements:

- An inner ring street, basically for the distribution of car traffic to the various entrances to and exits from the central area.
- A bicycle traffic distributor ring, allowing the innermost area to be free from great cyclists flows.
- A North-South exclusive or mixed-traffic bus corridor.
- An opening-up of a formerly covered river.
- As the innermost, a large area of pedestrian streets and squares, with some car access.

Bus street, Aarhus (Denmark)

As it can be seen, this diagram offers an extremely clear description of the primary functions of all streets, although most of the streets are still used by several types of road users. The main characteristics of the plan are /1/:

Key points:

a) Clear and comprehensible differentiated, coloured diagrammatic plan.

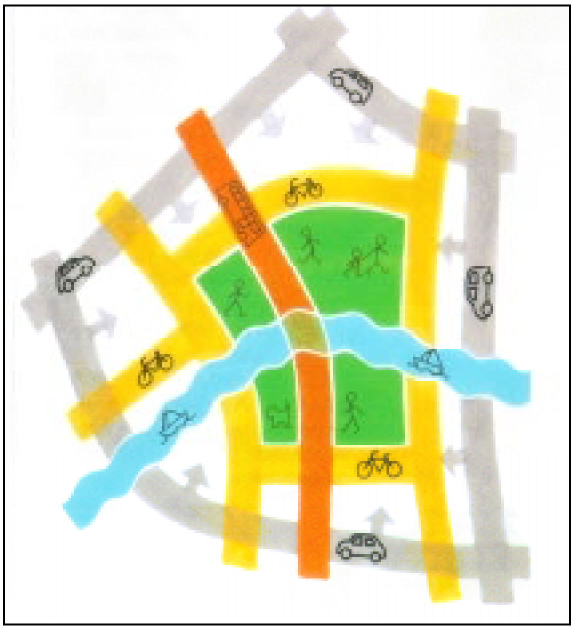
b) A final decision on the role of two key intersections made the jig-saw puzzle of street functions fit together.

c) Flexibility and step-by-step development possibilities give much better chances for a successful realisation work.

Important for:

a) Visualisation, pr-work, end-goal clear.

b) Practical conversions, budget, possible changes in ideals, day-to-day negotiations, public transport adaptations.



Sketch of the different elements in the traffic plan

Different aspects for pedestrians

Positive

The above mentioned decision on the role of the two intersections fixes the position of the North-South bus axis. Because of the position of the already existent pedestrian street, Soendergade, the extension of the pedestrian precinct towards the West is hereby decided upon. The very large pedestrian precinct is a major improvement.

At the same time, the bus axis is clear and easy to understand, giving, hopefully, an easy access to the precinct for bus passengers, who will move as pedestrians on their last stage to the squares.

Different aspects for non-pedestrians

Positive

Car and taxi passengers' access to most points will remain good, because most streets will retain a possibility for car access and goods delivery.

Cost of the measures

- Estimated cost to make the plan real is set at approx. 17.8 million ECU.
- Government subsidy is until now just about 1 million ECU. /1/.

Contact person

- Municipality of Aarhus. Mr. Jørgen Bunde. City Engineer's Office.
  Tel: +45 89 40 44 01. Fax: +45 89 40 44 40

P-36 No new shopping centres outside towns?

Place: Denmark **Year of implementation:** Unknown

Description

As in other countries, the development in retail trade in Denmark has led to an increasing number of very large centres on the urban fringe, combined with a large supermarket, perhaps discount centre type, and some specialised shops. These external centres have been shown to increase motorised traffic and to reduce the viable retail shop area in inner- town centres, as well as in local urban districts. Consequently, only car owners can go to the shopping centre (apart from some bus services), and the overall possibilities for shopping locally and on foot are reduced. This is an inconvenience for elderly or disabled people and even a threat towards quality of life in local dwelling areas and in villages.

Actions against this development seem to be difficult, as many see the external centres as a natural and necessary development in modern society. Some towns aim to be in the forefront and catch the next new centre, securing customers for their trade, at the cost of development in neighbour cities and, indeed, for the villages in-between.

The minister for the Environment and Energy, Svend Auken, created a committee (detailhandelsudvalget), which, after two years, issued a report pointing to a need for better regulatory procedures to plan and possibly curb this development.

Now, the rules of the planning law are currently, that municipalities can give building permission to new shopping centres, provided that they act according to the municipal plan or a new local plan is formulated covering the actual case. County councils make regional plans, and approve municipal plans. So the two “bottom” tiers of planning authorities are in charge of these authorisations, and national regulation can only be active through a National Planning Directive, or through provisions in the planning law itself.

In a new act, active from May 22nd 1997, the Danish Parliament changed the planning act to secure a better development concerning large shopping centres. The new act calls for an active planning by the counties and municipalities to stop the concentration of shopping centres to a few, large winning towns. In the future, also smaller and medium-sized towns must be secured a varied supply of shops. At the same time, inner towns are to be focused upon. The traditional active and complex central town with a rich trade environment must be secured. Pedestrians, cyclists and people dependent on public transport must be given good shopping possibilities.

The Minister of the Environment has no direct power to allow or forbid large shopping centres. But the intention is to launch a planning effort countrywide, which can curb the increasing concentration of retail floor areas to large centres, many of which are placed outside large towns, much to the frustration of existing inner-town centres, of neighbouring towns, of village shopping, etc.

By introducing first a total stop for the establishment of new centres, and now an interregnum period, in which countries and municipalities can make the now called for planning documents and release construction permits for centres on a very limited scale (maximum on floor area), the parliament tried to change the future course.

Thus in regional, municipal and local planning, a varied supply of shops must be secured, a good accessibility by all types of transportation and thus a sustainable societal retail structure. The change in the planning act specifies which guidelines must be defined in regional, municipal and local plans, and also what must be written in the plans concerning the situation behind the plans. This will much help the planning process, it is said, so that concerned citizens and potential investors will clearly see the possibilities at hand. To safeguard future development, it is stipulated that interregnum building permits to have an upper limit of 3.000 m^2 for shops selling more specialised goods. As a main rule, shops must be located in central areas, so also in the future, plans can only be approved if they localise shops in areas for shopping in a local, a district or a central town. Very bulky goods like timber, construction materials, furniture and cars are an exception. Countries should be reluctant to define now retail centres of regional importance.

So, without trying to perpetuate a “retail centre freeze”, Parliament has tried to increase the obligations of countries and municipalities to discuss large centres with the citizens beforehand, and publish the intended retail structure as a whole and the needed retail supply also for smaller communities.

Other information enclosed

At the time of writing, the new law act has not yet been brought to Parliament.

Contact person

- Mrs. Solveig Øster. The Ministry of Environment and Energy. Tel: +45 33 92 76 00. Fax: +45 33 32 22 27

P-37a Pedestrian plan (CH)

Place: Geneva (Switzerland) **Year of implementation:** 1995

Description

The main objectives of the Pedestrian Plan of Geneva are to improve pedestrians' road safety, to obtain continuity in the network and to beautify the city in order to improve walking.

To begin with, the study presents the legal framework for the Plan.

The Pedestrian Plan also includes the following instruments to analyse pedestrians' needs and to help taking decisions and making priorities:

1. **Detection of trip generators (schools, parks, commercial centres, etc.). Representation in maps.**
2. **The three levels of especial consideration:**
   Quarters network: functional and daily, which requires two types of measures:
   a) Priority measures, associated with safety
   b) Complementary measures, associated with continuity and beautifying.

   - A description of every quarter, indicating the characteristics of the area, the courses and continuity to the neighbour quarters and the obstacles to their access.
   - A description of the pedestrian generators in the quarter, as well as the main generators in the surroundings.
   - A description of the existing or desired pedestrian connections in the quarter or within the relationships with the neighbour quarters.
   - A project to put the priority measures together, with the superposition of the network of *Circulation 2000*
   - A project per each priority measure
   - A project to put the complementary measures together.
   - A project per complementary measure.

   Inter-quarters obstacles: functional and daily, mainly cross-roads placed either in the limit of the urban centre or in the ring-road.

   - A description of the obstacles around the city centre
   - A description of the obstacles in the outskirts, i.e. ring-road.

   Promenades network. Thematic and exceptional, it offers a choice of itineraries, blending culture, hobbies, nature and direct relationships.

   - A description of all the network of the city of Geneva (it might be modified) indicating also the junctions with the network of pedestrian roads in the canton.
   - A description per promenade, indicating the itinerary (circles, cross, line), its destination, the present situation;
   - A project with all the proposed measures along the itinerary, or those which will enable to set up an itinerary, with the superposition of the inter-quarter obstacles to cross.
   - A project per measure.

By means of the information obtained, programmes are elaborated and financing is found for the works that are finally carried out.

The first part of the Pedestrian Plan includes 3 quarters and one promenade of a total of 12 quarters and 8-10 promenades.

Special emphasis is put in the communication between road users and public administration. Information campaigns have been held to present the Pedestrian Plan. Future campaigns are going to be held in 1997 to assist the first execution of the Plan.

Different aspects for pedestrians

Positive

All five aspects (safety, comfort, directness, continuity and attractiveness) are taken into account in the Pedestrian Plan.

Different aspects for non-pedestrians

Positive

One of the objectives of the Pedestrian Plan is to beautify the city. This aspect is positive for all road users: pedestrians, cyclists and car drivers.

Negative

The continuity of the road network might be worsen for car drivers and the capacity slightly reduced.

Other comments

The Pedestrian Plan also includes a catalogue of recommendations, including the following:

- Minimum width of new pavements: 2.5 m.
- Reduction of the number of signals and urban furniture to improve visibility (safety) and pedestrians' comfort: min. 1.5 between obstacles.
- Roads narrowing and pavements enlargement. Installation of road islands in all possible pedestrian crossings.
- Change of colour/structure of pavement, lighting, etc. in pedestrian crossings.
- Installation of central and continuous road islands or pedestrian crossings in different levels in streets with high-speed traffic.
- Speed reducers near pedestrian crossings. Pavement enlargement in pedestrian crossings to improve visibility of pedestrians.
- Pedestrian crossings with traffic-light regulation: any crossing time inferior to 10 seconds is dangerous. 50% of pedestrians cross in red if their red time is longer than 45 seconds.
- Kerbstones in pedestrian crossings should be lowered to make crossing easier for people in wheel chairs, elderly people, etc.
- Squares and roundabouts should be used in pedestrian precincts to organise traffic.
- The Pedestrian Plan should take specialised organisations into account.
- A complete separation of transport modes is not recommended, as it might create a sensation of insecurity. Neither are pedestrian subways recommended.

Contact person

- Municipality of Geneva. Mrs. Marie-José Wiedmer-Dozio. Tel: (022) 786 45 33. Fax: 786 53 30

P-37b Pedestrian plan (NL)

Place: Zwijndrecht and Middelburg (Netherlands) **Year of implementation:** Unknown

Description

Some cities develop a pedestrian traffic plan as part of a general traffic plan or as an exclusive plan for pedestrians. The following subjects are treated in such plans /11/; /31/:

- Background for a policy to promote safe walking. Advantages of walking. Problems pedestrians are confronted with. Objectives of good pedestrian provisions related to the total municipal transport and governmental plans. Formulation for the general objective and spearheads: directness, continuity, safety, attractiveness and comfort.

  E.g. All important social and economic provisions must be easy to reach. All pedestrian routes must be safe and well-integrated. Attractiveness and comfort of pedestrian provisions must be high. Restrictive car policy combined with good parking facilities outside pedestrian precincts.

- Analysis of the current situation. Data on displacements on-foot. Pedestrian network analysis within residential areas and areas with central functions (shops, schools, community and welfare centres etc.), between residential areas and also analysis of public transport facilities, parking facilities and central areas.

- Description of bottlenecks. Accident analysis, and description of other problems, objective as well as subjective: detours, obstacles on the pavement, pavement quality, crossings quality, waiting times, motorised traffic flows and speeds, traffic noise, air pollution, social security, etc. Special attention is paid to children and disabled. Interviews are carried out with representatives of elderly and disabled people's organisations, as well as with pedestrian and consumers' organisations.

- Elaboration of 3 design principles for pedestrian provisions: practical, perceived and future value.

  Practical value relates to accessibility, minimal width and height, passing space, passing space for prams and wheelchairs, crossing facilities, and rest points.

  Perceived value concerns safety, social safety and attractiveness.

  Future value relates to expected changes in the composition of the population (number, age, handicaps), expected influence of political decisions regarding public transport, parking, restriction of car use, function of areas, etc.

- Specific measures, on the basis of design principles, related to the development of pedestrian routes and pedestrian networks, crossing facilities (zebra, traffic islands, narrowing of the road, traffic lights), improvement of existing routes, and improvement of residential (social, recreational) functions (playgrounds, etc.). Layout and non-layout measures. Technical design.

- Accompanying measures as street furniture, street names, street plans, signalling, publicity, maintenance schedules and surveillance.

- Priority of measures, costs, setting up of a pedestrian fund. Setting up of an execution schedule of concrete measures, often linked to other activities as renewal of pavement, cables, sewerage or waterworks.

Different aspects for pedestrians

Positive

All aspects: safety, comfort, directness, continuity and attractiveness are included, in a balanced way.

Negative

The completion of the plans can take a long time.

Different aspects for non-pedestrians

Positive

Much attention is devoted to good connections between public transport and parking areas on the one hand, and all provisions on the other hand.

Negative

Pedestrian plans often implicate restrictions for car users. E.g. pedestrian precincts, preferential treatment of pedestrians at traffic lights, paid parking etc.

Contact person

- City of Middelburg. RBOI. P.O. Box 430, 4330 AK Middelburg, The Netherlands.
  Tel: +31 118033344. Fax: +31 118023361
- City of Den Haag. Voetgangersvereniging. Emmapark 9, 2595 ES Den Haag, The Netherlands.
  Tel: +31 703471501. Fax: +31 703819654

Education and public information

P-38 Information desk with free street maps (Infostop)

Place: Amsterdam (Netherlands) **Year of implementation:** 1995

Description

This information desk supplies a free copy of a street map, with the best pedestrian routes printed on it. A touch-screen is used to tell the desk the destination address, company or public building, and, after 15 seconds, the map is delivered.

Infostop at Station South - World Trade Center, Amsterdam (Netherlands)

Information is provided in Dutch, German or English.

The information desk is checked and provided with new or modified information by telephone.

The system is funded by the companies whose names are stored in the desk. Each company pays 150 ECU per year.

This desk is placed in the hall of a station.

Different aspects for pedestrians

Positive

- Operating the information desk is easy.
- The most comfortable route could be programmed.
- The socially safer route could be programmed.
- The safer route could be programmed.
- No costs for pedestrians or public institutions.
- Dangerous searching is prevented.

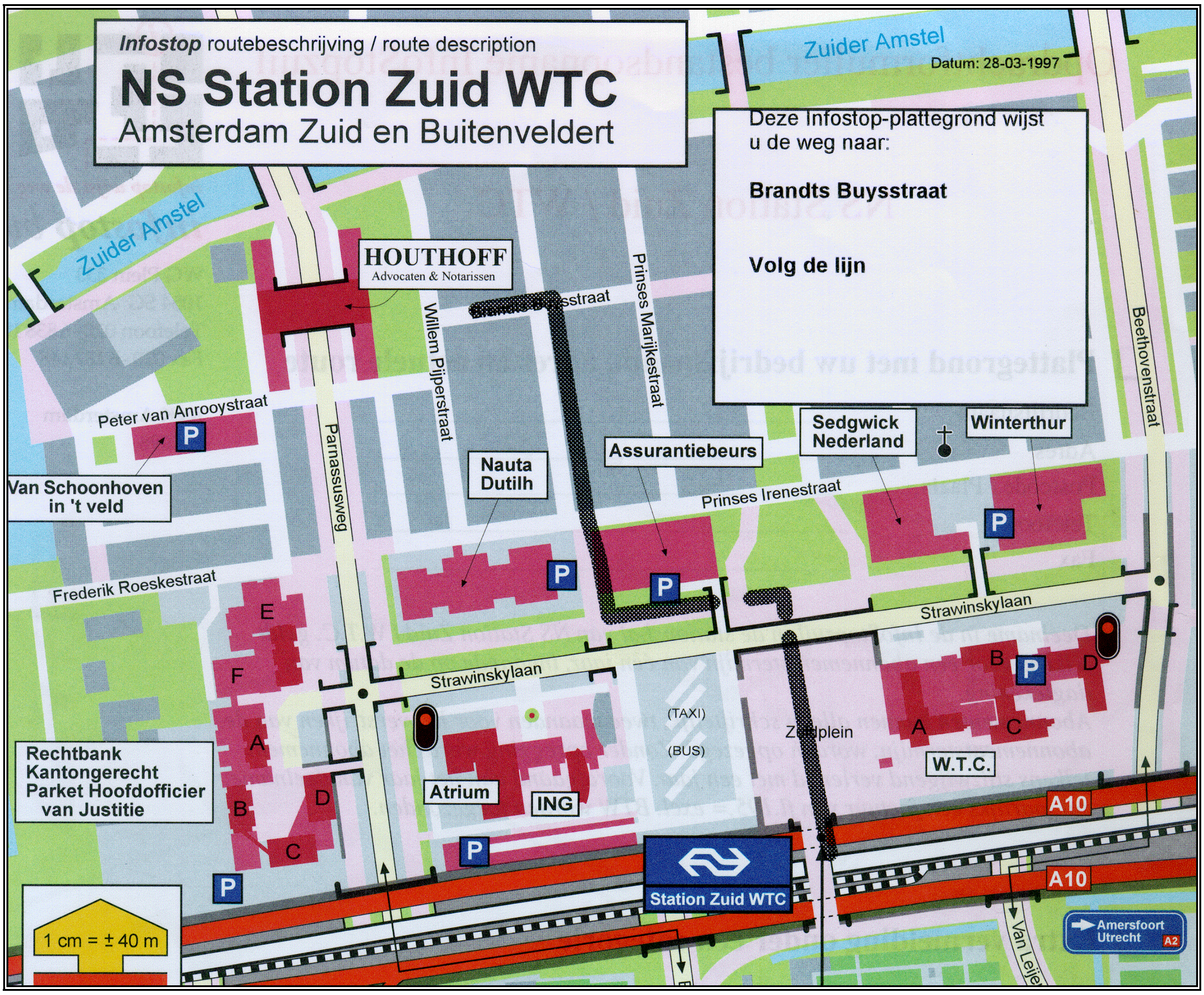
Other comments

The same Infostop is used along roads, and intended for car drivers. In this case, infostop indicates the easiest way to the destination, and, when no parking place is available, the way to the closest car park, with the following route to the destination.

An agreement was made with the telephone company for the installation of a telephone under the same shelter. Local authorities provide this shelter and a parking place next to infostop.

Other information enclosed

Infostop is supplied by INFOSTOP b.v., WG Plein 333, 1054 SG Amsterdam, Tel. + 31 20 6838 106. Fax. +31 20 6187 148.



Example of street-map

Cost of the measure

The price is unknown.
The price per map is 0,023 ECU

P-39 Parents' education

Place: Netherlands **Year of implementation:** Unknown

Description

The involvement of parents in children's traffic education and supervision is strongly recommended. That is why In many countries, traffic safety organisations create traffic clubs for children. Parents can enrol their children and, at regular intervals, children and parents receive mail on the subject. Another approach are campaigns by means of intermediate parties, which contact groups of parents.

One such Dutch project is named "Children of ethnic minorities in traffic". The involvement of these children in traffic accidents is higher than the average. The project is especially addressed to Turkish and Moroccan parents.

Here too, intermediate parties organise groups for parents. This is done through play groups, nursery schools, public health organisations or adult education.

The objectives are:

- Informing parents about their children's accident risks.
- Informing them about the causes of the vulnerability.
- Motivating parents to supervise their children and to teach their children how to behave safely.

The materials developed are:

- A manual for a series of four meetings with parents, within the context of adult education, including some sketches.
- A manual for an information evening, within the context of play groups, nursery schools, or public health meetings.
- A documentary video to make parents conscious and stimulate discussion (Turkish, Moroccan and Dutch versions).
- A manual for local authorities.

The first lesson is meant to familiarise parents with problems through discussion, the documentary video and some sketches. Assigned homework consists of looking for a good playground in their neighbourhood, and somewhere their children are not allowed to go.

Information leaflet

The second lesson teaches them that children's vulnerability makes supervision necessary. They learn how to practice crossing with their children, which becomes the homework for the following lesson.

In the third lesson, parents learn to teach their children about safe playing, and to contribute to traffic safety education. They learn that older children are not old and wise enough to supervise their younger children. They are expected to discuss what they have learned, at home with their partner.

The fourth lesson rehearses and strengthens the foregoing lessons by means of a game. The information evening treats the same subjects, but very shortened, and refers to the organisation where they can attend the complete course.

The project is developed under the authority of the cities of Amsterdam, The Hague and Utrecht, and three Regional Organs for Road Safety. Cities organise instruction meetings for prospective teachers.

Different aspects for pedestrians

Positive

Safety gains can be expected. Parents are stimulated to supervise their children, and to start traffic safety education.

First experiences are that parents seem to be very worried about their children's safety, and therefor very involved in the project.

Similar projects in Germany have reached large groups of parents.

Cost of the measures

The price of one complete package for one teacher is about 50 ECU.

Contact person

- City of Den Haag. Ministry of Transport, Public Works and Water Management. Public Information. P.O. Box 20901, 2500 EX Den Haag, The Netherlands. Tel: +31 703517118. Fax: +31 703516868

P-40 Danish traffic safety campaigns

Place: Denmark **Year of implementation:** Unknown

Description

Information campaigns have become a permanent part of Danish traffic regulating projects, both on a regular basis throughout the year - for example before winter sets in or at school beginning in August - carried out by The Danish Road Safety Council, and on a local basis, by the many local traffic safety councils. Experiencing user problems with new regulations (roundabouts, traffic calming, etc.) the Road Directorate insists on a campaign connected with every major change in local traffic patterns. /35/.

Many different media is being employed to get the messages across: newspapers, television, radio, pamphlets, information leaflets for schools, kindergarten and youth clubs, lectures or “theatre” in clubs, schools and institutions, and posters along the roadside.

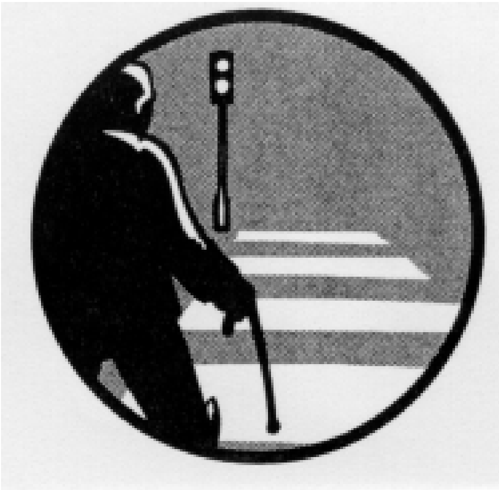
Examples of pedestrian safety campaigns in Copenhagen:

“Slip Boernene loes - men goer det med omtanke” (“Let the children free - but do it with caution”).
The campaign material is an information folder from the 4th Department of the City of Copenhagen, responsible for roads and traffic. The folder is distributed every year to new pupils in kindergarten class (pre-school form, but within schools) and in the first form. The idea is that children bring it home, and -hopefully- discuss it with their parents. Illustrations are adapted to children, since they are drawn in a way they recognise from their own books.

The folder tells parents what the municipality is doing to secure the way to school - and what parents should do themselves, on the basis of results from research about young schoolchildren’s abilities in traffic.

The main aim is to make parents realise that, in spite of many safety facilities introduced in the last years (for about 5 million ECU’s in Copenhagen through the 80’s), there are still problems and situations which may be dangerous, and thus only carefulness on the parents side and more training for their children can keep them safe.

“Begaa dig i krydset” (“The right behaviour at crossings”)
This campaign was a regional one for Copenhagen. It was distributed on one day with the two most important newspapers, but only in the distribution network in the eastern area of the Great Belt (approx. half the country). A large size folder was put into the newspaper, which was concerned with pedestrians’ and drivers’ duties and rights, when negotiating a crossing. Three vital rules for the two parties were mentioned. For pedestrians, it was recommended to start at a fresh green rather than later on, in order to be seen by motorists (try to wave or even smile!) and not to turn back if red light turns on.



About drivers, it was mentioned that a red man in the pedestrian traffic light does not mean in itself that drivers are allowed to cross, that one should try to establish eye-to-eye contact with pedestrians when turning in a crossing and, lastly, that one should be patient at pedestrian crossings and give special consideration to disabled, older pedestrians and children - unpredictable as they are. On the rear side of the folder a competition with three questions was printed.

One should be careful when crossing a street

"Trafikant i den tredie alder" ("Road user in her/his third age")
The folder is distributed in a different way from the two mentioned above. Its target group are older people, and the material is distributed to them at information meetings, institutions where old people live, meet or go to practise their hobbies etc. Lectures are then given by policemen, traffic engineers and a physiotherapists.

The advice, given by the Greater Copenhagen Traffic Safety Council, concerns difficult and dangerous situations in traffic. A number of situations are shown, urging the reader to chose one of the three actions mentioned.

Conflict often appears between straight on going cyclist and right turning vehicles

Other comments

None of these three campaigns mentioned have been evaluated.

Contact person

- Mr. Jesper Sølund. The Danish Road Safety Council. Tel: +45 36 30 13 22. Fax: +45 36 30 16 81

Organisational facilities

P-41a School crossing guard (DK)

Place: Denmark **Year of implementation:** Unknown

Description

The idea with school crossing guards is to ensure that the trip to and from school is made as safe as possible. The school crossing guard system consists of 6th graders and up (12 years old and older) who take responsibility for fellow students' safety across the main road-ways which students have to cross in order to reach their school. The program is geared towards ensuring students' safety as much as possible, by establishing a technical traffic system which permits school crossing guards to see if students use the system correctly. The initiative to establish such a system can stem from either the local police or schools themselves.

Traffic conditions vary from school to school and, therefor, a general set of rules and measures cannot be established. However it is accepted that school crossing guards are responsible only for school-mates, and that school crossing guards must never attempt to interfere with general traffic.

The two crossing guards are positioned on the crossing, holding their hand-sign

Every school should have a crossing guard instructor (teacher), who works in a close relationship with the police to instruct other crossing guards on their daily duties. Furthermore, the crossing guard instructor must supervise their daily routine. Before a student is admitted as a crossing guard, he or she must have the parents' permission. Then the candidate has to be supervised by the local police in co-operation with the crossing guard instructor. When the training is done, a diploma is presented which certifies that the police has qualified the student as a member of the crossing guard patrol.

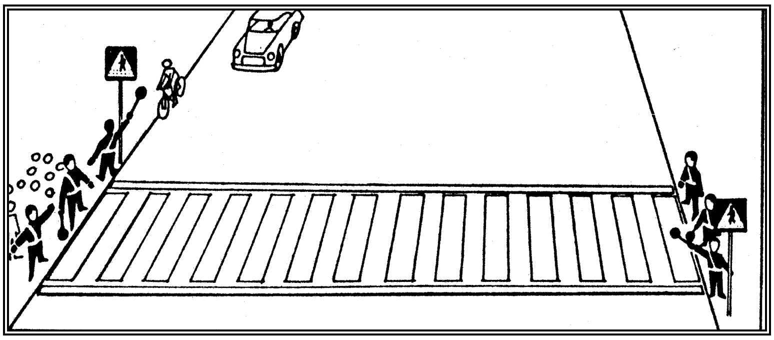
The crossing guard will be required to be always dressed in a traffic safety vest (bright yellow-green) or a white bandoleer which will make it easier for drivers to spot the guard. If the crossing guard must cross the street, the guards visibility will be further improved with the help of a yellow hand-held sign. Other tools are also available as e.g. a special yellow water-proof crossing guard poncho which is, in addition to being a protection against bad weather, very easy to spot when visibility is bad.

Schools which have school-patrols can define a crossing area outside the pedestrian crossings. This should be done by positioning a warning sign with a children symbol and supplied with a sign with inscriptions denoting "School" and the distance from the sign to the crossing area. On stretches where the speed limit is higher than 60 km/h, the before mentioned sign should be placed 150-250 m from the pedestrian crossing as a pre-warning, without indicating the distance. All signs should be separately illuminated and should be made larger in size if they are on roads with heavy traffic.

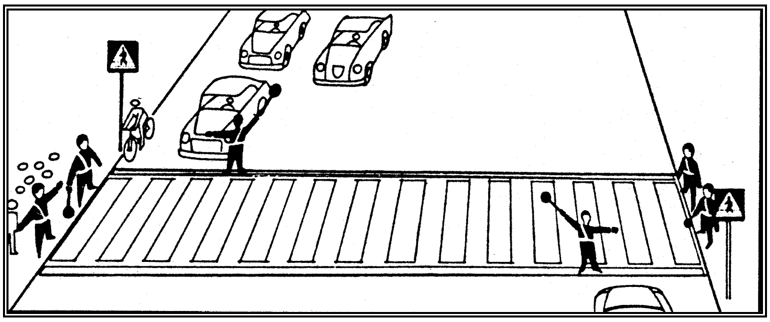
A flashing signal should be placed over each sign, with two alternating flashing apertures positioned beside each other and facing the traffic which the sign is designed to forewarn. The two yellow blinking lights can be activated with a key and will only be used when a crossing guard is on duty.

The markings should normally not be set up on roads, where car speed is low, and where schoolchildren do not make up the larger majority of pedestrians and cyclists, e.g. city streets which do not have town traffic through. /30/; /31/. Below is an example of how school crossing guards should function in practice

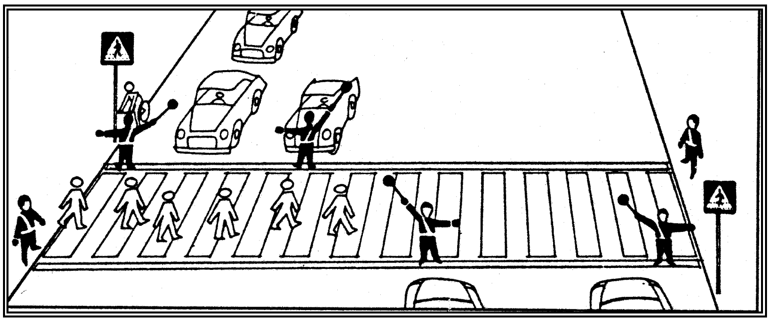
1) When the crossing guard judges that there is sufficient distance before the next driver arrives (i.e. avoiding any situation where sudden braking would be necessary) he or she can raise the yellow hand-held traffic sign so that it can be seen by drivers, to indicate that school children waiting at the curb would like to cross the street.



2) When the nearest car has come to a standstill, the crossing guard walks out onto the street until he or she can extend control over to the next lane with the hand sign.

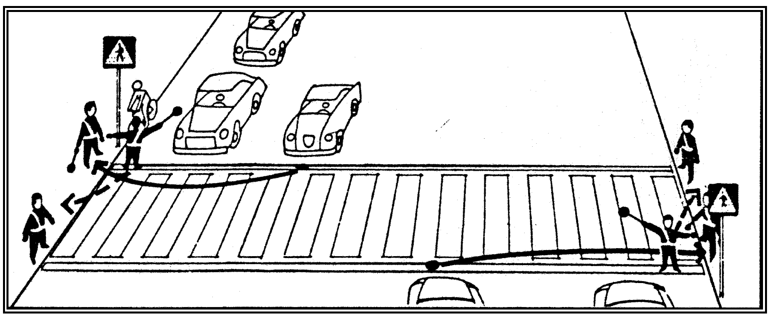


3) Now all drivers are at a standstill. The head crossing guard is positioned in front of the motorist who is nearest to the middle of the road, while another crossing guard steps onto the street from the pavement in front of the nearest vehicle to the pavement.



A crossing guard on the pavement gives the signal “safe crossing” to the school-mates once the head crossing guard gives the OK signal. The two crossing guards out on the street hold out a hand-held sign to help.

4) When the school-mates have crossed the street, the head crossing guard goes back to the pavement behind the crossing guard closest to the pavement. Once the head crossing guard is safely on the pavement, the last crossing guard can step onto the pavement.



Different aspects for pedestrians

Positive

School crossing guards ensure safe passage to and from school

Negative

If a school crossing guard frequently interrupts traffic, serious conflicts can occur.

Different aspects for non-pedestrians

Positive

School crossing guards signal drivers to be extra careful and aware about the fact that they are approaching a school crossing zone.

Negative

Not all drivers respect or fully understand signalling by school crossing guards.

Other comments

- The school crossing guard system has been in function for over 40 years. Schools themselves pay for all equipment
- The Danish traffic law instructs drivers to look out for children and school crossing guards.
- “The Danish Council for Road Safety” is responsible for the updating of material and equipment for crossing guards and their duties. The Council is in charge of the necessary equipment, warning panels, publicity and distribution of a crossing guard news-letter "Trafikanten", which contains matters of interest for school crossing guards.
- Every year, a party or an outing is organised for school crossing guards to thank them for their help. The celebration is paid by the municipality and "The Danish Council of Road Safety”.

Contact person

- Mr. Jesper Sølund. The Danish Road Safety Council. Tel: +45 36 30 12 22. Fax: +45 36 30 16 81

P-41b School crossing guard (BE)

Place: Genk (Belgium) **Year of implementation:** 1991

Description

Authorised traffic guards are parents or school staff who operate in crossings near schools in order to increase traffic safety and to help children crossing the street. They receive a short briefing from the city police. Genk is one of the cities using them in school surroundings. Authorised traffic guards are supported by an infrastructure policy.

Pedestrian path near a school in Genk, Belgium

Different aspects for pedestrians

Positive

Authorised traffic guards increase children's road safety near school gates.

Negative

- Authorised traffic guards are not as professional in traffic control as police officers.
- Traffic safety problems in home to school traffic do not only include immediate school surroundings. Other parts of the trip must not be neglected.

Different aspects for non-pedestrians

Positive

Crossing cyclists' safety is also improved by these traffic guards.

Contact person

- Municipality of Genk. Mr. D. Van de Goor. Cyclist officer. Tel: +32 89 30 97 26. Fax: +32 89 37 78 34

P-42 Children's Traffic Club

Place: Denmark **Year of implementation:** Unknown

Description

The Children's Traffic Club is a club created by The Danish Road Safety Council to teach children in the age group of 3-6½ years how to behave in traffic.

Before their child turns three years old, all parents in Denmark receive a pamphlet from the Road Safety Council to become aware that it is time to start educating the child how to behave safely in traffic. The Traffic Club offers the child a voluntary membership of the club for an amount of 110 DKK (app. 15 ECU) for a period of two years. There are two periods of membership, corresponding to children in the age group of 3-4½ and children in the age group of 5-6½.

In the Children's Traffic Club children and parents receive material twice a year, which helps parents teaching and training their child how to behave in traffic. The first material arrives when the child turns three years old.

The material consists basically of books, audio-tapes, games and small exercise books. In all packages there is enclosed a letter for the child and another one for the parents. In the parents' letter there is a short description of what the child is supposed to learn and how to learn it. In every package there is also a small exercise book that carefully guides parents in how to practise safe traffic behaviour with their child. The Children's Traffic Club has the philosophy that reading aloud, playing and talking can increase children's interest in traffic, but that the practical training should take place out in real traffic.

When the child turns 3-5 years old it is time to teach the child how to be a safe pedestrian. They should be taught to walk on the footpath in the right way and to look both ways when crossing the road, both at signalised and in non-signalised intersections. When the child turns 5½ years old, it is time to start practising to walk the most safe route to and from school/kindergarten. It is important to be aware that the most safe way to and from kindergarten is often longer than the most direct way.

At the age of five, the child is still not old enough to walk alone to and from kindergarten/school. When the child turns 6½ years old it receives the last material from the Traffic Club.

It is difficult for a child to cross a signalised intersection in a correct way. The child is supposed to know that green light means walk, red man means stop (or proceed if started) and that it should be aware of turning vehicles.

Different aspects for pedestrians

Positive

- At an early age, children are taught how to behave in a safe way in traffic.
- Parents get information and advice on how to teach their children to behave safely in traffic.
- A large number of traffic education programmes have been evaluated in terms of children's behaviour. Several studies showed that the practical training of children in real traffic improves their traffic behaviour. Theoretical teaching of children was shown to improve their knowledge, but to have limited effect on their behaviour. /28/; /29/.

Negative

- There are doubts about the effect on accident risk of teaching and training strategy based on the knowledge of child psychology. Children have a number of psychological and physiological limitations. They can learn how to behave, but they can never be relied upon to use their knowledge when necessary. /30/; /43/.
- There is no guarantee that effects on knowledge or behaviour automatically lead to a reduced accident risk.

Other comments

Approx. half of the children in the age group of 3-4½ are members of the Children's Traffic Club, while the amount of children in the age group of 5-6½ is much less.

The National Board of Health in Denmark recommends parents to begin teaching their children the most elementary "walking rules" in the age group of 2-4 years old.

When the child begins school it will still get traffic education, e.g. first class schoolchildren are given a voluntary "walking-test" to ensure that they know how to cross the road in a safe way.

In some countries, the membership fee for children's traffic club is free.

Contact person

- Mr. Jesper Sølund. The Danish Road Safety Council. Tel: +45 36 30 12 22. Fax: +45 36 30 16 81

6. Catalogue of good practice to promote *cycling*

Facilities for moving along road sections

C-1a Admission of cyclists into pedestrian streets in the Netherlands

Town: Zoetermeer, Gouda (The Netherlands) **Year of implementation: -**

Description


Photo: SWOV, Institute for Road Safety Research, A. Vis

Should cyclists and pedestrians mix in car-free shopping streets and areas and in squares? And should this mixing be structured by some form of cycle-lane? Cyclists who do not have their origin or destination in this area or square prefer to use an attractive and quick route. We recommend a cycle-lane if many of this type of cyclists occur. This lane should differ from the area for pedestrians by its pavement or colour.
Physical separation between cyclists and pedestrians is not recommended, because cyclists must be able to store their bicycle.
Mixing can be problematic if the volumes of both pedestrians and cyclists are high. In any case it should be clear to both cyclists and pedestrians which part of the area is intended to be used by either cyclists or pedestrians. The middle part of the street should be used by cyclists.
Car-free streets and areas with admittance for cyclists have special signposting. An additional condition is the presence of sufficient cycle-racks and/or storages near destinations that attract many cyclists.

Different aspects for cyclists

Positive
- Many attractive destinations within easy reach of cyclists.
- Short and safe routes for cyclists to public facilities and shopping centres.
- Short and relative safe routes through pedestrian areas and shopping centres.

Negative
- Possibility of conflicts between cyclists and pedestrians.

Contact persons

Municipality of Gouda
Traffic and Roads division
(+31) 182547550

Municipality of Zoetermeer
Traffic and Roads division
(+31) 793537587

C-1b Admission of cyclists into pedestrian streets in Belgium

Town: Mechelen (Belgium) **Year of implementation: various**

Description

Some pedestrian streets or squares force cyclists to make large detours, or to take a walk across these areas. Therefore, an attempt is made by the city of Brugge to open up some pedestrian areas for cyclists. However, federal traffic regulations do not allow this measure. But the city of Mechelen has already approved cycling in pedestrian streets. A number of pedestrian streets has been opened up for cyclists permanently. Cycle stands are also provided within this area. A special traffic sign has been designed for this situation. One pedestrian street is opened up for both cyclists and public transport (buses). The extension of the number of streets in this case is planned for the near future.

The city of Gent also considers opening some pedestrian streets for cyclists. The main motivation is to avoid detours for cyclists. These detours are sometimes even worsened by one-way streets. In a first stage, cyclists are proposed to be admitted outside shopping hours (before 10h00 and after 18h00). A wider admission is considered in pedestrian streets with public transport lines, in which cyclists can be allowed all day.

According to recommendations from the Belgian Institute for Road Safety, mopeds should be excluded from pedestrian areas. Other recommendations propose to avoid cycling in case of very dense pedestrian flows.

Different aspects for cyclists

Positive

- The opening of pedestrian streets for cyclists avoids detours to be made by the cyclists and makes cycling more attractive.

Different aspects for non-cyclists

Positive

- A small risk for (less serious) accidents exists. So far the measure has proved to be safe.
- During off-peak hours (e.g. at night) the presence of cyclists improves the social safety.

Negative

- Pedestrian sometimes don’t feel safe, especially during peak hours.

Contact person

City of Mechelen
Mr. J. Vandamme
Cyclist officer
Phone: (+32) 15297529
Fax: (+32) 15297515

C-2 Bicycle route - an example from Odense

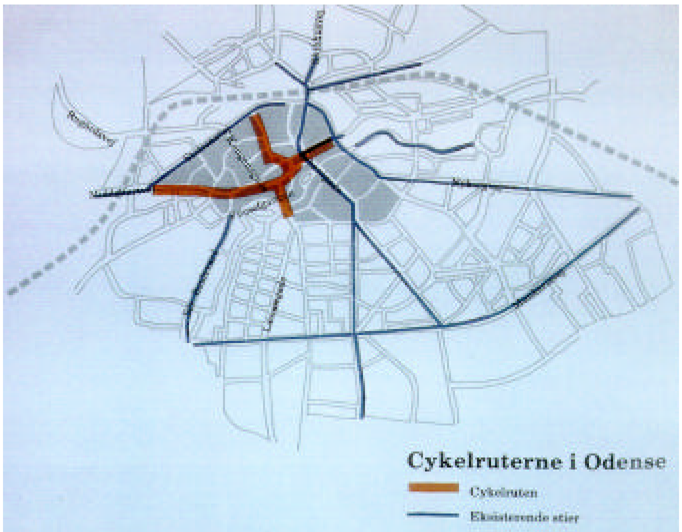
Town: Odense (Denmark) **Year of implementation: 1984**

Description

In the early seventies, the town centre in Odense was generally relieved from most of the through-traffic. This was an opportunity for a further moderation of traffic.

In 1984, the existing pedestrian street in the town centre had a total length of 600 m, and cycle tracks had been established along several important streets. But there was a lack of cycle tracks in the actual centre of the town which was the destination of 12,500 cyclists (each day).
The new traffic plan in Odense (prepared in 1984) is based on the fact that all general car traffic is channelled via a ring road system from where car traffic with origin/destination in the town centre is led to a number of car parks close to the pedestrian streets (enlarged to a total length of 2.5 km).

There are four types of streets in the city. Some are entirely pedestrianised, other shopping streets have a two-way cycle track within the centre of the city, slightly below the level of the footpaths on either side. The third type is a combined cycle track and bus route, a street of 6.0 metres wide, carrying traffic in both directions, while the few streets in the fourth category have one-way streets for cars, but lanes in both directions for cyclists. Different surfaces and street furnishings clearly mark each type.



Map of the bicycle route in Odense
Bicycle route
Existing cycle tracks
Photo: The Danish Road Directorate

Dimensions

Pedestrian streets with dual cycle tracks
The streets are 12-14 metres wide and the width of the cycle track is 3.5 metres. There is a small difference in height (3 cm) between the track and the remaining area for the pedestrians. The track is paved with dark paving stones and a bevelled edging which emphasizes the borderline between the track area and the pedestrian area.

The bus and bicycle route
The carriageway area in the bus street is 6.0 metres wide and demarcated from the rest of the area by means of a bevelled kerb. Formally the street is a normal one where pedestrians must give way to buses when crossing the street, but where vehicles, except buses, are prohibited.

The total length of the bicycle route is about 3 km.

Different aspects for cyclists

Positive
From the outset there was some doubt about the consequences of mixing pedestrian and cycling traffic in the pedestrian network. The results, however, have surpassed expectations. The traffic takes place with great mutual consideration, and only a few accidents involving cyclists and pedestrians have happened. /8/.

The provision of cycle ways has improved access to the car-free centre for both shopping bound cyclists and those passing through. On account of the scheme cycling has risen by 40 per cent in the city centre.
/24/.

The amount of accidents per year in a period respectively before and after the alterations of the city centre appears below:

Accidents	1980 - 1983	1989 - 1990
Total accidents	49.8 per year	38.0 per year
Involving pers. injury	15.8 per year	12.0 per year

/8/.

Negative
On the combined bus and cycle route in the city centre, buses pull up to the kerb leaving no room for bikes.

Concerning the cycle lanes or segregated cycle ways along the main roads: Car drivers can go fast on the wide roads and gently sloping terrain, especially on the ring road. This is also true of cyclists, with the result that cars and bikes meet at high speed at uncontrolled junctions. The accident rate at some junctions on the major routes near the centre has increased. The accidents involve among others turning cars and cyclists going straight on. However, the number of accidents involving cyclists has not risen as much as the number of trips made by bicycles.
/24/.

Accidents between vehicles and cyclists at junctions are handled by altering the road markings to narrow the cycle lane and thereby forcing cyclists to slow down.
/24/.

Different aspects for non-cyclists

Negative
Physical measures have been taken to help cyclists and pedestrians to get along better: Where the cycle route crosses pedestrianised streets, speed humps were installed in some places to warn cyclists of the crossing ahead and force them to slow down. However after some time the humps

were removed, because they were said to be dangerous - but that was because the cyclists were going too fast.

The lowered cycle way at the pedestrian streets gives many cyclists the idea that they have some exclusive rights.
/24/.

Other comments:

Odense is situated on Funen and is with its 140,000 inhabitants the third largest city in Denmark.

The bicycle route, is a part of a bicycle experiment in several Danish towns. In 1984, the Danish Road Directorate approved a 3.5 millions DKK (255.000 ECU) grant-in-aid to establish cycle routes through Odense town centre provided the Odense municipality contributed the same amount.

Studies show that the Centre Plan and new bicycle facilities have attracted many more cyclists. In the five years from 1984 to 1989 the number of cyclists using the eastern section of the east-west route increased by 70 per cent to 9,300 cyclists. In the central section the number almost doubled to 4,600 cyclists. Some of these users had previously used parallel routes, where cycle traffic decreased by 30 per cent.

Bicycle traffic to and from the centre of the city increased from 12,500 bicycles a day in 1982 to 15,400 in 1990.

An information campaign about the cycle routes in Odense has been carried out.

/8/, /18/, /24/.

Contact person

Municipality of Odense
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C-3 Bicycle Route and Signposting

Town: Nakskov (Denmark) **Year of implementation: 1989-1991**

General photo or drawing

The bicycle route
Photo: The Danish Road Directorate

Signs for cyclists
Photo: The Danish Road Directorate

Description

Road-type:
Roads with 1 or 2 lanes

Posted speed limit along the bicycle route:
Between 30 and 50 km/h

Bicycle route with special signing for bicycle traffic
Nakskov is a provincial town with approximately 15,000 inhabitants. The bicycle traffics share of the total transport volume is considerably larger than in many other comparable provincial towns. This is because the city structure is "tight", the distances are short, and the terrain is essentially flat.

Besides establishing the cycle-route itself, the Cycle-route project entails thorough rebuilding of the cities important roads. In total, six junctions on the bicycle route have been completely rebuilt. One of the junctions was rebuilt as a roundabout. In addition, the town squares were completely rebuilt, and a new design program for the cities road inventory. Light poles, benches, and pavilions were given a user friendly and functioning design throughout in a cobalt-blue colour.

The bicycle route in Nakskov is one of six bicycle route projects in Denmark. The Nakskov project consists of 2 bicycle routes: A route going east-west, and a route going north-south. The two routes intersect each other in the centre of town. The route is 1.3 km long and connects bicycle tracks to the surrounding residential areas. Emphasis has been placed on creating a coherent net with an aesthetic and characteristic overall impression.

Cycle tracks are established on both sides of the ring road, whereas in the towns centre, generally dual tracks or lanes are made, permitting cycle traffic against the otherwise one-way traffic.

As a continuous element of the bicycle route, the bicycle tracks are painted red, not only on stretches of bicycle tracks, but also at junctions. The colour suits the many red brick houses and tile roofs in the town, and makes cyclist areas stand out from the other road users.

While road signs for car traffic have not been changed in connection with the project, special signing for cyclists was established for the first time in the town. The blue signs with white writing were made specifically for the bicycle route project, as there are as yet no rules for road signing for cyclists along local bicycle routes in Denmark. There are bicycle symbols, naming the destination, and distances in kilometres on every sign. The sign is placed on a pole which suits the towns new street layout in terms of colour and design /6/, /7/, /24/.

Dimensions

Width of bicycle tracks : 1.8 - 2.0 metres.
Width of bicycle lanes : 1.1 - 1.4 metres.

Normally, it is not permitted to demarcate a bicycle area through a junction in colours other than blue or the same colour as the surface of the vehicle lane. But there are exceptions: to emphasize the structure of a path system, the colour of the cycle area through junctions can be the same as for the rest of the path system.

Different aspects for cyclists

Positive

Cyclist friendly :
- After construction of the bicycle routes, there are more people who ride bicycles, and fewer people who drive cars.
- Almost 80% of interviewed cyclists have experienced that their bicycle rides through the town have seemed markedly safer and more accessible than before the bicycle route was constructed.
- The thorough rebuilding of roads has resulted in lowering the average speed of cars /7/.

- The signs along the bicycle routes are placed primarily for the benefit of tourists; Danish as well as foreign. Therefore, as well as information about the surrounding residential areas, the signs include information about the recreative facilities such as; camping sites, information centres, theatres, youth hostels, etc.

Safety for cyclists and non-cyclists:
- Inspection of accident statistics 3 years prior to, and 3 years after the construction of the bicycle route project shows that the total number of accidents resulting in personal injury in the town zone has decreased from 81 prior to construction to 71 after construction.

- The number of personal injuries has also decreased, from 100 prior to construction to 77 after construction. An analysis of the severity of the personal injuries shows that the number of cyclists killed and less severely injured is generally unchanged, while the decrease in personal injuries mainly concerns the seriously injured.

Different aspects for non-cyclists

Positive
- As mentioned above, the total number of personal injury accidents, and the number of personal injuries has decreased after construction of the bicycle route - see *Different aspects for cyclists.*

Negative
- More streets have been rebuilt as one-way streets because of construction of the bicycle route.

Other comments

Degree of implementation:
During the 1970s, the number of traffic accidents causing personal injuries was halved in Denmark. Cyclists, however, enjoyed a relatively small share of this improvement and in the beginning of the 1980s, it was approximately 5 times as dangerous to travel 1 km by bike than by car. Against this background, from 1984 onwards, experiments supported by the Danish Road Directorate were started concerning the establishment of bicycle routes in 6 Danish towns: Herning, Aarhus, Odense, Helsingør, Odder and Nakskov.

Local bicycle route signs for cyclists are found in several other towns and municipalities around the country.

In 1993, a total of 3,500 km of national and regional signed bicycle routes were opened. The national routes are placed across the whole country, while the regional routes connect towns within a limited area. Together with bicycle tracks along the highways, the national and regional bicycle routes connect provinces, tourist attractions, and nature sites. In total, there are about 10,000 km of signed bicycle routes in Denmark.

In 1991, Nakskov was awarded the Associations Town-for-Cyclists prize.

Campaign/Information:
The people of Nakskov and its neighbours are being informed about the bicycle route project via an information campaign about the project. The campaign was launched in the autumn of 1990 partly by a door-to-door newsletter about the bicycle route and its purpose, and partly by posters along the ring road. The campaign was repeated in 1991, when the streets of the central town were involved.

Costs

The bicycle route project, including rebuilding, and new road equipment:
Approximately 20 millions DKK (2,700,000 ECU).

Cost per sign (prototype): Approximately 4000 DKK (550 ECU).

Other information enclosed

All photos: The Danish Road Directorate

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C-4 Bridges for cyclists as short cuts

Towns: Gent (Belgium) **Year of implementation: not implemented yet**

Description

Bridges for cyclists as short cuts
A bridge for cyclists, crossing a canal, is planned for the near future. By this bridge, an attractive cycle-route can be created between the city centre and a major suburb ("Wondelgem") north of the city. Now the only possibilities to cross the canal are bridges with high volumes which implicate an important detour for many cyclists.

The future demand on the route of the bridge has been predicted by a transport model.

For the bridge, an existing but abandoned railway bridge can be used.

Different aspects for cyclists

Positive

- The bridge would mean an important reduction of the distance for cyclists, which makes cycling more attractive.
- The bridge gives the possibility for cyclists to use less busy routes, which increases the safety.

Different aspects for non cyclists

Positive
- The bridge can be used by pedestrians as well, and by public transport users, since a bus line is existing along both sides of the canal.

Cost of measures

Since an existing but abandoned railway bridge can be used, the costs are moderate and considerably lower than in case of a new bridge. The only costs are the repair costs.
The exact costs are unknown for the moment.

Contact person

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C-5 Cycle streets with mixed use

Town: Utrecht (The Netherlands) **Year of implementation: -**

Description

A ‘cycle-street’ is a street with mixed traffic where the cyclists have a dominant position and motorized traffic is allowed but should not be dominant. Concerning the dimensions of the road profile a distinction can be made between a tight profile, a spacious profile and a critical profile.
With a spacious profile there is enough room for motorists to overtake cyclists, but this profile has the risk of a higher and thus dangerous driving speed of motorists. Therefore a spacious profile is not recommended.
A critical profile is in between a tight and a spacious profile. There is just enough room for motorists to overtake cyclists closely. Also this profile can lead to dangerous situations for cyclists and a higher speed of motorized traffic. Also this profile can not be recommended from the point of view of safety for cyclists.
A tight profile means that there is not enough space for overtaking manoeuvres. Motorists that wish to overtake cyclists have to wait until cyclists offer the space to overtake. This type of street design leads to lower driving speeds. However cyclists can feel pressed or threatened by motor vehicles wishing to overtake. Therefore this design is only for streets with low volumes of motorized traffic and with relative short road-sections. Speeds should not be higher than 30km/h.

Tight profile
Photo: SWOV Institute for Road Safety research, A. Vis

Critical profile
Photo: SWOV Institute for Road Safety research, A. Vis

In the example of the tight profile the motorists in both direction have to stay behind the cyclists. Between the two directions there is a physical separation. Overtaking is only possible at the junctions. Application of this design principle depends on the function of the road, the observed speeds and the type of traffic (e.g. the number of trucks and busses).

Dimensions

In the case of the example (two directional mixed traffic) 2.25 to 2.50 m per lane (thight profile).

Different aspects for cyclists

Positive

- more safety for cyclists.
- no overtaking manoeuvres by motorists.
- a lower speed.
- motorists are sometimes pressed to choose another route.

Negative

- cyclists sometimes feel pressed or threatened by motor vehicles.

Different aspects for non-cyclists

Negative

- motorists can be impatient.
- only applicable for streets with low volume and speed of motorized traffic.

Other comments

No other speed reduction measures necessary.

Contact persons

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C-6 Cycle lanes

Country: The Netherlands **Year of implementation: -**

Description

Photo: SWOV, Institute for Road Safety Research, A. Vis

Photo: SWOV, Institute for Road Safety Research, A. Vis

A cycle lane is a part of the road along the edge of a carriageway which is separated by a continuous line and where white bicycle symbols are depicted on the road. The design of this bicycle symbol is standardized. When there is a continuous line other road users are only allowed to use the cycle lane if they do not impede cyclists and moped riders. No stopping or parking is allowed. The cycle lanes mostly have a red colour and are sometimes provided with a different type of pavement.

Dimensions

A width of 1.50 to 2.00 m is recommended. In case of a width less than 1.50 m overtaking cyclists and moped riders may conflict with motorized traffic. If parking occurs at the right hand side of the cycle lane, a deterrent strip of 0.70 m should be constructed between cycle lane and parking space. With angular or perpendicular parking this strip should be at least 1.00 m. Parking space and cycle lane together should have a minimum width of 4.00 m and with much loading and unloading even 4.75 m.

Different aspects for cyclists

Positive

- separated position on the road with legal status.
- Other road users are not allowed to use the cycle lane.
- A stopping prohibition for the motorized traffic.
- No impediment of parking motor vehicles.

Negative
- Chance on increase driving speed of motorized traffic.

Different aspects for non-cyclists

Positive
- Better traffic flow of motorized traffic.
- Fewer confrontations/conflicts between cyclists and motorists.

Negative
- Sometimes higher driving speed of motorized traffic.

Other comments

Cycle lanes close to junctions usually have a function connected to filtering traffic, aligning and keeping the junction accessible for cyclists. In that case it is possible to create an expanded bicycle streaming lane (EBSL). The EBSL is only applied within built up areas at junctions with mixed traffic and equipped with traffic-lights. The EBSL consists of a separate streaming facility for cyclists in front of the streaming space for motorized traffic.

Expanded Bicycle Streaming Lane (EBSL)
Photo: SWOV, Institute for Road Safety Research, A. Vis

C-7 Cycle tracks and cycle lanes

Country: Denmark **Year of implementation: -**

Drawing

Cycle lane
Photo: The Danish Road Directorate

Cycle track (track and roadway separated by a kerbstone)
Photo: The Danish Road Directorate

Cycle track with verge between cycle track and roadway
Photo: The Danish Road Directorate

Description

Cycle tracks:
The following types of cycle facilities for separation can be found along roads in Denmark:

-cycle track
-cycle lane
-cycle strip

Cycle track
Cycle tracks will be applied in streets with a considerable amount of traffic. If the cycle track is located immediately adjacent to the carriageway, cyclists and car drivers should, at least, be separated from each other by a kerb.

Cycle lane
A cycle lane will be applied in streets with only a few cyclists and with limited space. A cycle lane is at the same level as the carriageway. The area is marked with bicycle symbols and is visually separated from the carriageway by a 0.3m wide continuous white strip.

Cycle strip
A cycle strip is a marking of the area close to the kerb of the carriageway. The area is marked with a colour, red for example. The cycle strip can be created as an improvised solution in places with only a few cyclists, with limited space and in cases which do not allow (according to the regulations) the marking of a cycle lane. The selected colour is not a road marking and thus legally it is not a cycle track, but a visual signal to car drivers to drive at a suitable distance from the kerb, and it is a signal to the cyclists to ride close to the kerb /5/.

Dimensions

The recommended width and minimum width are as follows /5/:

	Recommended width	Recommended minimum width
Cycle track	2.2 metres	1.7 metres
Cycle lane (incl. 0.3 m wide strip)	1.5 metres	1.2 metres
Cycle strip	-	0.6 metres

Different aspects for cyclists

Positive
Cycle tracks and cycle lanes
At stretches with a lot of car- and bicycle traffic, it is a good idea to construct cycle lanes or cycle tracks. Cyclists feel safer, and traffic safety is increased /9/.

Other comments

In urban areas, 3500 km of cycle tracks and about 500 km of cycle lanes have been constructed, while in rural areas the lengths are about 1600 km of cycle tracks and 350 km of cycle lanes.
The total length of the road network in Denmark is approximately 76,000 km, of which 64,000 km are municipal roads (primarily situated in urban areas) /10/.

Costs

Construction of cycle tracks on both sides of the road:
Urban areas: 2.0-3.0 million DKK per km (274,000-411,000 ECU).
Rural areas: 1.0-1.5 million DKK per km (137,000-205,000 ECU)

Construction of cycle lanes on both sides of the road:
35,000 DKK per km (ca. 5,000 ECU) not including the side expansion of the road.

Contact person

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8 Infrastructural facilities regarding social safety

Town: Utrecht (The Netherlands) **Year of implementation: -**

Description

Bicycle/ pedestrian tunnel Utrecht
Photo: SWOV, Institute for Road Safety Research, A. Vis

Bicycle/ pedestrian tunnel Utrecht
Photo: SWOV, Institute for Road Safety Research, A. Vis

Overfly for cyclists and pedestrians Zoetermeer
Photo: SWOV, Institute for Road Safety Research, A. Vis

Bicycle/ pedestrian tunnel Zoetermeer
Photo: SWOV, Institute for Road Safety Research, A. Vis

Social safety has also important implications for the planning and design of cycle facilities. Social safety concerns the extent to which (in this case) cyclists feel free of threat or confrontation with violence. Social safety is linked with the design of (public) space as well as the infrastructure. A distinction can be made between objective and subjective social safety. Objective safety concerns the crimes and offences actually being committed and subjective safety concerns the extent to which the environment is perceived as being safe. The subjective social safety can be influenced by the design of the public space and the bicycle facilities. However it is not possible to avoid all criminal activities by well designed infrastructural measures. Sometimes measures for promoting of social safety may be contrary to the objective traffic safety! These measures are not preferable!. In case social unsafety the consideration can be made to offer socially better alternatives. Detouring is in such cases acceptable. Especially social safety is of importance for design and construction of cycle-tunnels. Social safety promoting factors are a well designed lighting facilities, good visibility, the furnishing of the tunnel, the extent of social control (the number of people passing the tunnel at the same time), the enforcement, the possibilities for a good overview and the absence of objects close to the bicycle-track behind which possible assailants can hide. Furthermore it can be important that there are alternative routes to escape through.. The more users of the route (tunnel), the less danger for

them.
Also attractive surroundings are preferable to increase the social safety. The example(s) concern(s) a bicycle/pedestrians-tunnel in the neighbourhood of the central railway station in Utrecht and an overfly (for cyclists and pedestrians) across a motorway near Zoetermeer. The social control and lighting are very good, and the dimensions are very wide.

Different aspects for cyclists

Positive

- Very attractive for cyclists.
- A high level of social safety.
- A well designed lighting system.
- Good visibility.
- A good finishing touch.
- A safe and short connection.

Other comments

The costs will be higher than in a conventional design.

Contact persons

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C-9 Mixed traffic in areas with traffic calming

Town: Genk (Belgium) **Year of implementation: not defined**

Description

Mixed traffic in the city centre and other areas with traffic calming (city of Genk)
A traffic circulation scheme will reduce the car traffic in the city centre in the short run, within an inner circle road. The aim will be a maximum speed of 30 km (but not compulsory) by road reconstruction. Cars and cyclists will be mixed in all streets.
Other districts are or will be reconstructed as "zone 30" areas, in which mixed traffic of cars and cyclists is considered to be the best solution as well. About 70% of the districts - within the main road network - are already converted into "zone 30".
This policy is rather common in Belgium: in areas with maximum speeds lower or equal to 30 km/h, mixed traffic is the safest solution.

Different aspects for cyclists

Positive
The speed reduction for cars increases both the objective and subjective safety for the cyclists.
The traffic circulation scheme will reduce the volume of the car traffic, which makes cycling more attractive.

Different aspects for non cyclists

Positive
These measures will also increase the safety of pedestrians (both objectively and subjectively).
Also the attractivity for pedestrians will increase significantly.

Other information enclosed

The inner city of the city of Genk, in which the measures will be implemented, is rather small. A large number of parking places (no parking fees) have been situated in the immediate surroundings, in particular on one very extended parking area. From this parking area, the inner city is within walking distance.

Contact person

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C-10 New types of design for bus stops

Country: Denmark **Year of implementation: 1992-1993**

Description

In order to reduce the conflicts between bus passengers and cyclists at bus stops in urban areas, the Danish Road Directorate has studied three new types of design for cycle tracks at bus stops which are next to the cycle track.

Practically all accidents occurring at bus stops without passenger islands involved the leaving passengers. This is probably due to the fact that the bus passengers and the cyclists cannot see each other while the passengers are still in the bus. However, if there is an island from which the passengers can enter and leave the bus, the parties will have sufficient time to take notice of each other and, thus, to react.

In Denmark, there are two different traffic priority rules at bus stops. If there are no traffic islands between the cycle track and the bus stop the cyclists have to give way to the passengers. However, if there is a traffic island between the cycle track and the bus stop it is the pedestrians/passengers who have to give way to the cyclists.

Three new designs of cycle tracks at bus stops were designed and tested based on the assumption that conflicts between bus passengers and cyclists could be reduced by making the conflict area visible at bus stops and if possible by clarifying which party has the right of way /9/.

Design 1- Pedestrian crossing combined with profiled marking

The design comprises areas, each of which has three strips painted across the cycle track. These areas resemble pedestrian crossings and are located outside the doors of the bus. The areas are implemented in order to increase the attractiveness of cyclists and bus passengers and to guide the bus passengers across the cycle track at right angles. A broad profiled marking is also implemented on the offside of the cycle track as narrow lateral strips.

Design A - Pedestrian crossing combined with profiled marking
Photo: The Danish Road Directorate

Design 2 - Profiled marking on the offside of cycle facility
Photo: The Danish Road Directorate

Design 3 - Painted pattern with visual interruption
Photo: The Danish Road Directorate

Design 2 - Profiled marking on the offside of cycle area

The design comprises a 0.5 m broad profiled strip laid along the offside of the cycle track. The strip has the visual effect of reducing the width of the cycle track and it also causes physical inconvenience when ridden over, to discourage cyclists from doing so. Such a clearly noticeable strip is expected to reduce the speed of cyclists while it clarifies the conflict area. Apart from these effects, it also gives bus passengers a small free area on which to descend. The profiled strip is implemented in the form of narrow lateral strips on the kerb. The remainder of the conflict area is painted in white.

Design 3 - Painted pattern with visual interruption

The design comprises a painted area of the cycle track around the bus stop, supplemented with a 6 m warning area. The warning area comprises a number of painted areas, the lengths of which become shorter as cyclists approach the conflict area. It is expected that this will stimulate cyclists to reduce speed. Cycling on the strips will cause no physical effects in the form of rumble, while its coefficient of friction is the same as that of the surface of the rest of the cycle track /9/.

Dimensions

Design 1- Pedestrian crossing combined with profiled marking

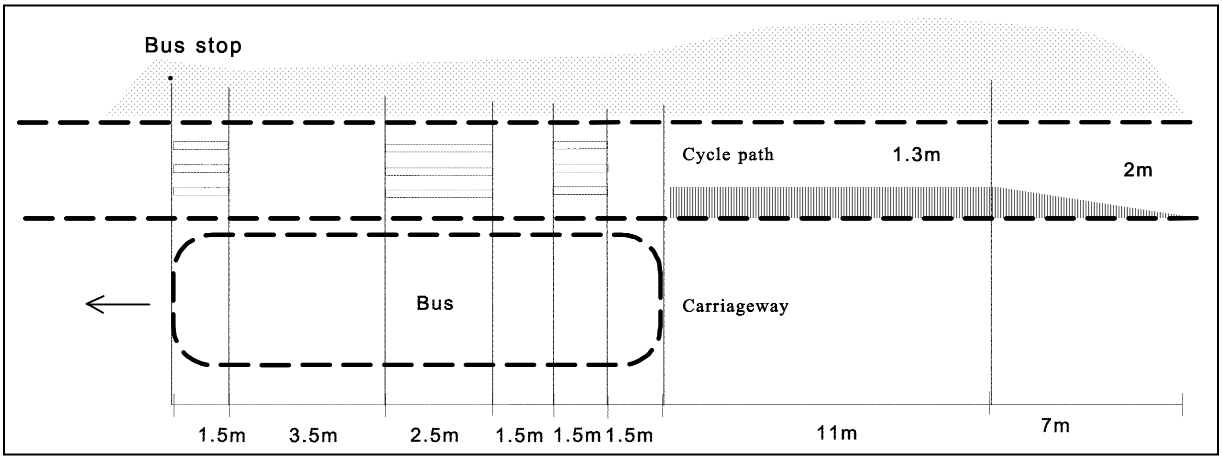
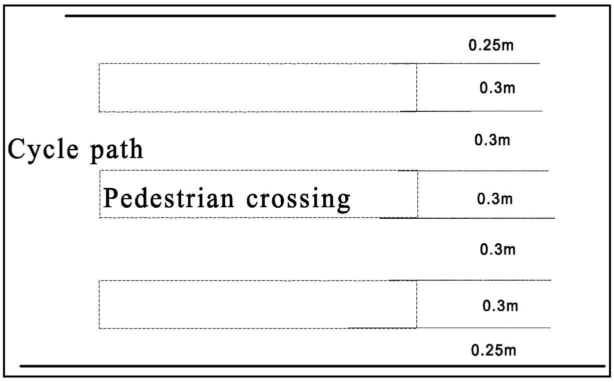


Illustration: The Danish Road Directorate

A 0.5 m broad profiled marking is implemented on the offside of the cycle track towards the vehicle lane. The profiled marking is implemented on the cycle track as narrow lateral strips, with a width of 5 cm and a height of 0,8 cm, in white thermoplastic material.



The dimensions of pedestrian crossing for a 2 m broad cycle track.

Illustration: The Danish Road Directorate

Design 2 - Profiled marking on the offside of cycle facility

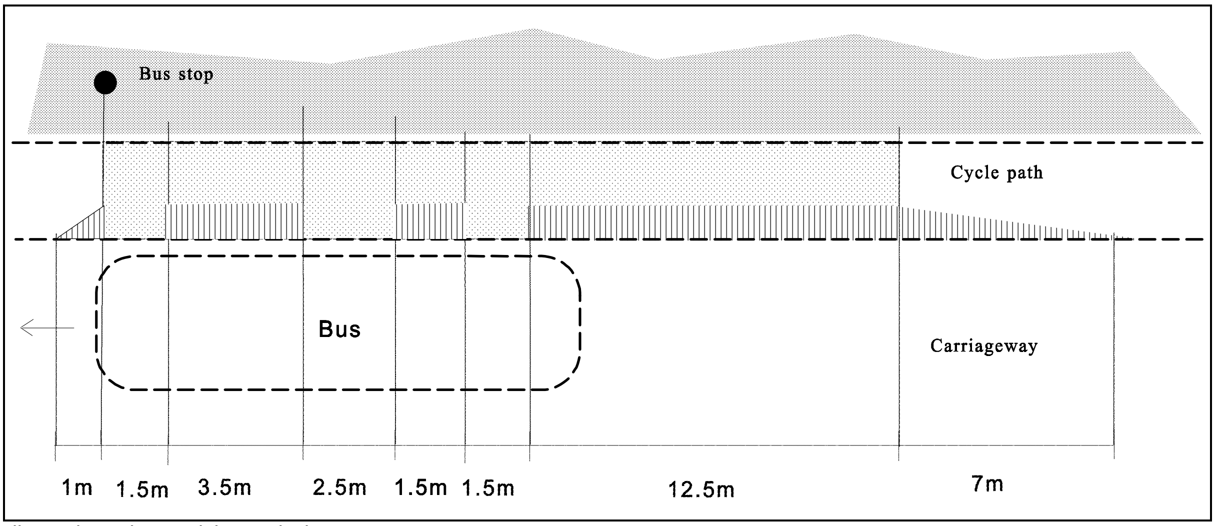


Illustration: The Danish Road Directorate

The design comprises a 0.5 m broad profiled strip laid along the offside of the cycle track. The profiled strip is implemented in white thermoplastic material, in the form of narrow lateral strips on the kerb, with a width of 5 cm and a height of 8 mm. The remainder of the conflict area is painted white.

Design 3 - Painted pattern with visual interruption

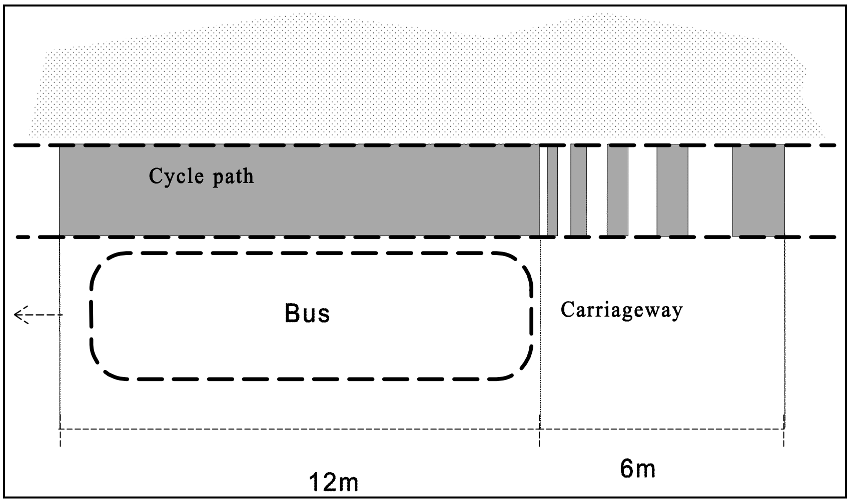


Illustration: The Danish Road Directorate

The design comprises a painted area of the cycle track around the bus stop, supplemented with a 6 m warning area.

Different aspects for cyclists

Positive

The following conclusions can be drawn from the behavioural studies:

- The number of serious conflicts dropped significantly at bus stops with painted patterns (design 3). The proportion of serious conflicts was very small at the two other designs of bus stops in the before and after periods.
- All three designs gave a reduction in the average minimum speed of cyclists at the bus stop. However, there is a tendency for pedestrian crossings (design 1) to give the greatest reduction, followed by profiled strips (design 1 and 2).

Cyclists and pedestrians safety:

- Overall it can be concluded that the new designs for the cycle area at bus stops bring about a change in behaviour that is expected to increase road safety. There is a tendency for the design with a pedestrian crossing (design 1) to give better results than the two other designs.
- The new designs give an increase in the distance between the cyclists' reaction point and the nearest conflict point. The number of cyclists who do not react also drops. Also in this case, pedestrian crossings (design 1) give a slightly better result than the other two designs.
- Only designs that include a profile strip increase the distance between cyclists and passengers leaving the bus. The distance increases by an average of 0.3 m. /9/

Negative

- The designs with profiled strips can be unpleasant for cyclists to pass.
- The proportion of the cyclists who wait for bus passengers and allow them to cross, remains unchanged for all three designs.

Different aspects for non-cyclists

Positive

- Pedestrian-friendly:
  Design 1: The pedestrian crossing makes it easy for pedestrians to see where they are supposed to cross the cycle track. It also makes the cyclists more aware of bus passengers crossing the cycle track to and from the bus.

Negative

- None of the constructions cause any modification in the behaviour of the bus passengers.

Other comments

Degree of implementation:

- Design 1 has been implemented in 1996 at about 90 bus stops in the city of Randers (town in Jutland)
- Design 2 is commonly used in Frederiksberg/(Copenhagen) and in several other cities in Denmark.
- Design 3 is as far as known only implemented in Frederiksberg.

Costs

Bus stop: 5,000 DDK per bus stop (680 ECU).

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C-11 Non-compulsory cycle lanes

Country: The Netherlands **Year of implementation: -**

Description

Non-compulsory cycle lane
Photo: SWOV, Institute for Road Safety Research, A. Vis

Non-compulsory cycle lane
Photo: SWOV, Institute for Road Safety Research, A. Vis

A non-compulsory cycle lane is a part of the road along the edge of a carriageway which is separated by a broken line without bicycle symbols. This lane is intended for cyclists and moped riders. They have no official (legal) status and do not imply a parking ban. Mostly these non-compulsory cycle lanes do not have deviant colours or different pavement .

Dimensions

A width of about 2.00 m is recommended. In case of a width of less than 1.50 m overtaking cyclists get into the carriageway and will conflict with motorized traffic. If parking occurs to the right a deterrent strip of 0.75 m should be constructed between lane and parking space. With angular or perpendicular parking the deterrent strip should have a minimum width of 1.00 m. Thus parking space and cycle-lane together should be 4.00 m, and where loading and unloading occurs 4.75 m.

Different aspects for cyclists

Positive

- A separated lane on the road, but not with a legal status.
- Other road-users are allowed to use the lane, however they are not allowed to cause impediment to cyclists.

Negative

- Cyclists are allowed to use other parts of the carriageway and their position is less clear.
- Cyclists are less protected than on a cycle lane with legal status.

Different aspects for non-cyclists

Negative

- more indistinctness about the positions of cyclists and mopeds.

Other comments

Cycle lanes close to junctions usually have a function connected to filtering traffic, aligning and keeping the junction accessible for cyclists. In that case it is possible to create an extended bicycle streaming lane (EBSL). The EBSL is only applied within built up areas at junctions with mixed traffic and equipped with traffic signals. The EBSL consists of a separate streaming facility for cyclists in front of the streaming space for motorized traffic.

Expanded Bicycle Streaming Lane (EBSL)
Photo: SWOV, Institute for Road Safety Research, A. Vis

C-12 Non-compulsory cycle lanes in cobbled streets

Town: Brugge (Belgium) **Year of implementation: 1995**

Description

Non-compulsory cycle lane in cobbled street

Cyclists' road infrastructure policy by the city of Brugge
Non-compulsory cycle lanes are integrated into the road surface, usually in red paint, indicating the space used by bicycles. They are often created in order to increase the safety for cyclists. They don't have a legal meaning and cars are allowed to drive on them as well. A good example of non-compulsory cycle lanes exists in the city of Brugge.

In one particular street ("Boeveriestraat") within the inner town, an uncomfortable cobbled road, which is an important link for cyclists, cyclist non-compulsory lanes are provided in red painted asphalt. This measure was carried out in order to improve the comfort for the cyclists. In other cases, the recommend cycle lanes have been created in order to indicate which part of the road is intended for the use by cyclists.

However, a non-compulsory cycle lane doesn't have any legal consequences. In the case of Brugge, because of the position within the inner town, separated cycle tracks (with legal consequences) have not been chosen. Similar measures have been implemented in the city of Gent and other cities.

Dimensions

The Belgian Institute for Road Safety recommends a minimum width of 1,5m for non-compulsory cycle lanes.

Different aspects for cyclists

Positive
The non-compulsory cycle lane is an important improvement of the cyclists' comfort

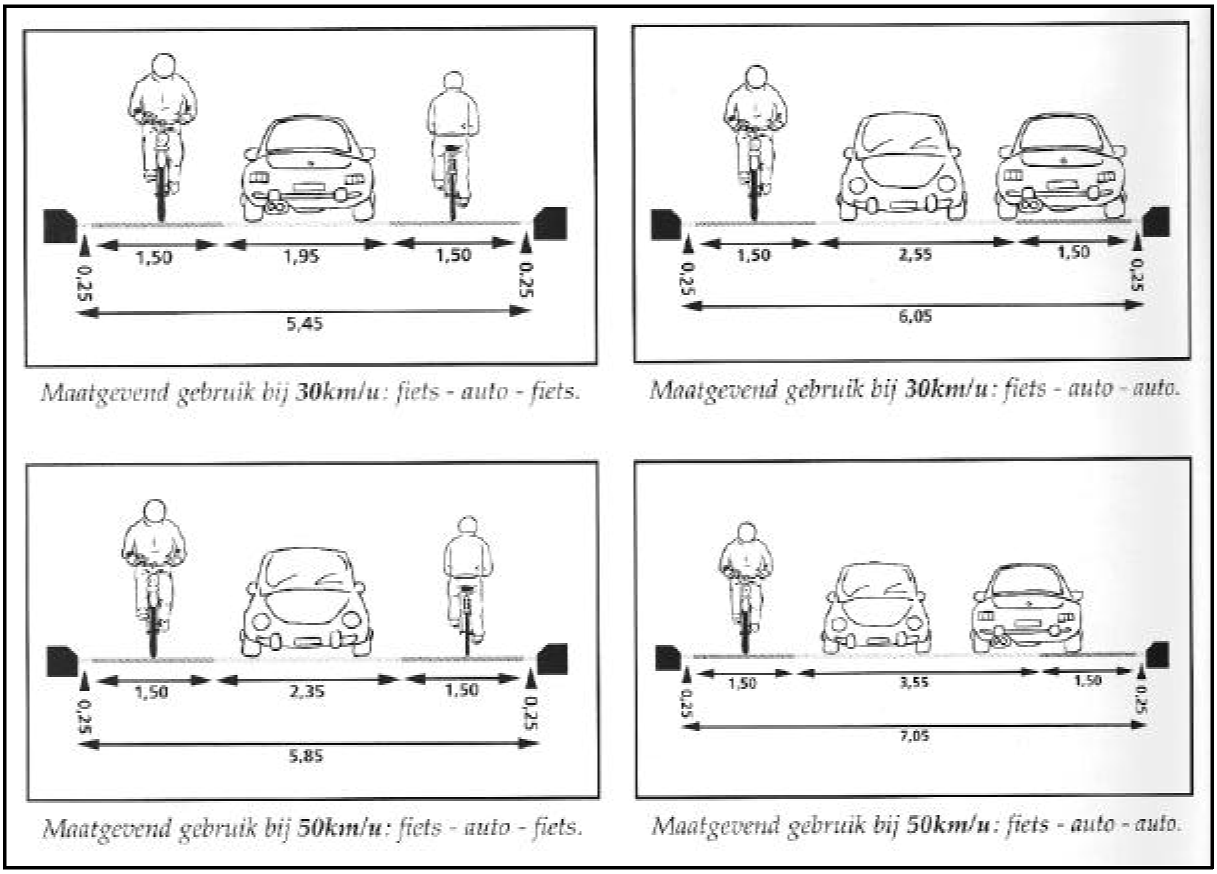
Negative
The non-compulsory cycle lane doesn't have legal consequences

Different aspects for non cyclists

Positive or negative

Non-compulsory cycle lanes can influence the speed of car traffic, since they visually narrow the road surface. In some cases the speeds have increased.

Other information enclosed (reports, photos, drawings, etc.)



Recommended dimensions:

Upper left:	*Recommended dimensions at 30 km/h; cycle - car - cycle*
Upper right:	*Recommended dimensions at 30 km/h; cycle - car - car*
Lower left:	*Recommended dimensions at 50 km/h; cycle - car - cycle*
Lower right:	*Recommended dimensions at 50 km/h; cycle - car - car*

Contact person

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C-13 Paving (cycle) tracks along canals and rivers

Year of implementation: Mechelen 1989-91, Gent and Kortrijk various, Namur 1997
Towns: Mechelen, Namur, Gent, Kortrijk (Belgium)

General photo or drawing

Description

Paving of tracks along canals in the cities of Mechelen, Namur, Kortrijk and Gent
The ancient tow-tracks along rivers and canals are or will be integrated in the cycle routes as much as possible by the city of Mechelen. They are car-free and attractive for cyclists. They will be surfaced as far as this is not yet the case.

A similar program is going on in the city of Gent. Five (partial) tow tracks have been converted in an attractive cycle route already. Three others are planned in the short run.

In the city of Namur, a tow track along the river Samber has been reconstructed in the period 1996-1997. It is part of an extended paving and reconstruction project within the program called "RAVEL". This program, financed by the region of Wallonia, is mainly directed towards recreational bicycle trips. But since the tow tracks cross the city of Namur, they might be useful in home-to-work trips and home-to-school trips as well. The reconstruction consisted mainly of illumination and new surfacing. The existing access points, limited in number, have not been extended.

Different aspects for cyclists

Positive

- The attractiveness for cyclists is increased by this policy. The safety is increased as well since the tow tracks have significantly less junctions than other separate cycle tracks.

- The cost-effectiveness is good since most tow tracks already exist. They only have to be paved or, tracks which had already been paved, have to be opened up for cyclists.

Negative
Many rivers do not follow a straight line between two locations. Detours cause discomfort.

Different aspects for non cyclists

Positive
The tow tracks might be used by pedestrians as well.

Negative
Detours cause discomfort.

Contact persons

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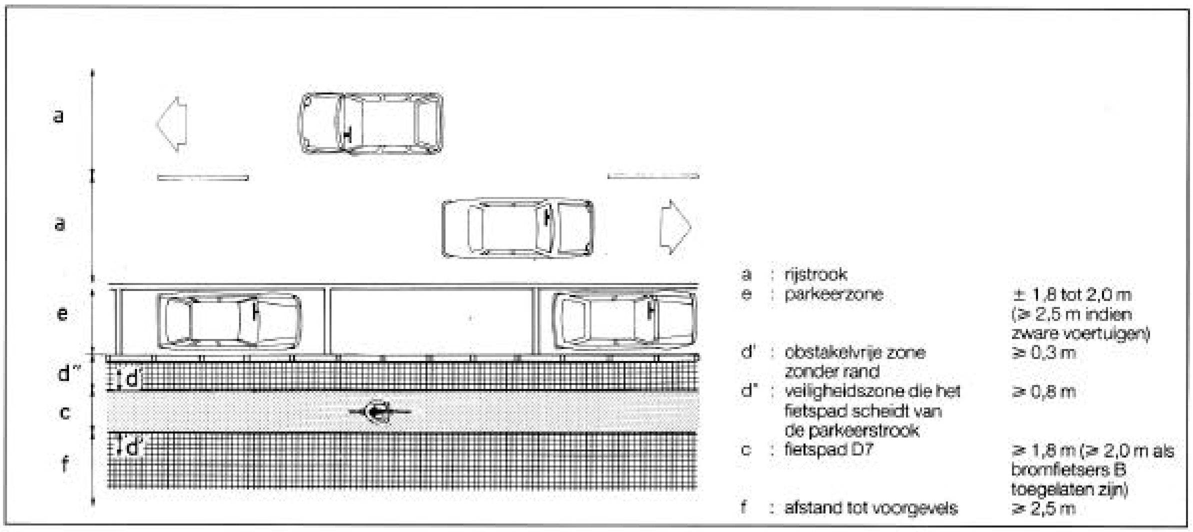
C-14 Separated one-way cycle tracks

Town: Genk (Belgium) **Year of implementation: various**

General photo or drawing



Description

Separated cycle tracks on most roads (city of Genk and others)
Almost all major roads within the boundaries of the city of Genk have been equipped with separate cycle tracks. The aim of these facilities is to provide a separate cyclist infrastructure for all roads on which the speed limit exceeds 30 km/h. The cycle tracks end up where the "zone 30" starts. To reach this, an important cycle track construction program is undertaken. In 1994, for instance, 37 km of cycle tracks, cycle lanes and recommended cycle lanes have been realised.

Next to the construction of these facilities by the city of Genk, most major roads under the authority of the Flemish region, have been equipped with cycle tracks, completing the city's network.

Most other cities in the Flanders region follow the same objectives for a separate infrastructure, but have made less progress in a separate cyclists' infrastructure.

Two-way cycle tracks are not recommended by the Belgian Institute for Road Safety. A cycle track as part of the footpath is not recommended as well. A difference of road surface material is necessary.

Different aspects for cyclists

Positive

. The choice for a separate infrastructure for bicycles on roads with speeds exceeding 50 km/h will increase the safety for cyclists.

- The subjective safety also increases for the cyclists, which makes cycling more attractive.
- Cycle tracks often give the possibility for two cyclists to drive next to each other, increasing the attractivity.

Negative

- In built-up areas with much junctions, a separate infrastructure might be less safe than mixed traffic. This is especially the case if cyclists are "hidden" behind a car in a parking lane or behind trees, This can be solved by moving the cycle track towards the carriageway when approaching an junction.
- Possible conflicts between cyclists and mopeds (if they are allowed), because of the difference in speeds
- Cyclists entering or leaving a cycle track can have difficult access in case there is a difference in level between the cycle track and the carriageway,

Different aspects for non cyclists

Negative

- The fact that cyclists are "removed" from the carriageway, might increase the speed of the car traffic in 50 km streets.
- Incidents between pedestrians and cyclists will be likely when there is no difference in road surface and no kerb between footpath and cycle track.

Dimensions

- The recommendations by the Belgian Institute for Road Safety are as shown in the figure.
- The cycle track must be at least 1,80m wide (2,00m if mopeds are allowed).
- Safety zones at both sides of the cycle track are necessary (min. 0,80m each).
- The curve radius should be large enough to allow a continuous bicycle traffic. A curve with a radius of 10m allows a speed of 15 km/h. A radius of 4m is an absolute minimum, but allows a very limited speed only.
- The surface should be as comfortable as possible. Cyclists prefer asphalt, but other smooth materials are possible as well. The crossfall should be at least 2%.

Other comments

A high degree of separate cyclist's infrastructure already exists for a long time in the city of Genk. This means that only a limited number of supplementary roads have to be equipped.

Contact person

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C-15a Signposting of bicycle routes in the city of Gent

Town: Gent (Belgium) **Year of implementation: 1994**

Description

The signposting system for cyclists indicates the final destination of each bicycle route. Until now, only one route is actually equipped with signs. The other routes will be equipped as soon as they are finished. No signs have been situated outside of the cycle routes. This might lead to situations in which cyclists ride close to a route but without being able to be aware of that.

A special type of sign has been designed for the city of Gent. This type of sign is not according to the official type of sign in the traffic regulations.

Different aspects for cyclists

Positive

- The signs indicate a safe route towards the city centre, which is potentially positive for safety.

Negative

- The signs have only been situated on the cycle routes, which is a disadvantage for cyclists outside these routes.

Different aspects for non-cyclists

Positive

- The signs might be useful for pedestrians as well.

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C-15b Signposting of cycle routes

Town: Kortrijk (Belgium) **Year of implementation: 1991**

Description

A signposting system for cyclists has been implemented by the city of Kortrijk. The signs indicate the main destinations towards the city centre, the railway station and the suburbs. Most signs can be found in the suburbs. Only exceptionally a sign is situated in the city centre. Usually the shortest route is indicated. In exceptional cases, another route might be preferred because of a better traffic safety.

The traffic regulations include a specific type of signs for cyclists is; this type of signs is used by the city of Kortrijk.

Different aspects for cyclists

Positive

- The signs for cyclists increase the attractivity since they indicate the most attractive way for cyclists, compared to the initial situation in which the cyclists could only follow the signs for cars, often making detours because of following main roads.
- The signs might increase safety, since they indicate the safest route for cyclists. In some cases this means that still (small) detours have to me made.

Negative

- The missing signs in the city centre are an important missing link.

Different aspects for non-cyclists

Positive

- The signs might be useful for pedestrians as well. However, a separate system of signs for pedestrians is installed as well in the city of Kortrijk.

Contact person

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C-16 Traffic calming which also considers cyclists

Town: Copenhagen (Denmark) **Year of implementation: 1989, 1992**

Description

During the past few years, it has been normal practice to rebuild streets in the town centres with the purpose of making the city centre more attractive and at the same time improve the traffic safety and the traffic environment - especially for the vulnerable road users. On road sections, traffic calming is normally introduced, as a narrowing of roads or as areas where public space and playing are primary functions, but where cycling is permitted. Normally the speed limits are 30-40 km/h.

Strædet
Photo: The Danish Road Directorate

In the centre of Copenhagen two streets have been rebuilt over a period of some years. One is a pedestrian street - Strøget - and the other is called Strædet.

Strædet mixes motorized traffic with cyclists and pedestrians, weaving their way between cafés and scattered parking places. Strædet is a so called Shared Area, where cars, bicycles and mopeds can travel at reduced speeds (normally below 15 km/h). It is the driving traffic, i.e. cars and bicycles that have to adjust to the characteristics of the pedestrians.

Normally road users are kept strictly separated from each other through the division of streets into carriageways, bicycle tracks and pavements. This does not apply to Strædet. Instead the signs and the road equipment mark the traffic status of the area. It is the steles, benches and parking spaces that are speed reducing. In the summer, the outdoor service at several cafés function as speed reducers. Additionally, the signs at the entrance to Strædet indicate that one is entering a Shared Area.
At Strædet, the road users have to show mutual consideration while giving up old rights.

Strædet runs through a well-preserved historical district. The purpose of the renovation was to promote the street as a shopping street and to preserve its distinctive architectural character while keeping the necessary traffic in the street. Earlier the street was an arterial road for motorized traffic. In 1989 Strædet was, as an experiment, regraded to a mixed pedestrian and vehicle street. As the experiment worked satisfactorily the street was reconstructed in 1992; the pedestrian paths were integrated in the carriageway.

The renovation of Strædet is a a good example of turning around drastically people's street behaviour. In the beginning it was difficult, but gradually the road users have got used to the new rules of behaviour.
/13/, /14/.

Dimensions

Strædet is 460 m long and has a width of 8-11 m.

The road covering of Strædet is made of granite materials and cement flags, all in one level. In the junctions, stones are placed in a circle-pattern.

Different aspects for cyclists

Positive
Strædet is a pleasant street to be on, especially for cyclists and pedestrians. It is possible to sit down, eat, drink and enjoy life, especially during the summer months.

Negative
Only on one part of the stretch, Strædet is two way for cyclists.

Different aspects for non-cyclists

Negative
Strædet is a one-way street for cars.

Other comments

Right after the reconstruction of Strædet, the road users had to get used to the phenomenon Shared Area.

The city will continue to extend types of streets like Strædet in which the road users will have to learn to show mutual consideration.

Costs

Installation costs: DKK 2,600,000 (approximately 360,000 ECU).

Other information enclosed (Reports, photos, drawings etc.)

Strædet
Photo: The Danish Road Directorate

Strædet
Photo: The Danish Road Directorate

Contact person

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C-17a Two-way bicycle traffic in one-way streets in Belgium and the Netherlands

Country: Belgium, The Netherlands **Year of implementation: various**

Description

The directness of the route is an important requirement for cyclists. Therefore most Belgian and Dutch cities allow cyclists in the opposite direction into many one-way streets. The city of Brugge is used as an example in Belgium, since also many other traffic circulation measures have been implemented in that city.

Two way bicycle traffic in one-way street

Since many years the policy of the city of Brugge (Belgium) is directed towards limiting the car traffic in the inner town. An extended traffic circulation scheme with one-way streets and prohibiting left turns is preventing through traffic completely in the inner city since 1992.

An exception is made for the cyclists, which are allowed in both ways in most streets. One-way traffic for cyclists is exceptional, e.g. when a nearby parallel streets gives a sufficient and practical alternative. About 50 streets have been converted from one-way into bi-directional streets for cyclists. Especially the streets from the inner town boundaries to the market square got special attention from the city council, and are mostly accessible in both ways for cyclists. The cycle map, published by the city in 1994, gives an overview of the one way and two-way streets for cyclists (see "Cycleroutes map with recommended routes" (measure 46)).

The Belgian Institute for Road Safety gives some recommendations for the introduction of bi-directional use of one-way streets. These recommendations partly concern the dimensions of the streets. In streets with much and/or fast car traffic a separate cycle track is recommended. Special attention should be paid towards possible conflicts between parking cars and cyclists moving in the opposite direction. Therefore parking cars on the left side of the street (facing the cyclists in the opposite direction) should be avoided under certain conditions. A specific traffic signing has been created for bi-directional use of one-way streets (see other information enclosed). Small refuges near junctions are recommended to prevent cars to make too sharp turns (see other information enclosed). Other road layout elements can give attention to the possible presence of cyclists on the junction as well, such as continuous coloured (red) recommended cycle lanes. Frequent repetition of a cyclist symbol on the surface can remind both car drivers and crossing pedestrians of the presence of cyclists in the opposite direction.

Dimensions

The Belgian Institute for Road Safety recommends the following dimensions for the introduction of bi-directional use in one-way streets: the minimum width of the main carriage way should be:

- 3,5m if lorries are expected in the street;
- 3,0m if the car traffic volume is low and almost no lorries are expected.

In the Netherlands the recommendations are different. A distinction is made between a bi-directional street with a tight profile or with a spacious profile:

- Streets with a tight profile should be 3,85m wide to prevent cars from overtaking cyclists when there are oncoming cyclists.
- Streets with a wide profile should be about 5,50m wide. Cars can overtake cyclists.
- If an important part of the traffic consists of lorries, the width should be at least 6,30m.

Different aspects for cyclists

Positive

- The bi-directional use of one-way streets for cyclists creates an important advantage (shorter roads) for cyclists. This increases the attractivity of cycling.
- The number of cyclists in the city of Brugge has increased with 21% after the introduction of the new traffic scheme. This increase is due to a mix of measures, of which the bi-directional use of one-way streets is only one.
- No negative effects on safety have been noticed so far.

Negative

- The pedestrian areas which are not opened up to cyclists, force cyclists into extensive detours.

Different aspects for non-cyclists

Positive

- Introduction of bi-directional use of one-way streets generally decreases the average speed of the cars. By this the safety is increased for all road users.

Negative

- The bi-directional use of one-way streets for cyclists might create subjective unsafety for pedestrians, since cyclists come from a non- expected direction.

Contact person

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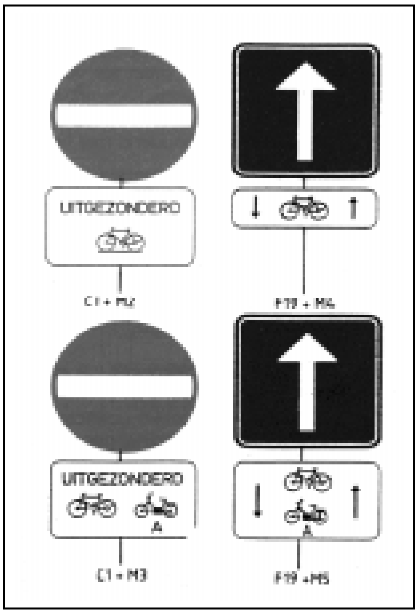
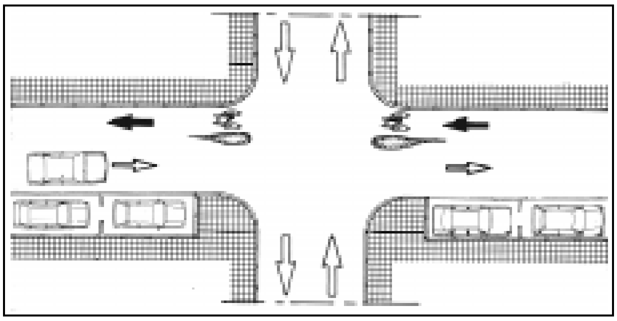
Other information

Recommended road layout on Belgian junctions, warning the car drivers that cyclists might come from the opposite direction.





Sign C2 + additional sign: Two-way bicycle traffic in one-way street
Photo: SWOV Institute for Road Safety Research, A. Vis

C-17b Two-way traffic for cyclists in one-way streets

Town: Utrecht (The Netherlands) **Year of implementation: -**

Description

Partial one-way traffic with tight profile
Photo: SWOV, Institute for Road Safety Research, A. Vis

Partial one-way traffic with spacious profile
Photo: SWOV, Institute for Road Safety Research, A. Vis

In much urban areas and town centres streets have been changed into one-way streets. This means that cyclists have to make long detours. However particularly for cyclists directness is a main requirement. The infrastructure for cyclists has to offer direct routes. Detours have to be kept to a minimum. Therefore in most Dutch cities cyclists are allowed to use one-way streets in both directions. The one-way streets can be divided up into partial one-way streets with a tight profile and partial one-way streets with a spacious profile.

Partial one-way traffic with tight profile
Photo: SWOV, Institute for Road Safety Research, A. Vis

I. Partial one-way traffic (only for motorized traffic) with a tight profile:
Motor vehicles have to remain behind the cyclists. A cycle-lane in the oncoming direction can help to stimulate this. The carriageway has a width of about 3.85 m. For both motor vehicles and cyclists in one direction 2.25 m. and for the single cycle-lane in the other direction 1.50 m. A alternative with a deterrent strip and adjacent parking strip is also possible. The design speed for motorized traffic should not be more than 30km/h.
This tight profile is not recommended if a greater part of the motorized traffic consists of heavy goods vehicles.

II. Partial one-way traffic (for motorized traffic) and spacious profile:
A car and cyclist in one direction and a cyclist in the other can simultaneously encounter/overtake. The total width of the carriage-way is about 5.50 m. However safety problems are possible with oncoming heavy goods vehicles. A carriageway of 6.30 m. wide is needed if a greater part of the motorized traffic consists of heavy goods vehicles. A speed level of 30 km/h is required.

Dimensions

I. A tight profile: 3.00 to 3.85 m
II. A spacious profile 5.50 to 6.30 m.

Different aspects for cyclists

Positive
- Speed reduction.
- Cyclists do not have to make a detour.

Negative
- Cyclists as a ‘speed reducing measure’
- Motorists do not always expect encountered cyclists.

Different aspects for non-cyclists

Negative
- Motorists do not always expect oncoming cyclists.
- Obstruction of and by motorized traffic in several circumstances.

Contact persons

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C-18 Two-way traffic on cycle tracks

Town: Zoetermeer, Utrecht (The Netherlands) **Year of implementation: -**

Description

Speed and volume of the motorized traffic are the most important factors in choosing for separation of motorized traffic and bicycles. However also the available space plays a role. Separation has effect on the overtaking manoeuvres and the speed of motorized traffic on the carriageway. The bicycle volume is subordinate to the matter of whether a cycle lane or a cycle track is necessary. The bicycle volume does determine the urgence of any cycling facility and the dimensions of it.
If the decision is made to construct a cycle track, there is still a choice between a one-way cycle track on either side of the carriageway or a two-way cycle track on only one side or on both sides of the road. These alternatives can be found in various cities in the Netherlands.

Photo: SWOV, Institute for Road Safety Research, A. Vis

Photo: SWOV, Institute for Road Safety Research, A. Vis

Dimensions

The preferred widths for cycle tracks vary strongly and depend on the volume of the bicycle traffic and on the choice for two-way traffic. The width varies between 1.50 and 3.50 m. If there are many moped riders these dimensions are 2.00 and 4.00.

Different aspects for cyclists

Positive

- Some cyclists with departure and destination at one side of the road never need to cross that road.
- If there are many T-junctions on one side of the road, the other side is much safer for bicycles (bicycles don't have to cross the connecting road of the T-junction).
- Less space requirements if a cycle track is situated on only one side of the road.

Negative

- Problems at junctions: motorists expect not always cyclists coming from two directions.
- A chance of frontal conflicts between cyclists.
- Cyclists need to cross too much If the cycle track is not well connected to the adjacent cycle routes.

Different aspects for non-cyclists

Positive

- decreased number of conflicts between cyclists and motorized traffic on road sections.
- A better flow of motorized traffic.

Negative

- A higher driving speed of the motorized traffic.
- A chance of more confrontations or conflicts between motorized traffic and cyclists (and mopeds) at junctions.

Contact persons

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Facilities for crossing

C-19 All-directions-green for cyclists on signalized junctions

Town: Enschede, Delft (The Netherlands) **Year of implementation: -**

Description

An attractive aspect of signalized junctions should be short waiting times for cyclists. A considerable reduction in waiting time for cyclists turning left can be achieved when all four directions get simultaneously green for cyclists: All-Directions-Green. An alternative solution can be to have more than one green phase for cyclists per cycle. The combination of these two options is also possible.
In case of only a limited number of cyclists these solutions will result in too much time losses for the rest of the traffic.
With the application of All-Directions-Green for cyclists it is necessary to inform all road-users with a special traffic sign. For good functioning of this facility it is also necessary to keep the junction area (for cyclists) as small as possible with respect to the clearance time of the junction.

Different aspects for cyclists

Positive

. Reduction of delays for cyclists.

Negative

. Usually a green signal means: no other traffic is using your lane. But now other cyclists can be met at the junction, in which case the rule ‘right for left’ should apply.

Different aspects for non-cyclists

Negative

. It can be that the car drivers have to wait longer than before and become inpatient. However, this depends on the length of the cycle.

C-20 Cyclist tunnels at junctions with high traffic flows

Town: Brugge (Belgium) **Year of implementation: various**

General photo or drawing

Description

Cyclists road infrastructure policy in the cities of Brugge and Genk
In the city of Genk, several cyclist tunnels have been constructed under junctions with high traffic flows. These junctions are part of main roads under the competence of the Flemish region.

The city of Brugge generally avoids to construct cyclist tunnels, with one exception. A cyclist tunnel has been constructed recently in order to avoid the crossing of a busy junction by an important cyclist route towards the railway station. The tunnel has been constructed by the Flemish road authority which is responsible for the junction.

A cyclist tunnel is better compared to a bridge because less difference of level is necessary; cyclists need less height than (heavy) vehicles. Special attention should be paid to the social safety. Therefore, a good visibility from outside is important: avoid curves inside the tunnel and dark corners. The illumination also needs special attention.

Dimensions

The height of a cyclist tunnel should be at least 3.0 m. A gradient of not more than 2% is recommended for comfortable cycling.

Different aspects for cyclists

Positive
The cyclist tunnel improves the traffic safety by avoiding contact between the car traffic and the cyclist traffic.

Negative
The social safety of tunnels is doubtfull. However in the case of Brugge, the construction allows a reasonable view from outside into the tunnel. This is not always the case for the tunnels which have been constructed in Genk.

The cost-effectiveness is still a subject of research. The outcome depends very much on the assumptions about the costs of accidents. If a tunnel prevents many accidents, then the investments costs of a tunnel will be very worth-while

Different aspects for non cyclists

Positive
Cyclist tunnels can be used by pedestrians as well, with the same advantages and disadvantages as for cyclists.

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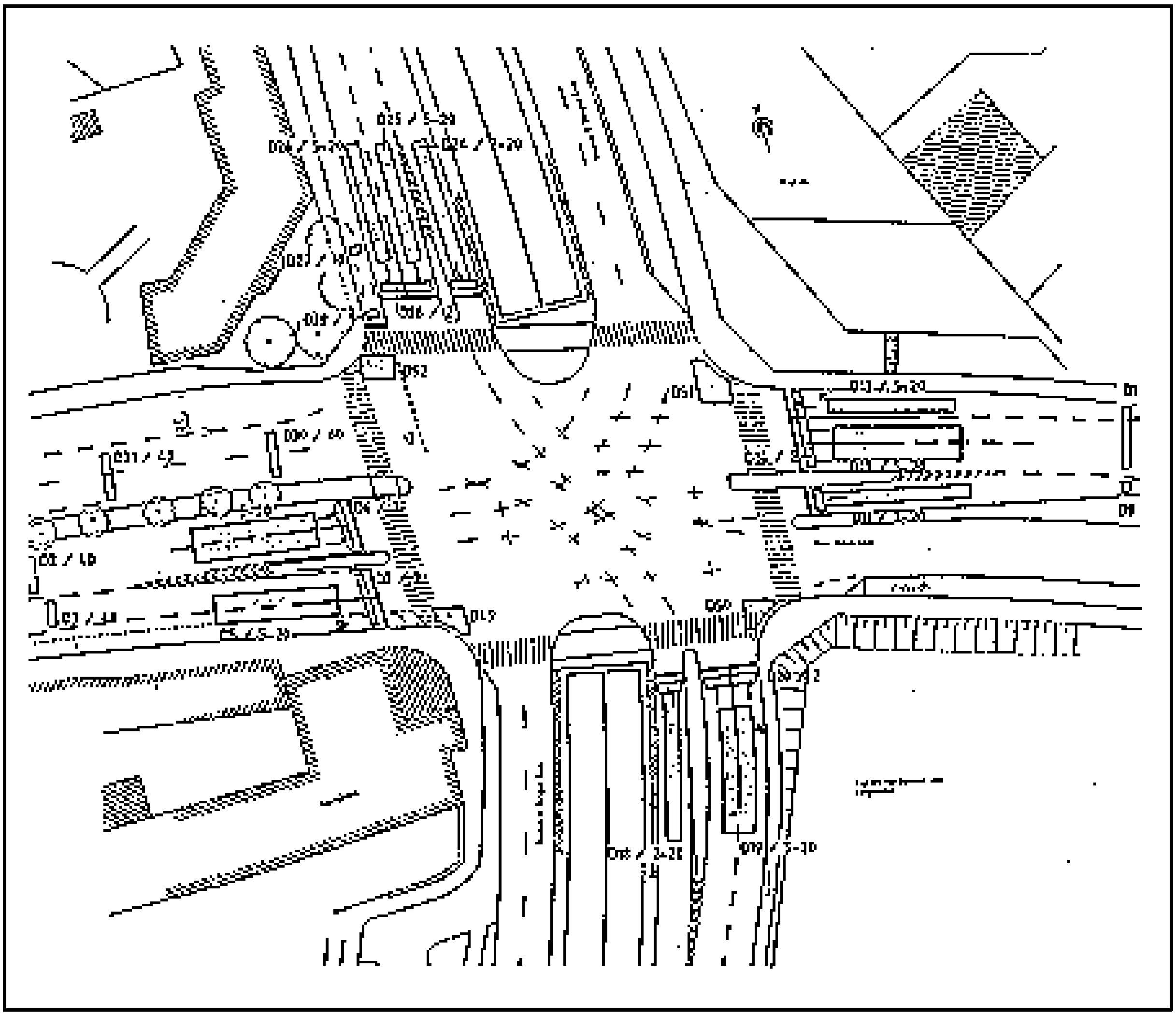
C-21 Detection of cyclists at signalized junctions with a traffic-responsive control system

Country: Denmark **Year of implementation: -**

Photo or drawing



Example of location of detectors for cyclists turning left
Drawing: Municipality of Odense

Description

At junctions with a traffic-responsive control system (TRCS), the number of incoming vehicles controls the duration of the green phase. TRCS is used especially in situations with a random distribution of the incoming traffic, mostly in case no other traffic signals nearby which could send vehicles in groups/ platoons to the junction at hand. The advantage of TRCS is that the green phase is always adapted to the current need. In principle, this entails that road users will not get a red light unless there is traffic in conflicting directions.

Denmark has ca 2700 signal installations, of which 1500 are with TRCS (in 1992).

TRCS provides the road users with good service, especially in conditions with low volumes, since it is possible (especially for car drivers) to go through the junction with little or no delay. /17/.

The detectors for cars are drilled into the asphalt or placed in the road before it was paved.
Bicycles can be detected either by detectors similar to those used for cars, or similar to those used for pedestrians; so manually by a push button.
The problem for cyclists in junctions with a traffic-responsive system is that they are often detected manually, using a cyclist push button or a combined cyclist-pedestrian push button. If the cyclists are not aware that the junction has a TRCS and finally presses a push button, unnecessary waiting time can result, and in the worst case scenario, the cyclists becomes a red-light runner. To avoid this situation, cyclists can be detected in the same way as cars.

At most junctions the detection of the cyclist occurs behind the stop line. In Denmark cyclists who turn left have to make an indirect (large) turning. So at first the cyclist crosses the road as if he was going straight ahead. Then he stops at the stop line of the road he wants to enter.
These cyclists are not detected if they stop just in front of that stop line. This problem can be solved by placing detectors in front of the stop line as well. The detectors are designed to fit with the geometric conditions at the individual junctions. This way, cyclists both behind and in front of the stop line are detected.

To avoid that cyclists who are not going to the left, will activate the detectors, a minimum of two seconds will pass before the message is passed on from the detectors to the control system.

Different aspects for cyclists

Positive

- Cyclist friendly: By using detectors, left turning cyclists do not have to activate manually a cyclist or pedestrian push button.
- Cyclist safety: No actual evaluation of the effect of cyclist detectors has been carried out.

Negative

- The unfortunate thing about detectors is that cyclists have to stop on a well-defined, but not clearly marked area in order to be detected.
- At junctions where many cyclists drive close together, there is the possibility that detectors are activated unnecessarily. If a group of cyclists block the detector for more than 2 seconds, the detector "thinks" that there are cyclists waiting in the cross-wise direction, and the signal might, change to green in the cross-wise direction.

Different aspects for non-cyclists

Positive

- junctions with a traffic-responsive control system minimize the delay.

Negative

- Pedestrians often get a longer waiting time at junctions with TRCS, because they have to announce their arrival by pressing a push button. Not all pedestrians notice the push button upon arrival, and therefore, their waiting time is increased. A case study showed that 80% of pedestrians actuated the junction upon arrival, while the remaining 20% waited an average of 13 seconds after arrival before they "discovered" the detecting button. /15/.

Other comments

Degree of implementation:
Detectors for cyclists are used around the country.

In Odense, there are some junctions that have detectors for left turning cyclists, and henceforth, new junctions with a traffic-responsive control system in Odense will use detectors for left turning cyclists as a standard procedure.

Costs

Costs per detector: ca. 10,000 DKK (ca. 1,370 ECU).

Contact person

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C-22 Four types of cycle crossings

Country: Denmark **Year of implementation: -**

Description

Type of junction:
Signalized junctions and junctions with right-of-way for car traffic.

At junctions cycle-tracks will mostly be interrupted. Drawing attention to the potential conflict between cyclists and cars can be beneficial. The crossing area should be demarcated by a broad broken line, or indicated with a blue surface. Bicycle symbols should always be marked in the area.
Bicycle symbols should only be present at signal-controlled junctions or at junctions with priority for cars.

Denmark operates essentially with four different types of bicycle areas at junctions: Minimum, Left-Hand edge, International and Blue surface.

Dimensions

Minimum cycle crossing
The cycle crossing is marked with broad broken lines, extending to the separation between opposing traffic lanes of the intersecting roads. If the width of the carriageway of the intersecting road is less than 5.5 m, the line should extend right through the junction. Only the left-hand edge of the cycle crossing should be marked. The line should be marked with 50 cm long and 30 cm wide markings. The strokes of the line must be of equal length. The width of the cycle crossing is often the same as the cycle track or cycle lane which is interrupted. The recommended minimum width is 1.7 m for a cycle track, and
1.2 m for a cycle lane while the normal width is 2.2 m and 1.5 m respectively.

Left-hand edge and International cycle crossing
At complex junctions, the line can pass right through the junction and the right-hand edge of the cycle crossing can be marked with a wide broken line. Where the right-hand edge of the crossing is bounded by another marking, eg. a pedestrian area or give-way line, the broken line at the right-hand edge can be omitted.

Blue surface cycle crossing
At complex junctions, the entire cycle crossing can be marked in blue as a supplement to, or replacement of the broad broken lines. This type of marking should be used at junctions with a high accident risk for cyclists and mopeds. Only the colour blue is used for marking crossings.

General
In all four types of cycle crossings cycle symbols must be marked in the area.
/14/, /5/.

Crossing – Minimum
Photo: The Danish Road Directorate

Crossing – Left hand edge
Photo: The Danish Road Directorate

Crossing – International
Photo: The Danish Road Directorate

Crossing – Blue surface
Photo: The Danish Road Directorate

Different aspects for cyclists

Positive

The idea behind a cycle crossing is to stimulate the car driver to look for the cyclist, especially car drivers who turn right.
Furthermore it separates the different sorts of traffic participants from each other, especially cars and bicycles which drive/ride in the same direction on the major road and it 'controls' the behaviour of cyclists at the junction.

A Danish study concludes that the safety of cyclists at junctions increases with cycle crossings. Traffic accident studies show a decrease in the number of personal injuries, while half of the serious injuries dropped significantly by 57%. This is based on an analysis of 137 bicycle accidents.

A comparison of the different types of cycle crossings shows that the blue markings have the best effect on safety. Crossings marked with a 30 cm wide broken line show no significant change in the number of accidents and personal injuries /26/.

Different aspects for other road-users

Positive
The cycle crossing is intended to increase the drivers' attentiveness to any cyclist and to show a driver how far he can drive into the junction without conflicting with cyclists.

The blue crossing is very cost-effective (cheap and good effects).

Negative
The blue crossings are often criticised because of their bad aesthetics.

Other comments

As mentioned previously, the cycle crossing has the same colour as the surface of the carriageway, if it is not marked in blue. If the local cycling network has a special type of surface than the crossing should have this type of surface too /14/. An example of this can be found in the town of Nakskov. (See also the description of the bicycle route in Nakskov).

Degree of implementation:
The blue surface at cycle crossings is used particularly in Copenhagen. The three other types of cycle crossing implemented can be found all over Denmark.

Costs

Example:
Four-armed signalized junction, road with two lanes, 3.25 m each.
Cycle crossing - Minimum: ca. 2,000 DKK (ca. 280 ECU)
Cycle crossing - Left-hand edge: ca. 3,100 DKK (ca. 420 ECU)
Cycle crossing - International: ca. 3,800 DKK (ca. 520 ECU)
Cycle crossing - Blue surface: ca. 15,000 DKK (ca. 2,050 ECU)

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C-23 Leading green for cyclists at junctions

Country: Denmark **Year of implementation: -**

Description

Traffic signals for cyclists are an auxiliary aid, which are only significant for cyclists and moped riders, for whom the other traffic signals do not apply. In Denmark traffic signals for cyclists can only be used if there is a cycle track and if the signalling for cyclists differs from the signalling of other road-users. Cyclists traffic signals should be positioned at the stop line or within 5 m of the stop line (if necessary and only if there is absolutely no doubt about the point at which cyclists should stop). The signal should be located to the right of any main traffic signal controlling the same direction. Their location should be such that it is impossible to confuse the two sets of traffic signals. /14/

Traffic signals for cyclists are used to give cyclists 'leading green'. Leading green implies that the cyclists get the green signal signal before the vehicles, so they will reach the junction *before* the vehicles get their green signal. The idea of giving cyclists the leading green is to increase the visibility of the cyclists especially to the car drivers which turn right.
This measure is intended to reduce the number of accidents between cyclists going straight ahead and vehicles turning right, which occurs when the parties start together after having stopped at a red signal.

Example of junction with leading green for cyclists
Photo: The Danish Road Directorate

Different aspects for cyclists

Positive
Cyclist-friendly: Increasing the visibility of the cyclist, especially to car drivers turning right.

Cyclist safety: There are no Danish studies of the effect of leading green for cyclists. Since the initiative has the same function as the measure "recessed stop line in carriageways", it is possible that leading green has a similar effect in reducing the number of accidents (furthermore, see the example about recessed stop line in Nakskov).

Different aspects for non-cyclists

Positive
- Leading green increases the awareness of right turning car drivers who set of from red towards cyclists going straight ahead.
- At junctions where there can be problems with interference the leading green can be helpfull in improving the visibility of pedestrians and cyclists who start from red.

Negative

- Leading green for cyclists reduces the capacity of the junction with respect to the number of cars entering the junctions each cycle.

Other comments

Degree of implementation

- Leading green for cyclists is used to a greater extent in larger Danish cities.
- In Copenhagen cyclists are given first priority in 23% of the signalized junctions /21/.

Costs

Signal post: ca. 100,000 DKK (ca. 13,700 ECU).

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C-24 New types of design at four-way junctions. Interrupted or truncated cycle tracks.

Country: Denmark **Year of implementation: 1993 ➜**

Description

In Denmark an “interrupted bicycle track” is usually known as a cycle track which runs right up to the actual junction area and stops just before the zebra crossing (see drawing 1).
A “truncated cycle track” is known as a cycle track which is interrupted 20-30 m before the junction (see drawing 2).

The design described in the following, is used in 4-way signalized junctions with interrupted or truncated cycle track.

The design comprises simply of a long profiled strip on the nearside of the cycle track towards the kerb, and a shorter strip on the offside. The strips reduce the cycle area at the cycle track.

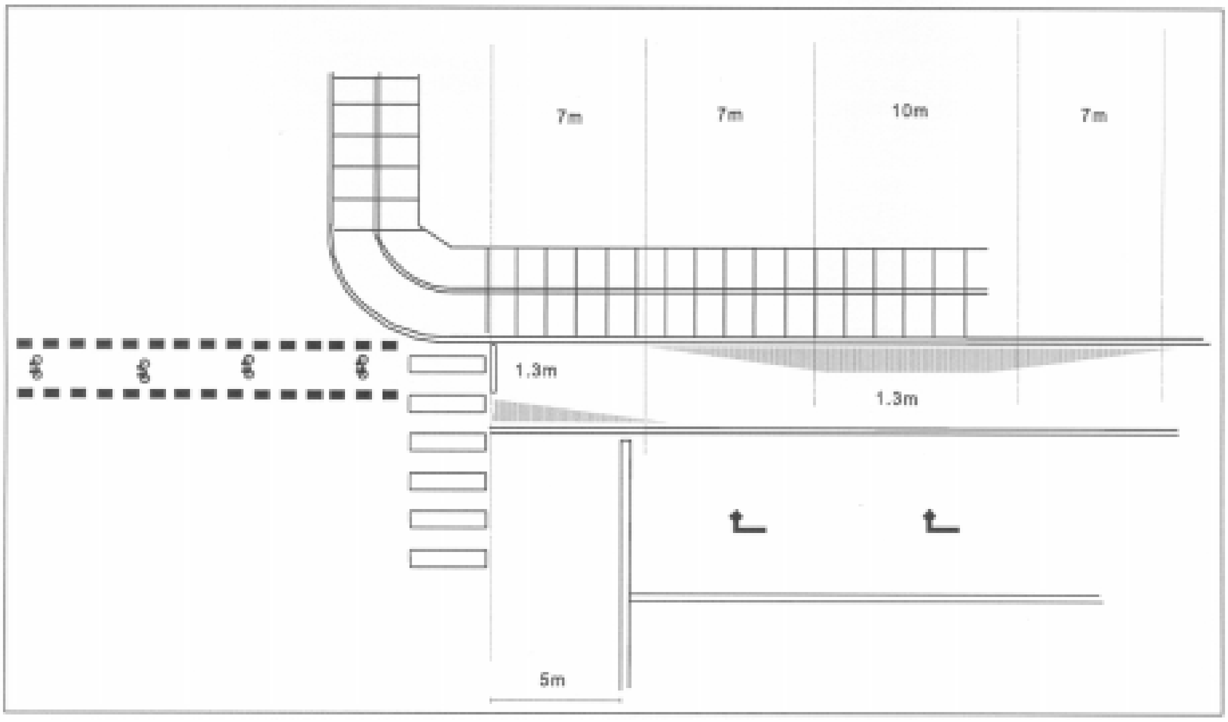
A cycle crossing, which comprises either a blue lane or a lane demarcated by two broken lines, continues through the junction. Cycle symbols are marked at the crossing. (A detailed description of this design is given in the description of Four types of cycle crossings).

For car drivers, the stop line is moved back in all lanes (see description of Recessed stop line in carriageway (measure 25)).

/9/

Interrupted cycle track at junction
Photo: The Danish Road Directorate

Dimensions



Drawing 1: Junction with interrupted cycle track, furthermore a crossing through the junction
Drawing: The Danish Road Directorate

The lengths and locations of the strips are shown in the figure above.
The profiled strips are so wide that the cycle area at the cycle track is reduced to 1.3 m (depending on the cycle volume). The profiled strips have a height of between 8 and 10 mm.

The width of the cyclist crossing through the junction is increased from 1.3 m to the cycle track-width on the opposite side of the junction.

For drivers, the stop line is moved back 5 metres in all lanes. (For details: *See description of Recessed stop line in carriageway*).

Different aspects for cyclists

Positive

Cyclist-friendly:
The purpose of the nearside strip on the cycle track is to guide the cyclists closer to the vehicles as they approach the junction, in order to increase the attentiveness of both parties. The distance between the parties is then increased again at the junction. A Danish before/after study of four junctions, two with interrupted cycle tracks and two with the ordinary kind of truncated cycle track, shows that the new design measure gives the right turning drivers more time to react if they have overlooked a cyclist /9/.

Cyclist-safety:
Overall, the behavioural study indicates that the junction design has changed the behaviour of cyclists and drivers, resulting in improved road safety:

- The time elapsing between cyclists and vehicles passing the conflict point (the point at which cyclists' and vehicles' intersect) has increased by between 0.4 and 0.7 seconds. This means that the physical distance between these road users has increased.

- At the four studied junctions, between 12 and 24% of the simultaneously arriving drivers turned right in front of cyclists in the before period, despite the fact that they were bound to give way. This proportion has dropped to between 3 and 6% in the after period.
  /9/

Different aspects for non-cyclists

Positive
Driver's attention to cyclists has increased, and by means of the short strip on the offside of the cycle track, right turning vehicles get up to 0.5 seconds more time to react if they have overlooked a cyclist /9/.

Other comments

The design can also be used at junctions with truncated cycle tracks - see the enclosed drawing 2.

Degree of implementation:
To begin with this type of design has been implemented in four test-junctions situated in Copenhagen and Roskilde.

As a demonstration project 1995-1998 the design has also been used at all four-way signalized junctions situated in Randers (town situated in the northern part of Jutland). Other municipalities in Denmark have also adapted the measure.

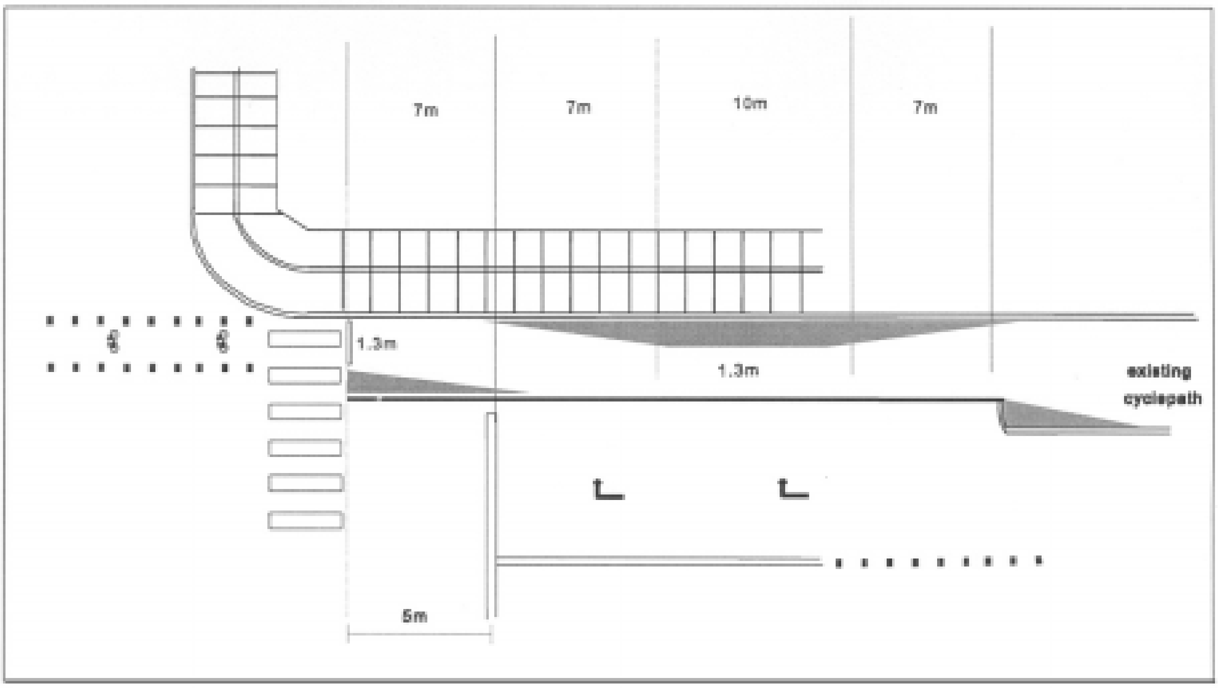
In general this measure is used at all trunk roads in Denmark.

Costs

Four-legged junctions controlled by traffic lights.
Installations costs pr. access:

10,000 DKK. (1,400 ECU), regardless of whether the cycle track is interrupted or truncated.

Other information enclosed (Reports, photos, drawings etc.)



Drawing 2: Truncated cycle track with recessed stopline.
Drawing: The Danish Road Directorate

Sketch and photo: Same design used at junctions with truncated cycle track.
At the junctions with truncated cycle tracks, the right-hand vehicle turning track has been shifted so that a 1.8-metre wide cycle track can be implemented. The last approx. 30 m up to the junction, the vehicles and cyclists are separated by a 0.1 m continuous white line /9/.

Photo: The Danish Road Directorate

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C-25 Recessed stop line in carriageway

Town: Copenhagen (Denmark) **Year of implementation: -**

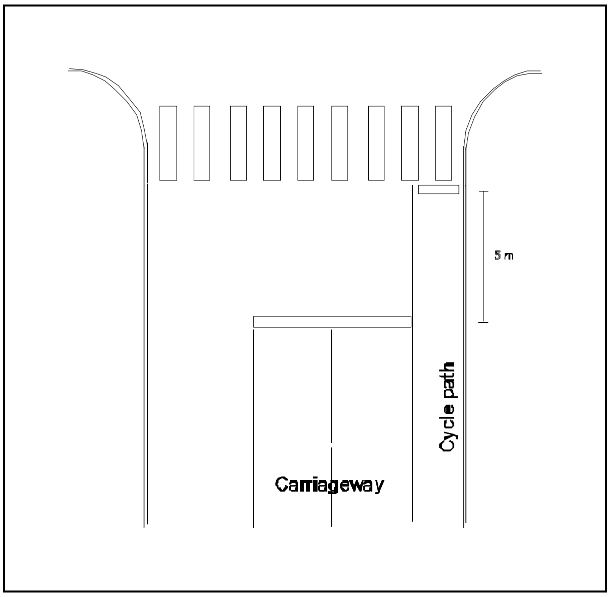
Description

Type of junction:
Signalized junctions.
The recessed stop line is used at signalized junctions with extended cycle tracks. This measure is intended to reduce the number of accidents between cyclists going straight ahead and vehicles turning right. In this type of accidents about 25 cyclist casualties are recorded annually, of which 1-2 are killed (in Denmark).

Recessed stop line in carriageway
Photo: The Danish Road Directorate

Dimensions

The vehicle stop line has been moved back by 5 m relative to the cyclists' stop line.
The reason for choosing 5 metres is based on a Danish study - angles of visibility of trucks. The study shows that cyclists have to be either more than 4 metres in front of or more than 2 metres behind the truck to be visible to the truck driver /19/. It should be noted that the study is based on one type of truck, the newest model (Volvo FH12).



Drawing: The Danish Road Directorate

Different aspects for cyclists

Positive
Cyclist friendly:
The underlying idea was to improve the visibility of cyclists, primarily to vehicles turning right at the junction when both parties start after having waited at red light. Thus, this measure is primarily

intended to reduce the number of accidents between cyclists travelling straight ahead and vehicles turning right.

Cyclist safety:
A Danish study concludes that the recessing of vehicle stop lines increases the safety of cyclists at signalized junctions with extended cycle tracks. The analysis of accidents reveals that recessed stop lines reduce the number of accidents mentioned above.
The results are based upon a limited number of accidents. The benefits by recessed stop line are also supported by a Swedish behaviour study /9/.

Different aspects for non-cyclists

Positive
Pedestrians:
The design is presumably advantageous to crossing pedestrians because they get a better overview and more time to evaluate the intentions of motorists at signal changes.

Car drivers
Car drivers have a better view on cyclists and pedestrians: The car driver can better see if a cyclist is going to turn right or not.
Waiting pedestrians get the green light a few seconds before the cyclists and cars, which means that they are already on the pedestrian crossing, and therefore visible for right-turning cars.

Other comments

Moving the stop line will normally not result in any extension of the intergreen intervals in the traffic light sequence, because these intervals mainly are determined by the calculated time by which pedestrians and/or cyclists need to cross the junction safely.

Degree of implementation:
The initiative itself is relatively old, but up till 1993, it has only been used to a very limited degree. Today, the initiative is used consistently on all trunk roads and furthermore in several cities around the country.

Costs

Example:
Junction, roads with three lanes.
Removal of the old stop-line (2 x 3.25 m) and addition of thermoplastic (2 x 3.25 m): 500 DKK (70 ECU)

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C-26 Roundabout

Town: Nakskov (Denmark) **Year of implementation: 1989-1991**

General photo or drawing

Photo: The Danish Road Directorate

Photo: The Danish Road Directorate

Photo: The Danish Road Directorate

Description

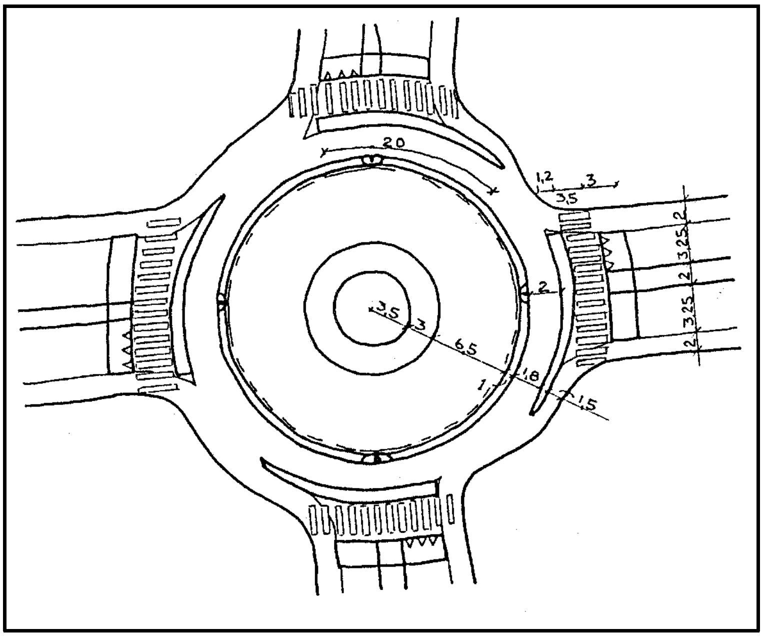
Road-type:
2 lanes in all approaches

Speed limit:
50 km/h

The roundabout is situated on the outskirts of a 1,3 km bicycle route in Nakskov.

The bicycle area of the roundabout is marked with a red asphalt coating. In addition, a row of paving stones and white painted boarder lines separate the cyclists from the motor vehicles. At each entry the bicycle track is divided by paving stone islands, formed like a banana. Furthermore ramps of paving stone have been built at each entry, which will help to reduce the speed of the cars, and bring attention to crossing pedestrians and cyclists.

Dimensions



Dimensions of the roundabout in Nakskov
Drawing: The Danish Road Directorate

Different aspects for cyclists

Positive

Cyclist friendly:
The construction of a roundabout reduces the speed at the entries. The distribution of waiting time will be similar on both roads, and the traffic flow will be smoother, although this is less valid for rush hours.
These circumstances seem to affect the cyclists positively.

The special design of the stone islands make it easier for the motorists to see, in an early stage, whether cyclists intend to turn or not.

Cyclist safe:
After building the roundabouts, accidents involving cyclists have been registered. In general roundabouts do not reduce the number of personal injury accidents involving cyclists, but do reduce the seriousness of the accidents. This is also the case for this particular roundabout.

Behavioural studies show that road users by and large use the roundabouts the way they were intended to. However, some of the conflicts that do happen involve cyclists who use the roundabout in a wrong way, like riding in the wrong direction.

Different aspects for non-cyclists

Positive
The distribution of waiting time is more equal on both roads and traffic flow is smoother.

Negative
The paving stones at the connection to the exits of the roundabouts can be perceived as not comfortable for some motorists.
It has been shown that cyclists, as a result of the special construction of the stone islands, do not show hand signals when they turn from the circulation areas to the exits.

Other comments

Degree of Implementation:
A single roundabout of this type has been built in this town.

There are approximately 300 roundabouts spread all over the country.

Costs

Installation costs- roundabouts: ca. 700,000-800,000 DKK. (96,000-110,000 ECU)

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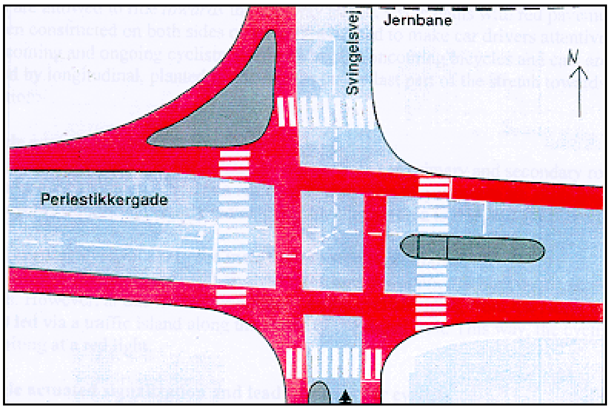
C-27 Signalized four-way junction in Nakskov

Town: Nakskov (Denmark) **Year of implementation: 1989-1991**

General photo or drawing



Drawing of the junction in Nakskov

Description

Signalized four-way junction

Road-type:
Primary road: one carriageway with two lanes
Secondary roads: a one-way street and a carriageway with two lanes.

Posted speed limit:
Primary road: 50 km/h
Secondary road: 50 km/h

Average speed in both directions:
Primary road: 44 km/h
Secondary road: 46 km/h

The junction is one of several on a bicycle route with a length of 1,3 km. There are a number of measures carried out at the junction, which can either be implemented separately, or like in this case, be part of an *overall solution.*

1) One-way streets with bicycle traffic in two directions
The southern leg of the junction is a one-way street for motor vehicles (see figure). Cyclists are allowed to ride in both directions. Cycle tracks with a red pavement have been constructed on both sides of the southern road to make car drivers attentive to cyclists coming from both directions. Furthermore,

bicycles which ride opposite to the car traffic, have been separated by longitudinal traffic islands on the last part of the road section.

2) Bicycle area at the junction

The bicycle tracks that lead to the junction from both the primary and secondary roads continue through the junction by means of a red bicycle area. The bicycle areas are supplied with white bicycle symbols that clearly indicate that the bicycle area is reserved for bicyclists.

3) Right turning for cyclists without waiting

The signal control also applies to turning movements including turning to the right. However, at this junction, right turning cyclists riding from the North to the West are led via a traffic island along the signal post. This way, the cyclists can avoid waiting at the red signal.

4) Vehicle actuated signalization and green-for-cyclists-only

The junction is vehicle actuated. In case there is no traffic, the traffic lights show red in all directions (all- red). Both cyclists and motorists can automatically change the signals to green as soon as they arrive.

Pedestrians influence the signal manual by pressing a pedestrian button, while the cyclists either ride to the stop line, under which is a coil which detects the arrival, or press the pedestrian/cyclists button (especially left turning cyclists).

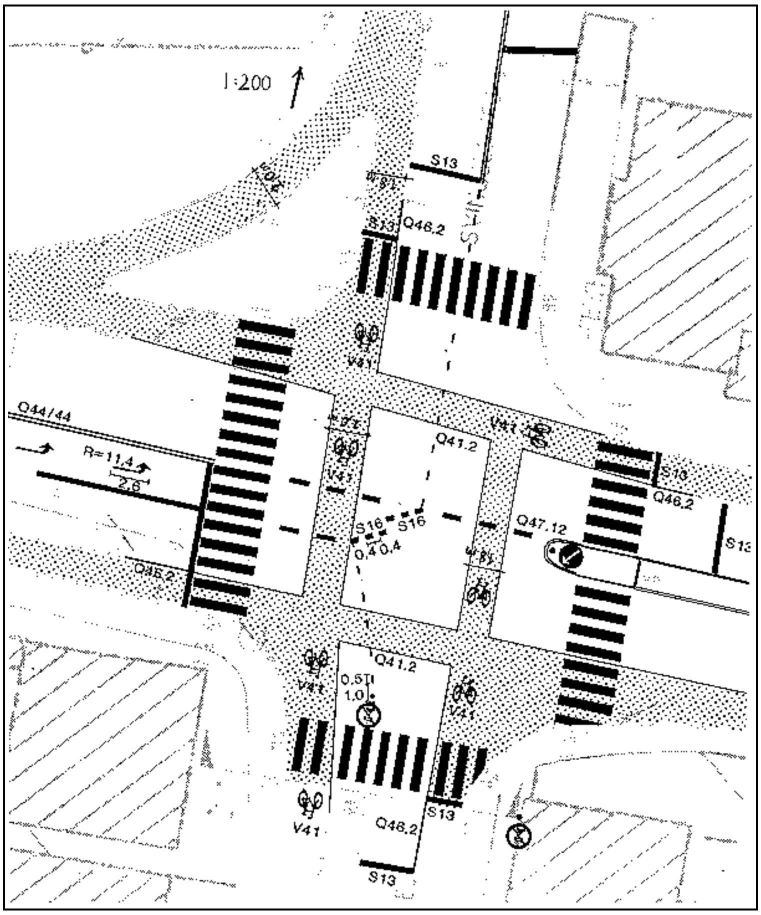
At signalized junctions in Denmark, left turning cyclists are not required to wait for a green light before carrying out the left turn. When the cyclist has reached the junction he or she can carry out the left turn, if the traffic situation allows it. If the traffic situation does not allow it, the cyclist can manually change the signal to green before turning left. Again this happens by using the before mentioned cyclist/pedestrian button. A white lamp on the cyclist button shows when the signal installation has registered that it should change to a green light.

Furthermore, at the junction, a separate cyclist signal with green-for-cyclists-only has been implemented. Green-for-cyclists-only implies that cyclists get green light a few seconds before the cars, and thereby reach the junction itself before the vehicles get their green light.

5) Recessed stop line

In all entries, the cycle track is extended to the pedestrian crossing, and the vehicle drivers' stop line is set three metres behind the bicyclists' stop line.

Dimensions



Drawing: Municipality of Nakskov

Different aspects for cyclists

Positive

1) One-way streets with bicycle traffic in two directions

Cyclist-friendly: it is a beneficial solution for cyclists which legally offers the cyclist fewer detours.

Cyclist safety: The effect of one-way streets on bicycle traffic in two directions is not yet clear. However, a safer environment can be assured when car drivers are made aware that they can expect oncoming cyclists and that there is a designated area for this purpose.

2) Bicycle area at the junction

Cyclist-friendly: The idea behind bicycle areas is to stimulate the car drivers to look for the cyclists. Furthermore, the areas contribute to separate the different types of road users from each other, especially cars and cyclists. The bicycle areas also decrease the number of situations in which right turning cars block the cyclists who go straight ahead.

Cyclist safety: A Danish study concludes that the safety of cyclists at junctions increases markedly when bicycle areas/ crossings are established /26/.

3) Right turning for cyclists without waiting
Cyclist-friendly: It must be regarded as beneficial to cyclists that right turning cyclists do not have to wait at a red light, but can pass to the right of the traffic island inside the signal regulation.

Cyclist safety: A definitive effect study has not been carried out on this measure, but experience shows that the this measure functions without any problems.

4) Vehicle actuated signalization and green-for-cyclists-only
Cyclist-friendly: Vehicle actuation refers to the control form of signalizing, where the road users can influence the signal by detectors. The idea is that none of the road users should wait at a red light if it is not necessary, which obviously is beneficial for all types of road users.
The idea of permitting cyclists earlier green than motor vehicles, is to increase the visibility of the cyclists especially to the right turning vehicles, when both start after a red light.
This initiative of traffic control, benefits especially the cyclists who go straight ahead. While the right turning cyclists can influence the signal by riding to the stop line, the left turning cyclists can only benefit from the initiative by pressing the cyclist button.

Cyclist safety: There are no Danish studies of the effect of green-for-cyclists-only. Since the initiative has the same function as the measure recessed stop line (see the section: Recessed stop line), it is possible that green-for-cyclists-only has a similar effect in reducing the number of accidents involving right turning cars and cyclists who go straight ahead.

5) Recessed stop line
Cyclist-friendly: As with the initiative, green-for-cyclists-only, the idea behind setting back the stop line for the cars, is to increase the visibility of the cyclists especially of the right turning vehicles, when both start after stopping at a red light. A combination of the two measures, green-for-cyclists-only and recessed stop line, gives the waiting cyclists the opportunity of passing the junction before right turning cars, at the beginning of the green light period.

Cyclist safety: Recessed stop line is generally assumed to have a high safety effect in connection to accidents involving right turning cars and cyclists who go straight ahead at the beginning of the green light period.
/9/, /14/.

Total effect at the junction
The junction is safer after the reconstruction.

Negative
4) Vehicle actuated signalization and green-for-cyclists-only
If cyclists fail to see that they have to activate the bicycle signal by pressing a button, the signal will not change until the arrival of ongoing or oncoming vehicles, cyclists, or pedestrians.

Different aspects for non-cyclists

Positive
3) Right turning for cyclists without waiting
The traffic island in the Northwestern corner of the junction separates the cyclists turning right from the ones going straight ahead.

Vehicles coming from the North, are made aware that cyclists on their side, are going straight through the junction. This is especially helpful for right turning vehicles, since they know which cyclists should get right of way.

4) Vehicle actuated signalization and green-for-cyclists-only
At a vehicle actuated junction, none of the road users have to wait at a red signal when not it is necessary. For example, if there are no detected pedestrians or cyclists, the cycle time of the signals will decrease.

2, 4, 5) Bicycle areas at the junction
Vehicle actuated signalization and green-for-cyclists-only
Recessed stop line
Bicycle areas, recessed stop lines, and green-for-cyclists-only increase the attentiveness.

Negative
1) *One-way streets with bicycle traffic in both directions*
   One-way streets usually require detours for motor vehicles.

Other comments

Degree of implementation:
- The majority of streets in the middle of the city which are one-way streets for vehicles are two-way for cyclists.
- Along the entire bicycle route, the red bicycle tracks are extended through the junction in the form of a bicycle area.
- Right turns inside the signal regulation is established at two junctions along the bicycle route.
- Cyclist buttons and separate cyclist signals are established at three junctions in the city.
- Recessed stop lines of the vehicle lanes are established at all junctions along the bicycle route.

Costs

The junction was established/constructed in connection with a large rebuilding of Nakskov town. The price for rebuilding the junction itself is not available.

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C-28 Special use of blue cycle areas

Country: Denmark **Year of implementation: -**

General photo or drawing

Cycle lane between the right-turning lane and other road lanes
Photo: The Danish Road Directorate

Description

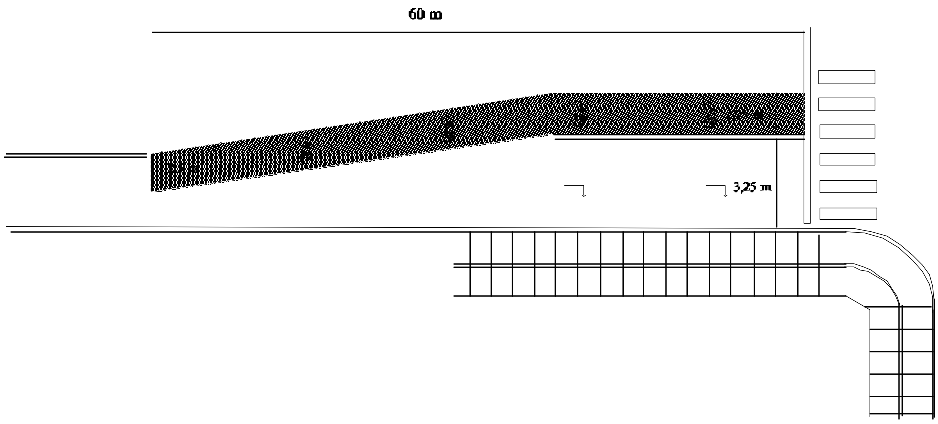
Construction of a cycle lane between the right-turning lane and other road lanes.

In Denmark two-third of the accidents involving cyclists happen at junctions, and many of these accidents happen between right turning cars and cyclists going straight ahead.

To improve traffic safety for cyclists, several municipalities and counties have carried out experiments by establishing a cycle lane between the right turning lane and the other lanes at junctions with much right turning traffic. This cycle lane can be constructed either as a blue cycle lane or as a lane marked by two flattened white lines, in both cases with bicycle symbols. This way, the cyclists have to cross the right turning lane at its beginning.

The idea behind the solution is that the conflict between right turning cars and cyclists going straight ahead will be replaced by a presumably less dangerous weaving conflict before the junction. By letting the cars and cyclists merge before the junction, the motorists and cyclists have fewer objects to survey. Besides, the cyclists going straight ahead will be more visible to oncoming left turning cars, when they meet at the junction /20/.

Dimensions



Example of the construction of a cycle lane between the right turning lane and other lanes. The cycle lane width is 2.25 m
Drawing: The Danish Road Directorate

Different aspects for cyclists

Positive

Cyclist friendly:
The cycle lane makes it obvious to cyclists and motorists where straight ahead going cyclists are expected to ride.

Cyclist safety:
A Danish study (10 different places) of the 'cycle lane between the right turning lane and the other lanes' shows that only few accidents involving cyclists have been registered that can be related to the construction of the cycle lane. It is not possible yet to evaluate whether the construction changes the number of accidents. The study does suggest, however, that there is no increase in the number of accidents involving cyclists and right turning cars at the point where the cycle lane crosses the right turning lane. Also, no accidents caused by space problems were found between cyclists going straight ahead on the cycle lane and either right turning cars or cars going straight ahead /20/.

Different aspects for non-cyclists

Positive
Car drivers have fewer objects to concentrate on when they reach the junction; the traffic situation is easier to survey.

Other information

The blue cycle lane continues through the junction as a cycle crossing
Photo: The Danish Road Directorate

The blue cycle lane between a bus passenger island and the lane for right turning cars
Photo: The Danish Road Directorate

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C-29 Staggered bicycle track at T-junctions

Town: Odense (Denmark) **Year of implementation: 1994**

General photo or drawing

T-junction after reconstruction
Photo: The Danish Road Directorate

Description

Staggered bicycle tracks at T-junctions

Road Type: Primary road with 4 lanes
Secondary road with 2 lanes

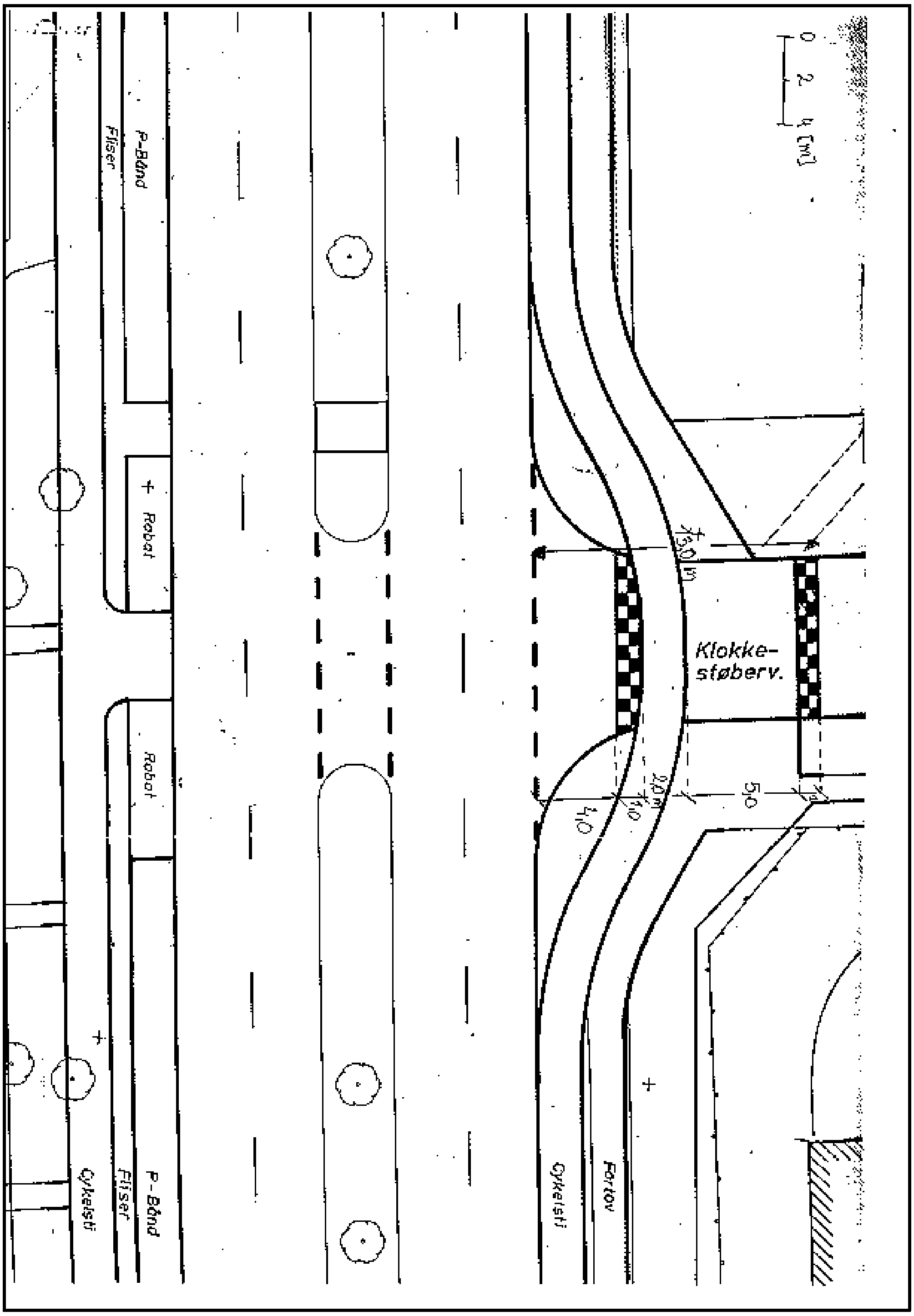
Speed limit: Primary road: 50 km/h
Secondary road: 50 km/h

Description: The bicycle track is parallel to the primary road. The intersecting secondary roads lead to residential areas. At each secondary road, the bicycle track is continued through the junction while the track is staggered from the roadway. The construction contributes to an increasing attentiveness of the cyclists. In addition, car drivers that cross the bicycle track are forced to reduce their speed because of the crossing.
The pattern of the track creates an area 5 metres long, where turning cars can stop. Right-turning cars from the primary road can therefore stop before the bicycle track without blocking the road for cars at their rear-side. Generally one can say that when a cycle track is staggered, the degree of staggering depends on the area that can be observed through the side windows of a vehicle turning right.

Exiting the secondary roads can take place at two tempos.

The degree of staggering is planned in such a way that the cyclists can ride through the junction with a maximum speed of 20 km/h.

Dimensions



Drawing: Municipality of Odense

Different aspects for cyclists

Positive
Cyclist friendly: Because of the staggered bicycle track, and therefore also the waiting area for cars, the cyclists avoid having the track blocked by cars entering or leaving the secondary road.
The construction of the T-junctions force the fast-riding cyclists to reduce their speed.

Cyclist safe: At the present time, it is too early to carry out an effect evaluation of this design in Odense. It seems that the measure will not decrease the number of accidents, but will reduce the seriousness of the accidents.

This design raises the attentiveness of both cyclists and car drivers.

Different aspects for non-cyclists

Positive
Turning cars can more easily survey whether there are any cyclists and they are not forced to make risky manoeuvres.

Other comments

Degree of implementation: The measure is carried out at 10 junctions in Odense. A similar project was carried out in Oesterbro in Copenhagen at the end of 1979.

Costs

Costs per reconstruction ca. 300,000 DKK (ca. 41,000 ECU).

Contact person

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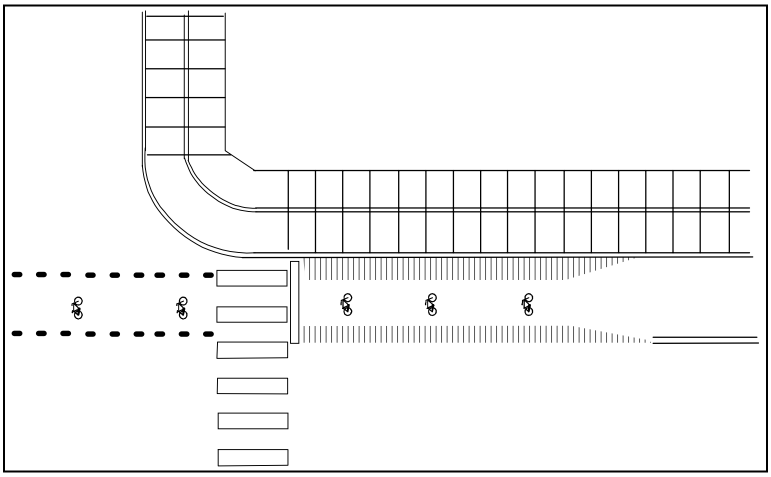
C-30 Truncated cycle track at junctions

Country: Denmark **Year of implementation: 1991 ➜**

General photo or drawing



Truncated cycle track at junctions
Drawing: The Danish Road Directorate

Description

Truncated cycle track at junctions.
The construction described is used in 4-way signalized junctions.

In Denmark a *Truncated bicycle track* is usually known as a cycle-track which is interrupted some distance before the junction. Because of the interruption car drivers and cyclists will mix before they arrive at the junction.

This type of design directs cyclists to follow their course right up to the pedestrian crossing. To make cyclists and car drivers more aware of each other, the kerb of the cycle track is cut off about 20 to 30 m before the junction. The cyclists ride by means of a ramp to the level of the carriageway, and the width of the cycle area is reduced. Cyclists and car drivers are separated from each other by a white line designed as a profiled marking.

Thus, cyclists remain their own area, but because it has been narrowed and it is at the level of the carriageway, it is expected that the alertness of car drivers and cyclists for each other will be improved /9/.

The cyclist crossing is designed in either blue thermoplastic or as an area demarcated by two broken lines. The cycle area is marked with bicycle symbols. A detailed description of the cyclist crossing is given in the description of Four types of cyclist crossings.

Dimensions

The standard for the minimum width of a cycle-track is 1.7 m and the normal width is 2.2 m.

The cyclists ride down a ramp from the cycle-track to the level of the vehicle lane, about 20 to 30 m before the junction. On the carriageway the width of the cycle area is reduced to 1.1 - 1.7 m (depending on the traffic volume).

The white profiled marking which separates cyclists and drivers from each other, is 30 cm wide.

Different aspects for cyclists

Positive

Cyclist-friendly:

. In this design cyclists have their own area (compared to the usual construction of truncated bicycle-tracks). This presumably improves the behaviour of the car drivers towards the junction, resulting in more safety for cyclists.

. In a Danish behavioural study, an analysis of seven junctions was carried out. Five of the junctions had cycle-tracks in the before period, while the other two junctions had the usual truncated cycle-track. In the after period, all seven junctions have the present truncated bicycle-track construction (see drawing).
The analysis concluded that:
- The way motorists drive is generally more positive after rebuilding the tracks.
- More motorists adjust their speed to suit the cyclists.
/9/.

Cyclist-safety:

. An overall evaluation of the Danish behaviour analysis shows that in most cases, the design being studied leads to changes in road-user behaviour, which is expected to result in an increased level of road safety for cyclists at major urban junctions.

. Before and after studies show that fewer motorists ignore the right of way of cyclists, when turning right in front of cyclists.

. Furthermore, it seems that bicycle areas at the junction, increase the alertness of the cyclists. /9/.

Different aspects for non-cyclists

Positive

. The design of the junction seems to bring the cyclists an average of 0.26 m closer to the vehicles. This was precisely one of the objectives of the reconstruction. This is expected to increase the likelihood that the various parties will notice each other before getting a conflict. /9/

Other comments

Degree of implementation:

This type of design has been implemented at seven experimental junctions in Denmark.

The construction is generally used on main roads and in several of the municipalities in the country.

Costs

Installation costs pr. access:

. 40,000 DKK (about 5,500 ECU), at junctions with interrupted cycle-tracks, where the kerb has to be removed.
. 10,000 DKK (about 1,400 ECU), at junctions with truncated cycle-tracks.
. The price levels depend on whether the districts implement the proposals themselves or whether they are made by external sub-contractors.

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C-31 Turning right by and on red for cyclists

Town: various cities (The Netherlands) **Year of implementation: -**

Description

Figure 1: Turning right on red
Photo: SWOV Institute for Road Safety Research, A. Vis

Figure 2: Turning right on red
Photo: SWOV Institute for Road Safety Research, A. Vis

Figure 3: Turning right on red
Photo: SWOV Institute for Road Safety Research, A. Vis

One of the ways of avoiding unneccesary delays for cyclists is the measure 'turning right by red'. This measure requires the following facilities:

Turning right by red should be indicated by a fixed road-sign with the text: 'Legal right turn for cyclists (and mopeds)' or a traffic signal with the same text that lights up when the traffic light for going straight ahead is red.There is a difference between turning right by red and turning right on red. In the first case the cyclists are kept outside the signalization system. In the other case cyclists are allowed to turn right while facing a red light.

In principle cyclists turning right on red should give priority to traffic coming from the left, to oncoming traffic turning left and to crossing pedestrians. This measure should only be taken if the possible conflicts between cyclists and other road users are thought to be acceptabel (low speeds, low volumes, wide cross-section).

Turning right on red is only allowed if a special sign is attached to the signal (see figure 3).

Dimensions

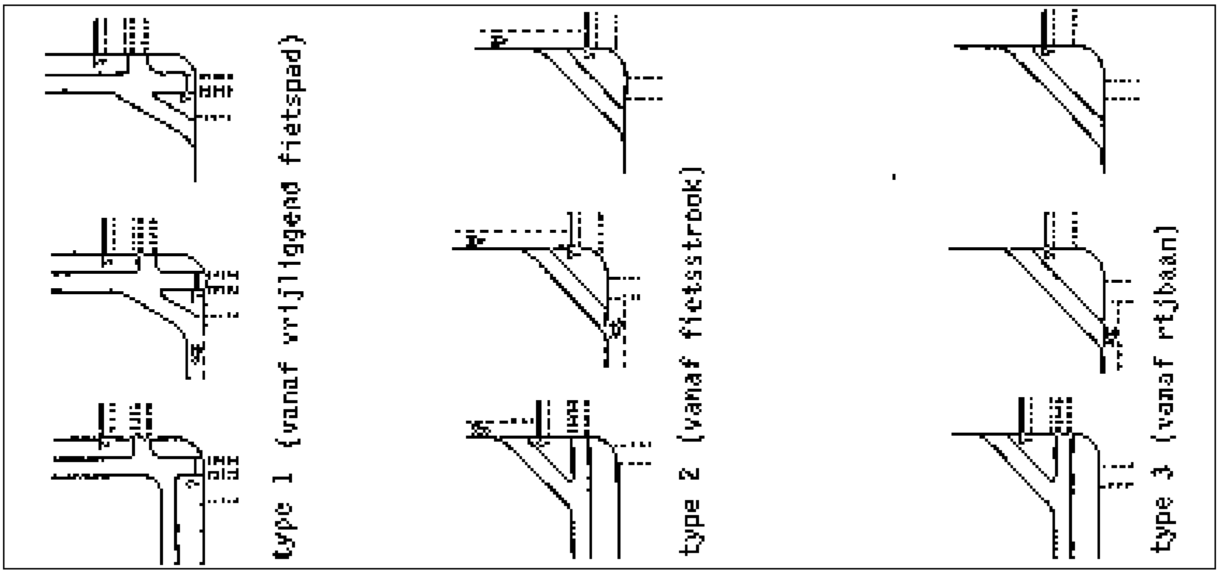

Figure 4: Turning right by red for various road cross-sections *type 1) coming from a cycle-track*
type 2) coming from a cycle-lane
type 3) coming from the carriageway

/27/

Different aspects for cyclists

Positive

. No delays for cyclists turning right.
. Less red-light running

Negative

. Conflicts with other road-users

Different aspects for non-cyclists

. Conflicts between right-turning cyclists and other road-users (cyclists from the left, left-turning oncoming motor vehicles and crossing pedestrians round the corner).

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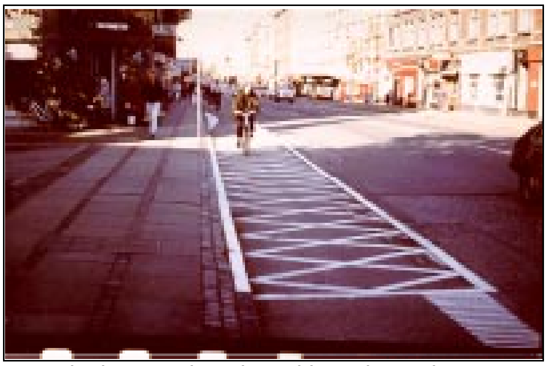
C-32 Two new types of design at T-junctions controlled by give-way markings

Country: Denmark **Year of implementation: 1993**

General photo or drawing

New design at T-junction with interrupted bicycle track
Photo: The Danish Road Directorate



New design at T-junction with cycle track extended through the junction
Photo: The Danish Road Directorate

Description

T-junctions controlled with give-way markings
From accident studies at T-junctions, it has been concluded that any proposal which enhances the visibility of the conflict area and increases the attentiveness of all parties, will also help to increase road safety. Based on this assumption, a proposal was developed for the marking of cycle tracks.

The underlying idea is to bring cyclists and vehicles closer together for the last 20 to 30 m before the junction. It is assumed that this will increase their attentiveness towards each other, thus increasing their level of alertness. The distance between them will be increased again at the junction, in order to give the car drivers more time to react. The cycling area through the junction itself is marked specially.

The following design has been tested at two junctions with interrupted cycle tracks and at three junctions with extended cycle tracks.

T-junction with interrupted cycle track (figure 1)
A long profiled marking has been painted on the nearside of the cycle track, towards the kerb, and a shorter profiled marking on the offside of the cycle track. The nearside marking compels cyclists to move closer to the vehicles, which is intended to increase the parties' attentiveness towards each other. The distance between the parties is increased again at the junction. An additional short profiled marking has been placed after the junction. The purpose of this marking is to persuade cyclists to maintain their distance from right-turning vehicles until they have passed the junction. Cycle symbols have been painted on the cycle area through the junction.

T-junction with extended cycle tracks (figure 2 and 3)
At this type of T-junctions two types of design have been tested. The first one (figure 2) looks like the design applied at T-junctions with interrupted cycle tracks, except for a Harlequin pattern painted on the cycle track at the junction itself; the pattern has no rumble effect. The purpose of the Harlequin pattern is to increase the parties' attentiveness towards each other in the area where there is a high potential for conflicts.
The second type of design (figure 3) is almost identical to figure 2, except that the profiled marking on the nearside of the cycle track, towards the kerb, is omitted (a low-priced version). The omission made it possible to evaluate the effects of the nearside marking.

/9/.

Dimensions

Profiled markings before and after the junction: their purpose is to visually and physically reduce the width of the cycle track, from 2 m to between 1.3 and 1.5 m, respectively.
Drawings: The Danish Road Directorate

The height of the profiled markings is 6 mm.

As a supplement to the profiled markings at T-junctions with interrupted cycle track (figure 1), a profiled marking (10-15 mm high) can also be implemented in the vehicle lane, to reduce the speed of the cars.

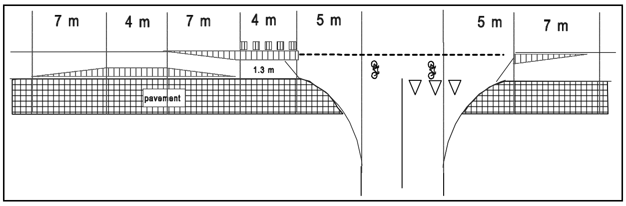


Figure 1: T-junction with interrupted cycle track

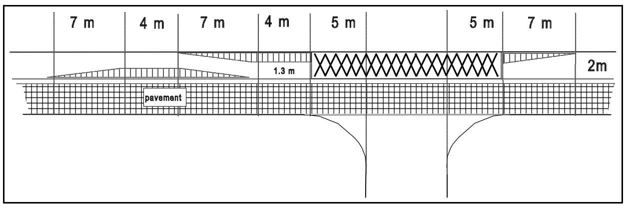


Figure 2: T-junction with cycle track extended through the the junction

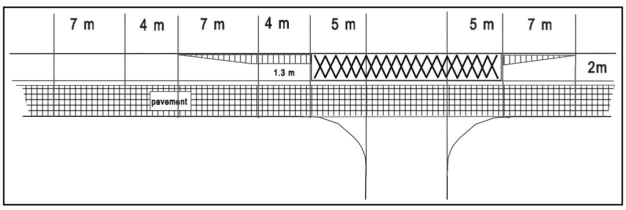


Figure 3: T-junction with cycle track extended through the junction

Different aspects for cyclists (eg. safety, comfort directions, continuity, attractiveness, others)

Positive

Cyclist-friendly:
In two of the current designs, (figures 1 and 2), the cyclists can visually be aware of entering a junction in an early stage.
In figures 2 and 3, the marking is furthermore made clear with Harlequin pattern. In this way, the cyclists are reminded that this is a junction, where it may be necessary to watch out for oncoming traffic, both right and left turning cars from the primary road, and cars coming from the secondary road that do not yield to the right of way.

Safety of cyclists
A Danish behavioural study of a series of experimental junctions concludes that the designs have changed the interaction behaviour of cyclists and drivers in a way that is expected to result in safer conditions.

For example, the new markings entailed:
- The minimum speed of the cyclists drop at four of the junctions.
- The cyclists become alert earlier which is the case especially at junctions, with the Harlequin pattern.
- The distance between the edge of the pavement and the cyclists is reduced just before the junction.
- At about half the junctions, the time distance between cars and cyclists at the points of intersecting has increased by between 0.7 and 1.0 seconds for conflict situations in which a vehicle turns in front of a cyclist.

/9/.

Negative
The Harlequin pattern is quickly worn down, and demands some maintenance.

Different aspects for non-cyclists (eg. safety, comfort directions, continuity, attractiveness, others)

Positive
Especially the two designs with Harlequin patterns let the car drivers be attentive to cyclists following the major road.
The increased distance between cars and cyclists, five metres from the junction, gives the car drivers up to an additional 0.2 seconds to react.
The costs of the profiled stripes and the Harlequin patterns are low.

Negative
The aesthetic value of the profiled stripes, and especially the Harlequin pattern can be disputable.

Other comments

The Harlequin pattern was chosen because it has no other significance as a road marking.

Degree of implementation:
To begin with this type of design has been implemented at five experimental junctions situated in Copenhagen and Odense.
City of Copenhagen: Approx. 500,000 inhabitants,
City of Odense: Approx. 200,000 inhabitants.

As a demonstration project 1995-1998 the designs corresponding to figures 1 and 2 are used at all T-junctions situated in Randers with interrupted cycle tracks and with extended cycle tracks respectively. (Randers is situated in the northern part of Jutland, inhabitants: Approx. 70,000). Other municipalities in Denmark have also adapted the measure.

Costs

T-junctions contolled by give way markings
Installation costs pr. access: 7,000 DKK (approx. 960 ECU)
(regardless of whether the cycle track is interrupted or extended).

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Facilities for storing

C-33a Dutch bicycle-storage facilities

Town: various cities, The Netherlands **Year of implementation: -**

Description


Photo: SWOV, Institute for Road Safety Research, A. Vis


Photo: SWOV, Institute for Road Safety Research, A. Vis

For distances of 7.5 km or more the sequence of 'bicycle or walking/ public transport / bicycle or walking' is important for offering an alternative for car trips. The potential growth of this combination depends amongst others on the availability and accessibility of theft-proof and user-friendly bicycle-storage facilities at railway stations and bus stops. The Dutch Railways want to improve the afore-mentioned transport chain and invest in bicycle- storage facilities. Some other public transport companies are placing lockable storage facilities near the stops of regional or local buses. The design differs from simple cycle-racks and stands to bicycle lockers and automatic storage facilities. Some experiments with lockers for one-day use and with automatic storage facilities are carried out at various locations at railway stations. The automatic systems have the advantage that they can be used 24 hours a day, against relatively low labour costs and at a very efficient use of the available space. At large railway stations there are guarded storage facilities, sometimes combined with a repair workshop and/or bicycle-store and/or the possibility of leasing or renting a bicycle. In general running of storage-facilities without subsidies seldomly is a commercially viable proposition. However, the Dutch Railways can, in cooperation with the local authorities, play a stimulating (financial) role in running this kind of storage facilities.

Different aspects for cyclists

Positive

- Stimulates the purchase of a better bicycle.
- Stimulates the use of better maintained bicycles.
- Consolidates the transport-chain 'bicycle/public transport/bicycle'.
- Is a good measure against bicycle theft.

C-33b New types of cycle racks in Belgium

Town: various cities, Belgium **Year of implementation: -**

Description

Many Belgian cities introduced new types of cycle racks. Various types are being used. The new racks usually replace older types of racks or car parking space.

One type of bicycle rack has been developed especially for the city of *Gent*. This type of racks can be found near public buildings and on the streets in the centre of the city. The racks near public buildings might be situated in pedestrian areas. In the streets the racks mainly replace previous car parking space. Old racks are also gradually replaced by the new type. The racks have been placed since 1994.

The city of *Genk* recently introduced 384 cycle racks of the “U-Lock” type. This type will prevent theft of course, and as a result, increase the use of the bicycle. This type of racks is primarily posted on new locations:
The locations on which the racks are provided:

- 40 racks near the station and in the shopping centre; financed by the local government;
- 134 racks near religious buildings; financed by the local government;
- 210 racks near busstops; financed by the local government, the public transport company “De Lijn”, the county of Limburg and the Flemish Regional Authority.

The local policy is to replace all existing racks gradually by the new type.

In the city of *Mechelen*, extra bicycle stands are added regularly. Meanwhile, existing stands of an older type are replaced by modern types, safer against theft and damage. A lot of new bicycle stands replace existing car parking space. Other stands are posted in pedestrian areas or in areas for both cyclists and pedestrians.

Different aspects for cyclists

Positive

- The new types of cycle racks significantly increase the degree of safety against theft.

Different aspects for non-cyclists

Positive

- The space for pedestrians might be increased if bicycles are parked in the new racks instead of on the footpath

Negative

- If cycle racks are constructed on the footpath which is the case in a limited number of places, the walking space available for pedestrians might be reduced.

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C-34a Covered bicycle racks in the Netherlands

Town: Utrecht (The Netherlands) **Year of implementation: -**

Description

For longer parking periods it is preferable to store the bicycle covered and locked (or under supervision). A great number of stolen bicycles are stolen in the vicinity of the home of the owner. Not all houses have a storage facility within the house or in a shed. Particularly houses in older neighbourhoods in cities lack a storage facility and are dependent on neighbourhood storage spaces. Sometimes each user has a key, sometimes (innovative) storage spaces are fitted with an electronic locksystem or chip card. A problem is a proper control. A special form is a bicycle safe for individual use or a group of users. In general the costs are often a problem. Nevertheless the afore-mentioned facilities have been installed while the numbers of bicycle thefts have decreased. But for exploitation mostly a (governmental) subsidy is necessary. Neighbourhood storage spaces are also good solutions for companies and schools.

Photo: SWOV, Institute for Road Safety Research, A. Vis

Photo: SWOV, Institute for Road Safety Research, A. Vis

Different aspects for cyclists

Positive

- Protection against theft and vandalism.
- Decreasing nuisance by stalled bicycles along the road or against buildings.
- People are stimulated to buy and use better maintained bicycles.

Negative

- Storage costs are higher than without a bicycle-storage facility

Different aspects for non-cyclists

Positive

- Less bicycles as obstacles for pedestrians.

C-34b Covered bicycle racks in Belgium

Town: Kortrijk (Belgium) **Year of implementation: 1994**

Description

The city of Kortrijk uses the "Erlau" type of bicycle-storage facilities, which is the same as e.g. in the city of Brugge. The bicycle-storage facilities are erected on several kinds of locations in the inner town, according to the situation:

- on the pavement, replacing car parking space;
- on the footpath;
- on squares;

On several locations in the inner town, covered bicycle-storage facilities are provided.

Different aspects for cyclists

Positive

- The bicycle-storage facilities on many spots in the inner town guarantee a good accessibility of inner town locations for cyclists
- Covered racks significantly increase the degree of attractiveness and comfort for cyclists.

Negative

- The number of bicycle-storage facilities near the railway station is not sufficient. As a consequence, a large number of bicycles is put on footpaths.

Different aspects for non-cyclists

Negative

- The insufficient number of bicycle-storage facilities near the railway station provokes the deposit of bicycles on the footpath, obstructing the passage of pedestrians.

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C-35 Facilities for repairing bikes

Town: various cities (The Netherlands) **Year of implementation: -**

Description

Facilities for repairing bicycles
Besides a high quality cycling-network a more cyclist-oriented design of bicycle facilities can be a stimulating factor in promoting a wider use of bicycles. It is found that a high incidence of bicycle theft is an impediment for an increasing bicycle ownership and use. Therefore it is important to set up secured or guarded bicycle-storage facilities especially near cyclists frequented destinations like stations and stops of the public transport and shopping centre.

Photo: SWOV, Institute for Road Safety Research, A. Vis


Photo: SWOV, Institute for Road Safety Research, A. Vis

Running of storage-facilities without subsidies seldomly is a commercially viable proposition. To limiting the costs the storage facility can be combined with a repair shop and bicycle sale and rent. An additional advantage for the cyclists is that in case of troubles with his bicycle repairing is possible while he is using the public transport or is shopping or carrying out other activities. That can mean an important reduction in loss of time and in most cases his bicycles is ready again for the return-journey after his daily pursuits.

Different aspects for cyclists

Positive
- Gaining of time
- In most cases the bicycle is ready for the return-journey after the daily pursuits.

Negative
- Sometimes the repairing is not finished in the estimated time and the owner had to consider other alternatives for his return-journey (but without repair shop he had to do that in any case)

Different aspects for non cyclists

No positive or negative aspects

Cost of measures

The costs of the measure can vary highly.

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C-36 Guarded cycle racks in city centres

Town: various cities, The Netherlands **Implementation: -**

Description

Photo: SWOV, Institute for Road Safety Research, A. Vis

Photo: SWOV, Institute for Road Safety Research, A. Vis

One of the best ways of preventing bicycle theft is storing the bike under supervision or in a locked (and covered) storage facility . But cyclists will have to pay for this type of storage. And it appears that cyclists are not willing to pay for short periods of storage, e.g. one short visit to a shop.

There are a number of types of guarded bicycle-storages: on the road-side (covered and uncovered), on separated parts of a parking place, in prefab facilities, in special buildings near (or as part of) stations or public transport transveria or near or integrated in shopping centres.
Guarded storage facilities should attract attention, should be accessible and social safe. A successful exploitation of a guarded storage facility is only possible when the facility is situated next to a bicycle route or near a destination for a large number of cyclists (railway station, shop centre), when it is easy to reach by cyclists and when it is integrated in the system of signposting.
Just like covered and locked bicycle-storage facilities the exploitation of a guarded storage facility can only be profitable with subsidies or sponsoring. Sometimes the storage facility is combined with repairing, selling, leasing or renting bicycles.

Different aspects for cyclists

Positive

- Good protection against theft and vandalism.
- Fewer bicycles stalled on places where they give nuisance for non-cyclists.
- People are stimulated to buy and use better maintained bicycles (as a consequence of a smaller chance of theft and vandalism).

Negative

- Storage costs.
- Mostly limited opening periods.

C-37a Storage facilities near public transport stops in the Netherlands

Country: various cities (The Netherlands) **Year of implementation: -**

Description

Photo: SWOV, Institute for Road Safety Research, A. Vis


Photo: SWOV, Institute for Road Safety Research, A. Vis

Photo: SWOV, Institute for Road Safety Research, A. Vis

An important issue in the Dutch traffic and transport policy is focused on limiting the growth of car use. The bicycle can be a promising alternative for the short distance trips. For distances of 7.5 km or longer the combination of bicycle or walking and public transport is a good alternative. The potential growth of this combination depends also on the availability and accessibility of theft-proof and user-friendly bicycle storage facilities at railway stations and bus stops. The Dutch Railways invest in these sorts of bicycle storage facilities. Some regional or local public transport companies are putting simple storage facilities near bus stops. The design differs from simple cycle-racks and stands to bicycle lockers and automatic storage facilities. Some experiments are carried out with new types of facilities at various railway stations.
The automatic systems have the advantage that they can be used 24 hours a day and against relatively low labour costs and a very efficient use of the available space. At large railway stations the guarded storage facilities are sometimes combined with a repair facility and/or a bicycle-store and/or the possibility of leasing or renting a bicycle. In general running a guarded storage facility is only possible if the government or railway company gives financial support.

Different aspects for cyclists

Positive
- Stimulates the purchase of a better bicycle.
- Stimulates the use of better maintained bicycles.
- Stimulates the combined use of bicycle and train or bus.
- Is a good measure against bicycle theft.

C-37b Storage facilities near public transport stops in Belgium

Town: Brugge (Belgium) **Year of implementation: 1996**

Description

An agreement has been made between the city of Brugge and the national railway company, in order to improve the bicycle storage facilities near the main railway station. 1500 new racks will be erected in front of the railway station, of which 50% will be guarded and be paid for by the user. All racks will give some protection from theft. The storage facilities will be paid for by the railway company.

Near the back entrance of the railway station the existing racks will be replaced by afore-mentioned types; the racks will be moved closer to the entrance, while car parking will be moved further away. The facilities near the back entrance will be paid by the city.

Different aspects for cyclists

Positive
- A better equipment for cyclists near the railway station increases the attractiveness for cyclists.

Different aspects for non-cyclists

Positive
- Better cycle racks near the railway station will prevent the stalling of bicycles on the footpath, improving both the comfort and the safety for pedestrians.
- Public transport users are better served as well, many of which come to the railway station by bicycle.

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C-38 Underground cycle racks

Town: Gent (Belgium) **Year of implementation: -**

Description

The number of underground cycle parking places in Belgium is very limited. The only known example is the city of Gent.
A limited access underground bicycle parking has been constructed for the employees of the local government. It is situated below the main office building. The access is given by a smart card. No guarded parking is available for the visitors of the office.
One of the aims of the cycle policy is to promote the construction of guarded parking space for employers. This does not necessarily mean underground parkings.

Different aspects for cyclists

Positive

. The underground bicycle parking decreases the chances of bicycle theft

Negative

. The social safety aspect is mostly a problem. This should be looked at in the design stage by the architect.

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Transport and bicycle policy

C-39 Bicycles for trips on duty

Town: Mechelen, Gent (Belgium) **Year of implementation: various**

Description

A limited number of bicycles is available for trips by the city empoyees of the city of Mechelen. They should be used by for all service trips, but not for trips to and from home. The bicycles used for this purpose were found on the street and not claimed by the owner. A similar system is operational in the city of Gent.

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C-40 City bikes in Copenhagen

Town: Copenhagen (Denmark) **Year of implementation: 1995**

Description

City Bicycles in Copenhagen
The concept behind the City Bicycle is to make it possible to ride a bicycle free of charge for use within the central part of Copenhagen. So far, there are 120 City Bicycle racks throughout the city where the City Bicycles can be both picked up and returned.

It is not legal to use the City Bicycles in all of Copenhagen. The area which the City Bicycle can be used is limited to central Copenhagen. At each City Bicycle rack there is an advertising column which includes a small map of the city. This map shows the areas of the city where the City Bicycles can be used.

The City Bicycles can be found at the 120 racks scattered through central Copenhagen and can be used by everyone. You only need a 20 DKK coin (3 ECU) to get a bike. In order to release a bike for use, the 20 DKK coin is inserted in the deposit lock. After using the City Bicycle it can be returned to any of the 120 racks and the 20 DKK coin will be returned automatically. The bicycles may not be locked with the users own lock.

The City Bicycle is made in such a way that it is easily recognizable with its many colours and advertisements. Furthermore, the City Bicycle is easy to ride and very robust. It has puncture-proof tires, and can easily be adjusted to fit e.g. the users height.

If one sees a City Bicycle outside of the city centre of Copenhagen, one should call the City Bicycle Foundation who will pick-up the bicycle.

The project for the City Bicycle in Copenhagen started in the Spring of 1995, and included 700 City Bicycles for the first year. This year (1996), the number of City Bicycles has reached a total of 1700. The plan is to increase the number of City Bicycles to 5000 during the next 2-3 years.

Dimensions

The City Bicycle weights approximately 10-12 kg.

Different aspects for cyclists

Positive

- The City Bicycle makes it easy to get around central Copenhagen in an inexpensive, quick, and healthy way.
- The City Bicycles give tourists the opportunity of experiencing the inner part of Copenhagen in a ‘different’ way.
- The City Bicycles are a good solution to quick and direct transportation in the downtown area.
- The height of the City Bicycles seat is easily adjustable.
- The City Bicycles are very robust and therefore need less maintenance than ordinary bicycles.

Negative

- The maintenance of the City Bicycles is not always good.
- The area where the City Bicycles can be used is limited to the downtown area.
- The City Bicycles are normally not available during the winter months (from December to April). The exact period depends largely on the weather. If the sponsors would like to, the City Bicycles could also be available during the winter months, although this has not yet been the case.
- It is not always possible to find a City Bicycle at the bicycle racks. There are not always enough of them available.
- Many cyclists park their own private bicycles at the City Bicycle racks, which can make it difficult to find space to park the City Bicycles.
- The City Bicycle is heavier than ordinary bicycles.
- It is difficult to transport bags on the bicycle, since it has neither a basket nor a luggage carrier.
- The City Bicycle is fastened to a rack using a chain. On some of the racks, the chain is so short that it cannot reach the bicycle, the bicycle has to be laid flat down on the ground before it can be made available.
- Children cannot be seated on the City Bicycles.

Different aspects for non-cyclists

Positive

- Car drivers can park their car outside the downtown area, and use the City Bicycles instead. The advantage is that it is easier to find parking places outside of the city centre, and furthermore, parking is cheaper outside the downtown area.
- At all railway stations in the city, it is possible to borrow and return City Bicycles. In this way, passengers who come by train or bus can continue their trip by bicycle.

Other comments

The City Bicycles are owned by an independent foundation which has been established exclusively to run the City Bicycle project and intends to expand and improve the project. The foundation has been established with the help of public institutions and by sponsorships.

The foundation carries out the ongoing maintenance of the racks and bicycles, and the income needed to run the foundation comes from advertising, from sponsors, other foundations, grants and contributions /23/.

For 2,000 DKK (275 ECU) a year, one can become a sponsor for the City Bicycles. The sponsorship covers the price of painting an advertisement on the bicycle as well as maintenance of the bicycle etc. The City Bicycle Foundation guarantees the sponsors that the amount of bicycles they paid for will always be on the streets in working order. This means that if a City Bicycle disappears, the City Bicycle Foundation will replace the bicycle so that the amount of City Bicycles is relatively constant.

The bicycles are assembled by a Copenhagen youth club "Sjakket".
The maintenance of the bicycles is carried out by prisoners at "Vestre" Penitentiary who are paid for the work done /22/.

A similar project in Belgium (Brussels) is discussed in measure C-42, page 229.

Costs

A City Bicycle costs between 2,000 and 3,000 DKK (275-410 ECU)

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C-41 Cycling in home to work trips in Aalborg

Town: Aalborg (Denmark) **Year of implementation: 1996**

Description

How to get people to use their bicycle as a means of transport between their work and home in a town in Denmark

The target of the so called ABC-Project is to transfer 6% of the trips made by car into trips made by bicycle, within a specified north-south bound corridor before the year of 1998. This increase in bicycle use should be created at the expense of car traffic and - at the same time - without increasing the number of victims amongst cyclists.

This implies that the project has as a goal to convince 6% of those who go to work by car, that they are better off taking their bicycle instead.

The main tools for making this possible is a new direct north-south bound bicycle route through the town centre, a company action plan and some campaigns.

ABC is an abbreviation of Arbejde-Bolig Cykel which means Work-Home-Cycling
Illustration: Municipality of Aalborg

The new bicycle route

The new bicycle route will be along a corridor which is 17 km long, 2-4 km wide and which comprises a lot of work addresses.

Of course there are already major north-south bound roads in this corridor, but much car traffic and a lack of bicycle tracks on important stretches make it quite unpleasant for those who would choose cycling as a means of transport, especially in the town centre.

In the outskirts of the corridor, the new route will give cyclists a quiet and safe alternative to the usual routes along the major roads. In the town centre the new route will consist of cycle tracks along major roads, with safe solutions at junctions and at all bus stops, to prevent accidents between cyclists and bus passengers. In general, all the well-known existing routes in the corridor are going to be improved with better cycle tracks and safer junctions, in order to improve the bicycle network. The principal objective is to allow cyclist the freedom to choose between a quick, direct route and a more quiet but perhaps longer one.

The company action plans for bicycle traffic

The company action plans are going to be made in cooperation with the project engineers and contact persons from companies who have volunteered for these plans. Nine companies and public institutions have joined in this part of the project - so far. All together they have about 12,000 employees.

So far there are four steps in the strategy for company action plans:

Step 1 - Questionnaire
The action plans starts with a questionnaire for the employees about their transportation habits:

- why do they take the car/bicycle to work
- what could induce them to use a bicycle
- are there any black spots on their bicycle route
- etc.

This will generate important information for the planning of a local campaign for bicycling for each company. The questionnaire will also provide information for a before/after study, which is a part of the evaluation of the project.

Step 2 - Company bicycles
At a press conference on the 13 of May 1996, the nine companies presented a couple of new, smart company bicycles decorated with logos and advertisements. 35 bicycles were bought for this purpose. The employees are going to use the company bicycles for on-duty short trips into the Town instead of using the car or taxi. One of the companies spends three millions DKK (ca 411,000 ECU) every year for taxis on short trips, this measure alone can presumably save them a lot of money. Once the project is completed, the company bicycles which have been ridden on for at least 300 km, can be kept by the company free of charge.

Step 3 - Better conditions for cyclists
The companies will improve the parking and showering facilities for bicyclists - and employees should be allowed to take a shower during working hours. Money saved on taxi bills could be used for in-service training or other improvements for the employees.

Step 4 - Good fun for those who choose to use their bicycle
The companies should invite their employees to use bicycles to ride to and from work. The invitation is supported and encouraged through use of information, small competitions, arrangements and reward systems. For instance there will be blood pressure checks every 6 months, so they can see how their health improves. The point is that the companies get happier and healthier employees who have less sick leave.

Campaigns and information
The construction of the new routes should be completed by the end of 1996. Therefore, in the spring of 1997, there will be a campaign with the objective of informing inhabitants in the whole town about the new bicycle network. There will also be a grand opening ceremony, hopefully with the two famous Danish racing cyclists Bjarne Riis and Jesper Skibby as guests.

/16/.

Different aspects for cyclists

Positive

Cyclist-friendly:
All inhabitants in the municipality of Aalborg will not only be glad for the new bicycle tracks but also for the improved existing tracks and roads. Even though the project focuses on the trips to and from work, the changes and campaigns will hopefully also influence people to use their bicycles at other destinations as well, e.g. shopping.

Cyclist-safety:
It is expected that a development of cycling networks together with an improvement of the existing tracks will help improve safety for cyclists.

Other comments

Aalborg is the fourth largest town in Denmark, situated in the northern part of Jutland on an inlet called "Limfjorden". Aalborg has about 150,000 inhabitants.

Degree of implementation:
In addition to Aalborg, a number of cities in Denmark have received state subsidies to finance different types of demonstration projects with the purpose of promoting bicycle traffic in Denmark.

Concerning the experiment with company bicycles, a similar experiment has been carried out in Copenhagen. 50 municipalities and private companies have each borrowed one bicycle for three months. After the three months, the participants were allowed to keep the bicycles, if they had ridden on them for at least 200 km, and/or 50 trips. The experiment went well. Only five companies did not fulfil the stated conditions to take over the bicycle.
The project in Copenhagen was financed by the City of Copenhagen and public businesses.

Costs

The project in Aalborg has obtained 5.5 millions. DKK (753,400 ECU) in state subsidies from the so called Traffic Pool 1995 . Another 5.5 millions DKK came from the local government.

Half of the financing will be used for constructing the route in the core of the corridor, the other half will be used for company action plans, campaigns, information and labour costs.

Contact person

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C-42 Free city bicycles

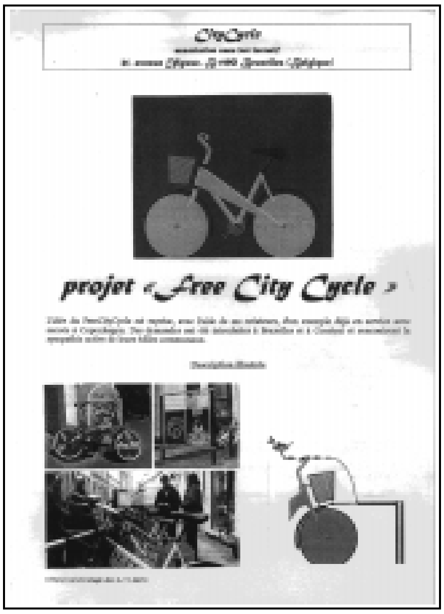
Town: Brussels (Belgium) **Year of implementation: 1997**

Description

A project concerning free city bicycles has been proposed recently for the city of Brussels. For this program, the existing scheme in the city of Copenhagen serves as an example, see measure C-40 on page 223. The use of the city bicycle will be limited to the city centre, this is within the inner ring road.

One of the objectives is to create an attractive transport from the railway stations to destinations within the inner town. For the moment, no bicycles can be rented in the railway stations.

Since the bicycles would be sponsored entirely by publicity, no costs are required for the cyclist or for the city.



Different aspects for cyclists

Positive

. Cycling will be more attractive, especially as a means of transport to and from public transport connections.

Negative

. The Belgian Institute for Road Safety has some reservations about the safety. Especially the brakes need good maintenance.

Different aspects for non-cyclists

Positive

. Public transport will be made more attractive since additional possibilities are offered for the connections to and from the traveller’s destinations.

Cost of measures

No costs, since the bicycles are entirely financed by publicity.

Other comments

A similar project in Denmark (Copenhagen) is discussed in measure C-40, page 223.

Contact person

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C-43 General bicycle programmes

Town: Gent, Bruxelles, Namur (Belgium) **Year of implementation: -**

Description

The city of Gent has developed and is gradually implementing a programme for cycle routes. It's part of the comprehensive bicycle programme, adopted by the city council in 1993. The programme consists of four major radial routes, connecting 7 suburbs with the city centre. The routes are scheduled to be finished:

- route 1 by end 1997
- route 2 by end 1998
- route 3 by end 1999
- route 4 by end 2000

The choices of the routes are made partially by a transport model, indicating the actual and expected bicycle traffic flows. The model gives a separate description of home to work trips and home to school trips from all suburbs to the city centre and vice versa (origin-destination matrix), for both the morning and the evening rush hours. Leisure and shopping trips were not included. The transport model also indicates the expected use of streets and connections in which cyclist measures were proposed (e.g. number of cyclists expected in a one-way street which will be converted into two-way street for cyclists, a new bridge over a canal, etc.)

Some road sections of the cycle routes have mixed traffic while other sections have separeted cycle facilities. The choice depends on the road hierarchy and on the expected subjective safety for cyclists.

A similar cycle programme was developed and implemented much earlier in the city of Basel (Switzerland).Two experimental cycle routes of 3 and 6 km length have been opened in 1975.

The region of Bruxelles recently developed a cycle programme as well, consisting of 16 routes. One of these routes will be implemented in 1997, three other routes will be implemented before 2000. The objective is to integrate the cycle routes in 30km zones. One of the measures is plateaus at junctions.

The routes will be signposted by special cyclist indicators. The signposting gives indications of quarters, important destinations, such as hospitals, universities, etc. Important reductions of the number of cars along the cyclist routes are undertaken as well (e.g. a transformation of a dual carriageway (2x2 lanes) into 2x1 lane plus cyclist track).

The city of Namur has started studying the possibilities of a cycle network. On this field, no results are visible yet. A budget is provided for a pilot project.

Different aspects for cyclists

Positive

. The safety for cyclists will be improved. A similar cycle route plan in the city of Basel (Switzerland) proved to be very effective: the accident rate on one route has decreased with 70%.

. The attractivity increases as well: in the case of Basel cited above, the bicycle traffic increased with 50% on the experimental routes, while in the city as a whole the bicycle traffic increased with 21% , (between 1975 and 1980.)

Negative

. There is a risk that the cycle routes are used as an excuse for not improving the safety for cyclists on other roads.

Different aspects for non-cyclists

Negative

. The cycle routes sometimes go through woonerfs, without any distinction between the areas for pedestrians and for cyclists. This might cause a subjective feeling of unsafety for pedestrians, while cyclists are forced to drive slowly.

Other comments

Similar cyclist route plans are made and implemented by other cities, e.g. the city of Kortrijk. This city might put slightly different accents, but also aims at more attractiveness for cyclists, by upgrading specific routes for cyclists.

Costs of measures

The costs of cycle routes depend on the types of measures on or near the routes. In the case of Bruxelles, the estimated average costs are *5 million BEF per km*. (approximately 125.000 ECU). These costs are an average of sections with and without new cycle infrastructure.

In the city of Namur, 6,0 million BEF (approximately 150.000 ECU) is provided, of which 3,0 mln. (75.000 ECU) will be used for making a programme and 3,0 mln. (75.000 ECU) will be used for a pilot project (still to be defined).

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C-44 Theft prevention program by the city of Gent

Town: Gent (Belgium) **Year of implementation: 1995**

Description

LAAT UW FIETS REGISTREREN

In het fietsatelier van de stad Gent kan iedereen (ook niet-Gentenaars) zijn fiets laten registreren. Ook bedrijven kunnen dit doen met hun dienstfietsen.
Het rijksregisternummer van de eigenaar of het B.T.W.-nummer van de firma wordt in het frame gegraveerd zonder schade aan de fiets aan te brengen.

Het rijksregisternummer is een unieke code die iedereen krijgt bij de geboorte. Het bestaat uit elf cijfers en u vindt het op de achterzijde van uw identiteitskaart of op uw belastingsformulier.
Indien u het nummer niet terugvindt, kunt u het opvragen bij de dienst bevolking van uw gemeente.

Samen met een aantal identificatiegegevens van de fiets (merk, kleur, type, ...) wordt het nummer op de fietspas vermeld. Bewaar deze pas in uw portefeuille.

FIETSPLAN GENT

FIETSPAS

De fietsplaat en de sticker zijn extraatjes die men aan de fiets kan bevestigen. Daarmee maakt u aan potentiële dieven kenbaar dat uw fiets geregistreerd is.

GEMERKTE FIETS

FIETSPLAN GENT

Bij aangifte van een gestolen fiets moet de politie enkel uw rijksregisternummer in de computer invoeren. De identificatiegegevens van de fiets worden automatisch op het proces verbaal afgedrukt. U hoeft enkel nog de plaats en de omstandigheden van de diefstal aan te geven, een klus die in een kwartiertje geklaard is. Wanneer een geregistreerde fiets door de politie wordt teruggevonden, is de rechtmatige eigenaar gemakkelijk op te sporen.

ALS UW FIETS ONDANKS ALLES TOCH GESTOLEN WORDT,
DOE DAN ZO VLUG MOGELIJK AANGIFTE BIJ DE POLITIE OF DE RIJKSWACHT.

Wanneer u een fiets laat registreren in het fietsatelier, maak dan van de gelegenheid gebruik om de fietsententoonstelling te bezoeken. U vindt er allerlei tips om veiliger en comfortabeler te fietsen.

Ook het preventiebureau van de politie 09/266.68.59 *~~(Staakskenstraat 45 - 9000 Gent • tel. 09/266.64.30)~~ geeft u graag advies bij de aanschaf van een goed fietsslot.*

A important series of theft prevention measures has been taken by the local Bicycle Unit

1. Bicycle registration as theft prevention is organised:

- for the schools as a result of the “LIFE” project. The schools with high numbers of actual and potential cyclists (shown by a questionnaire distributed among the pupils) are visited by the Bicycle Unit.
- for individuals half a day per week in the building of the Bicycle Unit
- decentralised for individuals in several public buildings in the city.
- for companies on their request.

The bicycle registration is free, also for non-residents. The registration consists of the individual national registration number (“rijksregisternummer”), which is marked in the frame of the bicycle. This increases the possibility of returning a stolen bicycle to the owner, even if it is found back in another city. In case of theft the identification by the registration number replaces an inaccurate description of the stolen object.

2. Promotion of the use of solid locks is done through the cyclist’s newsletter.

3. A special type of bicycle rack has been developed for the city of Gent, which gives a high degree of protection against theft.

Different aspects for cyclists

See the example "Registration as part of a theft prevention scheme”.

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Education and public information

C-45 Assertive cycling course

Town: Brussels (Belgium) **Year of implementation: unknown**

Description

An educational program “Velo-école” is developed by a non-profit organisation “Pro Velo”. The program is directed towards several categories: teachers of primary and secondary schools and the general public. A special program is developed for schools.

The program teaches the participants how to drive safely and comfortably by bicycle in the city of Brussels.

Vélo-école

apprentissage du vélo

Beaucoup de citadins, n'ont jamais appris à rouler à vélo. D'autres considèrent que c'est trop dangereux dans le trafic et se réservent ce plaisir uniquement à la mer ou en forêt.

Et pourtant, les statistiques montrent que le risque d'avoir un accident grave à vélo est plus faible en zone urbaine qu'en zone rurale, du fait de la moins grande vitesse des automobiles. En outre, l'essentiel des accidents est évité par le comportement approprié des cyclistes aguerris.

Par ailleurs, alors qu'il figure dans tous les programmes scolaires, l'apprentissage du vélo en situation réelle n'est presque jamais mis en oeuvre dans les écoles qui se contentent, au mieux, d'un exercice en terrain privé. Les enfants se trouvent alors bien démunis pour acquérir des bons réflexes de conducteur.

Pour donner à toute pesonne la chance de pouvoir se déplacer à vélo sans peur et sans reproche, Pro Vélo propose les activités suivantes :

Vélo-école pour adultes :
- cours pour débutants (12 h, 3 000 f)
- cours pour vaincre sa peur du vélo en ville (4 h, 1 000 f)

Ces cours s'accompagnent d'un vélotour guidé de Bruxelles et du parrainage du nouveau cycliste par un cycliste expérimenté.

Pour les écoles :
- rallye à vélo pour les élèves (sur demande)
- accompagnement d'une démarche menée au sein d'un établissement (aide du professeur titulaire, prêt de matériel, location de vélos, documentation, contrôle technique)
- prix réduit pour les tours guidés (à partir de 3 000 f par groupe)

Essentielle pour découvrir les bons réflexes de sécurité routière, la géographie ou une technologie appropriée, la sortie à vélo dans les environs de l'école, en classe verte ou en voyage scolaire doit se préparer longtemps à l'avance. Pro Vélo peut vous y aider.

Inscriptions et renseignements complémentaires :
Pro Vélo asbl, rue E. Solvay 32A, 1050 Bruxelles, tél : 02/502 73 55, fax 02/502 86 41.

La vélo-école bénéficie du soutien de l'IBSR et de la Région de Bruxelles-Capitale

Institut Belge pour la Sécurité Routière

Cost of measure

No costs for the government. Participants pay 3000 BEF (approximately 75 ECU) each for 12 hours.

Different aspects for cyclists

Positive
- The program increases the attractivity of cycling for those who were not used to cycling before.
- If attention is paid towards safety aspects, the program improves traffic safety.

Contact person

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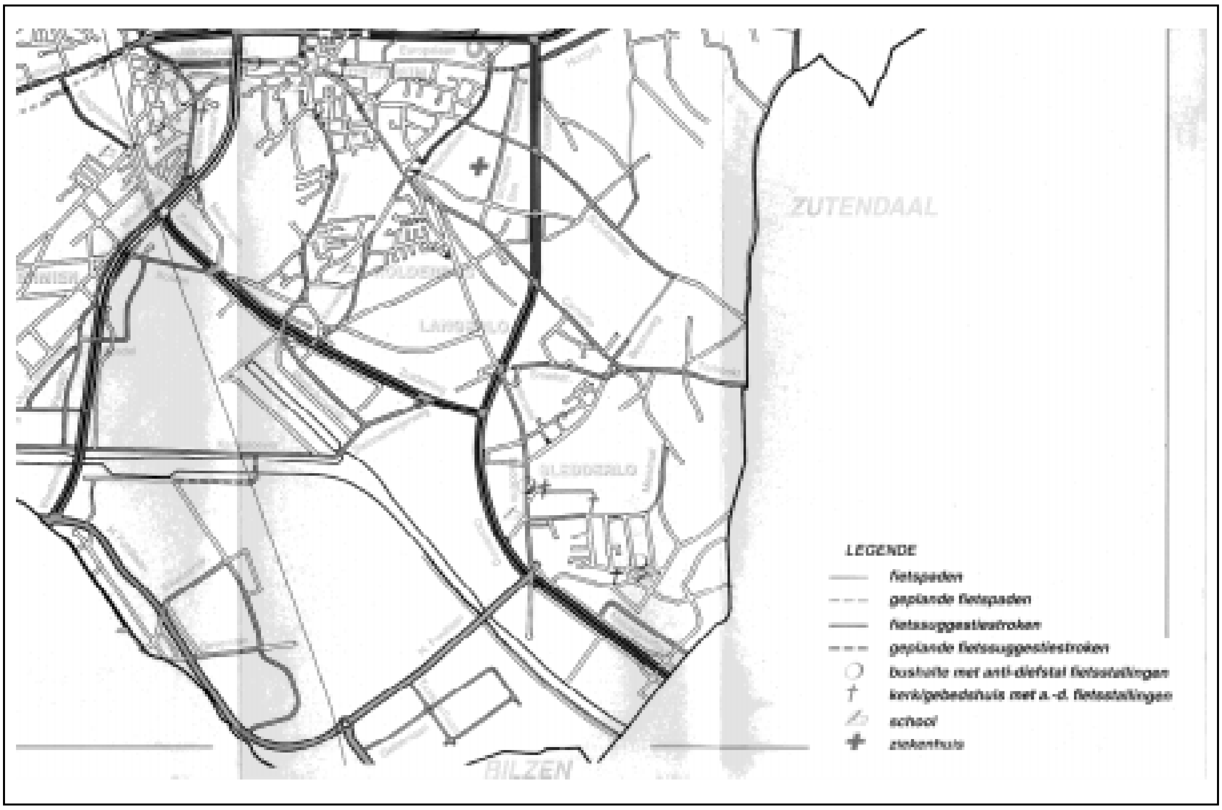
C-46 Cycle routes map with recommended routes

Town: Genk (Belgium) **Year of implementation: 1994**

General photo or drawing



Description

A cycle routes map is published and distributed by the city of *Genk*. The first edition was published in 1994. This map has been updated in 1996. The map gives an overview of all existing cycle infrastructure (cycle lanes and non-compulsory cycle lanes, both existing and planned ones). Cycle routes with mixed traffic are not shown on the map. Public cycle racks are indicated. The most recent version also contains map with a bus routes on the reverse side.

The maps are distributed in the schools on a simple request and are available in public buildings. The map is available without charge. The map was used in 1994 for personal travel advices as a part of the company transport plan in the “Genk-Zuid” industrial area. Every employee who had stated willingness to cycle, received an individual cycle route which was drawn on the map.

The city of *Brugge* has published a general cycle map representing the cycle infrastructure within the boundaries of Brugge. The map gives a detailed overview of all existing bicycle lanes and of the situation on the main roads (sort of cycle infrastructure). For the inner city, an overview is given of all one-way streets for cyclists (most streets are one-way for cars but bi-directional for cyclists).

The map also gives some brief information about the meaning of traffic signs for the cyclists: cyclist road crossing, roads compulsory for cyclists, etc. However, the map does *not* show recommended cycle routes like the map published by the city of Gent (see below).

The map of Brugge has been published when the traffic circulation plan (originally introduced in 1992) was adapted in 1994. It has been sent to all inhabitants.

The city of *Gent* has taken a similar initiative. However, this map is different from the others: It mainly shows a series of recommended cycle routes, without details about the road layout or other cyclist facilities. The map also shows routes which have not been implemented yet.

Contact persons

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Transport Alderman
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C-48 Initiative Red Crosses

Country: Denmark **Year of implementation: 1996**

Description

Every year, 2500 cyclists are injured in traffic. By far, the most serious accidents happen at junctions where the cyclists are easily overlooked. Based on this fact, The Danish Road Safety Council and the local traffic safety committees in Denmark started a campaign in the spring of 1996 with the purpose of reducing the number of accidents between cyclists and car drivers at junctions. The target groups of the campaign "Initiative Red Crosses" were primarily the 15-30 year old cyclists, and secondly the car drivers.

A red cross located at the conflict point between the turning vehicles and straight on-going cyclists in the junction
Photo: The Danish Road Directorate

The strategy of the campaign was to put focus on the bicycle accidents exactly at the spots where cyclists are hit by a car. Therefore, red crosses were painted on the pavement of the junctions during the campaign period, - as a warning and request to all road users to look out. The red crosses were painted approximately two metres ‘into’ the junction, which is where most accidents happen.

To further attract the attention at the junctions, three different road side posters were designed to give good advice to cyclists and car drivers. Posters were designed with or without 3D-effects. The advice on the posters was; "Get eye contact", "Check your blind spots", and "Look into the eyes of the car driver". The road side posters should make both cyclists and car drivers aware that they have a responsibility towards the other party, and just as important - to behave safely.

To ensure that the campaign reached as many people as possible, a leaflet was distributed to all households concerning information about the dangerous situations and how cyclists can avoid being hit by cars. The function of the leaflet is to explain to the reader how to avoid the dangerous situations at junctions. To encourage reading of the leaflet, it contained a contest: a "Scratch-and-Win" game, where the reader, could "scratch" at the cars of a hypothetical traffic situation that would be dangerous to cyclists going straight ahead at a junction. The "Scratch-and-Win" game also ensured that the message was understood, since only the people who scratched their coupons correctly, could participate in the contest.

The leaflet was designed so that its shape turned into an junction when it was opened by the reader. Not until the last part of the leaflet was opened, the reader could see the Scratch-and-Win plate, and in this way the reader was "forced" to read through the messages. The leaflet had a local return address, and the prize pool for the local area was stated on the back. The prizes were bicycles, sports watches, and bicycle bags, etc.

The advertisement about Initiative Red Crosses was directed at the general public, to explain the meaning behind the roadside posters and the red crosses painted on the road.

In communities where roadside posters were placed, and red crosses painted, material for schools were sent to pupils of primary schools. The school material had the purpose of informing school children about the campaign and the three dangerous situations they should watch out for at junctions. The material consisted of an accompanying letter to the teachers and a leaflet where the text was written in two versions; one for the age of 6-8 and one for the age of 9-12. The illustrations were the same in both versions. The material was illustrated in a comic-strip form that addressed the children in a direct way. The main point of the leaflet was to show where things go wrong at junctions and what you as a cyclist can do to be seen. This can be done, e.g. by getting eye contact with the car driver.

As a motivating factor for both students and teachers, the material contained a contest, where a school-class by a joint effort could win DKK 5,000 (ca. 700 ECU) for an excursion. Material was sent to approximately 350,000 pupils.

Dimensions

The red crosses are 90 x 90 cm, and the "legs" of the crosses are 30 cm wide. The crosses were painted 2 m into the junction, which is where most conflicts/accidents happen.

Different aspects for cyclists

Positive

- The campaign makes cyclists more aware of the conflict situations that can occur when crossing a junction.
- The cyclists are made aware that they must always be careful and look out when crossing a junction, and not blindly trust that car drivers have seen them.

Negative

- The campaign could be criticised for being directed too much at cyclists and not enough at car drivers. After all, it is the car drivers' responsibility to watch cyclists going straight ahead.

Different aspects for non-cyclists

Positive

- The campaign makes cyclists and car drivers aware that there are blind spots which obstruct the car driver’s view on the cyclist.

Other comments

The campaign was nationwide.

Costs

The entire campaign costs DKK 3.5 millions (approximately 480,000 ECU).

Contact person

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C-49 Promoting the services of the Bicycle Unit

Town: Gent (Belgium) **Year of implementation: 1995**

Description

The phone number of the Bicycle Unit of the city of Gent has recently been published repeatedly. This was the case in the cyclists' newsletter, which is published regularly to inform about the progress of the general bicycle plan. The phone number of the Bicycle Unit is published in order to facilitate direct contacts between the Unit and the population. Everyone can now contact the Unit with any kand of questions about the bicycle policy or with cycling problems in general.
However, no special personal service is linked to the telephone line: no personal travel advises are given. Furthermore there is no extra staff available to answer the phone. Therefore, the impact of the announcement will be rather limited.

Contact person

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C-50 Promotion day for sustainable transport modes

Town: Genk, Bruxelles (Belgium) **Year of implementation: 1995**

Description

Promotion day by the city of Genk - Action "Dring Dring" in the region of Bruxelles
Each year in the month of May, a promotion day for sustainable modes (“Auto-arme schooldag”) is organised in the city of Genk. The day is organised by both the city council and the Workshop Safe School Routes. The program is entirely financed by the city of Genk. The schools don’t participate financially. In the workshop every school of the city (44 schools) is represented. The following actions are promoted:

- Cyclist promotion: Safety material is provided by the city for low prices (subsidised). The enforcement by the traffic police is extended on dangerous spots.
- Public transport: "De Lijn", the Flemish public transport company sells cheap return tickets (20 BEF; 0.5 ECU), valid from every location in the county to and from Genk. These tickets are subsidised by the City of Genk. (a normal return ticket would cost 54 BEF (1.4 ECU) or more, depending on the distance).
- An education package for the schools is made, with differentiation for each level. All participating schools use it on the promotion day.
- A large press campaign precedes the promotion day.
- A letter is sent to all parents asking them to let their children use sustainable transport modes that day, preferably cycling. Even parents of nursery school children are asked to ride their children by bicycle or go by foot instead of driving them by car.

The results:
- All basic and nursery schools and a large part of the secondary schools participate in the promotion day.
- In normal circumstances in secondary schools about 18% of the pupils uses the car (which is a good result already). On the promotion day, less than 10 % of the pupils came by car.
- For elementary schools, only a few figures are available (from one school). Usually 52% of them comes by car. On the promotion day, less than 5% of them was coming by car.

A similar program has been implemented by the region of Brussels. This is a yearly communication program for cycling in Brussels. A non-profit organisation is subsidized by the Bruxelles government to organize this event.

Different aspects for cyclists

Positive

- The attractiveness of cycling is significantly increased during the promotion day. The number of cyclists on that day is bigger than usual.

Negative

- The consequences of the promotion day for the rest of the year are less clear. There is no obvious increase of the bicycle use due to the promotion day.

Contact person

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C-51a General public awareness campaigns

Town: Gent (Belgium) **Year of implementation: 1994**

Description

The Bicycle Unit of the city of Gent regularly publishes a “Fietskrant” (Bicycle newsletter) with information on the cycle policy of the city council and suggestions for cycling.

Fietsatelier stad Gent

FIETSATELIER

Antonius Triestlaan 12 • 9000 GENT
(ingang oud Militair Hospitaal)
Openingsuren fietsregistratie :
dinsdag : 16u00-19u00
~~woensdag : 13u30-16u30~~

De fietsregistratie vindt op regelmatige tijdstippen plaats in de verschillende dienstencentra in de stad.
De exacte data en uren vindt u in de lokale pers of bij de Fietsdienst
tel 09/ 266 77 64
fax 09/ 266 77 99

Fietskrant Jaargang 3 nummer 1, januari 1996
v.u. : Stadsbestuur Gent,
Technische Diensten, Directie-Generaal
Woodrow Wilsonplein 1 • 9000 Gent
Tel. 09/266 77 60
redactie en lay-out :
CIBE, bureau voor communicatie, Gent

FIETSPLAN GENT

FIETSKRANT GENT

VEILIG FIETSEN IN GENT

We brengen dagelijks heel wat tijd door in de auto. Toch is de afstand die we moeten afleggen meestal niet groot. Eens vaker de fiets nemen, is een goede oplossing : geen opstoppingen, geen parkeerproblemen, ...
In het kader van het Fietsplan Gent wordt gewerkt om de stad fietsvriendelijker te maken.

Veilig fietsen is meer dan de aanleg van fietsroutes en -paden. Het spreekt vanzelf dat de fietser de wegcode moet kennen en ... naleven.
De fietser is ook een kwetsbare weggebruiker. Een goede zichtbaarheid verhoogt de veiligheid op de weg.

Fietsendiefstal is een plaag die heel wat mensen ervan weerhoudt de fiets te gebruiken. Het Stadsbestuur nam een aantal maatregelen om dit probleem in te dijken. Maar u kunt er zelf ook heel wat aan doen !

Contents: The cyclists newsletter deals with:

- general promotion of cycling;
- information about the Bicycle Programme of Gent (“Fietsplan Gent”);
- information about the development of the cycle network;
- advices for traffic safety and theft prevention.

The cyclists newsletter is freely distributed:

- in all public buildings of the city.
- to the city employees
- to the schools
- in press conferences

Contact person

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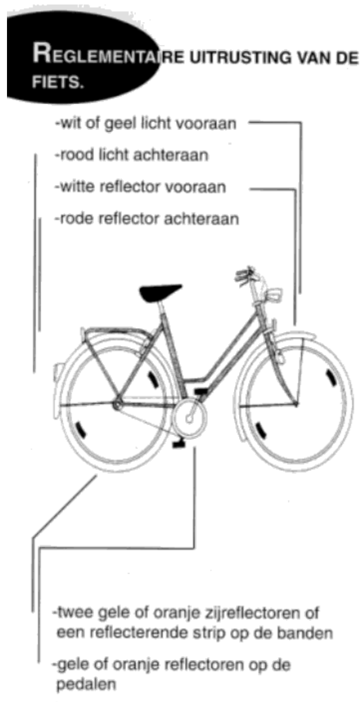
C-51b Public awareness by the city of Genk

Town: Genk (Belgium) **Year of implementation: various**

General photo or drawing



Description

The city has produced various documents in order to raise the public awareness for cycling. These documents are partly used for the traffic education as well:

- The bicycle map, showing all bicycle lanes and recommended cycle lanes within the city boundaries.
- A poster called 'Genk fietst" (Genk is cycling).
- A cyclists' calendar, indicating all bicycle activities in Genk. This calendar is mainly directed towards the recreational use of the bicycle.
- A leaflet indicating the compulsory and advised illumination equipment. This leaflet is distributed at schools and was used by some schools for traffic education.
- About 14.000 leaflets on general road safety were used at the elementary schools.

Different aspects for cyclists

Positive

- The leaflet indicating compulsory equipment aims at increasing the safety of cyclists.

- Other documents, such as the cyclist map, increase the attractiveness of cycling.

Different aspects for non-cyclists

- The leaflet indicating compulsory equipment also increases the safety for other road users, because of a better visibility of the cyclists.

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C-52 Traffic education: Checking compulsory bicycle equipment at school

Town: Brugge (Belgium) **Year of implementation: various**

Description

On request by the schools, the police gives traffic education in the schools, in order to obtain a good behaviour in traffic. These lessons are given to both pedestrians and cyclists.

Another educational measure, is the implementation of bicycle checks by the police at school. This check is carried out on request of the schools. Most schools have reacted positively and asked for a check, mainly in autumn. The state of all compulsory equipment is checked for each bicycle individually. Cyclists with good equipment receive a green card, those with failing equipment receive a red card with indication of the failing equipment. They have to show their bikes again after an repair or improvement has been carried out. However, no fines are given for pupils failing to show the necessary equipment.

Similar control schedules exist in other cities, among them the city of Gent.

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Organisational facilities

C-53 Admission of bicycles in public transport

Town: Copenhagen (Denmark) **Year of implementation: -**

Description

Bring the bicycle along in the train; Parking facilities at the railway station
In Copenhagen's S-train system (=S-togs net), it is possible to take your bicycle into the train. You can take your bicycle into the train on any day of the week except between the hours of 6.30 and 8.30 a.m., and 3.30 and 5.30 p.m. from Monday to Friday, inclusively. You need a special bicycle ticket for the bicycle each costing DKK 11 (1.5 ECU). Alternatively, a specially priced bicycle card with 10 tickets can be bought for DKK 100 (14 ECU). A bicycle ticket lasts for 1½ hours, and one has to get on the train before the time expires. Besides the bicycle ticket, a personal ticket is also required.
This arrangement was made free of costs for travellers (for their bicycles) for summer weekends in 1997. In August 1997 it wa made free of costs in weekend for the rest of the year 1997.

Bring the bike along in the train
Photo: The Danish Road Directorate

One can place the bicycle in any part of the train bearing the bicycle symbol (see photo on next page), but only two bicycles are allowed in each part. Passengers can bring only one bicycle each, and neither bicycle trailers nor tandems can be brought on the train. You have to stay with your bicycle during the entire trip.

In addition to the possibility of taking your bicycle into the S-train, 25 of the 81 S-train stations in the metropolitan area have guarded bicycle storage facilities. These facilities are built first and foremost for people who ride their bicycle to and from the S-train, and who want to protect their bicycle.
The bicycle parking area is directly connected to the station, and one can only get into the locked area if one has a key. The key is a magnetic card that gives access to the facility at any time during the whole week. The facility has a guard on weekdays between 8 a.m. and 6 p.m. The price for bicycle parking is DKK 5 for 24 hours (0.7 ECU), DKK 100 for 6 months (14 ECU) and DKK 200 per year (28 ECU).

If you use the facility only for 24 hours, you have to give in / pick up the bicycle between 8 a.m. and 6 p.m., when there is a guard.

At some of the stations, a facility is available for repairing bicycles. You can give your bicycle to be repaired in the morning, and pick up the bicycle in the evening. Furthermore, it is possible to rent a bicycle when your own bicycle is being repaired.

Different aspects for cyclists

Positive

- The bicycle is protected from the weather.
- To prevent from theft and vandalism, the bicycle parking area is surveyed by cameras at all hours, and also has guards during a part of the day.

Negative

- There is no access code on the magnetic card, so everyone who has a card can get into the bicycle parking area.
- The bicycle racks are too small to fit a mountainbike.
- It is only permitted to bring bicycles on the S-trains during specific hours, and only two bicycles are allowed in each train corridor.

Other comments

Degree of implementation:
25 of the 81 S-train stations have guarded bicycle parking areas.

Train corridor with bicycle symbols
Photo: The Danish Road Directorate

Bicycle parking at a railway station
Photo: The Danish Road Directorate

Contact person

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C-54 Bicycle Unit in the city of Gent

Town: Gent (Belgium) **Year of implementation: -**

Description

A cycle officer has been nominated by the city council of Gent in 1994. Nowadays the Bicycle Unit consists of 3 employees, dealing only with the cycle policy and related activities (e.g. communications). The Unit consists of:

- a cycle officer in charge;
- a communications officer responsible for the cycle action plan;
- an administrative employee.

The cycle officer takes care of proposal, implementation and follow up of all cycle measures. In 1993 a comprehensive cycle action plan was approved by the city council, consisting of cycle routes, installation of bicycle racks, etc. (More details about the plan are given in the example General cycle plan). One of the tasks of the cycle officer is to implement this action plan. Moreover, an agreement with the public transport company "De Lijn" was reached by the cycle officer. For more details see the example Cyclists and public transport.

The cycle officer has direct relations with the political authorities (Mayor and Aldermen). This is an advantage since no long hierarchical way up has to be followed.

A cycling committee consisting of all competent administrations meets every two weeks in order to resolve all bicycle questions.

On the political level, a committee called "VERO" meets regularly under the presidency of the transport alderman in order to resolve all transport and land use questions. The cycle policy is one of the covered items.

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C-55 Bicycle registration as part of a theft prevention scheme

Town: Kortrijk, Gent, Genk, Brugge (Belgium) **Year of implementation: various**

Description

Cyclist registration as a part of theft prevention is organised by many cities, among them the cities of Kortrijk, Genk, Brugge and Gent. (In the case of Gent, this is part of a larger program, which is shown below.) The registration is carried out by the municipal police. Most cities use the national register number which can be found on the frame of the bicycle.

The system used by the city of Kortrijk contains the name of this city in order to identify the home-base if the bike has been found back in another town.

In the city of Genk the identification number of the national registration is used ("Rijksregisternummer"). Until recently, the procedure to find back stolen bicycles used a specialised computer program, called "ROMEO 2000". Since 1996, another program is used, called "PIP". This program is part of a comprehensive police supporting program.

The registration in the case of Brugge is permanently offered on a fixed address, but 2 to 3 times a month every quarter and suburb is served by a mobile registration team of the city police. The registration is not free: it costs 100 BEF (about 2,5 ECU) per registration
Other cities offer a free registration.

Few figures are available about the number of stolen bikes or the number of recovered bikes. Generally the results are not very satisfying, in numbers of recovered bicycles.

In the city of Brugge, an additional measure is implemented. Like many Belgian cities; Brugge has some city guards. They are civil officers in order to increase the social safety. One of the tasks confined to them by the city of Brugge is to keep an eye on the cycle racks, especially those in the vicinity of the railway station and other locations where bikes are stolen regularly.

Different aspects for cyclists

Positive

- In case of positive results of the bicycle registration, the attractiveness is significantly increased by implementing a registration system.
- The inspection of the city guards (city of Brugge) is also increasing the social safety.

Negative

- If additional staff is needed for inspection of cycle racks, the cost effectiveness might be low.

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C-56 BikeBus'ters in Aarhus

Town: Aarhus (Denmark) **Year of implementation: 1995**

Description

The BikeBus'ter Project

The project is a scientific study carried out by the Traffic Research Group of the Aalborg University. The purpose of the project was to examine whether it is possible to change some of the short daily car trips, into trips by bicycle or by public transport.

Are you willing to leave your car at home and take the bicycle or bus instead ? We will lend you a bicycle (without any charges) and as many bus tickets as you need.

The Project Logo
Illustration: Municipality of Aarhus

The project used incentives to get people interested. About 1700 people from Aarhus municipality were interested and volunteered to take part in the project. From this group 175 people were chosen by the researchers to take part in the project. They were all car drivers that had to travel between 2 and 8 km to work, and up till that point had taken their car every day. The purpose of the project was to let habitual car drivers choose for the bicycle to make their daily trips from home to and from their work.

The 175 so called "BikeBus'ters were each given a bicycle of their own choice, in exchange for a 1000 DKK deposit (137 ECU). The actual costs of the bicycle were 4000 DKK (550 ECU). They borrowed the bicycle for a one year's period.

Together with the bicycle they received three bicycle service inspections, mending of bicycle punctures, spare bulbs, a rainproof suit, a child-seat for the bicycle (if needed), a bicycle computer for registration of the number of kilometres travelled, and an unlimited number of bus tickets for the Aarhus Bus Company. When winter approached, they were also given warm mittens and a winter time-table for the public transportation.

Furthermore, the BikeBus'ters were offered three health checks with the Heart Foundation, they were invited to various relevant arrangements, and every second month they received a Bikebus'ter newsletter. The newsletter contained advice about diet and such, information from Danish Cycling Federation, the Heart Foundation, as well as competitions/contests, articles written by other BikeBus'ters etc.

In addition, a service was set up to help the BikeBus'ters who might run into problems along the way.

The BikeBus'ters filled out various questionnaires, and kept an updated account of the kilometres travelled, using the bicycle computer and using the stamps on the bus tickets in order to log how far they had travelled by car, bicycle and bus.

The BikeBus'ters also filled in travel diaries that described their trips during a one week period giving an overview of; destination, purpose, means of transport and length of the trips. The travel diaries have been filled in during a period of three weeks: One week in the first period before the start of the project, and two weeks during the project, one of which was during the summer and one week during the winter. After the experiment, the BikeBus'ters will fill in the travel diary one last time. The follow-up study will tell us something about the willingness of the BikeBus'ters to continue without "weight watchers control". /1/, /3/, /4/.

Dimensions

The project has run for one year: From May 1st 1995 to April 30th 1996.

Different aspects for cyclists

Positive

Not all BikeBus'ters completed the experiment, but 159 of them succeeded. The other 16 participants had to be omitted because they no longer fulfilled the criteria for BikeBus'ters. They either moved away from Aarhus Municipality, or got a new job which was too far for using the bicycle. Those who completed the experiment all bought their Bikebus'ter bicycle.

Results:

Before period - First Travel diary

- The first travel diary was filled in during one week in April 1995, before the beginning of the experiment. During this week, the total number of car trips made by the BikeBus'ters was 2760, which corresponds to 80% of all trips made by car. (This is approximately 20% above the national average, /25/).
- In total, the BikeBus'ters used the bicycle in 290 trips, corresponding to 9% of all trips. So the BikeBus'ters were far less using the bicycle compared to the national average of cycle trips: 18% /25/.
- 2% of trips were done by bus, while 10% of trips were made by foot.

Experimental period - Second Travel Diary

- In September 1995 the second travelling diary was filled in, after the experiment started. The total number of car-trips had fallen to 1030, corresponding to ca. 34% of all trips by car.
- The number of cycle trips increased to 1500, corresponding to more than 53% of the trips by bicycle.
- The share of bus-trips increased from 2% to 4% while the share of trips by foot dropped to 9%.
- The length of a trip by bicycle of a Bikebus'ter amounted to 40 km a week during the period from May to October. The BikeBus'ter took the bus less than once a week.
- After the summer, the health check at the Heart Foundation showed good progress, after the former car drivers had taken the bicycle to and from their work for 6 months. About 40% of the BikeBus'ters had improved their physical condition. Improvements had also been noticed in terms of weight loss and less cholesterol.

Experimental period - Third Travel Diary

- After the winters hardships, the modal split for March 1996 was 40% by car, 28% by bicycle and 16% for bus and walking together.
- From November, when the snow really started falling, the average was 20 km a week, while from January, and for the rest of the winter, the length was 10-15 km a week. The number of bus trips increased to an average of 2.5 times a week.
- After the winter, the condition of the participants decreased while the weight and cholesterol level increased.

Conclusion: a very large percentage of the BikeBus'ters have kept their travel habits and presumably resume their good cycle habits after the winter.
A BikeBus'ter travels 1600 km by bicycle a year which is 80% more than the inhabitants of large cities, who cycle an average of 1000 km a year /25, pg. 18/.

/2/, /4/.

Different aspects for non-cyclists

Positive

- In many cases, the BikeBus'ter persuaded members of the family and colleagues to choose for the bike too.
- Twenty-one BikeBus'ter families had two cars at the beginning of the experiment. Most families kept both cars during the experimental period, but some have sold one of the cars afterwards, after finding out that the total travel needs of the family could be covered by the combination of bicycle and car.

Other comments

Relevant facts and traffic numbers

Aarhus has ca 209,000 inhabitants (1994) and is situated in the middle of Jutland. 26,000 people are working in the centre of the town. 80,000 of the houses lie within a 6 km radius from the town centre. There are a total of 200,000 trips made daily to and from the centre of town. Of these, 70,000 are bus-trips, and 10,000 are bicycle trips, which means that only 40% of the daily personal transportation to and from the town centre is made by bicycle or bus /3/.

The project has a number of cooperating parties, public as well as private companies, and private sponsors.

Costs

The BikeBus'ter project is financed by The Danish Environmental Protection Agency, The Municipality of Aarhus and The Danish Transport Council, each contributing 1 million DKK (approximately 137,000 ECU).

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C-57 Cyclist officer and cyclist workshop in the city of Genk

Town: Genk (Belgium) **Year of implementation: -**

Description

A cyclist officer has been nominated by the city council of Genk. He has been assigned to the traffic police department.

Function profile:
- raising of public awareness and traffic education (considered as main task);
- advising on traffic infrastructure;
- traffic research;
- organisation of the “auto-arme schooldag” (a day on which sustainable transport modes should be chosen for going to and from school);
- yearly quality control of the cycle track network;
- bicycle registration for theft prevention.

There is no strict delimitation of the competence, which creates an important flexibility: the bicycle officer might be occupied with other (non-cycle) tasks in periods with only a few cycle tasks while in busy periods other employees cooperate with the bicycle officer. On an average one person is doing this job full-time.

Some results of the cyclist officer:
- yearly a promotion day is organised for the sustainable transport modes. These days are a success since the number of car users among school pupils drops drastically at that moment. However, no figures are available about the evolution of the modal split on other days. (For more details see the example Information and communication)
- a cycle map has been edited by the cyclist officer and updated every two years (see also Information and communication).
- Yearly the condition of the complete cycle network within the city boundaries is checked by the cyclist officer. If necessary, reconstructions are subsequently undertaken.
- Several public awareness campaigns have been carried out by the cyclist officer.

A “Fietsplatform” (Cyclists’ workshop) has been installed in order to organise the promotion day for sustainable transport modes. The workshops regularly take place under the presidency of the alderman for transport. The Technical traffic police and other administrations also take part in these workshops.

Contact person

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C-58 Escorted home to school traffic

Town: Brecht (Belgium) **Year of implementation: various**

Description

Two elementary schools in the community of Brecht organise “bike groups” for their pupils. A bike group is a group of school children which is escorted during their trip to and from school. The groups are escorted mainly by parents and sometimes by teachers.

A bike group consists of seven children at most, in order to guarantee a sufficient view for the escorts/parents, and in order to avoid that the cyclists behave themselves as “exceptional” cyclists: if more then fifteen cyclists ride together, they are authorised to drive on the car lanes instead of using the cyclist lanes.

A special insurance is installed to cover the risk and the responsibility of the escorts/parents. This insurance is paid by the local authority. The price is symbolic: 20 BEF (0.5 Ecu) per escort per year.The municipal police gives a briefing to the escorts.

In case of bad weather, cyclist groups also are on the road. However, in case of snow or heavy showers the bike groups are replaced by car trips. Very precise rules have been set up for practical appointments: warning in case of absence, substitutes.

As a result of the initiative, the number of school children cycling in home to school traffic has significantly increased: +12% in 2 years, 70% of the children now takes the bike for home to school traffic.

Different aspects for cyclists

Positive

- The safety has increased, not only in home to school traffic, but also when the school children make trips for other purposes.
- The use of the bicycle in home to school traffic has increased with 12% in 2 years.

Different aspects for non-cyclists

Negative

- The use of the school bus has dropped since the bike groups have been implemented. This service will probably be ended.

Contact person

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C-59 Green Bicycle Couriers

Town: Copenhagen (Denmark) **Year of implementation: 1989**

Description

The company The Green Couriers employs 110 full time bicycle couriers in Copenhagen, mainly young people under the age of 25. The couriers deliver mail mainly for public and private companies, but the delivery of private mail can also be made by the courier service.

The courier service mainly delivers within the inner city area. The couriers will generally deliver all kinds of mail: Press releases, advertising material for newspapers, Christmas greetings, jubilee presents, etc. An important feature of the service is that the mail is delivered directly to the addressee.

Green Bicycle Couriers
Photo: The Danish Road Directorate

The Green Couriers make between 1500 and 2000 trips a day, and the average price of a delivery is between 50 and 60 DKK (7-8 ECU per delivery). A courier travels an average of 80 km a day, which corresponds to about 9000 km/day in total for the 110 couriers. The couriers get their orders by radio, which means that the couriers can reach their destination within 10 min.

Because of one-way streets, amount of traffic, and problems with parking in the city, the bicycle couriers are very competitive with taxis, both in terms of speed and price.

/11/, /12/.

Different aspects for cyclists

Negative

- Some of the Copenhagen couriers do not respect the traffic regulations: Sometimes the couriers run the red light, ride in the ‘wrong’ direction, ride on the footpath, etc. Because of this behaviour couriers get a bad reputation amongst other road users. Therefore, the courier company will start a campaign for its employees to eliminate the worst traffic violators.
- Besides getting a bad reputation, the behaviour of the couriers can have negative effects on other road users, for example, other cyclists who could follow their bad example in traffic.

Different aspects for non-cyclists

Positive

- Although the couriers have a bad reputation amongst some of the road users because of their sometimes reckless behaviour, they do demonstrate an environmentally positive image. This image may influence others to change their habits of transportation by sometimes choosing the bicycle on trips in the city.

Other comments

Degree of implementation:

- In Copenhagen, there are competitors to the "Green Couriers" - which are the "Red Couriers", "Yellow Couriers", and "Blue Couriers".
- Courier companies are also starting up in other parts of the country.

Costs

Four young students with a starting capital of 200,000 DKK (about 27,400 ECU) are behind the "Green Courier" initiative. The company started with 7 couriers, who at the beginning were "seven too many". With the help of advertising agencies and the Copenhagen news office, a lot of contacts were made which quickly led to a powerful growth in the company within a relatively short period of time.

Contact person

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C-60 Priority snow cleaning on cycling routes

Country: The Netherlands **Year of implementation: -**

Description

Rural areas as well as urban areas in the Netherlands have many kilometres of different types of cycle-track. To make it possible and safe to use the cycle-tracks in case of snow or under other icy circumstances, many municipalities have special equipment for snow and ice removal.
Beside suitable equipment many municipalities give priority to the cleaning of the (main) cycling routes or the main cycling network (simultaneously with or directly after the main routes for the motorized traffic).

Photo: SWOV, Institute for Road Safety Research, A. Vis

Dimensions

Adapted to the dimensions of the most important cycle-track routes.

Different aspects for cyclists

Positive

- Cyclists can use the cycle-tracks also after snow-fall or glazed frost or other icy circumstances.
- Benefits the safety of cyclists under these conditions.

Different aspects for non-cyclist

- Reduces possible conflicts between motorized traffic and cyclists using the carriageway.

Contact persons

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C-61 Theft prevention: computer program for recovered bicycles

Town: Genk (Belgium) **Year of implementation: 1996**

Description

A bicycle registration program is implemented as a major theft prevention measure. Registration is free. For the registration, the identification number of the national registration is used ("Rijksregisternummer"). Until recently, the procedure to find back stolen bicycles used a specialised computer program, called "Romeo 2000". Since 1996, another program is used, called "PIP". This program is part of a comprehensive police supporting program.
The results of the system are not very satisfactory so far. This is due to the limited number of recovered bicycles and not to the technology of the computer program

Different aspects for cyclists

Positive

- As far as bicycle registration and/or the used computer program reach any result, the attractiveness for the cyclists will be increased.

Cost of measures

Since the program is part of a comprehensive police supporting computer program, no specific cost for cyclist registration is required.

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7. Discussion and recommendations

7.1 Discussion

Bad practice

Making an inventory of good examples of facilities for promoting walking and cycling has a drawback, the activity implies the (virtual) existence of an inventory of *bad* examples. However we did not explicitly make such an inventory, although we have a notion about these bad examples. Bad examples do not fulfill one or more of our requirements. Good facilities must at least:

1) be attractive, and in case of an infrastructural facility, make the trip shorter or faster;
2) stimulate walking and/or cycling;
3) be cost effective;
4) be safe (both road safety and social safety) and at least be safer than the existing situation without the measure.

Unfortunately there are a lot of bad examples in almost every city. We do not want to stress the existence of these bad examples. Our efforts are aimed at influencing a process which gradually will make an end to all bad examples.

Network level and route level

The catalogue mainly contains measures on the level of the road sections and intersections (tabel 5). However, examples of facilities on the level of the transport network and of the routes can be very important for stimulating cycling and walking. It appeared to be difficult to find these kinds of examples. A few good examples can be found in ‘Cities make room for cyclists; examples from towns in the Netherlands, Denmark, Germany, and Switzerland’ (Ministry of Transport, The Netherlands, 1995).

Knowledge about effects

In many other cases there is only some knowledge gained by experience, and sometimes this experience is even lacking. This is all due to our selection process. We were looking for *new* measures, and the evaluation of a measure which has recently been taken, is mostly still in progress. So it was mainly our own judgement which determined if a measure is ‘good’ or ‘bad’.

7.2 Recommendations

Recommendations for local governments

Local governments should consider the expected growth in the use of the private car, especially the share of the short trips (shorter than 5 km) by car. Will it ever be possible to provide sufficient facilities for this sort of transportation? In most cases the answer will be NO. Public transport, cycling and walking can be a solution to this problem. The ADONIS project concentrated on cycling and walking. However, in cities with almost no cycling and walking it will be difficult to ‘get the machine started’. In that case it can be very interesting to make people acquainted with cycling and walking by creating facilities for leisure trips, e.g. cycle tracks outside urban areas. If people get to know the bicycle for these kinds of trips, there is a good chance that they will use the bicycle more easily for other purposes.

Facilities for cycling and walking should never stand-alone, but must be part of an integrated transport plan for cycling and walking. Each facility can be derived from such a plan.

Recommendations for road designers and transport planners

The ADONIS catalogue should not be used as a design manual, but as a background during the design process in order to get a better impression of the variety of facilities for cycling and walking.

One should take care that the application of the facilities in the catalogue depends on the regulations of a country; see chapter 3.

Facilities for cycling and walking should be treated in an integrated way in order to let both types of road users share in the benefits of a facility.

Recommendations for further research

Many of the measures have not been evaluated yet; more knowledge can be gained from (systematically) evaluating these types of measures.

A European design manual for walking (like “Sign up for the bike” for cycling) is still missing.

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Annex 1: Comparison of cities with different shares of walking and cycling

1. Introduction

Information gathered on the mobility policy in different cities, car ownership, street network etc. will be compared with the actual shares of cycling and walking in the same cities. The effect of the declared mobility policy will be analysed in order to find possible reasons for the attractiveness of different measures.

The cities included in this analysis are:

Country	Town
Denmark	Copenhagen* Aarhus Odense Nakskov Randers
Belgium	Brussels Brugge Genk Gent Kortrijk Mechelen Namur
the Netherlands	Amsterdam Delft Houten Heerenveen Deventer Helmond Apeldoorn Groningen Utrecht
Spain	Barcelona Granollers El Prat de Llobregat Sabadell Vitoria

*Copenhagen and Frederiksberg municipalities

The information includes different factors that could influence in the share of pedestrian and cyclist trips: size of the city, number of inhabitants, car and cycle ownership, street network and traffic regulation, public transport services, modal split, transport/mobility policy and special pedestrian/cyclist measures. In the following chapter, this information is presented for all the 26 cities.

City	Size (km^2)	Inhabitants	Modal split					Street network	Cars per 1000 inh.	Mobility policy	P. T. services
			Car	P. T.	Bicycle	Walk.	Others				
Amsterdam NL	212	718.000	37 %	16 %	28 %	23%	3 %	• Historical city: narrow streets. • Some pedestrian and cyclist areas. • 30 km/h zones are being installed. • 284 km cycle track, cycle lane or recommended cycle lane.	292	• Creation of more space for the bicycle. • No policy on pedestrians. • Paid parking is quickly spreading in the old part of the city. • 30 km/h zones are slowly being installed.	Good: buses, trains and metros.
Apeldoorn NL	340	150.915	44%	5%	38%	13%	-	• Central shopping area with access restrictions for cars and cyclists at shopping hours. • Rings and radials.	399	• Road-narrowing schemes, realignment of junctions and speed humps. • Cycling strategy since 1990, mainly to improve road safety for cyclists and to get through-traffic out of the centre	Good: bus and interurban train services.
Delft NL	25	93.229	40%	7%	29%	20%	4%	• Fine-mesh network of cycle ways.	313	• 1979 cycle way network plan mainly carried out between 1982 and 1986. Constructing costs: 29 million guilders • In 1992 some measures were taken to discourage car use: higher parking charges, less parking spaces in the centre and some traffic-calmed areas. • The current municipal budget for measures favouring cycling is only 100.000 guilders/year.	• Good: tramway, bus and train services.
Deventer NL	35	69.023	49%	4%	31%	15%	1%	• Historical city with narrow streets in the centre.	349	• In 1980 Deventer decided to give priority to pedestrians' and cyclists' interests by resolving traffic problems. In 1994, 70% of a cycle way system consisting of a hierarchy of urban, district and neighbourhood networks was completed. • 25% of the municipal revenue from car-parking charges goes to investments in cycling facilities.	
Groningen NL	80	169.627	36%	6%	35%	23%	-	• Car-free centre. The centre is divided into four sectors with no access by car from one to another. • Park & Ride facilities on the ring road. • 30 km/h zones in many residential areas.	303	• A new restructuring scheme for the city centre was planned in 1987 in order to exclude cars from streets, make more room for pedestrians and improve cycle facilities. • The US World Watch Institute rates Groningen as the first cycling city in Europe, and the third in the world. Over the past four years, 40% of the municipalities' transport budget, of over 20 million guilders, has been invested into cycling facilities throughout the city.	Good: • Urban and regional buses and interurban train services. • Speed limiters (15 km/h) on buses which is activated in the centre.

City	Size (km^2)	Inhabitants	Modal split					Street network	Cars per 1000 inh.	Mobility policy	P. T. services
			Car	P. T.	Bicycle	Walk.	Others				
Heerenveen NL	136	39.351	40%	2%	43%	12%	3%	• Heerenveen is divided lengthways by the railway and by the highway N32, which is to be upgraded to motorway standard. This barrier has few crossing points. The city attracts heavy traffic.	393	• Transport Structure Plan (1991): traffic calming in the centre with an only-pedestrian shopping precinct constructed to cross the highway. • A ring road is to be constructed with separate cycle ways linked to cycle routes. • A car-free central shopping district is completed, crossed by a number of routes shared by pedestrians and cyclists. Since 1991, 40 million guilders have gone into urban reconstruction with a little over 15 millions channelled into cycle way improvements.	Regular: • Interurban trains • Buses
Helmond NL	50	74.918	46%	4%	32%	18%	-	• Helmond is a town of short distances. No one lives more than 4 km away from the centre. The city has a complete cycle way network which includes a two-way thoroughfare 3.5 metres wide.	377	• All major public destinations should be accessible by bike and cars. • Give way to bikes at all junctions at neighbourhood level. • On-street parking spaces are to be cut. • Extension of pedestrianised areas. • More cycle thoroughfares planned.	Regular: • Interurban trains. • Buses
Houten NL	56	31.093	55%	6%	31%	4%	4%	• New town from 1979. • A ring road surrounding an area of 3 km across. • Extensive cycle way. The area within the ring consists of sixteen residential zones. Car access from one zone to another is possible only via the ring road.	341	• Future expansion of public transport. • Improvements in the cycle way route linking Houten with Utrecht. Expansion of the city with the same parameters: railway station it the centre, a ring road and a set of radial cycle ways.	• Regular inside the town (only regional bus routes). Good connections by train.
Utrecht NL	61	234.254	37%	12%	28%	23%	-	• Compact city. Two kinds of bicycle network are being developed: a system of local access routes and through-routes.	365	• 10% cut in car traffic by 2015 compared with 1987 because of improvements for cyclists (fine-mesh network of cycle ways and a city-wide network of access routes), and car-sharing. • The objective of the municipal planning policy is a compact city, keeping travelling distances to a minimum giving bicycle and public transport the greatest scope.	Regular: • Interurban trains. • Buses

City	Size (km^2)	Inhabitants	Modal split					Street network	Cars per 1000 inh.	Mobility policy	P. T. services
			Car	P. T.	Bicycle	Walk.	Others				
Barcelona ES	97,6	1.508.805	24 %	43 %	<1 %	33 %	-	• Inner city with narrow streets. • The big Eixample area has 20 m wide streets with 2 x 5 m. pedestrian pavements. • 60 km cycle lanes and tracks in 1200 km of streets • Some pedestrian areas.	383	• Future traffic calming in some small zones. • Plans to improve pedestrians' and cyclists' conditions. • Traffic policy is centred on sustainable transport and mobility.	• Good: buses, metros and trains. • Problem: no integrated fare system
Granollers ES	15	53.012	53 %	8 %	<1 %	39 %	-	• Central shopping area with access restrictions for cars. • No cycle installations. • New ring road to avoid through traffic.	408	• Improve public transport with new bus lines. • Elimination of through traffic. • Paid parking is spreading in the centre.	• Limited: 5 urban bus lines, interurban bus lines and 2 train stations.
El Prat de Llobregat ES	32	64.321	35 %	15 %	<1 %	50 %	-	• Old city centre with some pedestrianised streets. • Many large road infrastructures with very bad permeability. • Some cyclist installations (parking).	299	• Some measures have been carried out to reduce speed • Pedestrian zones are spreading in the centre.	• Limited: interurban bus and train services. Barcelona international airport is located in the municipality.
Sabadell ES	37	189.006	53 %	22 %	<1 %	25 %	-	• Small central area with narrow streets. • Pedestrian areas in the historical city. • Cycle lanes in the new shopping area. • Ring roads absorbed in the urban area with congestion problems in rush hours.	372	• Special measures for cyclists. Cyclist plan under collaboration. • Paid parking is spreading in the centre.	• Limited: urban bus lanes, interurban and train services.
Vitoria ES	277	215.000	17 %	16 %	<1 %	66 %	<1 %	• Small central part with narrow historical streets. 3 ring roads (18,5 km.) • 7,8 km of radial roads which connect the ring roads. • Approx. 6 km of pedestrian streets and 8,5 of bicycle lanes.	381	• Special measures for pedestrians and cyclists • Elimination of through traffic. • Improve public transport.	• Good: 12 urban and interurban bus lines.

City	Size (km²)	Inhabitants	Modal split					Street network	Cars per 1000 inh.	Mobility policy	P. T. services
			Car	P. T.	Bicycle	Walk.	Others				
Copenhagen DK	96,9	562.419	37 %	19 %	26 %	15 %	3 %	• 717 km of road length in "traffic" roads, traffic calmed local roads and local roads. • Almost completed cycle network. • Ca. 41 km bicycle routes • Old city centre with some pedestrianised streets.	150	• Special attention is given to public transport (mini-metro, extended suburban railway, new link to Sweden). • Environmental capacity and the amount of traffic must be reconciled. • Speed camera control on a pilot basis.	• Good: buses and trains. • Integrated fare system. • Mini metro under construction.
Nakskov DK	3,3	15.365	50 %	7 %	35 %	8 %	1 %	• Coherent network for bicycles. • Few streets in the centre carry one-way motor traffic and two-way cycle traffic, but for the rest, the centre is car-free; the main shopping street is fully pedestrianised. • Large car parks on the edge of the shopping area.	257	Plan from the year 1991 • 15 % reduction in car traffic before the year 2000. • 5 % reduction in heavy traffic before the year 2000. • Increasing bicycle traffic. • New bus terminal.	• Few local and many regional buses. • No metro, tram or local train. • Inter-city train station. • No integrated fare system.
Odense DK	30,4	183.127	57 %	8 %	24 %	10 %	2 %	• Four types of streets in the city centre: ∗ Entirely pedestrianised streets; ∗ Two-way cycle lane, slightly below the pavements on either side; ∗ Combined cycle way and bus route (5.6 m wide carrying traffic in both directions); ∗ Streets working one way for cars, but cycle lanes in both directions for cyclists. • Parking facilities on the edge of the central area which is reserved to buses, cyclists and pedestrians.	280	For the last decades, the town has constantly been at the forefront as regards traffic policy and the implementation of concrete traffic solutions, giving priority to environment and vulnerable road users. Odense carried out some of the first successful traffic calming schemes and the municipality has also been abreast of the situation concerning the establishment of safe bicycle routes, paths, etc. • Plans for improving conditions for cyclists and pedestrians. • Establishing a coherent bicycle network. • Campaigns and information about the coherent bicycle network and promoting of cycling.	• Many local and regional buses. • No metro, tram or local train. • Inter-city train station. • No integrated fare system.

City	Size (km^2)	Inhabitants	Modal split					Street network	Cars per 1000 inh.	Mobility policy	P. T. services
			Car	P. T.	Bicycle	Walk.	Others				
Randers DK	15,4	61.876	58 %	8 %	19 %	13 %	2 %	• Main roads through the town centre with cycle tracks on both sides. • Cycle routes • The main shopping street is fully pedestrianised. • Large car parks on the edge of the shopping area.	289	Plan for June 1995 • Plans for improving conditions for cyclists and pedestrians. Establishing a coherent bicycle network. • Future traffic calming projects. • Campaigns and information about traffic safety.	• Few local and many regional buses. • No metro, tram or local train. • Inter-city train station. • Integrated fare system.
Århus DK	46,9	279.525	51 %	15%	18 %	14 %	1 %	• 1.980 km roads and 150 km cycle tracks.	250	• The traffic policy is centred on a reduction of traffic impact on the environment. • Therefore the historical centre has/and is undergoing a total rebuilding where car traffic has limited access.	• Many local and regional buses and two local train routes. • No metro or tram. • Inter-city train station. • Integrated fare system.

City	Size (km^2)	Inhabitants	Modal split					Street network	Cars per 1000 inh.	Mobility policy	P. T. services
			Car	P. T.	Bicycle	Walk.	Others				
Brussels BE	158	951.841	54 %	26 %	1 %	9 %	10 %	• Small central part with narrow historical streets. • The rest of the city with 19th and 20th century streets. • Part of the centre converted into pedestrian areas.	452	• Gradual limitation of parking space. • Bicycle policy is being implemented.	• Good: four underground railway lines, tramway and bus lines. • Problem: certain congestion in the whole urban area.
Brugge BE	138	116.273	53 %	11 %	23 %	4 %	9 %	• Historical city: narrow streets.	399	• No through traffic in inner city. • Special measures for pedestrians and cyclists. • More P.T. and use of the bicycle.	• Good
Genk BE	87	62.132	73 %	8 %	8 %	4 %	7 %	• Recent development of new and wide main roads.	409	• Future traffic calming in the city centre and strict hierarchy of roads in the rest of the city. • “Zone 30” areas in the residential quarters. • General municipal cyclist policy. • No explicit pedestrian policy.	• Regular
Gent BE	156	226.436	56 %	17 %	11 %	6 %	10 %	• Historical city: narrow streets. • Some pedestrian streets.	402	• No through traffic in the inner city • Traffic circulation scheme (1997): better possibilities in inner city for cyclists, pedestrians and P. T. • Special cyclist policy. • Extension of pedestrian areas.	• Good
Kortrijk BE	80	76.040	59 %	7 %	19 %	6 %	9 %	• Historical city: narrow streets. • Some pedestrian streets.	436	• Traffic calming in residential quarters. • No general cyclist route plan. Some cyclists and pedestrian measures implanted.	• Regular
Mechelen BE	65	75.654	58 %	17 %	13 %	6 %	6 %	• Historical city: narrow streets. • Important shopping streets in part of the centre are being converted into pedestrian and cyclist areas • Some “zone 30” areas	398	Conversion of inner city and residential quarters into “zone 30”. • A cyclist route plan. • Reconstruction of main access roads to improve safety. • Minimum clear width for pedestrians on footpaths.	• Regular
Namur BE	97	105.041	65 %	18 %	3 %	8 %	7 %	• Historical city with narrow streets. • A central area with pedestrian zones. • Free parking space available.	385	• The aim of the mobility plan is <u>not</u> to reduce the use of the car.	• Regular

3. Comparative analysis

3.1. Comparison of modal split

In Europe, modal split varies from city to city. In capitals like Amsterdam and Copenhagen, up to 30% of the trips are made by cyclists and another important share of the trips is made on foot. In south European cities, trips on foot are more frequent, with 32% of all trips as pure pedestrian trips in Barcelona. In Vitoria 66% of the total trips are made on foot. These differences are due to many circumstances like tradition, climate, topography, street design, traffic speeds etc., differences which exist but which are difficult to translate in calculations and predictions. Nevertheless, it seems that, eventually, the car driver mode will be in majority only in few towns.

The general data on modal split in different European cities, as shown in the following table, has the important variation in percentages of pedestrians and cyclists in the total transport scheme. Part of these differences are due to the way of defining a pedestrian trip. In many cases, only pedestrian trips over 10 minutes or over a certain length are considered. This means that in almost all cities, information on walking is below real figures.

Even so, when analysing actions to substitute short trips by car by walking and cycling, one realises that these two modes have an important role in the transport scheme.

City	Walking	Cycling	P.T.	Car	Inhabitants
Amsterdam (NL)	24%	23%	16%	34%	718.000
Groningen (NL)	23%	35%	6%	36%	170.000
Delft (NL)	20%	29%	7%	40%	93.000
Brussels (BE)	9%	1%	26%	54%	952.000
Gent (BE)	6%	11%	17%	56%	226.000
Brugge (BE)	4%	23%	11%	53%	116.000
Copenhagen (DK)	19%	28%	20%	33%	562.000
Århus (DK)	14%	18%	15%	51%	280.000
Odense (DK)	10%	24%	8%	57%	183.000
Barcelona (ES)	32%	<1%	39%	29%	1.643.000
Sabadell (ES)	25%	<1%	22%	53%	189.000
Granollers (ES)	39%	<1%	8%	53%	53.000
Vitoria (ES)	66%	<1%	16%	17%	215.000

The data from the Netherlands, Denmark and Spain shows that cyclists, together with pedestrians, play a very important role in the transport environment, even if not all pedestrian trips are taken into account. In Denmark and Holland years of experience giving more attention to cyclists and pedestrians have been gained, with a result of maintaining the importance of cyclists within the transport system. The data from Belgium (only home to work) is different, with low participation of the two types of vulnerable road users.

City and transport planners should focus on getting sufficient data on all trips and all modes. The pedestrian data from Barcelona and Catalan cities has convinced many politicians and technicians that now they must start the planning taking pedestrians into account and, only once their needs have been fulfilled, space for drivers can be thought of.

3.2. Quantitative analysis

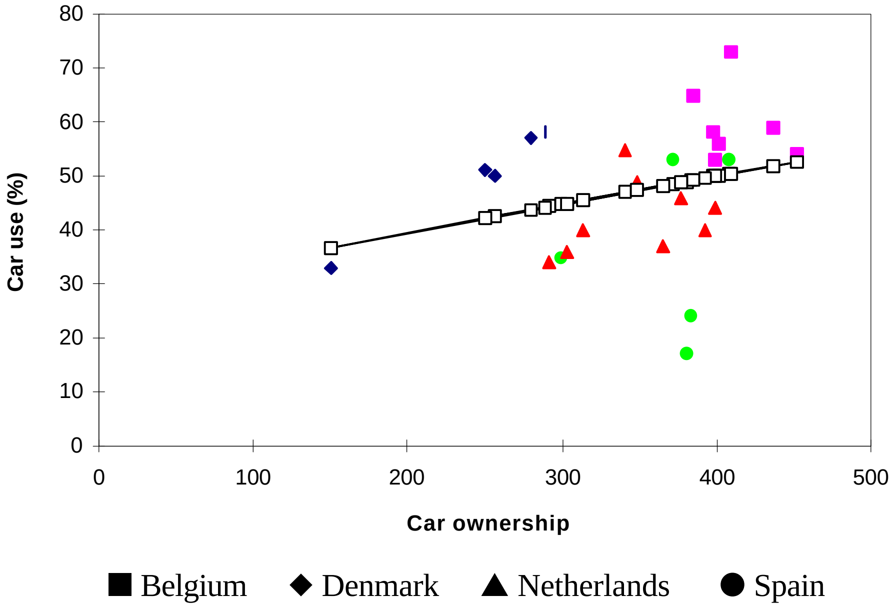
A quantitative analysis was made in order to find out any relation between e.g. the number of cars per thousand inhabitants, population density, modal split, mobility policy, etc. The following relations were tested:

car ownership - car use
car ownership - bicycle use
car ownership - % of walking
population density - car use
population density - bicycle use
population density - % of walking
size of town - car use
size of town - bicycle use
size of town - % of walking

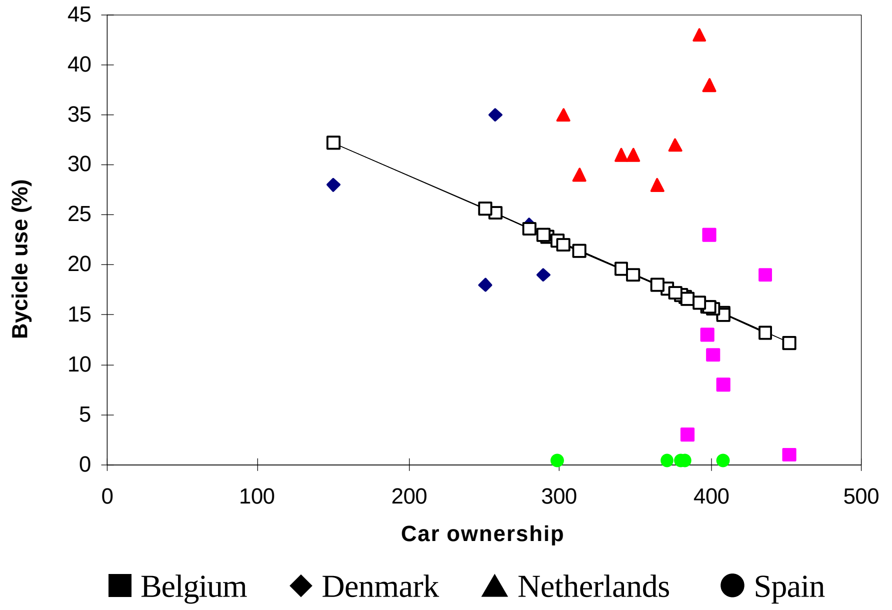
Results:

- The results of the regression analysis are to be taken with special care as it was not possible to find homogeneous input data. Because of that, it should be mentioned that the modal split data from Belgium only includes trips from home to work (this might partly explain the low percentage of trips on foot or cycling). This information from Denmark, the Netherlands and Spain includes all kind of trips. Once these differences were taken into account, the results were as follows.

- The results showed that only in a few cases a certain relation exists, e.g. car ownership - car use (R^2 = 0,06) and car ownership - bicycle use (R^2 = 0,11). The indirect relation between car ownership and modal split was proved in 160 municipalities in the Metropolitan Area of Barcelona. The results of this analysis showed that increased car ownership resulted in less trips made on foot compensated by more trips by cars.



Car ownership - Car use:
Result of regression analysis: $R^2 = 0{,}06$



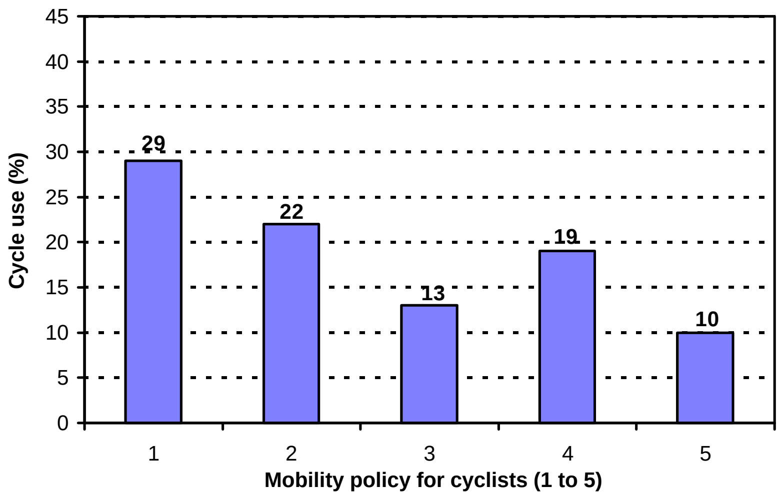
Car ownership - Bicycle use:
Result of regression analysis: $R^2 = 0{,}11$

Relations	Cities	R^2
Car ownership - car use	all	0,06
Car ownership -bicycle use	all	0,11
Car ownership - walking	all	0,003
Population density - car use	all	0,10
Population density - bicycle use	all	0,08
Population density - walking	all	0,03
Size of town - car use	all	0,11
Size of town - bicycle use	all	0,001
Size of town - walking	all	0,02

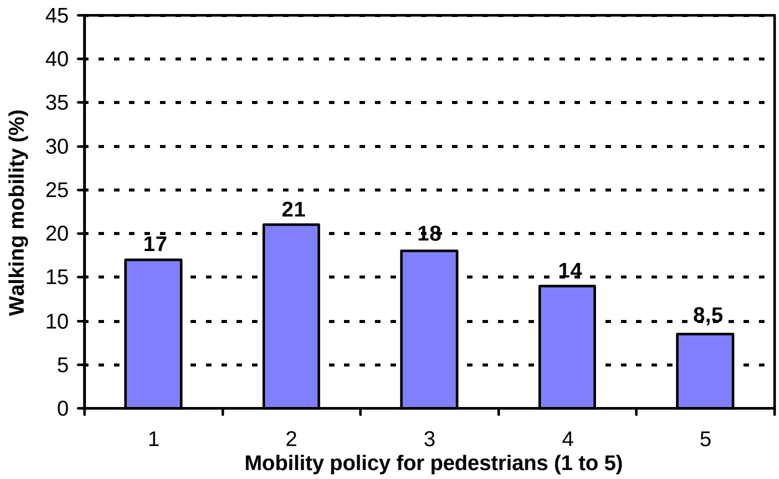
- Dividing the information on pedestrian and cycling policy, etc. into five different levels, and comparing these results with the share of walking and cycling (middle value for each policy level) gave a good result in the case of cycling, while the relation between pedestrian policy and the share of walking is not seen (see next page). These results can be understood in the way that in order to get more people on the bike one has to provide them with good conditions, while, in the case of pedestrians, they keep on walking under all circumstances.

  This does not mean that now traffic planners can canalize all municipal investments into cyclists facilities and forget about pedestrians' needs because they manage without. For the last two decades, the car has received almost all attention in Spain, while pedestrians (and some few cyclists) had to manage as they could (especially in small and medium towns). The result of this mobility policy can be read in an important switch over from walking to car-use i.e. in Barcelona, the percentage of pedestrians has decreased from 41% in 1986 to 33% in 1991, while car use has increased by 5%.

  One of the reasons for the bad result of the regression analysis might be that Spanish cities are out of range compared with the rest of cities. This shows again that it is difficult to compare Spanish cities with the results of the cities presented in the analysis, since modal split is an "all or nothing" - either you walk or use motorised transport modes.



1 = high (many measures for cyclists)
5 = low (almost nothing is done for cyclists)



1 = high (many measures for pedestrians)
5 = low (almost nothing is done for pedestrians)

3.3 Qualitative analysis

Similar trends can be found in the declared mobility policy in almost all the cities analysed. City centres have zones with priority for pedestrians and/or cyclists, although in different degrees, car parking restrictions can be found, both as a decrease in the total number of places and in the parking fees implemented almost everywhere. Public transport is given priority and improvements are made in traffic safety.

But there are, of course, differences which should be found in the different moments when the municipality policy includes restrictions for car traffic and improvements for pedestrians and cyclists. As an example, it can be mentioned that pedestrians were already given certain priority in the Urban Plan for the Eixample District in Barcelona, elaborated in 1859 by the architect Ildefons Cerdà. Approximately 50 % of the street section was reserved for pedestrian pavements. On the other hand, the first cycling facilities were not introduced in Barcelona until the 1990's.

The measures implemented in Barcelona to improve cycling are mainly bicycle parking facilities, cycle lanes (no physical separation between cyclists and motorised traffic), such as some stretches of cycle tracks. These measures have still not had any effect on modal split, basically because of: it takes numerous years to change people's travel habits and maybe the results can be detected in 4-5 years, or measures have not had enough impact, and they are surely not enough in number to encourage people changing to this travel mode.

Road layout measures dividing physically the areas for cars, cyclists and pedestrians are needed in areas with normal/high urban speed (50 km/h), at least this is the case in cities with very low share of cyclist trips in the total modal split as e.g. in Spain. There are not enough cycle lanes to promote a switch over from car-use to cycling. Car-users do not respect a painted white line in an overcrowded traffic situation, and cyclists do not feel safe. In order to avoid a boom in accidents involving cyclists, special care is to be taken in intersections, especially with right turning vehicles. As bicycles are seldom seen in the traffic landscape, car drivers are not aware that they have to look out for cyclists before turning.

Another important factor is the investments made in pedestrian and cyclist facilities. Not only the municipalities but also central governments in countries, like Denmark and the Netherlands, provide funding for cycling facilities in urban areas. Spanish municipalities, on the other hand, reserve only a small part of the budgets for pedestrians and almost nothing for cyclists' facilities. This factor might change in the following years if the boom in bicycle sales continues, and therefore there might be more and more cyclist claiming better cyclist infrastructure.

The same may happen for pedestrian investments as municipalities recognise that there are more trips on foot than by car.

Denmark and the Netherlands have a long tradition in cycling. But the information received from the two countries shows that it was not until the 1980's and the 90's that special emphasis (and investments) was put into improvements for cyclists and pedestrians. The measures implemented in these two countries for the last decade are mainly: 30 km/h zones in residential areas, network of cycle ways, improvements in intersections (to improve traffic safety) and car-free zones in centre areas. The result of this effort can be found in a high percentage of bicycle trips (between 18 and 35% in the Danish cities and between 23 and 43% in the Dutch cities analysed).

The situation for pedestrians and cyclists in Belgium is quite unclear. In Brussels and Namur almost nothing has been done in order to improve walking and cycling, resulting in a very low share of non-motorised trips (10 and 11% respectively), while the situation is significantly different in Brugge with 28% of the trips made either by bicycle or on foot and implementation of special measures for these road-users. From the presentation of the mobility policy implemented it is not possible to point out exactly which measures gives the best result.

4. Conclusions

- There seems to be a certain correlation between car ownership (cars/1000 inhabitants) and car use, which is also reflected in an indirect relation between the number of cars and bicycle use. The indirect relation between walking and car ownership has only been proved in Catalan cities.

- The quantitative analysis showed a relation between cyclist policy and cyclist use. This indicates that the effort and investment put into cyclists measures results in an important percentage of bicycle trips. The declared mobility policy and investments do not always go together. This means that data on direct investment in pedestrian and cyclist measures might have been an even better indicator for the share of walking and cycling. It has not been possible to clear out what comes first: if many cyclists infrastructures give a higher share of cycling or if it is the other way around: many cyclists result in actuations to improve their conditions.

- It has not been possible to indicate specific measures that are especially good to improve walking and cycling. It can be mentioned that in order to promote e.g. cycling in towns with no tradition for cycling and with a low share of bicycle trips, important road layout measures have to be implemented, in order to reserve space for these specific road users, and especially to protect them from the motorised road-users, who are not used to take them into account in e.g. intersections.

- In countries with a high cyclist share, different factors played a role in order to achieve this status: a long tradition in the use of this transport mode, a flat landscape and the implementation of a long list of measures both infrastructural and non-infrastructural. What seems to be important is a continued network, such as some special attention in crossing points between different types of road users.

Annex 2: Glossary of terms and expressions

Accident:
Unexpected adverse event. May be a fall, a crash, a collision, an explosion.

Road accident (or traffic accident)
Definition used for statistics in most countries: Collision occurring on a public road and involving at least one moving vehicle. Road accidents include damage-only accidents and injury-producing accidents.

Accident causation
Set of events involving different elements of the road traffic and transport system (the road environment, the vehicles, the road users) and leading to collisions.

Accident data
Formalised set of information on injury-road accidents.

Accident factor (or contributory factor)
Any element of the traffic and transport system (i.e. related to the road and its environment, vehicles, traffic or transport organisation, road users, or to interactions between these) that has been identified as taking part in an accident process in such a way that the accident would not have occurred if this element had been different or missing.

Attractiveness
Pleasing or interesting. The infrastructure is designed in a such a way that it fits aesthetically with the environment and that cycling is made attractive.

Bicycle crossing or **cycle crossing**
see crossing

Campaign
A series of planned activities with a particular social, commercial or political aim. To promote a particular product or event to occur.

Carriageway
Part of a road on which vehicles travel.

Comfort
State of being free from suffering, pain or anxiety; state of physical or mental well-being.

Conflict
Meeting of two opposing elements; simultaneous action of incompatible motivations; argument between two powers demanding the same rights.

Traffic conflict (or near-accident)
A traffic situation in which two road users approach each other in such directions and with such speeds as to produce a collision unless at least one of them performs and emergency evasive manoeuvre. More rarely, a traffic conflict may involve on road user only, on a collision course with a fixed obstacle or and animal.

Crossing
A place where two roads cross. Specific regulations usually define the proper use of crossings by the various categories of road users.

Bicycle crossing or **cycle crossing**
Area marked or signed through the intersection of the carriageway.

Pedestrian crossing
Area marked or signed, on which pedestrians cross motorised traffic flows with a priority, sometimes absolute, sometimes restricted to particular conditions or periods of time. Use of pedestrian crossing may be recommended, or mandatory within a defined distance, according to national regulations or legislation.

Zebra crossing
Marked area on which pedestrians, either have absolute priority (as in Great Britain), or have priority to cross provided they have taken precautions to avoid creating a major hazard (as in France).

Level crossing
Place where roads cross each other at the same level. (US) Grade crossing.

Cycle lane
Marked area on a carriageway which is allocated to bicycle traffic. In some countries, mopeds are also allowed to use cycle lanes (also bicycle lane).

Cycle path
Infrastructure designed and built for bicycle traffic and along the road or separated from the motorised traffic network.

Cycle rack
Composition of metal tubes where various bicycles can be stored, either hanging or standing (also bicycle rack).

Cycle strip
Marked coloured area for cyclists as part of the carriageway.

Cycle track
Road, traffic-lane or carriageway intended for cyclists/moped-riders. A cycle track may be one-way or bi-directional. In some countries, mopeds are also allowed to use cycle tracks.

Cycle way
Infrastructural facility for cyclists: cycle track, path, lane, strip.

Efficient
Able to work well. Producing a satisfactory results without wasting time or energy.

Efficiency
State or quality of being efficient. Efficiency of a road safety measure: quality of a remedial measure that succeeds in significantly reducing the expected number of future accidents or casualties.

Evaluation
Find out or form an idea of the amount or value of (sb/sth). Type of study aimed at qualitatively and/or quantitatively assessing the effects of a remedial measure (or of safety policies) in order to determine if the goals set for the measures have been achieved.

Exposure
To uncover or make (sb/sth) visible. Variable measuring the presence of traffic and/or other road users.

Firmness or **level of firmness**
Relates to the quality of the knowledge about a measure. For instance some measures have a high level of firmness according to accident evaluation studies.

Footpath (also Path way)
Way or track designed for pedestrians and separate from the road network.

Hazard
An event, or thing, that can become dangerous. Anything that threatens the integrity or the existence of a person.

Infrastructure
Complex system used as a support for an activity.

> **Road (or traffic) infrastructure**
> The physical system supporting traffic and road transport activities.

Interaction
Situation in which two elements of a system influence each other.

Interchange
Junction (e.g. on a motorway) where vehicles leave or join a road without crossing other lines of traffic.

Junction
Place where roads meet (also **intersection** or **crossing**).

Left turn

> **Direct left turn** or **flat left turn**
> Means that a cyclist positions in the same way as a car during a left turn.
>
> **Indirect left turn**
> Means that a cyclist's left turn consists of two straight ahead manoeuvres separated instead of **one** direct turn.

Mobility
Ability of a population to move by various modes of transport. The number and characteristics of the trips performed by a given population over a period of time and for various purposes.

Mode
Particular form under which an action is accomplished.

> **Mode of transport**
> Any means through which trips are performed, or goods are moved. For example: car, bus, bicycle, walking.

Parking
Positioning of a vehicle in a stationary position, except for loading/unloading or when people are getting in or our.

> **Parking lane**
> Paved lane intended for parking.

Pavement
Path with a hard surface at the side of a road for people to walk on. (US) sidewalk. Use of pavements is usually, but not always, restricted to pedestrians.

Promotion
Raising or being raised to a higher rank or position. Encouragement or aid to the progress of a cause.

Quick
Moving fast or doing sth in a short time. Refers to speed, time and trip length. A higher (mean) speed usually results in a shorter duration of a trip, which also can be achieved by shortening the trip length (less detours).

Road
Physical area specified for the movements of people or vehicles.

> **Road section**
> Length of road selected for a particular study or operation.

Road-marking
Signs introduced to the road-surface for the guiding, warning and regulating of traffic; gives the layout of the road in longitudinal and cross-sectional directions; indicates the path of the road and the various road-sections intended.

Road user
Any person moving on a public road.

Cyclist
Road user travelling on a bicycle, defined as a non-motorised vehicle with at least two wheels and pedals or hand-cranks, designed to carry one or several persons and possibly also goods.

Disabled road user
Any person with a physical, sensory or mental impairment affecting mobility.

Driver
Road user driving a motor-powered vehicle or a non-motorised vehicle.

Pedestrians
Road users that walks on public roads or spaces subjected to traffic legislation. Disabled persons using a motorised or non-motorised wheelchair, people using roller-skates, skis, pushing a pram, steering pedal cycle or a moped are usually considered pedestrians.

Vulnerable road user
Road user belonging to a category most at risk in traffic and generating little risk to other road users. By extension: road users unprotected by an outside shield, i.e. pedestrians and two-wheelers.

Routes
Chains or strings of road sections and junctions. A route connects important parts of the urban area with each other

Safety
Freedom from injury or risk. Relates to the safety experienced in the transport process (absence of conflicts and accidents in traffic).

Social safety
Relates to a person's perception or feeling of security (freedom form danger, harm or anxiety).

Speed control hump
A locally introduced raising of the carriageway with a curved shape in a cross-sectional profile, intends to lower the speed of motorised traffic.

String
Route consisting of road sections and junctions.

Traffic calming
Area wide programme of self-enforcing measures aimed at reducing speeds of motorised vehicles, and at enhancing the quality of interaction between road users.

Traffic
Movements of road users on the road network.

Traffic-light
Automatic signals that controls road traffic, esp. at junctions, by means of red, yellow and green lights (also light signal, traffic signal, traffic sign and signal control).

> **Traffic-light regulation**
> Traffic control with the aid of traffic lights.

Trip or **journey**
Movement performed to go from one place to another. One trip may include several stages, performed by one or different transport modes. A return-trip is the combination of two successive trips, performed to go from one place to another and to come back.

Two-way-cycle-track
Cycle-track which is predominantly, or for a substantial part, used for non-recreational purposes.

Urban area
Built-up area whose limits are marked on the roads leading to or from them by specific signs. Speeds are usually limited in urban areas (to 50km/h in most European countries).

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Annex 3: List af ADONIS measures

Technical facilities

page

Facilities for moving along road sections

page

Facilities for moving in areas

Facilities for crossing

page

Facilities for resting or waiting

Facilities for storing

Non-technical facilities

Transport and pedestrian policy

Transport and bicycle policy

page

Education and public information

Organisational facilities

Annex 4: Key word index to ADONIS measures

Annex 5: Where to find results from ADONIS

The ADONIS results are described in four separate reports, and further information or copies are available from one of the authors or institutions:

- **Best practice to promote cycling and walking**
  giving guidelines for local authorities to choose a key to relevant measures, taking into account the actual situation and policy of the city for cycling and walking.

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Building 115, 2800 Lyngby, Denmark
Phone: +45 45 93 64 11, Fax: +45 45 93 64 12, Email: jgl@ivtb.dtu.dk

- **Behavioural factors affecting modal choice**
  giving new knowledge of road users transport behaviour and important factors for modal choice in urban traffic, based on interviews and survey data.

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- **A qualitative analysis of cyclist and pedestrian accident factors**
  giving new knowledge of factors in urban traffic accidents and proposals for measures to prevent such accidents, based on interviews with accident-involved persons.

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- **How to substitute short car trips by cycling and walking**
  giving recommendations and guidelines for urban decision makers, based on the research results of the above three reports.

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Analysis and **D**evelopment **O**f **N**ew **I**nsight into **S**ubstitution
of short car trips by cycling and walking **- ADONIS**

Best practice to promote cycling and walking

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Langzaam Verkeer VZW, Belgium
Danish Road Directorate, Denmark
Technical University of Denmark, Denmark

A research project of the EU Transport RTD Programme
European Commission, Directorate General for Transport

Road Directorate Denmark Ministry of Transport

1998

Analysis and **D**evelopment **O**f **N**ew **I**nsight into **S**ubstitution
of short car trips by cycling and walking **- ADONIS**

Best practice to promote cycling and walking

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Belinda la Cour Lund, Jan Grubb Laursen

Contributors: Ton Hummel, Sandra Rietveld, Pim Slop, Aad Vis

A research project of the EU transport RTD programme
European Commission, Directorate General for Transport

Copenhagen 1998

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The ADONIS project was commissioned by the European Commission to a Consortium comprising 7 partners as part of the Fourth Framework Programme. Original title of the project is: **A**nalysis and **D**evelopment **O**f **N**ew **I**nsight into **S**ubstitution of short car trips by cycling and walking - **ADONIS**.

The ADONIS project was partly funded by the EU - DG VII Transport RTD Programme, Urban Sector and was co-financed by Danish Transport Council, Danish Ministry of Transport, Municipality of Barcelona, Catalan Institute of Road Safety, SAINCO TRAFICO S.A., Swedish Transport & Communications Research Board and Belgian Institute for Traffic Safety.

The Consortium consisted of :

Co-ordinator	Danish Council of Road Safety Research (DK) - RfT
Partners	SWOV Institute for Road Safety Research (NL)
	Ingeniería de Tráfico S.L. (ES) - INTRA
	Swedish National Road and Transport Institute (SE) - VTI
Ass. partners	Langzaam Verkeer (BE) - LV
	Danish Road Directorate (DK) - RD
	Rijksuniversiteit Groningen (NL) - RuG
Subcontractor	Technical University of Denmark (DK) - DTU

PREFACE

The European Commission has commissioned a Consortium of researchers to carry out a research project: **A**nalysis and **D**evelopment of **N**ew **I**nsight into **S**ubstitution of short car trips by cycling and walking - **ADONIS** - as part of the Fourth Framework Programme. The project is partly funded by the EU - DG VII Transport RTD Programme, Urban Sector. The project started on 1 May 1996 and will run until end of 1997.

The ADONIS results are described in four separate reports:

- **Best practice to promote cycling and walking**
- **Behavioural factors affecting modal choice**
- **A qualitative analysis of cyclist and pedestrian accident factors**
- **How to substitute short car trips by cycling and walking**

This report deals with **Best practice to promote cycling and walking.** The report includes a catalogue of good measures to promote cycling and walking. It also gives guidelines for local authorities to choose a key to relevant measures, taking into account the actual situation and policy of the city for cycling and walking.

It is the Consortium's hope that the ADONIS results and guidelines will be useful for planners, policy-makers, traffic managers and administrators, both at a European, national, regional and local level, to improve road safety and the urban environment.

However, the ADONIS project has only succeeded thanks to help from a large number of persons: cyclists, pedestrians and car drivers by their willingness to participate in interviews. We are also grateful for the co-operation of traffic planners, local authorities, police officers and research colleagues around Europe.

Executive Summary

ADONIS stands for Analysis and Development of New Insight into Substitution of Short Car Trips by Cycling and Walking. As a component of this European project, this document comprises information about measures which are intended to stimulate cycling and walking so that the number of short car trips will be reduced.

Participants from four countries started by looking at measures being taking in Amsterdam, Brussels, Copenhagen and Barcelona. Next, other locations in the Netherlands, Belgium, Denmark, Switzerland and Spain were studied. The measures have been described and been put into a standardised format. A collection of a great many descriptions is usually called a catalogue. Such a catalogue of measures is a substantial part of this document.

For whom is this document intended?
This document is intended for local traffic authorities, particularly for those who create designs for the construction or improvement of traffic facilities, and for those who wish to influence the use of these facilities. In most cases, this will make the translation of this publication necessary; this will be the task of national governments.

What is new about the catalogue?
For cycling measures, certain international catalogues have been published. For pedestrians, no European comprehensive work yet exists although some starts have been made in that direction. It seems as if cycling organisations can stand up for the interests of cyclists better than the pedestrian organisations can stand up for the interests of pedestrians. For this reason, cycling measures are sometimes not relevant to the needs of pedestrians.

Developing a combined catalogue expresses a philosophy that emphasises the minimising of the use of measures that would negatively affect the ‘other group’, the ongoing considering of each group’s interests, and the serving of each group’s interests whenever possible.

A catalogue like this will never be really complete; other measures are conceivable, and there is more to report about each measure. The main purpose of this description of how to use the catalogue is to stimulate road authorities to prime the creative process intended to keep looking for good solutions.

Furthermore, it is assumed that only when people have good facilities will they use other means than the car for short trips. Naturally, just having good facilities is not enough; people have other reasons for taking the car instead of cycling or walking. Obviously, therefore, it is necessary to accompany this project with another one (WALCYNG) involved in developing a marketing strategy (based on the wishes and convictions of target groups) for developing communications intended to replace short car trips with cycling and walking.

Which measures are presented?
In general, two kinds of measures are presented: technical and non-technical measures which are friendly for pedestrians and cyclists. Examples of the first category are good cycle tracks

and good crossing facilities. The second kind of measures concern rules and regulations, traffic signals, and public information and education.

Addressed here are 71 technical measures and 31 non-technical measures.

This catalogue places a different accent on its descriptions of cycling measures than on those for pedestrians. The part dedicated to pedestrians is more like a catalogue with an emphasis on individual measures. This was done because there was as yet no comprehensive European catalogue written in English.

In the bicycle section, the main emphasis is on creating a stimulating effect. This is why solutions consisting of a number of measures are so frequently described.

Both cases, however, focus on interesting or new measures. Traffic authorities already have experience with the many traditional measures; this report is meant to be attention-getting and stimulating. More can be expected, thus, from these somewhat more striking examples.

Also important are the selection criteria:
1) comfort: is the solution attractive and does the solution make the trip shorter or faster?
2) does the measure stimulate walking or cycling?
3) is the measure cost effective?
4) does it encourage safety and social safety (which must not be endangered in any case)?

Which measures are not presented?

This document assumes that a municipality has already allowed some space for cyclists and pedestrians in its city planning or restructuring and that decisions have already been made in regard to the locations for new cycle and pedestrian routes. Once this has been established, individual measures such as the ones presented here can be considered.

The same applies to public transport facilities. Walking and cycling are often used to cover the distances previous and subsequent to the routes covered by public transport. This document is limited to the covering of these supplementary distances. Furthermore, effective public transport does not usually contribute to a shift from use of the car to cycling and walking. On the contrary, much public transport replaces bicycle and walking trips.

What is included?

Each description of a measure is accompanied by illustrations: - photos, diagrams of a lay-out design, or other road elements - as well as illustrations of public information material. Infrastructure measures are sometimes provided with dimensions as well.

Next, the advantages and disadvantages of the measures in terms of comfort, costs, safety, and social safety are described in as much detail as possible. Also discussed are the advantages and disadvantages for road users other than pedestrians and cyclists. If possible, a cost estimate is provided.

Finally, the names of publications or organisations are listed as sources for more information.

Laws and regulations

Some of the four countries have special regulations in force for pedestrian and cyclist facilities, a fact which has consequences for the use of this document. One example is how the Netherlands strives to give cyclists broad cycle tracks. This measure is partially determined by the fact that in the Netherlands cyclists are allowed to ride side by side. It is always important, therefore, to involve the regulations in a certain country when choosing measures. In addition to the national laws and regulations, there are also European regulations (the Vienna Agreement and the Geneva Convention). Not every country has ratified these agreements, and every country can also apply the rules in its own way.

Classifications of the measures

Road authorities can have many different questions when wanting to take measures to encourage cycling and walking. They may wonder which regulations will provide the strongest motivation to cut back on short car trips, or they may wonder what can be improved in regard to the infrastructure.

In the first case, classifying the measures according to the their level of firmness - from very strong to very weak - is necessary. In the second case, making a distinction between infrastructure and non-infrastructure is most useful. And, obviously, both questions can be posed simultaneously. Classifying according to both criteria at once is handiest.

In this set of directions, several possible classification criteria will be applied to the measures while always implying a different presentation of the question. Although the classification used in the document may be the most obvious one, it is certainly not the only one possible, as we shall see. For this reason, various systems of selection will be offered.

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Key word index to ADONIS measures

Search facilities are available in the following documents:

- **List of ADONIS measures**
  - listed according to type of measure
- **Key word index to ADONIS measures**
  - with reference to measure numbers

How to search:

- Click on “ ▷ “ to open the sub-indexes
- Click on “ 🗋 “ to open one of the documents with search facilities
- A click on a measure number or title in the **List of ADONIS measures** will open the actual measure.
- A click on a measure number in the **Key word index to ADONIS measures** will open the actual measure.

Finding your way in the document “adonis.pdf”

When you open the file “adonis.pdf” on the CD-ROM you will see the main index in the window to the left.

The main index consists of three parts:

- The ADONIS report: ”Best practice to promote cycling and walking” (also named *the best practice catalogue).*
- Search facilities (search for measure numbers and key words).
- Finding your way in the document (user’s guide).

Index: Best practice to promote cycling and walking

The sub-indexes contain all parts of *the best practice catalogue* (title page, colophon, preface, executive summary, and table of contents, all chapters and sub-chapters as well as all annexes named in the table of contents.

To open the sub-indexes:

- Click on “ ▷ “ to open more sub-indexes of the main index.
- Click on “ ▽ “ to close the sub-indexes.
- Click on “ 🗋 “ to open the document of the index or sub-index.

Print facilities:

To print the report “Best practice to promote cycling and walking” (also named *the best practice catalogue)*:

- Click on: file, print, shrink to fit, decide number of pages. Print of the pages 1-317 will give you a print of the whole report.

Index: Search facilities

The sub-indexes contain:

- A list of ADONIS measures, listed according to type of measure.
- A key word index to ADONIS measures, with reference to measure numbers.

How to search:

- A click on a measure number or title in the list of measures will open the actual measure.
- A click on a measure number in the key word index will open the actual measure.

Index: Finding your way in the document

- Click on “ “ to open the user’s guide.

General information on facilities in the Acrobat Reader

The menu will among others show you how to:

- Step forward.
- Step backwards.
- Zoom.
- Select the zoom-in tool.
- Select the hand tool.
- Display the previous page.
- Display the next page.
- Go to the previous view.
- Make the current page fit inside the window.

Examples of useful commands:

- To search for any word, click on “Tools, Find”, write the word you want to search for, click on “Find”.
- To search for any page, click on “View, Go To Page”, write the page number you want to go to, click on “OK”.

For more information, please use the help menu in the Acrobat Reader.