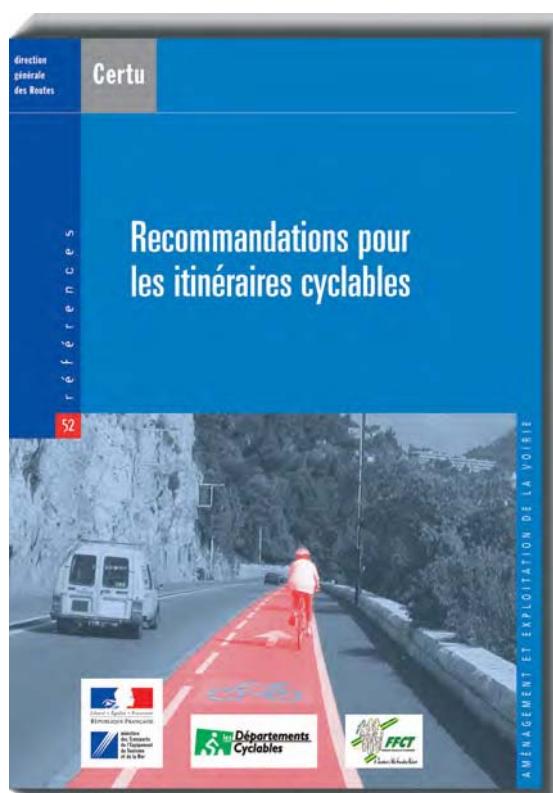


# Guidelines for cycle facilities

English version





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# Recommandations for cycle routes

**Certu**

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## Foreword for publications translated into foreign languages

The purpose of translated documents and publications is to pass on to non-French speaking readers the French know-how set out in the original publication, whether this concerns methodologies, tools or best practices.

Original publications in French are subject to a checking process, which leads to a CERTU commitment regarding their content. English versions do not undergo the same process, and consequently carry no CERTU commitment.

In the event of differences between the English and the original French text, the French text serves as the reference.

## Reference collection

This collection includes the technical guides, methodological guides and other works that present in an educational way what the ordinary professional needs to know within a relatively broad given field. Certu guarantees the content in the french version.

Certu also publishes collections of debates, files, research reports, surveys and analyses.

Catalogue of publications available at <http://www.certu.fr>.

## Acknowledgements

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Thank you to everyone.

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# Introduction

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Since 1996, the legislative and regulatory texts have required decision-makers and developers to act in favour of sustainable development, by controlling motorised journeys and maintaining a balance between urban areas and the countryside. Encouraging bicycle use by systematically taking it into account in road developments means acknowledging it as an economic and environmental alternative, an appropriate solution for tackling social and spatial exclusion. Despite the efforts made in recent years to increase bicycle use in towns, it is still used primarily in periurban or rural areas for sports and leisure activities. The mountain bike, represents half the annual purchases, closely followed by the hybrid bike for all roads. Having for a long time been a predominantly male sport, bike riding is today becoming a family leisure activity : this new tendency is encouraging local authorities to create medium- or long-distance cycle routes using routes on which motorised traffic is light or even banned (greenways). The statistics show that, in the countryside, the bicycle remains the second most common form of individual transport, a long way behind the car, admittedly, but ahead of walking. Therefore, whether they use a bike for their utilitarian journeys, for leisure purposes or for sports training, cyclists are entirely separate users of the roads. It is important to ensure theirsafety, whether they are travelling alone or in

a group, on the edge of towns or on country roads. Applying a methodology and an analytical approach which are structured and organising the shared use of public space by cyclists and other users is bound to help promote cycling and reduce the feeling of insecurity often associated with this mode of transport.

The first Recommendations for cycle facilities (original French title : RAC : *Recommandations pour des aménagements cyclables*) guide, published in 2000, was geared particularly toward the urban environment. What was missing, therefore, was a reference document offering solutions for the rural environment and also for journeys across small towns and in less built-up periurban areas. This work gathers together in a single document the knowledge accumulated within central government technical departments and local authorities, while referring to the enlightened opinion of the users. It tackles the situations encountered most frequently by contracting authorities and infrastructure designers and covers all roads open to public traffic, whatever their aspect of a project they are in charge of. For built-up areas, and depending on the size and the urban composition of the environment being crossed, planners will assess, whether it is necessary to refer to this guide or to the reference document that preceded it.

P A R T O N E

# Knowledge of cycle use and regulations

The presence of cyclists on the roads is underestimated and often forgotten in road projects just as it is in selective maintenance operations. A single category is generally mentioned, that of sports cyclists, who are considered, wrongly as we will see, «not to need anything». Familiarising oneself with the practices and behaviours of the different types of cyclist, understanding the risks they run by analysing accident statistics, and having detailed knowledge of the regulations in force are all important considerations for improving the quality of development projects in inter-urban areas and also for cross-routes through small towns.

# 1 Cyclists and other users

In order to make the existing road network safer and more comfortable for cyclists, it is necessary to be familiar with their needs and their behaviours. There are several different categories of cyclist : some try to find direct routes and accept shared use with motorised users, others prefer to avoid them, even if this means choosing slightly longer journeys.

## 1.1. Several categories of cyclist

Cyclists are not all the same. It is common practice for those who cycle outside towns and use the so-called «inter-urban» routes to be grouped into two categories : the more experienced sports cyclists, and the more pleasure-oriented leisure cyclists. This overly restrictive classification omits the utilitarian cyclists who travel to their place of study or work each day by bicycle. Depending on the type of use, the requirement in terms of infrastructure and services is different. But most people want to be able to enter and leave towns easily and safely. It is therefore important to identify the expectations and behaviours of each of these categories, not so as to favour one over the other, but in order to offer everybody diverse and complementary facilities that are better able to meet their requirements in terms of comfort and safety.

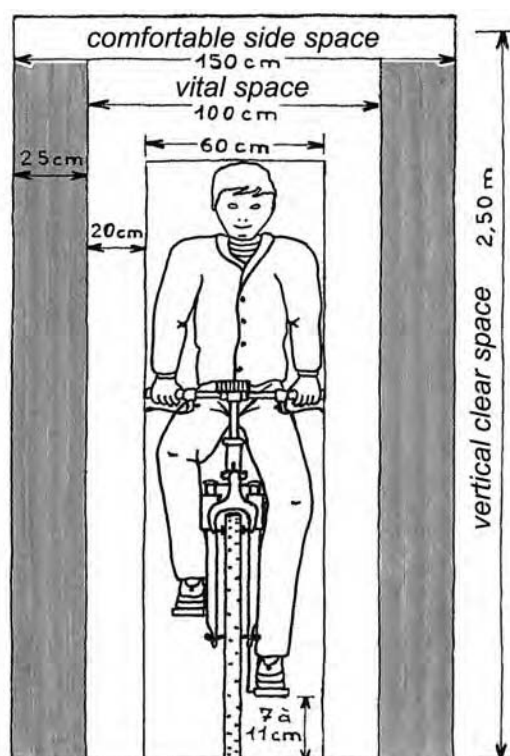
## 1.2. Points common to all cyclists

On the road, cyclists travel on the right-hand side of the road. Their attention is focused on the immediate environment so that they can react quickly – in the event of gravel, broken glass, potholes, careless behaviour of motorists trying to overtake them –, while remaining extremely vigilant as to what is happening a long way in front of them so they can anticipate situations or events that may be dangerous : poor visibility of a junction, risky manoeuvre by a vehicle, lateral obstacles, and so the

list goes on. They endeavour to save muscular energy by looking for the most direct path, avoiding braking sharply, stopping as little as possible and travelling on the smoothest road surfaces.

Cyclists travel in a relatively straight line, with wobbling in the order of 20 to 30 cm, perhaps a little more when going uphill. But, depending on the circumstances and the obstacles they encounter, they may want to overtake a slower cyclist or be forced to swerve sharply by up to a metre before resuming their normal path. A strong side wind can easily carry them off course. When going downhill, they tend to position themselves on the inside of the bends in order to maintain a direct path.

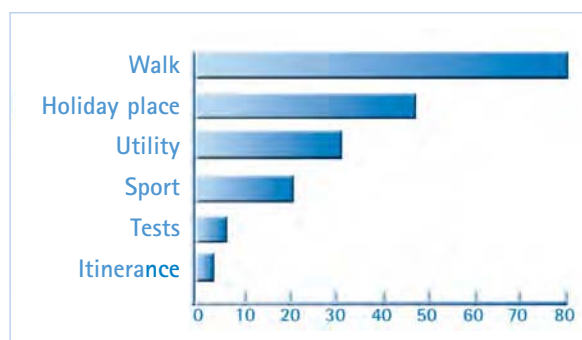
They can hear noises better in calm weather or if they have a following wind ; but in a head wind, they are less able to hear vehicles coming up behind them. They dread lorries and caravans for two reasons : the suction produced by the displacement of air from



these vehicles and their considerable size prevents them from swerving easily to avoid an obstacle. Under Article R.414-4 of the French Highway Code [Code de la route], any vehicle overtaking a cyclist outside built-up areas must keep a lateral clearance of 1.50 m and signal its manoeuvre by switching on an indicator. This obligatory distance would benefit from being more widely known as this would lead to greater compliance. Cyclists also fear vehicles coming in the opposite direction and making overtaking manoeuvres : they sometimes approach them at great speed.

### 1.3. Particular expectations according to the category of cyclist

Studies by the AFIT, the French agency for tourism engineering (Agence française de l'ingénierie touristique) and more local studies show a wide predominance of bike riding (bibliography 31).



The distribution of uses (diagram AFIT 2003)

#### 1.3.1. Daily cyclists or utilitarian trips

Two millions is the figure often quoted for the number of French people who regularly use their bicycle to go to work, to study or to do their shopping. But, according to the data provided by the INSEE's national transport and communications surveys or by the more local household travel surveys (bibliography 20), there is more bicycle use in rural or periurban areas, where it represents 4 % of trips, than in the suburbs (3 %) or the town centre (2 %) : the ease of parking it at home in areas where there is a predominance of single-person dwellings may partly

explain these differences. Daily cyclists are often classed as experienced users who try to find quick, direct routes and who prefer cycle lanes or hard shoulders on the routes. In fact, the majority of daily cyclists are young people (secondary school pupils or college students) : admittedly, they are very familiar with their route but they may be more easily distracted than their older counterparts and may underestimate risks. Moreover, in rural areas, secondary schools are intermunicipal and are usually on the outskirts of the residential areas or villages. It is in the interest of the "Conseils Généraux" (county councils), which are responsible for managing secondary schools and school transport, to encourage and facilitate this mode of transport, either as a direct home-education establishment link, or as an intermodal solution between the home and the school bus stop : the bicycle is a flexible and economical mode of transport for both its user and the local community ; it promotes the independence of young people and gives them the opportunity to practice a sport. But this requires continuous, sign-posted facilities, well-maintained junctions and suitable parking areas. It is these same requirement criteria that are expressed by the inhabitants of villages and the residents of periurban sectors for turning the bicycle into a daily mode of transport : these low-density urban areas are poorly served by public transport, so a continuous, safe cycle lane running past the local stations with suitable parking would be a highly rated asset. In any event, it is an avenue to be developed given the success of this bicycle/train intermodal transport system in neighbouring countries, such as Switzerland, Germany and Italy.



Secondary school pupils in Hérault enjoy safe routes (CG 34)

### 1.3.2. Leisure and tourist cyclists

This is a category which is represented particularly at weekends and in the summer months. Often accompanied by their children, cyclists on short rides for leisure purposes or on longer touring routes seek facilities that allow safe cycling, separate from motorised traffic or using little-used roads. Routes prohibited to all motorised traffic, called «greenways», are particularly suitable for these cyclist categories, who are the main users of these routes. They appreciate a well-marked route so they can get to it easily. When they leave this route to explore an interesting site or to simply take a break, they want to be able to find it again without a problem.



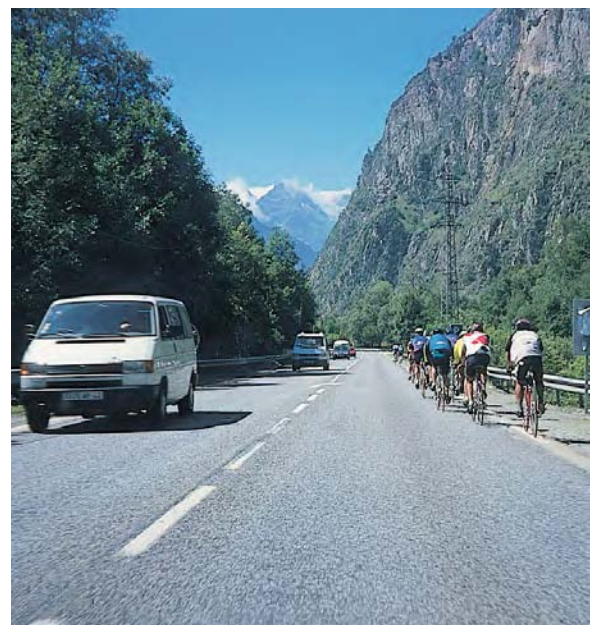
Shared pleasure between father and son on little-used roads (CG 67)

### 1.3.3. Cyclotourists who are sportspeople rather than tourists

As the name of their federation (the French cyclotourism federation – FFCT), implies, these users cycle particularly at the weekend but also during the week. Alone or in a group of a dozen or more, with average speeds easily between 20 and 30 km/hour, they can cover great distances. They make less use of on-site facilities, cycle paths or greenways : sharing use with slower, less experienced users can prove difficult owing to the very different travelling speeds. They prefer to travel on the secondary road network. They like hard shoulders and cycle lanes with a well-maintained surface for cycling.

Representing around 20 % of all cyclists, this category of cyclists is very evident on the roads, owing to the frequency with which they go out and the distances travelled. It is also the category the most exposed to serious accidents. Road managers must ensure that their safety is improved at all points of the road network.

Keen racers use the road network for their training. Like the other categories of cyclist, they are sensitive to the road surface being in good condition and well swept. During competitions, marshals provide supervision and warn other users that cyclists are approaching, and safety arrows indicate the points to be approached with caution. For major races requiring exclusive use of the road by the participants, it is possible to interrupt the general traffic selectively via an order : *«the administrative authority responsible for exercising police powers as regards road traffic may regulate the traffic, temporarily prohibit it if need be, and stipulate that the event, the race or the sporting competition shall enjoy right of way which shall be brought to the knowledge of the users through appropriate signalling, defined by order of France's Minister for the Interior, Minister for Defence, the Minister for Transport and the Minister for Sport»* (Article 411-30 of the Highway Code).



Without a hard shoulder, cyclists are overtaken by other vehicles at very close range (Certu, J. Robin)

## 1.4. Coexistence with other users

### 1.4.1. Private vehicles, commercial vehicles and lorries

Under Article R.412-7 of the Highway Code, the bicycle is a vehicle : it can travel on all roads, apart from motorways and express roads. This shared use between bicycles and motorised vehicles does not require any particular cycle facilities or signage from a regulatory point of view. Any reminder of this basic principal at certain points, via a «let's share the road» message, for example, creates ambiguity in terms of understanding roads without cycle facilities and is contrary to the principle of signage homogeneity.

As there are more of them on the roads, private vehicles constitute, proportionally, a greater threat for cyclists : they are involved in the majority of accidents with cyclists (more than 80 %). Collisions between cyclists and lorries or commercial vehicles are much rarer (3 % of accidents) but are often more serious and are due to the vehicle drivers having insufficient visibility of what is happening behind them and to their right (blind spots).

It is important to mention a few figures (bibliography 1) : during the day, nearly 40 % of tourist coaches and lorries drive on average at between 50 and 60 km/hr through towns of less than 5 000 inhabitants, therefore above the authorised speed limit of 50 km/hr. This finding is identical on the entry and exit routes for built-up areas. This reinforces the usefulness of developments to make journeys across small towns safer and more pleasant.

### 1.4.2. Motorised two-wheeled vehicles

Merged together into a single, two-wheeled vehicle category for too long, bicycles or «light two-wheeled vehicles» today suffer considerably from this classification. In fact, the first barrier to using the bicycle remains the fear of an accident, whereas it is mainly the drivers of motorised two-wheeled vehicles who are involved in the most serious accidents. Out of a total number of around 1 million motorcycles

and 1,400,000 mopeds, there were tragically nearly 600 motorbike riders and 200 moped riders killed in the countryside in 2004 alone, which is in no way comparable with the 100 cyclists killed in the countryside in the same year.

Riders of motorised two-wheeled vehicles behave differently from cyclists : their speed is greater and therefore their stopping distance is much greater than that of a bicycle ; the weight of their vehicle poses recovery problems on a bend or when faced with an unexpected event. Loss of control of the vehicle or hitting a fixed obstacle are frequent accidents for motorised two-wheeled vehicles but are much rarer for cyclists. It was in 1998 that the Highway Code was modified to reduce the danger that shared use with motorised two-wheeled vehicles represented for cyclists. These vehicles are now banned from cycle facilities unless decided otherwise by the authority invested with police powers.

### 1.4.3. Public transport

Whereas the town-planning and other planning documents have to promote a reduction in the use of the private car for short journeys (cf. chapter 3.3.5.), the bicycle is a partner which is too often neglected in the periurban and «rurban» sectors. This neologism designates the rural communities on the urban fringe that are being encroached upon by the movement of the population away from the town centres. The car is the dominant mode of transport in these sectors and only an efficient bicycle/public transport combination, which reduces journey times, may prove interesting for the individual. Travelling four or five times faster than on foot, the cyclist can easily reach the public transport arteries, in particular the main arteries (tram, train, trolley-bus, tram-train, etc.), without suffering the general traffic jams. But choosing the bicycle to the detriment of the car can only happen on two conditions :

- the presence of attractive cycle routes linking the residential areas and the stations, the main bus stops or the major tram stations ; these routes must be as direct as possible so as to be quicker than, or at least as quick as, a motorised mode ;

- the presence of easily accessible parking places, in the immediate vicinity of the stops and clearly visible for greater safety ; these may, depending on the context, be supervised or simply under shelter (cf. chapter 7.1).

Outside the built-up area sign, the speeds of public transport – buses, school buses, interurban transport, tourist coaches – increase. Unlike in urban environments, shared use of a reserved «public transport/bicycle» lane is therefore not to be recommended unless it is organised in a sufficiently wide dedicated space. It is preferable to separate the bus lane from the cycle lane.



*A form of road-sharing which is appropriate in periurban areas for well-spaced bus stops*

Stopping places are manoeuvring areas : a bus often blocks the view both for the individuals getting off at the stop and the vehicles passing or overtaking the bus. Cyclists can be caught out by a pedestrian crossing the road and may have to swerve suddenly in order to avoid him. The location of the stops and the visibility of the area around them is therefore not without impact on the movement and safety of cyclists. This is an important area of conflict to be taken into account when developing plans for cycle routes for utilitarian or leisure use.

#### 1.4.4. Pedestrians and their counterparts

The Highway Code classes a whole series of users in the «pedestrian» category : people travelling on foot alone or pushing a pram or wheelchair, people pushing a bicycle or a moped, and also people using roller skates or roller blades, children aged under 8 riding bicycles, and disabled people in wheelchairs, motorised or otherwise. The general rule is to maintain walking speed (5 to 8 km/hr) and not to inconvenience other users. Electric wheelchairs must also adopt a restricted speed.

Outside these categories, there are few pedestrians to be found. They do exist, however, since the proportion of pedestrians killed outside the built-up area sign, is far from insignificant. It represents 38 % of the pedestrians killed in 2003. A motorised vehicle is involved in the majority of serious accidents, usually when the pedestrian is crossing the road. Even though they are few and poorly quantified, collisions between pedestrians and people on roller blades or pedestrians and cyclists can cause serious injuries due to the difference in speed and the absence of protection. In fact, a good roller-blader can easily move at 15 km/hr, and an experienced cyclist can easily travel at 20 or 30 km/hr. These are clearly much higher speeds than that adopted by the quickest of walkers.



*The greenway, a space that is conducive to meetings (Florence L.)*

«Coexistence» is therefore not authorised by the Highway Code unless it is organised across sufficiently wide areas and unless each user respects the others. It is in this spirit that, in Article R.110-2 of the Highway Code, the law has defined «greenways» as routes reserved exclusively for the movement of non-motorised traffic, pedestrians and horse riders. Everyone travels freely without speed, position or direction constraints while respecting the other users.

#### 1.4.5. Horse riders

The main problem with shared use between cyclists and horse riders comes from the unpredictable behaviour of a horse when it is overtaken by a cyclist : if frightened, it may swerve and surprise its rider...or the cyclist. Moreover, horses prefer an unpaved surface which is not suitable for bicycles or roller blades.



*Restricting shared use to short sections is preferable (CETE S.O.)*

Even though they are permitted to travel freely on greenways, horse riders will prefer to quickly reach the areas that are strictly reserved for them. Along the common sections of the route, it is preferable to allow sufficient width for overtaking or passing without danger.

## 2 Accident data

In 2004, cyclists represented 3 % of the 5232 people killed and almost 4 % of the seriously injured (bibliography 16). They have, more so than other categories of users, benefited from the positive effects of the road safety actions undertaken in recent years : a 30 % drop has been recorded in the number of cyclists killed over the period 1990-2000 whereas the total drop for all modes of transport is 15 %. These results have been achieved even though the practice of cycling has been noticeably increasing for commuting and leisure purposes. The findings in other European countries are confirmed in France (bibliography 14) : the higher the total number of cyclists, and the greater the personal experience of the cyclist, the lower the risk of an accident.

Nevertheless, cyclists killed or seriously injured outside built-up areas due to the excessive speed of the other road users are always needless victims.

### 2.1. The general characteristics of accidents

Unlike other vehicles, for which the total number in use is known fairly accurately through their registration and for which there are numerous surveys giving the number and distance of the trips made, the data relating to cyclists is very patchy : through household surveys, we have a rough idea of the volume of trips and the average number of kilometres travelled per activity (leisure or utilitarian) and per town. For this reason, their exposure to risk cannot be calculated. The only indicators available concern the characteristics of the accidents themselves.

**Outside built-up areas**, there are not many road injury accidents involving a cyclist (only 18 % of the overall total) but the number of serious injuries is five times greater than that recorded in built-up

areas. Two-thirds of these accidents happen in the common section and one third of these have fatal consequences for the cyclist.

Other specific findings are related to the methods of bicycle use (bibliography 17) :

- the low number of accidents in rainy weather or at night is the result of an absence of bicycle use rather than a lower risk ;
- the significant number of accidents in the summer is partly due to the higher number of cyclists travelling at this period of the year ;
- the majority of the victims are men but then more men are cyclists and they also cover greater distances than women, particularly in the countryside ;
- the age ranges most affected are the 10-19 year-olds and people aged over 65, with a vulnerability and an accident severity level that increases with age ;
- accidents are more frequent on major roads more than 6 m wide than on narrow roads.

### 2.2. The main types of accident

Collisions from behind – when a vehicle hits a cyclist travelling in the same direction as him – are the most frequent in the countryside. This type of accident which occurs during the day and at night raises questions about the detection of cyclists by users of motorised vehicles and about assessing and respecting overtaking distances. Accidents at junctions, which account for more than a third of accidents and deaths, are also linked to detecting cyclists and under-estimating their travelling speeds.

Since 1996, a team of researchers at INRETS, the French National Research Institute for Transport and its Safety [Institut national de recherche sur les transports et leur sécurité] in the Rhone "département" (county), has been carrying out an

epidemiological survey of all the victims of traffic accidents treated by the healthcare services (bibliography 18). The number of cyclists involved in accidents recorded in this file is eight times higher than the national file for road injury accidents : this difference is explained by the fact that three out of four cyclists are injured in an accident in which only they are involved, therefore no official accident report is drawn up. In general, their injuries are not severe : superficial grazes, bumps and bruising to the upper limbs. The accident site (private road, car park or even forest track for 13 %) and the age of the injured persons (peak 10-14 year-olds) match the period of learning to ride a bicycle and thus confirm the dangers linked to «mountain-biking» which is very popular in the "département".

### 2.3. Detection of cyclists by motorised users

In accidents, the problem of insufficient visibility of the cyclist is often mentioned by motorists. The detection of cyclists is probably linked to the «selective» attention of the drivers : «an environmental factor will have more chance of being exploited if it is sought or expected» (bibliography 19).

These reflections confirm that, even if it is not the only factor since the users' attention may be distracted or occupied elsewhere, the configuration of the road is an essential safety parameter : for cyclists to be seen, junctions need to be simple and homogeneous, with nothing to block the view. But nothing can replace personal equipment : user federations advise wearing bright clothing, and retroreflective or fluorescent jackets or armbands : these are useful for night-time journeys and also in

cloudy weather. Reflectors at the rear of and underneath the pedals and a headlamp are still absent too often even though they are obligatory.

Regarding personal equipment, remember that a helmet ensures a reduction in head injuries in the event of falling off and receiving a blow to the head, which is the case for 17 % of cyclists involved in accidents and also 24 % of motorists and 26 % of pedestrians. Outside built-up areas, this equipment is particularly recommended for children, who do not yet have very good balance, and for adults since they travel fast and over great distances.

#### Définitions

A road injury accident involves at least one vehicle moving or travelling on a road open to public traffic. It causes the death or injury of one or more persons. All material accidents, injury accidents which do not involve a moving vehicle and also voluntary acts (voluntary manslaughter, suicide, etc.) and natural disasters are excluded. The users involved include the victims – involved persons who have died or who have received medical attention – and the uninjured – involved persons who are not victims.

Since 1 January 2005, victims have been divided into :

- the dead : victims who have died at the scene or within 30 days of the accident ;
- the hospitalised injured : victims admitted to hospital as patients for more than 24 hours ;
- the non-hospitalised injured : victims who have received medical attention but who have not been hospitalised or who have been admitted to hospital for less than 24 hours.

# 3 The legislative corpus and reference documents

In strategic fields such as planning or infrastructure, there are endless laws, regulations and circulars : consideration of the needs of cyclists at the various regional levels must take place in compliance with the rules in force. In this chapter, the main provisions involved in the implementation of policies or facilities in favour of cyclists are briefly mentioned, in order of administrative hierarchy and of their opposability by third parties : first, rules with legislative value, then those with regulatory value – decrees then orders (interministerial, ministerial) – and finally regulatory decisions taken by the central government devolved authorities (Prefect, etc.) or the local authorities (town, "department", region).

Legislative articles, decrees and judgements are gathered together and organised into codes in a coherent fashion so that citizens, representatives, government officials and businesses are aware of their rights and obligations. Circulars and directives are sent to the "departments" that come under the authority that signed the circular in order to facilitate the implementation of the legislation or to clarify the interpretation of certain provisions.

Where there is a contradiction between rules laid down at national level and provisions adopted through deliberation of the local assemblies, it is difficult to say what the courts will use in the event of a dispute. In response to parliamentary questions relating to the difficulty in defining proper cycle facilities and in the absence of standards, the Minister for Infrastructure [Ministre de l'Équipement] has stated (OJ of 24/09/01) that *«although the local authorities are not strictly obliged to follow the national technical recommendations published by Certu, it is very much in their interest to do so since a court will naturally refer to these in the event of a dispute, and the contracting authority may be held liable if it appears that the established rules have not been respected»*.

## 3.1. The European context

There is no European directive making it compulsory to develop cycle facilities. This topic is however the subject of an increasing number of declarations and agreements in principle both for developing utilitarian bicycle use and for contributing to the creation of a European cycle network.

**The declaration of the European conference of transport ministers** (Ljubljana, May 2004) committed each country to having an identified national policy promoting bicycle use, with quantified and measurable objectives. This policy must be carried out in conjunction with the other policies. Several European countries have already implemented such a policy : many northern European countries (e.g. Denmark, Sweden, Finland.) and also those closer to us, Germany, Switzerland and even the United Kingdom (bibliography 15).

In the declaration for a European green network (Lille, September 2000), the signatories agree on the common characteristics defining the network : *«reserved for non-motorised users, predominantly greenways combined to a lesser extent with low-volume, low-speed routes that have been developed, offering continuous long-distance routes and also a local link for local trips and leisure activities, based on the availability of a body of services to make them attractive, continuous and reliable»*. This declaration is annexed to the interministerial circular on the implementation of the national cycle route and greenway scheme mentioned below (cf. § 3.4.2).

### 3.2. The French laws promoting sustainable development and their transposition into the codes

The French Clean Air and Energy Act (Loi sur l'air et l'utilisation rationnelle de l'énergie – LAURE-1996) makes it compulsory to have urban transportation plans for major cities (a subject which does not really concern us within the scope of the present document – and deals solely with small towns in urban areas) and also requires the development of cycle facilities when creating or renovating urban roads, whichever road manager and whatever size of town is involved (Article 20 codified in Article L.228-2 of the French environment code [Code de l'environnement] – cf. § 3.3.4.).

For roads situated outside urban areas, in other words, within the meaning of the Highway Code, beyond the EB20 sign, the law does not require anything so specific but **the 1982 French law on domestic transport planning (Loi d'orientation des transports intérieurs – LOTI)** applies to the entire national territory, *particularly* in interurban areas. It indicates in its first Article that *«the national transport system must satisfy user requirements through the implementation of facilities that render effective the right of any user to travel and the freedom to choose the means»*. For cyclists, this freedom to choose one's means of transport means, among other things, the possibility of finding suitable routes for entering and leaving a town, whatever its size : it must be recognised that to date this freedom is not yet established everywhere !

The law also stipulates the development of business transportation plans (PDE – plans de déplacement d'entreprises). Quite a number of small and medium-size businesses are based outside towns : although these businesses cannot individually offer alternative solutions to the car that are satisfactory for their employees, a sector-wide PDE offers the possibility of pooling resources and energies and applying pressure to obtain direct cycle routes and secure parking spaces for bicycles, from the station for example. Employees and managers can both be winners : employees by saving time, stress and the litres of fuel wasted in traffic jams, and managers by

saving land since ten bicycles can be parked in one car parking space.

The French Act on Solidarity and Urban Renewal (Loi relative à la solidarité et au renouvellement urbains – SRU-2002) clarifies and reinforces Article 1 of the LOTI by incorporating it into the strategic planning documents. Article L.121-1 of French town-planning law [Code de l'urbanisme] states that :

*«The town-planning documents shall determine the conditions for ensuring :*

- **a balance** between urban regeneration, and urban or rural development and preservation of agricultural, forest or natural areas ;
- **the diversity** of the urban functions and **the social diversity** in the habitat, in order to satisfy, **without discrimination**, the current and future needs as regards habitat and economic, commercial and sporting activities, by taking into account **the means of transport** ;
- **the economical and balanced use of spaces, control of transportation needs and car traffic**, preservation of **air quality** and resources – water, soil, green spaces, habitats, sites, countryside – reduction in **sound nuisance** and prevention of **pollution and nuisance** of any sort».

A new concern is also incorporated into this law : improvement in the safety of all journeys, particularly by defining *«balanced sharing of the roads for each of the different categories of user and by setting up, in the urban transportation plans (plans de déplacement urbains – PDU), where they exist, a facility for monitoring accidents involving at least one pedestrian or one cyclist»*.

Bicycle promotion actions, which can be adapted to suit all levels, may therefore appear in the territorial coherence scheme (SCoT – Schéma de Cohérence Territoriale) – taking account of the bicycle as a structuring mode of transport –, in the PDU – the cycling master plan for the town –, in the local town-planning scheme (PLU – plan local d'urbanisme) – the cycle route and cycle parking scheme –, and also at the level of the district plan or a simple architectural project – accessibility of public establishments and shopping centres, etc., cycle garages in apartment blocks.

The French Framework Act on Town and Country Planning and Sustainable Regional Development (LOACT –Loi d'Orientation pour l'Aménagement et le Développement Durable du Territoire) of June 1999 also introduces a project logic particularly for the regions. These regions, at the level of a residential area or an employment area, must convey a new urban/rural balance. Finding a balance of activity between the rural world and the towns is also achieved by considering the modes of transport : if the car is the only possible link between the areas, families with only one car or young people who have not yet passed their driving test quickly become excluded or dependent. It is therefore clear that all these laws converge towards the need, for any decision-maker, to plan and schedule actions that are consistent with the challenges of sustainable development. A high proportion of these actions inevitably involve the redevelopment of roads in favour of alternative modes of transport to the car. This is the price of «controlling transportation needs and car traffic».



The cycle route benefits first and foremost from the preservation of the natural and the architectural heritage (Certu)

### 3.3. The codes

#### 3.3.1. The Highway Code (Code de la route)

This classifies road users into two categories, vehicles and pedestrians, and defines the rules of movement between the two. The bicycle is classed in the «vehicle» category by Article R.311-1, which describes it as :

*"A vehicle with at least two wheels and propelled exclusively by the muscular energy of the person on this vehicle, particularly with the aid of pedals or crank handles".*

Electrically-assisted bicycles come within this category. By contrast, any machine travelling on two or more wheels without a motor is not necessarily a vehicle. The code stipulates in particular certain obligations as regards brakes and lighting (Article R.313). Roller-blades and the majority of scooters are not fitted with these and are today classed as «pedestrians».

Article R.412-7 stipulates that :

*Any driver must, unless absolutely necessary, drive his vehicle exclusively on the carriageway.*

This carriageway may be open to general traffic, or reserved in part for cyclists (cycle lane), or entirely dedicated to their use (cycle path). This rule has only three exceptions :

- **in urban areas**, Article R.412-34 authorises children aged under eight to travel by bicycle on the pavement, unless indicated otherwise by the authority invested with police powers. Article R.431-9 authorises cyclists to travel in pedestrian areas, at walking speed and without inconveniencing the pedestrians ;
- **outside built-up areas**, the same Article R.431-9 indicates that cyclists can travel on verges that have a road surface ; Article R.43-10 authorises them to travel at walking speed along paved roads or roads undergoing repair and on pavements and service roads designated for pedestrians ;
- on a greenway, in other words a route exclusively reserved for the use of cyclists, pedestrians and horse riders (Article R.110-2).

The code also states the rules for using the facilities. For example, the cycle lanes and cycle paths defined in Article R.110-2 are exclusively reserved for bicycles : any movement, stopping or parking by another vehicle is liable to be punished by a class 2 fine. Their use is optional for cyclists subject to other arrangements made by the authority invested with police powers.

*«For the application of all regulations relating to right of way, a cycle path shall be considered as one lane of the main carriageway along which it runs, subject to other arrangements made by the authority invested with police powers» (Art. R.415-14).*

The lateral overtaking distances are specified in Article R.414-4 : 1.50 m outside built-up areas (1 m in built-up areas).

### 3.3.2. The highway maintenance code (Code de la voirie routière)

This applies to all roads open to public traffic and governs the rights and obligations of all road managers : central government, the "Départments", the districts and their public establishments for intermunicipal cooperation.

It indicates the 3 fundamental requirements for the road networks, whoever their managers may be :

- dispersal of rainwater and collection of waste water from the roadbed in order to preserve its properties ;
- the work template (4.30 m across the entire width) ;
- homogeneity of road characteristics, particularly on bends and on slopes for user safety reasons.

It points out that only the authorities responsible for road services have the right to place signs or signals relating to traffic in any regard in public view, by all appropriate means (Article L.113-1).

The costs of constructing, developing and maintaining the roads and their dependencies are the responsibility of the road manager. The notion of «road dependence» was established by the case-law which considers that the elements necessary for the preservation and operating of the road and the safety of its users are indissociable from the carriageway, including when crossing through towns : pavements, trees planted along the edge of a public road and cycle facilities are the responsibility of the road manager. Where several managers have common interests, arrangements may be concluded in the form of management agreements.

### 3.3.3. The general code for local government [Code général des collectivités territoriales] and the countryside code [Code rural]

This governs the general competences as regards traffic policing. These competences cannot under any circumstances be delegated. Outside built-up areas, the prefect exercises traffic policing on national roads ("routes nationales"), the president of the county council [Conseil général] on the "departmental roads" (roads within a given "département") and the mayor on local roads. The traffic policing for cycle lanes, cycle paths or greenways is dependent on the owner of the road, outside built-up areas, and on the mayor in built-up areas. Managers may, by reasoned order, prohibit the movement of certain categories of vehicle on certain roads. The mayor also has responsibility for preservation and traffic police powers on rural roads (Article L.161-5 of the rural code).

### 3.3.4. The environment code (Code de l'environnement)

#### ■ Cycle routes

Stemming from the Clean Air act, Article L.228-2 stipulates that *«on the occasion of developments or modernisations of urban roads, with the exception of motorways and express roads, there must be developed cycle routes equipped with facilities in the form of paths, markings on the ground or separate lanes, according to the needs and constraints of the traffic. The development of these cycle routes must take into account the guidelines contained in the urban transportation plan [PDU] where this exists».*

This Article is binding on any road manager, without exception. It applies to all built-up areas, whatever their size, and across the entire urban road network, demarcated in principle by the EB 10 and EB 20 town entry and exit signs. The only roads that are excluded are express roads which have motorway or express road status and are therefore reserved for motorised vehicles. Even though this article only applies in urban areas, the route concept it introduces implies a notion of continuity : it may therefore have an

impact on the connection between the urban and interurban networks to make it easier for cyclists to enter and leave towns and villages.

### ■ Touring routes

Under Articles L.361-1 and 361-2, French "départements" must draw up departmental plans for leisure and touring routes (PDIPR - plans départementaux des itinéraires de promenade et de randonnée) in order to «promote the exploration of natural sites and rural landscapes by developing the practice of touring» and to «protect a rural heritage of considerable richness : rural paths» (circular of 30 August 1988). The creation and maintenance of these routes are the responsibility of the "départements". «Greenway»-type facilities, in other words those reserved for all non-motorised modes of transport, may be included in these plans but the law has stipulated that concrete or tarmac paths should not exceed 30 % of the total length contained in the plan. Moreover, even when they are included in the PDIPR, the paths retain their legal status : thus coastal paths are authorised solely for pedestrians while, for towpaths, there may be a written agreement between the State and the local authorities to authorise cyclists and horse riders. Likewise, where a route uses a private road, it requires the written consent of its owner. Concerning routes open to public traffic, the users of these roads are always subject to the Highway Code.

#### 3.3.5. The town-planning code (Code de l'urbanisme)

This code was extensively modified on the occasion of the publication of the Act on Solidarity and Urban Renewal (SRU). In addition to the aforementioned Article L.121-1 (cf. § 3.2.), other articles encourage bicycles to be taken into consideration. The following are just two examples :

- Article R.123-3 of the town-planning code under which the planning and sustainable development project (PADD - projet d'aménagement et de développement durable) may specify : *«(...) the characteristics and the treatment of roads, pedestrian paths and cycle tracks, and the public spaces and public works to be preserved, modified or created ; (...) the*

*conditions for developing entrances to towns in application of Article L.111-1-4» ;*

- Article L.122-1 which indicates that the territorial coherence scheme (SCoT) includes, as does the local town-planning plan (PLU), a planning and sustainable development project (PADD) which lays down the public town-planning policy objectives as regards habitat, economic development, leisure activities, movements of persons and of goods, parking of vehicles and regulation of motor traffic».

On 29 March 2004, a decree relating to the noteworthy natural spaces on the coast modified several articles of the town-planning code in order to specify the nature of the activities permitted in these areas (Article R.146-1) and the nature of the road surfaces for the pedestrian, cycle and equestrian routes providing access to these activities : these routes may not be covered in cement or tarmac (Article R.146-2a). In these areas, the car parking areas must be restricted to the barest minimum and may not be covered in cement or tarmac (Article R.146-2b). It will be noted that the legislation makes no mention of bicycle parking spaces : but in the work permit application required for all installations open to the public (Article R.442-4-1), this subject will certainly be included in the notice that has to explain «the measures planned to limit car movement on the site».

#### 3.4. Interministerial orders and directives

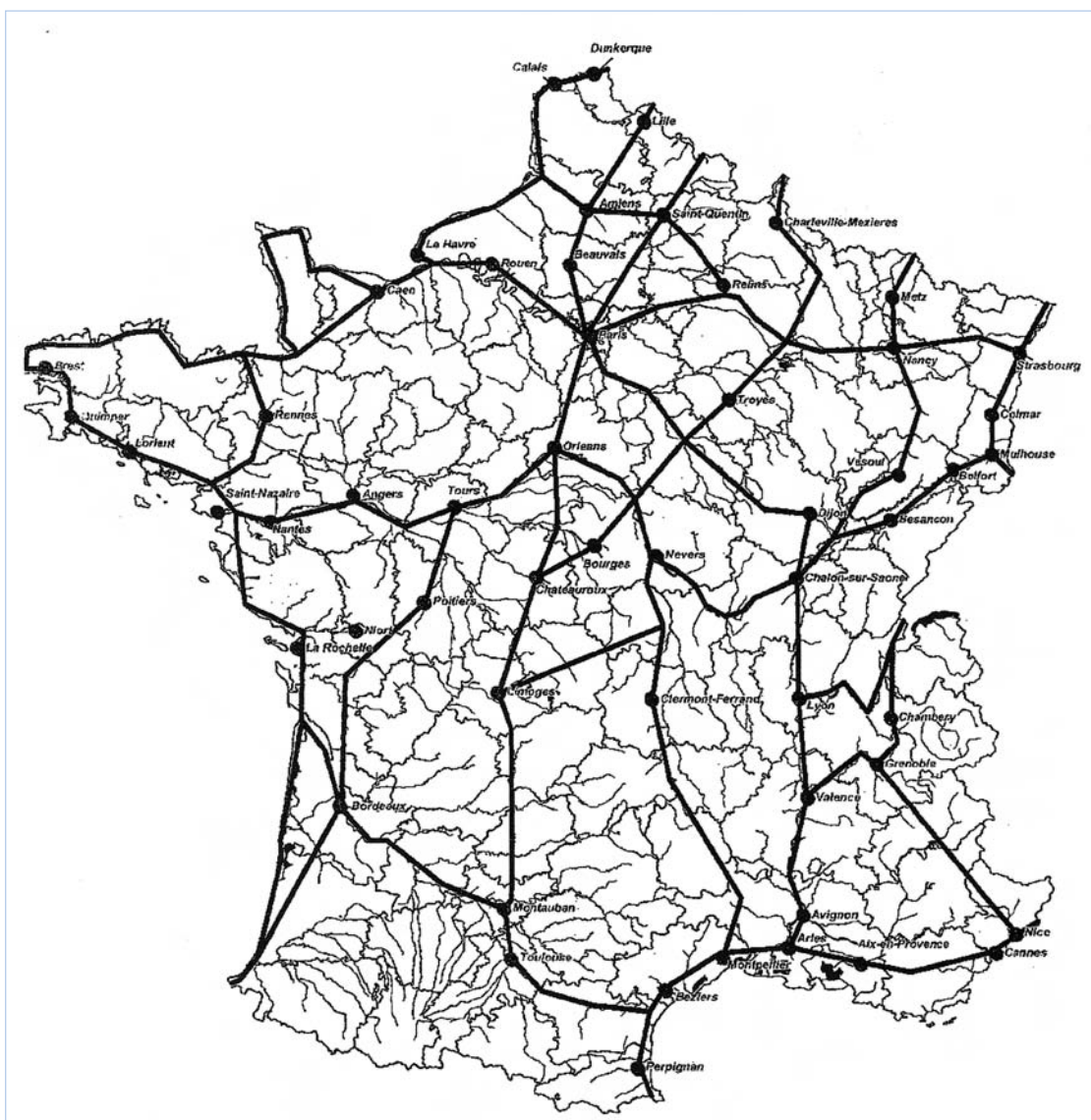
##### 3.4.1. The order of 24 November 1967 modified and the interministerial directive on road and motorway signage [Instruction interministérielle sur la signalisation des routes et autoroutes]

Unlike the design of cycle facilities, which meets the technical recommendations based on the current knowledge in the field, signage must comply with specific national rules. These rules are binding on all road managers. The principal signage rules specific to cycle facilities and cycle routes are stated in chapter 11.

### 3.4.2. The interministerial circular on the national cycle route and greenway scheme [Schéma national des véloroutes et voies vertes]

This was signed jointly by three ministers then responsible, respectively, for Town and Country Planning and the Environment [Aménagement du Territoire et de l'Environnement], Infrastructure, Transport and Housing [Équipement, Transports et du Logement], Young People and Sport [Jeunesse et des Sports], and by the Secretary of State for Tourism [Secrétaire d'État au Tourisme]. Sent on 31 May 2001 to the regional prefects, it requires the creation of a regional committee for the

development of cycle routes and greenways which will draw up the regional part of the national scheme. This regional part must be submitted for the approval of the national commission for cycle routes and greenways which must, among other things, ensure the continuity of the routes between the different French regions and also with the border regions. The map adopted by the interministerial committee for town and country planning and development (CIADT - Comité interministériel d'aménagement et de développement du territoire) in December 1998 and the specifications document of 5 January 2001 attached to the circular constitute the reference framework for the national scheme.



Scheme for cycle routes of national importance known as the «national cycle route and greenway scheme»

At the end of 2004, AF3V, the French association for cycle routes and greenways (Association française des véloroutes et voies vertes) listed, in France, more than 5000 km of long-distance routes of more than 80 km, or «cycle routes». About 70 % of these cycle routes were greenways.

|                                           |          |
|-------------------------------------------|----------|
| Low-traffic routes                        | 1,400 km |
| Surfaced greenways of more than 12 km     | 2,057 km |
| Non-surfaced greenways of more than 12 km | 1,200 km |
| Total cycle routes of more than 80 km     | 4,657 km |

### 3.5. Local regulations

All contracting authorities with competency as regards transportation are equipped with regulatory and technical tools in the form of books, guides and technical sheets : these documents have greater legal weight than a simple recommendation where they are adopted through a deliberation published in the records of administrative acts. They serve as technical reference documents for organising the fieldwork of the various partners. Their content is sometimes more restrictive than the national recommendations.

In 2003, according to a survey undertaken by the association of cycle-friendly "départements", around twenty county councils ("conseils généraux") had specific bodies and technical guides for implementing their cycle policy.

Several of them followed safety improvement policies for their departmental roads.

The Drôme, for example, planned in its PDASR, or departmental road safety action programme (programme départemental d'actions de sécurité routière) to create 1.50 m-wide cycle lanes on roads where the traffic exceeds 1500 vehicles/day or even to separate the cycle traffic from the road traffic on the major roundabouts (cf. § 9.3.3.).

## 3.6. National technical recommendations

### 3.6.1. The directive relating to the consideration of cyclists in road improvements on the national road network [Instruction relative à la prise en compte des cyclistes dans les aménagements de voirie sur le réseau routier national]

This text of 31 October 2002 states that even if the national road network, in which the largest volumes of motor traffic are concentrated, is not intended to cater for the majority of cyclists, these cyclists are nevertheless required to use it, particularly when entering or leaving a town or in order to join a cycle route. In all cases, it is for the representatives of the State to comply, in the urban environment, with Article L.228-2 of the environment code and to support the initiatives of local authorities everywhere.

*«In particular, where interfaces between the national network and the cycle routes reveal conflicts of use or where there are particular risks due to junction crossings or the use of a section of national road, the State must actively participate in seeking appropriate solutions. Depending on the circumstances, this may involve making improvements to the national network or trying to find alternative solutions to facilitate the connection to other less busy but sufficiently attractive routes».*

A circular signed by the director for roads in August 2004 defines the implementing procedures for this directive.

### 3.6.2. Recommendations on improving principal roads

On the national road network, the technical recommendations in force are for the most part contained in two documents :

- circular on main road development [Circulaire sur l'aménagement des routes principales], known as «ARP» (1994 - bibliography 2) ;

- technical guide on interurban at-grade junction layout [Guide technique sur l'aménagement des carrefours plans en milieu interurbain], known as «ACI» (1998 – bibliography 3).

These recommendations concern all users, including cyclists, and are binding on the national road network. They serve as references for the other networks and all road managers can draw considerable guidance from them.

Even though it is not always explicit from reading these documents, the ARP and the ACI consider the possible presence of cyclists in their recommendations. It is therefore appropriate to continue to apply all their recommendations. The objective of this work is to show the extent to which the provisions of the ARP and the ACI do not contradict the needs of cyclists, how they improve their safety and what values are to be used to size works in way that is compatible with a regular or expected presence of cyclists (bibliography 21).

### 3.6.3. Other texts of national scope

Other documents take cyclists' requirements into account :

- *Recommendations for cycle paths* : this deals mainly with urban and periurban environments and tackles the interurban environment to a very limited extent (2000 – bibliography 23) ;
- *Safety of roads and «SPR»-rated streets* : this is not a recommendation or a guide but rather a technical information document covering infrastructure safety knowledge. It devotes one chapter to the needs of cyclists (1992 – bibliography 5) ;
- *Facilities for interurban roads* : a technical guide relating to road facilities in general, which includes brief details of signage for cycle facilities (1998 – bibliography 4) ;
- *Signage for improvements and for cycle routes* : this points out the cyclist-related content of the interministerial directive on road signage ; it illustrates the main situations that may be encountered in the field and covers the elements of the directional signage standard (2004 – bibliography 24) ;
- *Treatment of lateral obstacles* : a technical guide giving details on the technical recommendations relating to the recovery area and the safety area (2002 – bibliography 9).

The technical guides published since 1999 by the association of cycle-friendly "départments" also represent an important bibliography for the design of cycle routes on the interurban departmental network and for promoting these facilities for tourism purposes. One file is a particularly useful tool for any contracting authority (bibliography 25).

The «safe cycle facilities charter» [Charte pour les aménagements sécuritaires cyclables] (bibliography 26), published in December 2003 by the French cyclotourism federation presents, in summary form and with copious illustrations, the desires of users for facilities that meet their cycling needs and their experience in the safest way possible. Some of the claims contained in this work do not conform to the legislation in force (non-standard signs, for example) but the aim of this charter, of unquestionable educational quality, is to encourage authorities to become better at integrating the presence of cyclists into their road networks and at visualising this presence in areas where there is conflict of use.

P A R T     T W O

# Designing a cycle network

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The notion of a cycle network alludes to the notion of a route and subsequently the principle of continuity. Criticism levelled at project owners usually deplores the fact that they are piecemeal facilities. That being said, it takes time to construct a network because it takes form at the same time as urban planning or roadway upgrading operations and is dependent on land availability. It is essential that planning and programming tools are set up to manage both continuity and coherence, primarily in those localities where more than one administrative authority has a say in matters. However, continuity does not imply that facilities are all the same.

# 4 Defining the routes that will make up the network

## 4.1. The notion of a route

*Route : the definition given in the Petit Robert dictionary is "the course to be travelled between one place and another".*

Cycle routes first appeared in an act (art. 20 of the LAURE Act - see § 3.2) to meet to cyclists' mobility needs. A good route juggles five criteria : it must be safe, coherent, have no futile detours, be attractive and comfortable. Cyclists select their routes on the basis of their reason for travelling - utility or pleasure - and their cycling proficiency - seasoned or otherwise.

### ■ Cycle route and cycle path must not be considered to mean the same thing

Creating a cycle route is not meant to cater solely for existing cycle traffic ; it must enlist new enthusiasts and satisfy the potential demand, that like cycle uses, is mushrooming. Cyclists prefer to steer clear of the main arterial roads. They seek out routes that are pleasant and safe, that offer them signposting continuity rather than standardized facilities. Expectations differ between those who go on short-distance jaunts and those who travel long distances at a steady pace, between racing bike owners and mountain bike or hybrid all-road bike enthusiasts (see § 1.3.).

The choice of whether to provide a reserved lane cycle facility or mix cycle traffic with motorised vehicles on a cycle route is not only the most important phase, it is also the most sensitive phase. The route will often comprise an expedient combination of different types of facility and local roadways with low or moderate traffic flows in line with the constraints and opportunities offered by the sites it crosses.

Complementary facilities can be proposed on a single section of the route to meet the diversity of demands : hardstrips on the main route and running parallel, a signposted path or route on roads that carry lighter traffic.

## 4.2. Active and passive safety

Safety and risk management are governed by the subjective perception of what danger is, over and above objective driving conditions (road surface, obstacles, visibility, etc.). Relations between the route's users are the key issue. Swiss planners distinguish **passive** from **active safety** in their interpretation of the subject.

The **passive safety** notion prevailed when the first facilities were created for cyclists. If one takes the view that the bicycle is a vulnerable mode requiring protection from other vehicles, this principle leads to the systematic segregation of cycle traffic in time and space - separated cycle paths, intersections with special signalling, etc. But while there are grounds for this principle in specific situations where great speed differentials apply, in main thoroughfares that have no escape lanes, for example, it leads to cyclists and other users into being caught off their guard :

- **the perception of gratuitous safety increases risk-taking** : motorists drive at higher speeds when cycles are on a path and thus out of the main traffic flow ; cyclists on a separate path cycle faster and are less attentive than those riding on a cycle lane ;
- **conflicts increase at the end of the safe facilities when over-confident**, distracted cyclists and motorists merge (see the results of many European studies on cyclists' safety).

The notion of **active safety** describes a behavioural and intervention model in which common accountability and reciprocal behavioural adjustment is encouraged. This model becomes all the more relevant as traffic speeds tend to approach each other. Facilities tend to be based on mixed traffic, while seeking to improve their conditions : cycle lanes which not only mark out the space for cyclists but make motorists more attentive, physical car speed retarders, and so on.



*On paths, alertness wanes, risk-taking increases (Cete Lyon)*



*Cyclists on a lane or shoulder, remain on their guard (FFCT S. Jackson)*

## 5 Planning the network over time and over the space

If the cycle network is to be constructed as and when the technical and land availability opportunities arise and at the same time as scheduled road works, whilst sticking to a reasonable, agreed timetable, it is vital to include it in the strategic planning documents.

The various elected representatives can draw on a number of instruments that they can pool :

- informal documents with or without contractual value (cycle charter, cycle master plan) ;
- documents drawn up applying a legally defined procedure and legal remit (territorial coherence schemes and urban planning schemes).

The Urban Transportation Plan (PDU) essentially applies to «urban» territory.

This tool is not the exclusive preserve of major conurbations as more and more communities with fewer than 100,000 inhabitants are voluntarily adopting their own PDU.

Even though this guide primarily covers inter-urban sectors, it is worth remembering that this programming tool can incorporate a scheme for linking the town centre with outlying districts or secondary centres as part of a conurbation's structuring cycle network.

### 5.1. Cycle charter and cycle master plan

«Cycle charter» is usually used to designate a document that expresses a common pro-cyclist policy, committing the signatory local authorities to concerted actions and pooling their financial, human and other resources. It is the local reference bylaw.

Sometimes a scheme of intent may be appended to the charter with or without an implementation schedule.

Alternatively, the scheme can be incorporated into a strategic planning document drawn up by the local authorities (urban transportation scheme, SCoT territorial coherence scheme, and so on).

Here we refer to this document by the term «cycle master plan». Regardless of the term used locally, it is important to have one document adopted by all the parties who will subsequently be stakeholders in the physical construction of the facilities.

This charter or plan may also be instigated by the Region, "Département", community or intercommunity body.

However, it is vital that master plans are complementary and consistent across the board, if the projects are to be a success at the various scales of territorial competence :

- at regional level, as part of national cycle routes plan implementation, commonly called the «national cycle routes and greenways plan», and also to ensure that routes are seamless between "départements" as they feed multimodal hubs and stations ;
- at the level of the "département", to identify cycle routes earmarked for daily use, tourism, sports or leisure that will link towns and conurbations across the whole department ;
- at community or intercommunity level, to weave a dense, unbroken network.

Even if they can be improved on, these plans lay the groundwork for developing the «think bicycle» mind-set needed for introducing the cycling element into town planning documents and the projects of various prime contractors.

## 5.2. Mobility policy in SCoT territorial coherence schemes

Drawing up a SCoT provides an opportunity for devising a «cycle master plan» at a relevant territorial scale. The SCoT may help in promoting the bicycle with a view to «sustainable mobility». For example, SCoTs may define the principles of a structuring cycle network without actually defining its route. They could aim at improving or strengthening cyclists' access to the major shopping, sports and leisure amenities, urbanised areas, strategic development or urban renewal sites without necessarily setting parking standards (in contrast to the PDU or PLU). Similarly, they underpin the aim to develop bicycle/public transport intermodality. SCoTs could also pinpoint natural spaces (riverbanks, canal banks, woodland, green strips) as suitable potential locations to ensure seamless cycling between centres or districts.

- **SCoTs can stipulate the principles of urban function diversity to shorten distances and thus encourage the use of bicycles**

SCoTs could list the development principles for urban fabric that exists, or is earmarked for renewal or creation. They could thus specify the processes for reducing the effects of breaks generated by infrastructures or natural elements (such as, the principle of a new pedestrian/cycle footbridge across a river).

- **The Scoping Document (DO) could define the main structuring lines of the territorial cycle networks, meshing and set cycle access goals for specific sites or major amenities**

If a cycle master plan has been filed by the "département" or conurbation authority or local district council, this information must be incorporated when drawing up the SCoT.

## 5.3. Mobility policy in local urban planning schemes

Drawing up a PLU is an opportunity for gearing community organisation to proximity modes, by curbing the dispersal of activities and urban sprawl. As it is tied to supra-community documents to which it is subordinate (the DTA territorial planning directive, SCoT territorial coherence scheme, PDU urban transportation scheme and PLH local habitat agenda), the PLU will contribute to their implementation. For example, the PLU will identify the localities where bicycle travel is difficult, such as housing estates with «loop» roadway systems, outlying sectors isolated by natural breaks (rivers, hills) or infrastructures (major thoroughfares, railway lines) to find suitable solutions to make alternative travel modes a real possibility.

The PLU could specify the cycle network itinerary that complements public transport, to ensure that residential sectors enjoy good access to structuring amenities (hospitals, educational establishments and universities, etc.), services and existing and future employment centres. Accessibility to employment districts via the cycle network should be examined for the conurbation and its outlying areas.

Special attention will be paid to cycle and public transport pairing, by examining cycle routes that could feed the main public transport lines and interchange hubs : the appeal of the transport network would be considerably enhanced for a wider audience.

Establishing links to leisure amenities and tourists sites with suitable cycle facilities would enable dispossessed land to be improved, a district to be restructured on the basis of meshing conducive to proximity exchanges. Disused railway lines and riverbanks or canal towpaths redeveloped for alternative travel would make for direct, level entry routes into towns.

Encouraging cycling will be to no avail if the effort stops once cycle routes are created without providing suitable parking facilities on public

spaces, in front of shops, for short-term stops and long-term parking facilities in dwellings and in the workplace.

#### ■ The PLU could define the cycle network layout and goals for parking

Links for daily use should be attractive, safe, free of detours and comfortable. Outlying hubs that induce to-and-fro travel should be easy to access within a 3-5 km radius. The PLU could specify what treatment should be given to roads and public spaces affected by the route. It could make recommendations for public and private space parking standards (art. 12) : there could be variants depending on the type of dwelling, education establishment, company, and so on. If the department or conurbation has an approved cycle master plan, this information should be added to the PLU to supplement the cycle routes of local interest.

#### ■ The PLU could indicate the locations set aside to ensure the routes are seamless

The point of incorporating them into planning documents is to use the set aside appropriation procedure and make the project enforceable if a building application or housing development application is filed. Article R.332-15 of the town planning code defines the conditions for free cession : the latter is possible when a building permit or land subdivision application is filed, excluding farm buildings, and cannot exceed 10 % of the total land surface involved.

### 5.4. All planning bodies have the same challenge – to ensure that the cycle network is seamless and coherent

Network coherence must be a guiding discussion thread whatever the scale of operation, regardless of how many communities are involved. A user does not necessarily reside on a structuring route : (s)he must start by joining it. It may be a simple trip to buy bread from the baker.

Defining a cycle network at a given geographical or administrative scale calls for giving thought to a larger catchment to examine the upstream and downstream connections : unfortunately a route entering a municipality by a path remaining unconnected to the path provided by this municipality is no exception to the rule

Thinking about network seamlessness to link two centres is essential, but should not push the needs of lateral travel off the route in question into oblivion.

There are three usual types of break (bibliography 22) :

- linear breaks due to major infrastructures – motorways, expressways, railway lines ;
- breaks caused by major industrial, shopping or railway (marshalling yard) land developments, specific green spaces (parks that ban cycles, cemeteries) ;
- natural breaks caused by contours and watercourses.

It is vital to identify the «black spots» that get in the way of seamless routes when strategic land-use planning discussions are underway, to design a meshed, attractive and coherent cycle network. The opposite holds true. When major infrastructure or superstructure developments are being constructed, it is crucial to make allowance for existing or planned cycle routes, and parking needs by the same token.



*The road project has totally ignored the presence of cyclists (F. Tortel)*

# The methodical design of cycle networks 6

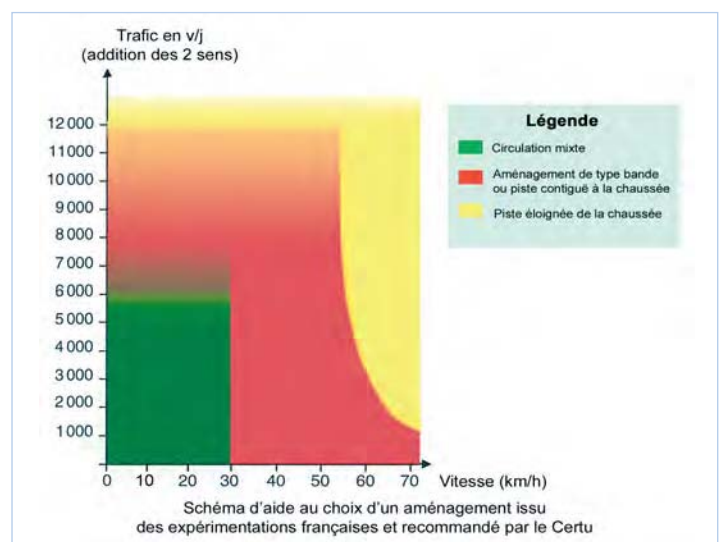
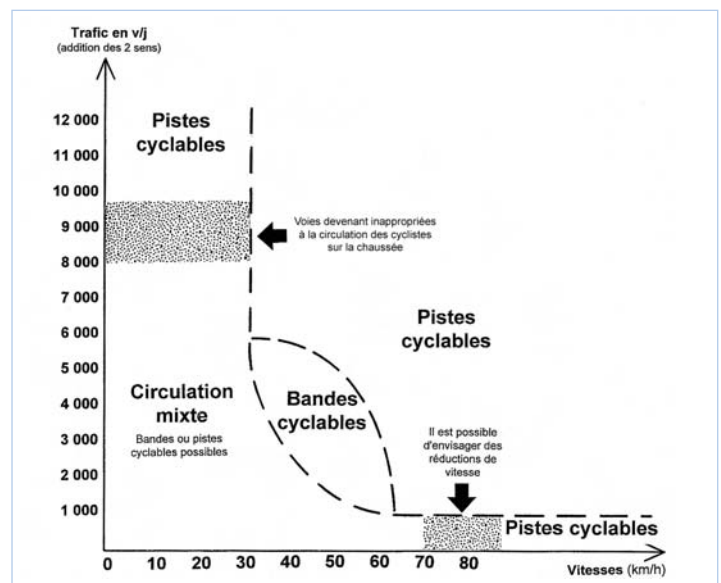
Cyclists' interests will conflict with other interests as do any other facilities planning project : those of other motorised or non-motorised public space users, those of residents, road managers, operators of the spaces in question... The only way of achieving consensus is by adopting a method based on a step-by-step approach, that is, one that incorporates approval phases. Approving a study phase and drawing up the framework for the following phase provides opportunities for discussion and negotiation that eventually ensure that the operation is a success.

Each of the stakeholders must be fully familiar with the terms of the facility construction and the rules for sharing these spaces with the other users. The usefulness of setting up a programme over several years is justified by the need to match the facilities offer with the potential or expressed demand. Land-use management is decisive in the same way as it is for roads, even if a small footprint is required for cycle facilities by comparison with other road facilities.

## 6.1. Adopting a multicriteria analysis method

Planners would like to have a set of infallible standards and technical criteria for determining which is the most apt cycling facility, as they would for road planning. **There is no universal panacea, no absolute rule** that immediately selects the cycling facility based on hard and fast criteria. All possible variants in the scope of the study must be examined and compared in a multicriteria analysis : safety, comfort, footprint, cost, future ease of upkeep, and so forth. Thus the technical choice of a solution, for example between a two-way path or cycle lane, will more often than not depend on the conditions at the ends of the facilities where cyclists merge with the traffic and will depend on site constraints.

Now the various schemes found for help in choosing a cycle facility in technical literature only give hints about the normal section and are more suitable for the urban environments as they are expressed merely in terms of the traffic and the speed of motorised vehicles. They cannot be transposed as they stand to the open countryside and French outer suburban zones that present a broad array of different densities and environments.



*There is no scheme that covers inter-urban issues satisfactorily*

Many counterexamples prove that the most apt solution can only be defined by a making specific in-depth analysis of each specific situation :

- cycle lanes along roads carrying heavy traffic (~15000-20000 VPD) in the Basle and Geneva cantons ;
- cycle lanes along the RD 424 road between Sélestat and Marckolsheim (Lower Rhine) carrying 9000 VPD because cycle paths cannot be created in flood zones and nature reserves ;
- 30-kph restriction zone on roads carrying heavy traffic, on the way out of the conurbation (Chambéry-le-Haut, Montélimar, etc.) ;
- etc.

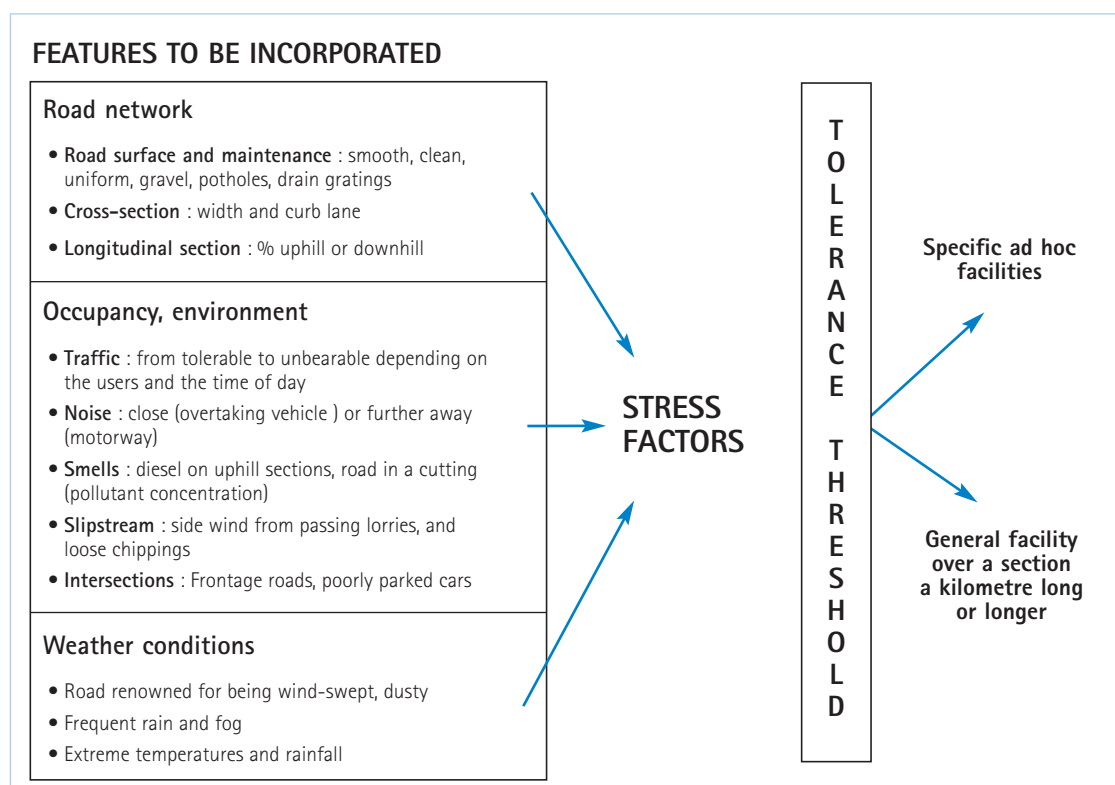
The «motorised vehicular traffic» criterion can give rise to situations interpreted in many different ways. This is because cyclists already consider 60 vehicles per hour on a steep hill to be heavy traffic, especially if the road is narrow. In contrast, cyclists may view 600 vehicles per hour (ten times more) as bearable traffic along a wide, flat route.

Traffic counts in both directions of travel need to be firmed up and assigned to their particular sections of relevance :

- daily use, identify the weekday time slots  
7-9 a.m., 12-2 p.m., 4-6 p.m. ;
- recreational cycling, Saturdays, Sundays and public holidays, hour by hour in both directions.

### ■ When and where should facilities be provided ?

There is no decisive factor that makes stipulating one facility in preference to another infallible. The range of tools does not boil down to a simplistic «lane or path» option : for example, the authority invested with police powers can, if it likes, enact a bylaw putting a weekend ban on motorised traffic along certain rarely used roads or roads that serve tourist spots with alternative access routes. That explains why only a question-and-answer based method provides the best approach to needs definition.



The features that should be incorporated comprise the **road network**, its **occupancy**, **environment** and **climate factors** - the latter are hard to influence but they can aggravate matters. As cyclists are not protected by an enclosure, they experience some of these features as stress factors that force them into applying additional muscular effort, or increasing their attention. A subjective «**tolerance threshold**» notion could be determined by experience, leading to case-dependent instances of one-off facilities to relieve a particular point or total facility over one kilometre or more (see adjacent diagram). Additionally, involving more and more cyclist-designers, draughtsmen and construction workers is highly recommended.

## 6.2. Structuring the process

### ■ Defining the order

As the table on page 35 describes, the process is kicked off by the prime contractor's decision to set up a cycle-friendly mobility policy. This decision must include a definition of the general aims, but also stipulate the more specific grounds that have led the local authority to embark on this discussion process. This eventually leads to :

- more accurate pinpointing of the various constraints or conflicts in use ;
- detailing the qualitative and quantitative goals ;
- defining the priorities when drawing up operations schedules.

It is recommended that a **project leader** be assigned from the outset to supervise the process and coordinate the various parties involved : institutions – the local elected representatives and their technical services, the Prefect and his services, the State departmental (DDE, DDAF, etc.) and regional administrations, the public establishments (French waterways, National Forestry Commission, etc.), the chambers of commerce and industry, the road managers and network concession holders, private project owners –, associations – local cycling associations and also public life representatives and inhabitants in general. Each is an essential link for finding out about related projects and integrating

them into the decision-making process. Even if by the nature of things forecasts are random, long-term considerations will be the order of the day.

The project leader, who will be in place from the initial goals definition stage to project implementation, will also be informed if he is not associated with any mobility project in the local authority. This is particularly useful for coherent actions, for instance for land-use, if town-planning falls within the remit of another department. Experience shows that making full allowance in planning for cyclists' mobility needs bears fruit in the end. Acquiring a «think bicycle» mindset is often more useful from this angle than the financial resources themselves.

### ■ Identifying and analysing problems

A facility's service level must match the importance of the link. Points requiring action are ranked in order of priority. Routing variants can be sought during this phase to improve cycling conditions, primarily taking on board facility constraints and costs. This may lead to odd amendments to the initial project or the phasing of construction work : a temporary solution pending a wider-ranging full project where other opportunities come into play.

### ■ Drawing up the operations schedule

The MOP Act of July 1985 on public procurement contracts and its connections with private owners, obliges the contract owner to define and approve a schedule.

Facilities cost assessment and budget-planning implementation are used to set the annual target for the programme on the basis of identified resources and priorities. The cost-effectiveness of the infrastructure works is generally determined from the cost of facilities works in relation to the number of users who will benefit by it. Various parameters are taken into account in a multicriteria analysis with weightings (comfort, safety, appeal, costs, etc.) if necessary. It is essential to add into the equation all the savings that the local authority will make in terms of financial commitment with the bicycle : fewer car trips, means less impervious road

surfaces for traffic or parking, fewer serious accidents, etc. Even if they are hard to quantify, this data must guide and clarify the decision-making. Project owners who adopt a cycle mindset must also immediately enlist the relevant maintenance services (DDE, Park, local authority or private firms) : grass verge mowing and levelling, ditch cleaning and surveillance, clearing away sand and gravel after heavy rain – all that costs money.

Infrastructure improvements are not the only means of helping cyclists travel. Additional initiatives are needed to improve the safety and appeal of routes :

- limiting the maximum authorised speed of motorised vehicles ;
- redistributing traffic lanes ;
- regular road surface cleaning and maintenance ;
- providing preferably sheltered bike garages, near specific sites.

#### ■ Consultation and communication

This includes checking that the project matches requirements or the uses identified during the diagnosis phase with the institutional partners, chamber of commerce members, user representative and future users.

#### ■ Operations performance by the contractors

However well a project is designed, it will not match all expectations fully unless it is executed with care. Not enough emphasis can be placed on how important it is to ensure that the camber is designed so that rainwater does not collect on cycle lanes or paths, drain gratings must be oriented perpendicular to the kerb so that they do not trap bicycle wheels, kerb heights must be designed so that cyclists do not knock them with their pedals, there must be no high ridges to negotiate at facility entrances and exits, posts and shrubs must be planted so that they do not obstruct visibility, etc. Developing a cycling culture in project owners' mindsets is vital.

#### ■ Cycle network assessment

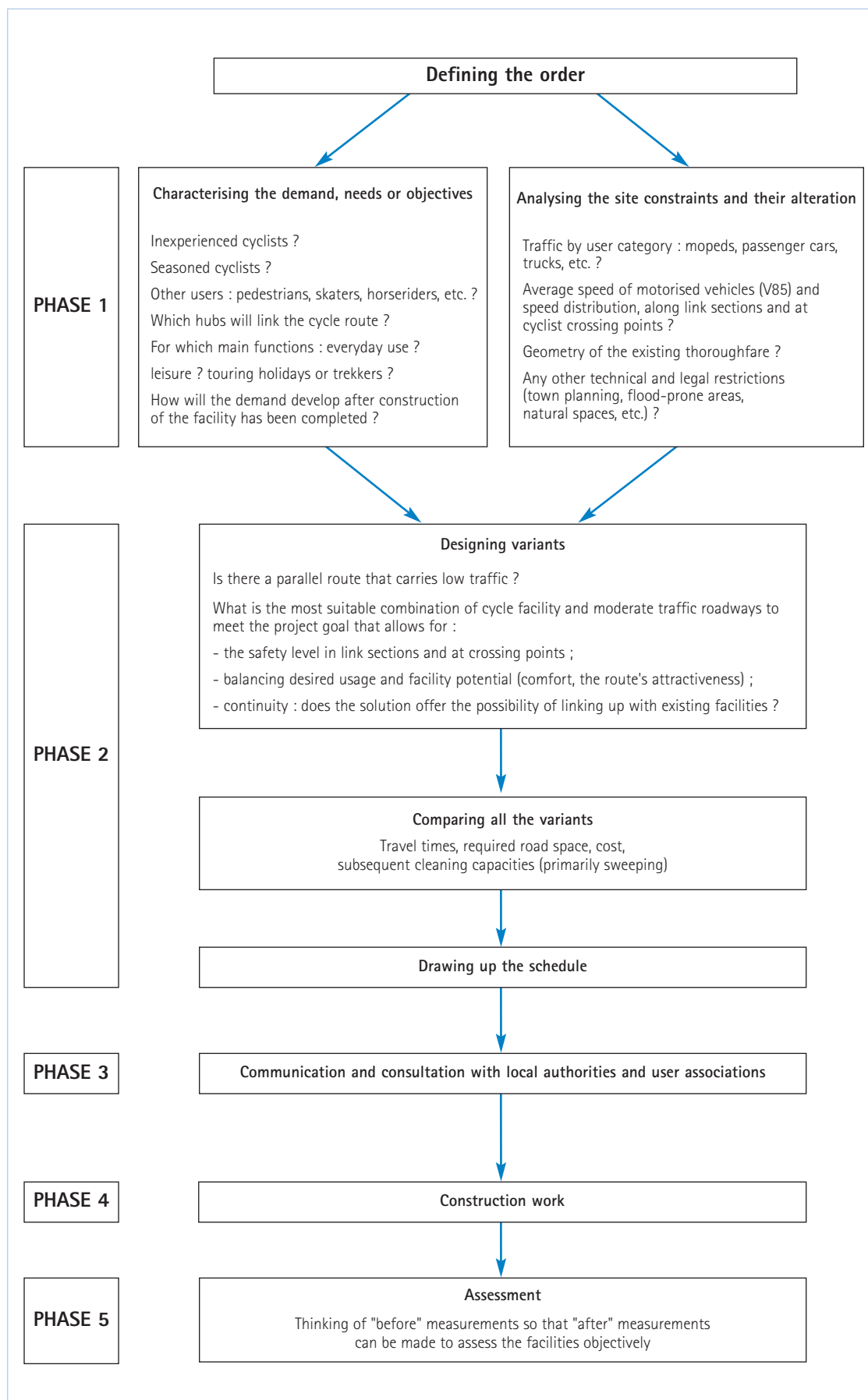
Apart from post-completion spot-checks to verify that they are effective, 5-year checks should be made to ensure that the cycle network still matches cyclists' mobility needs and the general goals sought. Urban development may have altered driving conditions or the traffic-generating centres. This may lead to proposing amendments or additional facilities.

##### The concept of the complete route

The American League of Bicyclists promotes the concept of the complete route to express the gaps in current provisions in the clearest terms to their political and technical counterparts : by definition, an ordinary road should take all users into account. However, many roads have no dedicated space for pedestrians in particular and where cyclists feel unsafe. These roads do not fulfil their mission : thus they are incomplete. Another view on the road network can be posited through this type of approach together with the level of service to be assessed in the interests of all users, not merely one single category.

#### ■ Summary chart

The process is the same as for a conventional road project. The toughest constraints for cyclists' safety are at the points where they meet other users (intersections, merging at the ends of facilities, etc.). Thus the facility should be defined along link sections on the basis of the measures to be adopted at these conflict points. It should not be forgotten that the search for facility solutions must be preceded by the accident risk reduction (if not elimination) approach. This approach is basically founded on limiting or controlling speed.



## 7 Parking and intermodality should not be overlooked

A person purchasing a car knows that all over the country there will be ample provision of :

- roads with different levels of service, giving free choice to use a very fast network (motorways) or a slower network made up of national highways, trunk roads and local roads ;
- pleasant, practical lay-bys ;
- filling stations and repair workshops ;
- facilities for simple transfer from one's car to another mode of transport, the train, tram or plane, or simply from the garage to the lift ;
- and even driving schools for learning how to drive.

Clearly cyclists have no chance of running out of petrol, but as for the remainder, intermeshed road networks, accessible parking, transfer to another transport mode, light repair services – finding similar services to those laid on for motorists is a pipe dream. When will there be a bike system along the lines of the car system ?

### 7.1. Parking

No planner would ever dream of planning a road system without thinking about provision for car parking. It is part and parcel of the project. Motorway car parks are not organised like airport car parks, and residential car parks have nothing in common with shopping centre car parks. In the provision of cycle routes, parking does not appear to be a stock item – as if a different "département" or authority were responsible for it – and what is technically offered matches expectations only now and again.

Proximity, visibility, and security (safety ?) are criteria that should be given different treatment depending on whether the bike park is located near a railway station, college, beach or greenway. These different expectations tend to be expressed in

terms of parking time : short-, medium- or long-term (bibliography 23). It is up to each developer to find the solution that matches each situation.



*Sheffield stands are to be preferred over all other cycle hoop systems (ST Lorient)*



*Combining visibility, proximity and easy access (Certu)*

### 7.2. Intermodality

Cyclists, like hikers, may wish to cover part of their journey by some other mode of transport : leaving the car in a car park is often the easy way out when going on a round trip before returning to the point of departure and back to the car. Not all routes are suitable as circuits.

It may be nice to travel part of the way by public transport : train, coach or boat. Local authorities and transport companies are increasingly innovating, much to the delight of their subjects or customers. Bicycles can be carried in many regional express trains (TER), and a special bicycle reservation guarantees carriage by high-speed train (TGV). Coaches can generally carry bicycles in their luggage holds. Cycles even have their own special place provided inside the coaches themselves at La Rochelle and Annecy.



*Cycle feeder to the park-and-ride station (Certu)*



*Transport in or at the back of the bus in the tourist area (ST La Rochelle)*

P A R T   T H R E E

# The toolkit

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A cycle route is a discerning combination of successive facilities : hardstrips, lanes, paths and greenways. The project owner with the relevant authority, the available space and the existing or expected cyclists must arrive at a design. Therefore, how cyclists are taken into account at intersections is decisive when choosing the facilities offered along link sections.

## 8 Link section facilities

Outside conurbations, namely beyond the town entry and exit signs (EB 10 and EB 20), over 70 % of accidents involving cyclists occur away from intersections and over 60 % on roads over 6 metres wide (bibliography 3). That does not mean that cyclists should be prohibited from riding on certain arterial roads, as the main routes are often the most direct links between two population centres. However simple, legible road developments should be made for the benefit of all users and provide suitable facilities for the types of cyclists likely to ride along them, on sections of the routes where a particular danger has been identified.

The characteristic geometry of link sections comprises :

- the horizontal alignment : made up of bends and alignments ;
- the vertical alignment : that plots the vertical grade differences, up- and downhill users will come across while riding ;
- the cross-section : that describes the road width element and differentiates between carriageways and shoulders. Carriageway width is generally an indication of the traffic level : the more lanes there are (2.6 m – the width of an HGV – to 3.5 m gauge), the higher the road category.

### 8.1. Horizontal and vertical alignment recommendations

The recommendations made in this document cover future roads and improvements to existing roads where programmed. vertical or horizontal alignment facilities are expensive as they involve land purchases (that often have long acquisition

times) and heavy earthworks. In the interim, special signs warn users of upcoming sharp bends and steep slopes.

Some motorists, regardless of how sharp the bends are, move out into the centre of the carriageway to iron out the bends... cyclists often do the same, especially on hills. While the behaviour is similar, so are the development solutions : technical guides corresponding to the road type (the ARP for main roads, with its rules on visibility, bend sequences, the ratio between the bend and length of previous alignment) apply to all the improvements and their recommendations promote good general safety all road users be they cyclists or otherwise.

All pedestrian and bike trekkers know that hills bring additional difficulties their way : some actually seek them out, but many are ready to make a detour to avoid them. By way of illustration, the Eurovelo programme specifications, that define the recommendations framework for cycle route construction on a European scale, stipulates that :

- slopes with a gradient of over 3 % must be marked on maps and in guide books ;
- those with gradients of over 6 % should be avoided on long-distance rides ;
- tolerance is about 10 % in mountainous areas.

These recommendations are suitable for family users of greenways and roller-bladers. These routes must remain optional, leaving cyclists the possibility of riding along other roads or arteries. The ideal is to offer different itineraries linking two destinations together : one will be more direct, on the existing road for racing cyclists ; the other, more segregated from the general traffic, using a disused railway track or a slightly longer but more protected route for adolescents, older riders and family parties.

## 8.2. Recommendations for cross-sections

The French Highway Code does not set any minimum or maximum road width. The width will depend on vehicle clearances that are for their part regulated : in 2005, maximum HGV width is 2.6 m excluding rear-view mirrors. The cross-section offers an image of the roadway : motorists will behave differently on narrow roads and wide roads, and the difference is even greater on one-way carriageways. Cyclists are more vulnerable on wide roads if the traffic is heavier and driving speeds higher. In such cases, car drivers make poorer safety distance assessments when overtaking cyclists. Cyclists may resort to hardstrips on these major arterial roads to distance themselves from danger, but the most popular solution is a path running parallel to the roadway.

Narrow roads neither have centreline road marking nor shoulders. Accidents on narrow roads involving cyclists are rare and tend to be less serious than on major arteries (see § 2). It is these so-called «quiet» roads that are particularly popular with walkers and trekkers on foot, bicycle or even horseback, when they carry little traffic. But when car drivers very familiar with the locality drive fast, cyclists may feel vulnerable.

As this has already been discussed at length (see § 6.1), the choice of cross-section on link sections depends on many criteria, the two most important being :

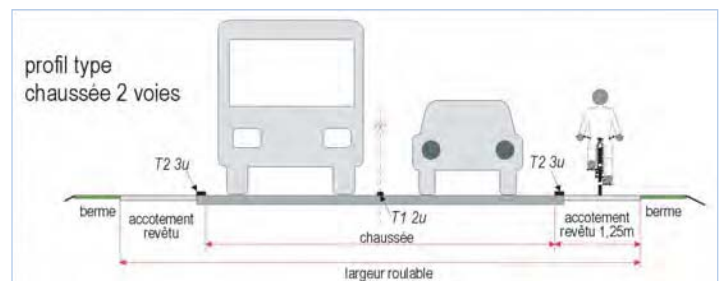
- the user type ;
- the type of intersections found, since many of the difficulties arise from bad connections between link sections and intersections.

There are three possible options :

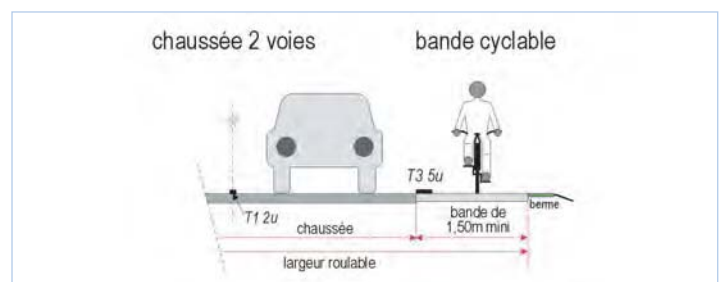
- **«coexistence»** entails leaving cyclists in the general traffic flow. This is the most commonly-found option as bicycles are vehicles (article R.311-1 of the French Highway Code) and all the ordinary roads are by definition open to them. A hardstrip is not a cycle facility : however, cyclists have been authorised to ride on them since article R.431-9 of the French Highway Code was amended in March 2003 ;

- **«traffic segregation on the same carriageway»** : marking out a cycle lane on a carriageway offers cyclists cycling space specifically set aside for them ;
- the **«reserved lane»** : creating cycle paths or greenways physically takes cyclists out of the general traffic flow making them ride parallel to the main roadway or along another route. But attention must be paid to road crossings and path ends as they are often conflict points for cyclists. Furthermore, creating cycle paths or greenways parallel to a road does not exempt road managers from ensuring that the many cyclists who will stay on the road are safe, in the same way as safety must be provided for the other users.

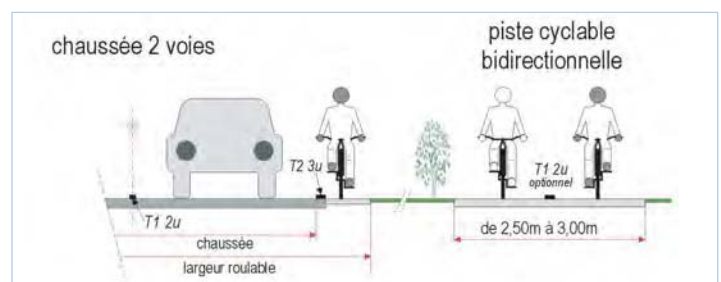
The acceptance and popularity of these three principles depends on the cyclist's category and their personal cycling experience and practice.



Shoulder profile



Lane profile



Path profile

### 8.2.1. How cycles and motorised vehicles coexist

As bicycles are classified as «vehicles» by the French Highway Code (article R.412-7), they can be driven along all roads except motorways and expressways.

This principle of coexistence – that some refer to as «shared road» – between bicycles and motorised vehicles effectively applies to all ordinary roads, without any special facilities or signage.

**Care must be taken to avoid misunderstanding :** «shared roads» are not only those that offer a signposted route for cyclists, they are **all** ordinary roads – only expressways and motorways are not «shared roads».

Most of the time seasoned cyclists mingle with the general traffic. In certain cases, however, they prefer to use more appropriate facilities. A hardstrip is not a cycling facility but is a first potential step towards improving cyclists' comfort and safety.

#### ■ Definition of a hardstrip

When a shoulder is surfaced, it can accommodate all users, motorised or otherwise, for various reasons :

- to enable vehicles to make emergency stops ;
- to enable pedestrians and cyclists wishing to, to use it ;

- to enable vehicles deviating from their normal course of travel to be recovered. It is in this sense that it can be qualified as «recovery area» ;
- to enable vehicles to avoid pile-ups by authorising emergency manoeuvres to the side on the shoulder (such as collisions due to left-hand turns or overtaking) ;
- make it easier to clean the carriageway and its appurtenances.

#### ■ Choosing a width suitable for bicycle traffic

The recovery area recommended by the ARP is an opportunity to offer cyclists riding space away from the traffic. The ARP sets the shoulder width in line with the carriageway width. The following table, taken from the ARP, lists the minimum recommended widths : the most favourable width, that is 1.5 m (high range) will be kept, wherever possible for carriageway widths of 6 m or over.

#### ■ Choosing a surface suitable for bicycle traffic

Shoulders are generally stabilised but not necessarily surfaced. When project owners decide to provide hardstrips for bicycle riding, they select a surface that will offer cyclists a long-lasting comfortable ride. In practice, this amounts to selecting a surface of the same quality as the rest of the carriageway. Project owners must undertake to provide more regular cleaning than for a shoulder unsuitable for cycling. All obstacles (overhangingsigns, etc.) must be removed both on the surfaced part and in the immediate vicinity.

| Available width              | Maximum roadway width | Minimum width of lower lanes |
|------------------------------|-----------------------|------------------------------|
| 7 — 7.5 m (difficult relief) | 5.5 m                 | 2 x 0.75 m — 1 m             |
| 8 m                          | 6 m                   | 2 x 1 m                      |
| 8.50 m                       | 6 m                   | 2 x 1.25 m                   |
| 9 m                          | 6 m                   | 2 x 1.50 m                   |
| 9.50 m                       | 6.5 m                 | 2 x 1.50m                    |
| 10 m                         | 7 m                   | 2 x 1.50 m                   |



*A shoulder with a good surface does the job well in many cases (CG67)*

### ■ Surface or solid colouring of shoulders

The distinction between the carriageway earmarked for use by cars and the shoulder, especially when it is surfaced, is made by the statutory marking of an edge line. The ARP recommends emphasising this distinction by colouring shoulders or using a different aggregate. The perception of carriageway limits is improved by accentuating the contrast between the two spaces and thus improves legibility. Furthermore, better landscape blending is achieved by narrower bands of black asphalt.

Road managers often discuss painting the hardstrip green. The inter-ministerial circular of 15.05.96 relating to the use of colour on the road sets out the following guidelines :

- the regulations must be strictly observed to avoid reducing its value or leading to confusion ;
- the facility should be analysed in its context : any decision on colouring must incorporate the issue of absence of colouring in similar facilities especially when they are nearby (if there are «coloured» hardstrips on a route, is this also true of the routes that cross it ?) ;
- continuity of surface requirements, primarily, road holding and uniformity.

This same circular reserves green for cycle facilities while indicating that the colour is optional. This means that the colour backs up the statutory marking but does not replace it. Limiting its use to specific zones such as car park or filling station exits at city outskirts, complex intersections and dangerous bends reinforces the warning message given to users. In the light of the above comments, hardstrips should never be solid green because they are **multipurpose** in essence. The circular suggests toned-down colours (light or dark backgrounds) such as pink, brown, brick, sand or ochre.



*Colouring optically narrows the carriageway width (Certu)*

### ■ No signs as a rule

According to the regulations, hardstrips have no vertical signs or specific road markings. Nonetheless, a number of French "départements" have green figures marked at regular intervals to remind users that cyclists are possibly using this space. The pictogram, generally exclusively used with a cycle lane, may sow doubts or confusion about hardstrip status : motorists and cyclists who are puzzled when the marking is abruptly stopped, or by its absence on other similar hardstrips on neighbouring roads, will certainly look for an explanation that could lead to taking hardstrips and cycle lanes to be one and the same thing.

### How the French “départements” handle the issue of hardstrips

In 2003, the Association des Départements cyclables («cycle facility» working party) conducted a survey of trunk road hardstrips.

The lengths of equipped roads vary considerably from “département” to “département” : less than ten kilometres for some of them (Isère and Yvelines), about twenty in the Aude and Lower-Rhine, almost 80 km in Maine-et-Loire, and so on. Bouches-du-Rhône holds the record with 600 km. They have different aims : making cycle travel easier along trunk roads (Bouches-du-Rhône and Maine-et-Loire) or are to provide for special features as in Isère (bend or steep incline) pending the development of cycle lanes.

The most commonly-found surface is black asphalt with neither any vertical signs or specific road markings. However Bouches-du-Rhône has opted for ochre-coloured surfacing.

The disadvantages mentioned by several “départements” are : soiling by farming machinery, miscellaneous debris left by careless users and gravel and broken glass swept to the sides by general traffic, that result in cyclists abandoning hardstrips. This observation underpins the need for these spaces to be regularly cleaned.

#### 8.2.2. Traffic segregation on a single carriageway

##### ■ Definition of a cycle lane

According to the French Highway code definition in article R.110-2, the term **cycle lane** used with reference to a *roadway comprising several lanes, designates the one that is reserved for use by bicycles or tricycles. Thus it is part and parcel of the carriageway.*

This definition implies that cycle lanes are by force one-way and marked on the carriageway in the direction of the general traffic flow. Its main strength is that it allocates a specifically dedicated space to cyclists.



*The Rhone “département” has opted for cycle lanes along its high-density touring cycle arteries (CG 69)*

##### ■ Cycle lane signage and colouring

The statutory white T3 5u marking is accompanied by a white figure depicting a cyclist. This marking may be supplemented by the colour green in areas that should be limited to the strict minimum to avoid any risk of skidding. The mandatory vertical sign is the C113 or B22 panel that indicate whether or not use of the facility is recommended or compulsory for cyclists.

##### ■ The criteria for choosing between hardstrips and cycle lanes

According to the regulations, since cycle lanes are defined as a carriageway path, they are not part of the safety zone measured from the carriageway edge. The ARP recommends a 4-m width for safety zones on existing routes. Motorists out of control of their vehicles will use cycle lanes in the same way as they will use hardstrips. Thus, in practice the effective safety zone is not reduced. The choice between a hardstrip and a cycle lane is not solely governed by the issue of cost or surcharge resulting primarily from the dimensional aspect of

carriageway structure, nor is it necessarily linked to a problem of site-specific land availability. First and foremost, this choice stems from road managers' stated willingness to encourage or discourage cyclists from using this route. Generally, this choice will be dictated by the existence or absence of other safer, more pleasant alternative routes, traffic density and driving speeds along the particular section, and the physical possibilities of equipping and eventually maintaining the facility. The preference of a hardstrip over a cycle lane should be determined on an individual case basis, depending on the route, its occupancy level, cross-section and usages, whilst bearing in mind that the continuity of routes does not necessarily imply the continuity of their component facilities. The upkeep of lanes and hardstrips is easier than cycle paths : road managers must be even more demanding about cycle lane upkeep quality than they are for hardstrips.

### Hardstrips suffice for most of the road network

Cyclists offered the possibility of riding on a hardstrip when they want to or consider it essential for safety reasons, gives seasoned cyclists comfort and considerable flexibility, especially when HGVs overtake them.

### Cycle lanes are preferable for some cyclists or specific points

However, in popular or up-and-coming cycle touring areas hardstrips are unsatisfactory. Preference will be given to consigning part of the shoulder to a cycle lane strictly set aside for cycle traffic. For example, it is preferable to provide links between a conurbation exit and the greenway with a cycle lane combined with a space earmarked primarily for pedestrians.

In special situations, choosing a cycle lane would seem more appropriate even if it is restricted to the danger zone : for example uphill along a narrow route or on a wide, winding road, and whenever road managers identify sections where the space given over to cyclists must be clearly marked to avoid any risk of conflict or dangerous manoeuvres

by motorised vehicles : poor visibility on bends, carriageway narrowing on the approach to particular points, etc. Bypasses are recommended on bends to avoid cyclists being hemmed in by other road users.



*Bypass : the cyclist is protected behind the separator (FFCT S. Jackson)*

The project owner should seize the opportunity of redesigning the cross-section. This is because when bilateral cycle lanes are built along a route outside the conurbation, traffic lane widths are reduced to 3.25 m, or even 3 m. There are two particularly interesting and immediate outcomes worth mentioning : 1) private car driving speeds are reduced, which is beneficial to overall road safety on a route and 2) the impact on the project's global savings. A mean saving of one metre of shoulder improvement can be made on a cross-section per linear metre of equipped roadway.

### The width required for cycling comfort

The Highway Code stipulates that a vehicle should not get closer than 1.5 m to a cyclist in the open countryside. «To overtake (a cyclist) the motorist must pull out sufficiently to eliminate the risk of hitting the user s/he wishes to overtake. Whatever happens, lateral clearance of no less than one metre must be given in conurbations and one and a half metres outside conurbations from all animal-drawn vehicles, two-or three-wheeled vehicles, pedestrians, horse-riders and animals» (art. R.414-4). The demarcation of a cycle lane or creation of a hardstrip to make cycling

easier must not lead drivers to flout this precautionary principle. Thus cycle lane and hardstrip widths of the order of 1.25-1.5 m are recommended, except at particular points where very occasionally a narrower width could be tolerated rather than abruptly interrupting the facility and continuity of the route in a recognised danger zone.



*Wouldn't it have been preferable to leave things as they were ? (FFCT J. Fournat)*

### ■ How particular points are handled

Logic has it that cycle lanes or hardstrips run either side of the roadway. However, if not enough land is available, the designer will have to question the advantage of making a single facility instead of two very narrow curb lanes. The topography, distribution of intersections and particular points along the route have to be borne in mind when deciding on which is the most apt side of the road to develop : it is advisable to give preference to the uphill direction as cyclists' efforts are greater and their speeds reduced, or another key alternative on the inside of a tight bend where vehicles tend to «clip» the shoulder to iron out the bend... Mountain routes tend to be equipped in this way with a hardstrip on the ascent. Many racing cyclists are very keen on attacking routes with steep hills : while their speed is reduced on the ascent by the effort made, their speed on the descent is often similar to that of other users.



*The lane turns into a path on ascending bends (FFCT)*

### Cycling policy in the Lower Rhine : a prime exponent of multicriteria analysis

Whenever possible the department of the Lower Rhine plumps for cycle lanes, sometimes even narrow lanes (1-1.2 m excluding marking), because this enables reserved spaces to be marked out for cycles and clearly demonstrates its political determination to give cyclists a space of their own. However, there are some twenty or so kilometres of hardstrips where special situations prevail :

- hardly 1 metre of space deemed insufficient for creating cycle lanes. *For example : RD 919 between Haguenau and Schweighouse (~8K VPD) ;*
- proximity of a greenway running parallel along a disused railway line, presence of heavy traffic with many HGVs on the trunk road and long bends enabling speeds to pick up despite limited visibility distances. Conclusion – no display of the cycle route and thus merely a 1.5 m wide hardstrip. *For example : the RD 422 between Molsheim and Marlenheim or the RD 263 between Haguenau and Surbourg (~12K-14K VPD) ;*
- hardstrips 1.5 m wide chosen because of parallel routes on minor roads, and high likelihood of tractor soiling in a mainly farming area. *For example : RD 419 between Brumath and Pfaffenhoffen (~4K-6K VPD) ;*

This "département" has decided not to differentiate between cycle lanes and hardstrips on the highway structure plan, at the new shoulders to be constructed. When traffic flow requirements justify upgrading, hardstrips can be fairly easily converted into cycle lanes at any time by using a traffic bylaw, signage and road markings.

### Summary of selection criteria : hardstrips and cycle lanes

|                             | Hardstrips                                                                                           | Cycle lane                                                                                                                                                  |
|-----------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Functions                   | Integral part of the shoulder                                                                        | Traffic lane allocated to cyclists                                                                                                                          |
| Traffic flow                | Driving authorised for cyclists ; pedestrians urged to use the hardstrip if it can be negotiated     | Cyclists and possibly moped riders if authorised ; pedestrians on the edge if the hardstrip cannot be walked on ; optional for cyclists (saving exceptions) |
| Emergency stop for vehicles | Tolerated                                                                                            | Tolerated                                                                                                                                                   |
| Parking                     | May be authorised when conditions apply (signage, marked bays)                                       | Not authorised                                                                                                                                              |
| Features                    |                                                                                                      |                                                                                                                                                             |
| Technical structure         | Not necessarily equivalent to the carriageway                                                        | Generally equivalent to the carriageway                                                                                                                     |
| Wearing course              | Wear as good as the carriageway but not necessarily of the same kind (primarily difference in shade) | Generally identical to that of the carriageway                                                                                                              |
| Width                       | 1.25-1.5 m surfaced (see ARP table § 8.2.1.2.)                                                       | 1.25-1.5 m                                                                                                                                                  |
| Signage                     | Nearside line T2 3u, nothing vertical                                                                | T3 5u road marking and vertical (C113 or B22a) signs                                                                                                        |
| Green                       | Not applicable                                                                                       | Possible (circular dated 15/6/1996)                                                                                                                         |
| Cleaning                    |                                                                                                      |                                                                                                                                                             |
| Cleaning, repairs           | May be less frequent and not as thorough as for the roadway                                          | Regular because it is a major user expectation                                                                                                              |



*A lane that is almost as comfortable as a path (non-statutory marking) (Cete NPC)*



*Hardstrips that easily convert into cycle lanes (CG 69)*

### 8.2.3. Reserved lane facilities

#### ■ Cycle paths

According to the French Highway code definition in article R.110-2, the term **cycle path** designates a *carriageway exclusively reserved for use by bicycles or tricycles*.

This facility is particularly suitable for long, even sections that need to be improved or when the preliminary study concludes that cyclists must be removed from the general traffic flow. There may be various reasons for this : the road has special status (motorway, expressway), safety reasons (heavy traffic, high speed), the need to provide for less seasoned cyclists (schoolchildren, families, etc.). There are two possible types of facility : paths that run parallel to a road carrying heavy traffic make for the shortest route and recreational paths, where comfort and appeal are the main issues.

The following discussion elements are more directed at the first instance. Recreational paths are covered in the paragraph about greenways.

It is becoming commonplace on the way out of conurbations to see wide trunk roads narrowing to two single lanes by the inclusion of a central reservation several hundred metres long and the installation of nearside lane boundaries. The laudable aim of slowing down motorists in the interests of better all-round safety of the artery must not lose sight of the fact that this type of facility endangers those cyclists riding along it. Some drivers, particularly truck drivers, tend to drive close to cyclists, «pushing» them along even though they have no possible escape route. The construction of parallel-running cycle paths is suitable for this type of configuration. They will have to be regularly maintained.

#### Segregating the path from the road

The path is physically segregated from the road either by an impassable separator or a grass strip. Segregation should not introduce a dangerous

obstacle for users, whoever they are. On the cyclists' side, a 0.5 m clearance should be provided from the obstacle when calculating the path width.



*Quite suitable if there are few intersections and a regular cleaning programme (Cete NPC)*

#### One-way or two-way ?

In contrast to the cycle lane, the path can be one- or two-way.

Every additional ten centimetres improves user comfort and makes overtaking easy. Two-way paths are space-saving where space is at a premium, as their width does not necessarily have to be twice that of a one-way path. They make for good seamless routes in zones where intersections are scarce.

On the outskirts of town, the many intersections and residents' entrances may result in a preference for a cycle lane type solution.

In inter-urban contexts, a path initially designed for one-way travel is frequently seen to be used indifferently in both directions by some regulars. Thus it is preferable to create two-way paths from the outset.

The designer must first and foremost check that visibility is good both ways for all users, motorised or otherwise, at path entrances/exits so that cyclists can be free to enter or leave them without danger. The presence of roundabouts at the ends makes this installation very much easier.

### Recommended widths

| Path    | Minimum width | Recommended width |
|---------|---------------|-------------------|
| One-way | 1.50 m        | 2 m               |
| Two-way | 2.50 m        | 3 m               |

These values make allowance for moving cyclists' clearance requirements. These values may be reduced over short distances for hard spots and major stresses. In certain situations, these widths may be increased : heavy cycle use, poor visibility on bends, etc.

### ■ Greenways

According to the French Highway code definition in article R.110-2, the term **greenway** is a route exclusively reserved for use by non-motorised vehicles, namely cyclists, pedestrians and similar : persons with reduced mobility, roller-bladers (see § 1.3.2. and 1.4.4.) as well as horse riders (see § 1.4.5.).

Horse-drawn vehicles are not admitted. The only motorised vehicles likely to drive along a greenway are : emergency rescue vehicles, maintenance and operating vehicles with onboard signals (revolving light, triangle) and moving maintenance vehicles, operators duly authorised by the waterways or forestry codes when the greenways are towpaths or forest paths. Residents cannot be forbidden access to their property if there is no option but to travel along the greenway. However if existing practices already lead to considerable motorised vehicle traffic, such as many anglers on the site, or if the surface of a path leads to parallel uses – such as serving a housing estate, unauthorised parking – it will be in the project owner's interest to desist from classifying these sections of the route as greenways but leave them as paths open for use by the public, for reasons of responsibility in the event of conflict.

The geometric and technical features of greenways are identified in relation to the characteristics of their expected use : presence or absence desired of roller-bladers, horse riders ; compatibility of a

stabilised or asphalt surface with the site's environmental constraints ; comfort and safety level for walking or riding several abreast, overtaking, passing each other, etc. This facility tends to be adopted for everyday use by schoolchildren or people living nearby, on sections near to population centres, although the greenway was initially designed for leisure use. A preliminary socio-economic study is needed to define these different usages and the constraints they engender.

The width range often recommended is **3–5 metres** excluding shoulders, where 5 metres is more appropriate close to the access car park or the nearest population centre because of the higher occupancy rate by all modes. But it is also important to offer pathways suited to each type of usage : joggers, horse riders, anglers walking to the river all have different expectations ; pathways that fan out from a shared artery and then come together again tend to be popular.

The concept of a greenway, a reserved site facility for all non-motorised persons, now for both the French and foreigners designates a high quality tourist facility, which does not mean uniformity.

Users of **cycle routes**, medium and long - distance route networks, are keen to rediscover a region through its landscape, flora and heritage. Greenways are one cycle route element, but not the only one : routes also follow roads with light traffic, cycle lanes, cycle paths, etc.



Separate pedestrian and cycle pathways (CG 69)

# 9 Intersections

Only a third of accidents involving cyclists outside conurbations occur at intersections. However, cyclists tend to associate their perceived insecurity closely with the way intersections function : the difficulty of crossing the roads, sliproads making breaks in the route at major intersections, etc.

## 9.1. Basic design principles

Intersections on ordinary roads that accommodate vehicles of all types, including bicycles are normally single-level. The principles indicated by the ARP (main road development guide – bibliography 2) and the ACI (interurban at-grade junction layout guide – bibliography 3) promote safety for all users including cyclists. The main principles are :

- incorporating route logic : uniformity of facilities, contributing to artery pacing and splitting ;
- the legibility of the facility making for easy, fast, unambiguous recognition of the intersection on entry ;
- optimising safety conditions for all traffic and movements, primarily simplicity and compactness, not to mention the visibility required for making out the intersections and reciprocal perception of users.

Upgrading existing intersections to comply with the ARP or ACI recommendations for ordinary roads contributes to the safety of all users, especially cyclists.

## 9.2. Ordinary at-grade intersections

### 9.2.1. Definition and terms

Ordinary at-grade intersections are non- gyratory and on a single-level. The main roads are generally assigned priority over the remainder of the road network. All the priority variants must be respected by the other roads : give way, stop or yield to traffic coming from the right. Traffic-light controlled intersections are not recommended outside conurbations and are not discussed here.

As for cyclists, at-grade intersections can be broken down as follows :

- intersections where two roads meet, including at least one that is a main road ;
- intersections where two ordinary roads meet ;
- intersections involving a road and a reserved site cycle facility that technical literature calls a «cycle crossing».

In practice, the same principles apply to intersections between two main roads as intersections between a main road and a secondary road.

The handling of cycle path and greenway ends is discussed in § 9.2.9.

### 9.2.2. Design rules

The above general principles break down into rules about :

- intersection siting constraints (environment, slope, traffic, etc.) ;
- the configuration of the intersection (coherence, simplicity, legibility principle) ;
- information-gathering conditions (visibility) ;
- intersection perception and the loss of priority (generally leads to recommending that refuges are installed on the secondary spur roads) ;
- limiting the width to be crossed, orthogonality, and so on.

The provisions for visibility and cross-section have a direct impact on cycling conditions.

*As a reminder* : A cycle path has the same priority as the main carriageway it runs alongside, unless different driving provisions are made by the authority authorised to exercise police powers (article R.415-14 of the French Highway Code).

### 9.2.3. Legibility

The concept of legibility applies to the route as a whole and all its constituent parts :

- emphasising cyclists' presence ;
- uniformity of provisions along a route or network ;
- emphasising the cycle path exits ;

In the interests of legibility and coherence, cyclists must be encouraged to cross :

- in zones where other road users pay special attention (such as where their expectations of lateral movements are highest at conurbation entries) ;
- in zones where speeds along the road to be crossed are really moderate.

Incidentally, it must be remembered that swathes of equipment – panels, marking – rarely solve all the problems !



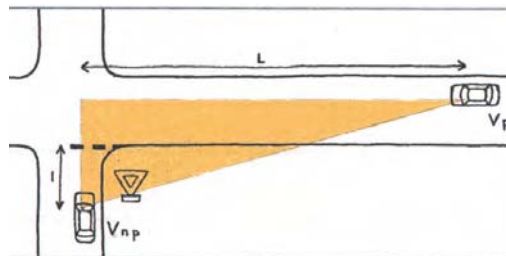
*Cycling continuity up to the intersection (CG 69)*

### 9.2.4. Visibility

What is meant by visibility is the physical possibility for users to see each other, or for a given user to see an obstacle or simply signs in place.

This notion of visibility goes hand-in-hand with the travelling speed with its strong impact on the user's field of vision and stopping distance.

The ACI provisions for single-grade intersections on main roads also seem to be suitable for other types of road. The visibility distances do not need to be increased. This is because a cyclist who halts at a STOP sign, or who has right of way, is placed closer to the stop (or give way) line than a motorist (2 m as against 4 m) and is higher up (>1.50 m as against 1 m for a motorist's eye) : the cyclist has a better view, being closer to the conflict zone and higher up than other users !



#### ■ Visibility distances

The ACI guide expresses visibility time enabling non-priority users to cross the main road. It gives both minimum and recommended values. The latter make better allowance for cyclists' crossing difficulties (slower acceleration) and are the recommended values for appropriate adoption. These values should be rounded up by one second in some cases : priority three-lane highway, presence of a left-hand turn feeder lane, slope, etc.

|                            |            |
|----------------------------|------------|
| STOP                       | 8 seconds  |
| Give way                   | 10 seconds |
| Left-hand turn feeder lane | + 1 second |
| Access via a slope         | + 1 second |

The speed to be used when calculating the proposed visibility distance is V85, namely the speed below which 85 % of users drive. A cyclist who does not have right of way must be able to make out a vehicle arriving on the main road at a visibility distance that is directly deduced from this data : visibility time and speed.

#### Visibility distance = V85 x visibility time

The problems other users have making out priority cyclists riding along the main road are not expressed in the same way. In practice the distance at which such cyclists can be made out from the secondary spur roads is always much more satisfactory than for motorists, as the cyclist's speed is clearly much slower. However, the cyclist is less perceptible, rides further over to the right than other vehicles and thus is less in the centre of day vision. Furthermore, the probability of seeing a cyclist arrive is low, except on arteries frequented by many cyclists. The extent of this problem of making out cyclists has already been emphasised (§§ 2.3. and 5.3.) : they must be seen and expected if other users are to make proper allowance for them.

#### ■ Measures for ensuring or maintaining good visibility

The recommendations for visibility are no different from those for motorised road users. However, on cycle routes, more care will be taken to ensure that the signs and roadside amenities are correctly positioned and installing unnecessary signs(B21) that obscure visibility, will be avoided. When reserved lane cycle paths exit onto a road, effort will be made to ensure that the intersection can be easily detected in its immediate environment and that no obstruction, plant, handrail or architectural element conceals the arrival of cyclists.

### 9.2.5. Intersections between secondary roads

Cyclists come across this type most frequently on their travels. No special measures are needed at the intersection.

#### ■ Special case of a cycle lane on a secondary road

This is really a special case because secondary roads generally do not have cycle lanes because they tend to be too narrow to accommodate them.

When there is a cycle lane, special care must be taken to ensure that the exit is not too wide, encouraging many cars to line up side-by-side. Depending on the traffic type and uses of the road, the choice will be to :

- merge cyclists into the general traffic flow before the intersection ; the T3-5u marking is in this case interrupted and only resumed after the intersection ;
- alternatively the lane is maintained, but the rest of the carriageway narrows to avoid compromising safety at the intersection.



*The lane is kept ; the T3 5u turns into a solid line (Cete Lyon)*

### 9.2.6. Intersections with at least one main road

#### ■ Continuity of the cycle lane when it is on the main road

Naturally the cycle lane should be continued at the intersection : the Stop line or give way line must be recessed outside the cycle lane.

While this appears to be necessary to strengthen perception of the intersection entrance and exit, it could be used to remind users that this zone is dedicated to cyclists and that they have right of way by boosting visualisation at the intersection, and if necessary some ten metres ahead of the

intersection using closely grouped white cycling figure road markings. If green is chosen, solid blocks of green paint (preferably checkerboard pattern) will be avoided to make allowance for motorised two-wheelers skidding.

### ■ Continuity of the hardstrip when it is on the main road

In contrast to cycle lanes, hardstrips are not exclusively reserved for cyclists (see § 8.2.1.). Nonetheless, any configuration that forces cyclists to merge into the main traffic flow ahead of the intersection and then subsequently rejoin the hardstrip, should be avoided. Consequently, the STOP or give way line, as in the previous case, should not interrupt hardstrip continuity and thus should be recessed. Naturally, a check will be made to ensure that this does not create any visibility problems for motorists (cleared sight triangle).



*The marking abruptly interrupts the cyclist's path*



*The presence of the cyclist is taken into account (FFCT S. Jackson)*

In intersections that may present specific dangers (due to configuration, visibility problems, risks that cyclists' priority will be ignored, etc.) one could go as far as «reclassifying» the hardstrip and giving it cycle lane status with road marking (pictogram) and vertical (C113) signs to accompany it.

### ■ Upgrading a surfaced curb-lane at a T-junction

Whatever the road's service level (main road or otherwise), it is possible to upgrade a curb-lane that is of benefit to all vehicles, not only cyclists. Surfaced curb-lanes are primarily envisaged when there is no hardstrip or cycle lane up-or downstream of the junction.

The upgrade entails surfacing the shoulder at the intersection to avoid stationary or slow-moving vehicles preparing to turn left. The ACI recommends handling this curb-lane in terms of geometry, signalling and marking so that it does not encourage driving on the hardstrip, which could mar cyclists' safety.



*The cyclist waits on the right for the right moment to turn left (CG 67)*

### ■ Upgrading the exit from secondary spur roads

A refuge island at the exit of secondary spur roads is considered to be a safety-related improvement. Any potentially harmful consequences to cyclists can be limited by setting the refuge island 1.5 m back from the nearside lane of the main road.

### 9.2.7. Improvements for right-hand turns out of the main road

The Interurban At-grade Junction Layout guide (ACI) (bibliography 3) advises against these as they are a danger to cyclists. These intersections should be redesigned and brought up to standard to meet current specifications.

#### ■ On a road down to a single lane

The negative effects on safety of laying out a deceleration lane or feeder lane on single-lane carriageways are mentioned in the ACI guide : high risks of moving obstacles, traffic merging becoming more complex. If we consider the case of cyclists riding directly on the main road, their path is likely to be cut at fairly high speed by users leaving for the main road or entering it. These lanes are thus particularly unsafe and uncomfortable for them. Improvements need to be found, by working towards adopting the guide's recommendations.

#### ■ Half intersections on roads with separate carriageways

These half intersections tend to be found on town outskirts, major penetration roads and are a major management concern for high levels of exit traffic. This type of dual carriageway or dual single-lane carriageway is found primarily in coastal tourist areas between town centres and beaches, (Brittany, Languedoc, etc.) As the carriageways are separated, the safety repercussions for all vehicles are not negative as in the previous example. However dangers persist for cyclists. Travelling speeds travelled may reach 90 kph. Cycling on these roads is therefore not recommended, but it cannot be banned out of hand. If heavy cycle traffic is observed at this kind of intersection, say, for quick access to a more attractive artery, it is essential to :

- use a sign to indicate a safer variant that can meet expectations (primarily an acceptable detour)

**AND**

- look into transforming the intersection by removing the feeder and deceleration lanes.

### 9.2.8. Upgrading for left-hand turns

Cyclists are particularly vulnerable when making left-hand turns. Technical documents offer several facilities for improving manoeuvring safety for those users who wish to turn left off the main road into a secondary road. Most of these are suitable for fit cyclists.

#### ■ Upgrading a left-hand turn feeder lane shared by all users of the main road

Upgrading a left-hand turn feeder lane generally entails placing a refuge island on the main road. This island separating the two directions of traffic alters driving lane width distribution. Cyclists will get caught between the edge of the island and the shoulder. The ACI makes provisions for avoiding or limiting the drawbacks for cyclists riding on the priority road.

ACI rules guarantee a minimum «riding» width for the direction of travel by recommending :

- that normal section lane width is maintained (no less than 3 m) ;
- that the minimum 1-m width is maintained for the hardstrip (lower lane on right) ;
- a lower left-hand lane of at least 5u or 0.3 m should be provided on a main road (0.5 m being desirable).

The rules that complement the ACI for making proper allowance for cyclists' safety are :

- ensure that the intersection is compact, put a limit at one island length no more than 70 metres (deflection + right-hand alignment) so that cyclists do not feel «pushed along» by other vehicles ;
- ensure the continuity of cycle facilities, especially cycle lanes ;
- where there is no cycle facility, surface the shoulder.

The constraints arising from the installation of a segregating refuge island are limited in space by observing the recommendations on its length.

**Reminder of the ACI rules : drivable width offered for one direction of travel at a refuge island as dictated by the normal section carriageway width**

| Link section carriageway width | Drivable width per direction at the separating island | Car overtaking cyclist         | HGV overtaking cyclist |
|--------------------------------|-------------------------------------------------------|--------------------------------|------------------------|
| 5.50 m                         | $\geq 4.30 \text{ m}^*$                               | possible at low speed          | no                     |
| 6.00 m                         | $\geq 4.30 \text{ m}^*$                               |                                |                        |
| 6.50 m                         | $\geq 4.55 \text{ m}^*$                               | possible at normal speed (car) | awkward                |
| 7.00 m                         | $\geq 4.80 \text{ m}^*$                               |                                | at low speed           |

(\*) Lower Left-Hand Lane (0.3-0.5) + lane (3-3.50 m) + 1 m hardstrip – HGV – Heavy Goods Vehicle

■ **Two special left-hand turn configurations for cyclists only**

In certain specific instances, where there is heavy cycle and car traffic (for example around 20.000 VPD for motorised traffic), it may be necessary to provide specific configurations such as :

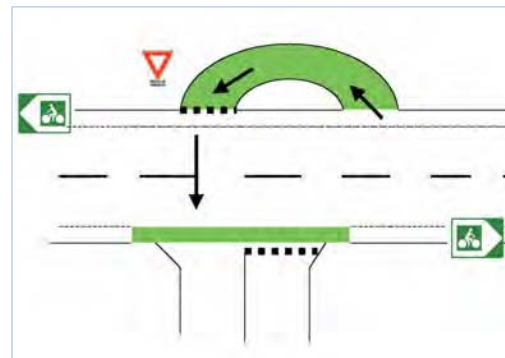
• **Left-hand turning involving a right-hand detour**

It is reserved for cyclists only as it is inadvisable for motor vehicles.

- Think about cyclists' turning circle : do not shorten the radius too much, provide an adequate queuing buffer for several cyclists to stand on.
- From design stage, do not overlook the upkeep problems, otherwise the cyclists will not use the facility.



Separation can be made depending on the case, by a refuge island or a hatched area (Certu)



Shoulders are occasionally turned into cycle paths (FFCT J. Fournier)

• **Creating a special left-hand turning lane for cyclists only (access to a greenway or cycle lane)**

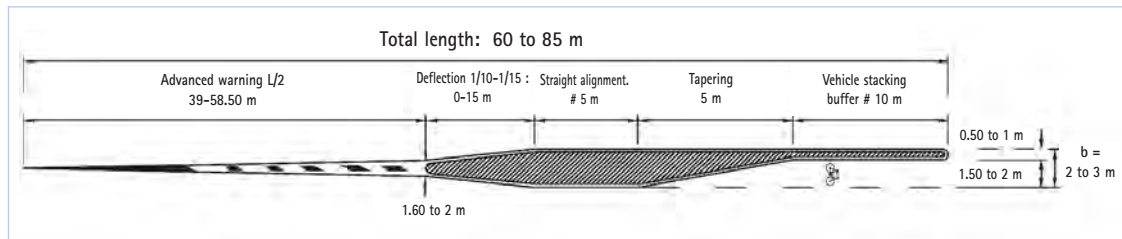
Scope :

- access to paths strictly reserved for non-motorists, facility only to be envisaged on arteries with one lane of travel in both directions, since it would be dangerous to encourage novice cyclists or families to cut across several lanes to turn left.
- If other private vehicles are also called on to turn left, a lane dimensioned for cycles only cannot be envisaged. This is because a facility of this type would be difficult for users to understand.

Facility features :

- queuing buffer lane width : 1.5-2 m ;
- length : very short (60-85 m) ;

- geometry : same principle as for a conventional left-hand turn  $\Rightarrow$  1/15 (or 1/10) deflection etc. ;
- curb work desirable (ditto see conventional LH turn) ;
- green colouring can be envisaged to emphasise that it is a reserved lane and provided the facility is a one-off ;
- specific signage (in addition to J5 marker) : pictogram on the ground.



Basic diagram : the geometric features should be adapted to the size of the road

### 9.2.9. Cycle crossings

The term «cycle crossings» designates the intersections between cycle paths and roads open to general traffic. By extension, these recommendations also apply to greenways.

#### ■ The choice of vehicle priority scheme

Give way should be the general rule and STOP, the special case as in the case of intersections between the main road and secondary road. Then, depending on the usage and traffic on each artery, it should be determined which artery should give way. The choice of giving the cycle path priority or not over the road it crosses will depend on several factors : the visibility level of the cycle route, the geometric

configuration of the intersection, the traffic on the road crossed. If it is a rarely used rural lane, a road that serves a few residents, with limited passage of tractor or regulars, the cycle path or greenway can maintain priority over the road crossed. Thus, it is useful to give the greenway priority over the road that bisects it with traffic below the 500 VPD mark : in so doing, the cycle route is not disjointed and so becomes more attractive.

#### ■ Warning devices

Good reciprocal visibility for all users is essential so that they :

- slow down when approaching the intersection or stop if necessary ;
- they see that the road they are going to cross is near and that it may entail losing priority.

C113 road signs at the ends of a cycle path are enough to inform car drivers that access is forbidden.

In order to make users vigilant and inform them of the imminent approach of an intersection, the latter must be announced by adequate vertical and horizontal signs on both routes, for both cyclists and motorists. Depending on the conflict that this intersection presents, resort can be made to :

- emphasising the message by using a colour or a change in road surface texture at the immediate approach to the crossing ;



The greenway maintains priority (D. Couval)

- combining geometric cross-section and/or longitudinal section constraints, (for example by narrowing the greenways to 3 m when their normal section is wider) ;
- possibly providing a barrier system to encourage cyclists to slow right down or even dismount.

If the road crossed is a secondary road then it is generally considered that no special provisions need to be made. However, on a main road, if traffic levels warrant and there is enough room, an edged central refuge island with queuing buffer capacity for at least two bicycles will be installed. Thought has to be given to families travelling along the greenway and also tandem riders and trailers with children.

Simple, orthogonal crossing will be sought wide enough to keep the cycle route seamless.



*Staggered barriers slow down cyclists but limit the number who can queue (Certu)*

### ■ Crossing a wide road

The line of the cycle route must be perpendicular to the road as it meets it. However, solutions that make cyclists slow down will be entertained : for example making the route swing out beforehand by negotiating a bend so they arrive at the intersection at a lower speed.

Because of the high costs involved, crossing level differences can only be envisaged in extreme cases when all other solutions are unsafe for cyclists : for example, when it is impossible to move the end of a heavily used greenway that would otherwise feed onto a high-speed road with heavy traffic, or is on a bend or has a major concealing feature.

It is recommended that a 3-lane artery crossing is reduced to 2 lanes on the crossing approach and that a 2.5 m minimum central refuge is installed to encourage two-stage crossing.



*National trunk road redeveloped to make the greenway safe (Cete Lyon)*

### ■ Ends of cycle paths and greenways : anti-intrusion devices

Wooden anti-intrusion poles in the middle of path entrances have caused serious accidents. Some cyclists ride fast with their eyes fixed on the road surface, looking out for potholes, glass shards or broken-off branches, while others riding in groups are less on their guard than they would be alone. Single, dark poles are not particularly visible at nightfall... If they are really considered necessary, then devices must be found that are highly visible both during the day and at night, preferably «retractable», namely devices that lower under the pressure of cyclists who have not seen them.



*0.9-m bollard with reflective band (CG 69)*

A check will be made at each greenway intersection as to whether devices are needed to limit access to the cycle route to non-motorised vehicles only on the basis of the use and locality crossed. Any route with a dissuasive barrier spaced out at one-kilometre intervals will lose its attraction for cyclists and rollerbladers !

Reducing the cross-section could be a possible solution, provided that emergency and cleaning vehicles can still have access. Whatever equipment is chosen it must be visible to cyclists and the other users of the greenway, but should not create an obstacle for vehicles travelling on the main road. Devices will be chosen with unsuspecting users in mind : no protruding corners or material that is too hard.

Where systems of this type are needed, half-barriers, preferably wooden, appear to give satisfaction on many greenways :

- care must be taken not to set clearances that penalise persons with reduced mobility, tandem riders or trailers ; a clearance of about 1.4 for staggered barriers ;
- consider removable systems for enabling access to emergency and maintenance vehicles... It should be remembered that we are aiming for dissuasion rather than actually preventing illicit intrusions.



*A clearance that does not penalise reduced mobility users (CG 69)*

Any device, regardless of its form, must be declared to users at least ten metres in advance by clearly visible vertical and horizontal signage.



*Backing up the horizontal and vertical signage (CG 69)*

## 9.3. Gyratory systems

### 9.3.1. Safety

Roundabouts are the least dangerous type of intersection for all users in inter-urban contexts including cyclists. Their positive effects are measurable at the intersection itself, but also before and after along the artery, because they contribute to reducing speed. Notwithstanding, cyclists feel uncomfortable and insecure especially on large roundabouts. In 2002, a Cete (West) study supplemented by a Certu/Departmental Facilities Directorate cycle station survey revealed a link between roundabout geometry and accidents. Accident numbers increase with size, so these findings confirm the futility and harmfulness of wide radius roundabouts : capacity gains tend to be low, cost and accident numbers much higher. Over half of the accidents during the study period (1993-1997) resulted from motorists entering the roundabout refusing to give way to cyclists already riding on the circle ; motorists leaving the roundabout cutting across the path of cyclists riding on the circle account for only 12 % of accidents. Motorists underestimating cycling speeds (see § 2.) may be to blame for these accidents.

### 9.3.2. Design principles

While gyratory systems are generally safe, their safety and comfort levels for cyclists can be considerably compromised when certain principles are not upheld.

There is a particular need for :

- small dimensions for the outer radius and circular roadway width.

*Note : roundabout size, defined by the outer radius, is dictated by the road status, function and thus the design, traffic load, width (number of entry lanes) and thus the required capacity, number of spur roads, etc. The guides offer radius ranges that rarely exceed 25 m ;*

- designing a simple facility : a circular shape with no superfluous slip roads, avoiding direct right-hand turning lanes, that are very uncomfortable for cyclists continuing on around the circle. If their construction is viewed as essential, their geometry must be designed to encourage slow exit speeds ;
- imposing entry path and intersection crossing path constraints to avoid motorised vehicles travelling at speeds that are too high and incompatible with cyclists' safety and priority rules ; off-centred roundabouts should be avoided ;
- avoiding over-wide entry (>15 m) and exit (>25 m) radiuses ;
- in the case of small roundabouts or steep descents, the entry path constraint must be compatible with good road holding for cyclists (generous turning circle so that they are not encouraged to veer out to the offside).

#### Reminder of Setra and Certu recommendations

##### Setra recommendations for interurban contexts :

- outer radius :  
max. 25 m ; min. 12 m if few HGVs ;
- circular roadway :  
7-8 m (min. 6 m if curb lane passable) ;
- single-lane entries and exits.

##### Certu recommendations for urban contexts :

- outer radius :  
max. 25 m ; min. 7.5 m ;
- circular roadway :  
7 m (6 m if curb lane passable) ;
- single-lane entries and exits.

**Two-lane entries** are to be avoided wherever possible unless capacity needs are overriding :

- they reduce the deceleration constraint, and thus, increase the risk that vehicles will not give way to another vehicle already on the circle, especially if it is a bicycle ;
- where there are cycle paths outside the circle, the crossing width is greater and thus the risk exposure time is longer, the probability of moving obstruction interference is much higher.

For similar reasons, two-lane exits must be justified by capacity problems.



2-lane and 3-lane entries and exits on the circle = danger (FFCT J. Fourna)

### 9.3.3. Specific cycle-friendly facilities

The applications of the design principles and rules mentioned above generally offer cyclists satisfactory levels of safety and comfort by making for highly legible facilities, speeds that are compatible with the way the roundabout operates and cyclists paths. Therefore no dedicated cycling facilities are needed. However they may be considered when :

- there are enough cyclists present on one or more arteries feeding a roundabout ;
- one or more of these arteries already has dedicated facilities (cycle lanes or paths) ;
- the roundabout design does not fully correspond to the technical recommendations, which is often the case with the older «first generation» gyratory systems that are too big and whose circle width should be reduced.

The most favourable position for cyclists generally, is in the middle of the circular roadway. That is where they are best seen by the other users. However, this principle should be qualified by the roundabout size and its circular roadway width in particular. The paths adopted or sought by cyclists differ according to roundabout dimensions : central path on small roundabouts and tendency to ride on the outside of the circle on big roundabouts. In practice the issue boils down to whether or not to mark a cycle lane on the edge of the circle. Whatever happens, marking a cycle lane around the central island, that is on the inside of the circle, is not recommended. Furthermore the relevance of a cycle path on the outside of the roundabout needs to be examined. Without going as far as to say that the «cycle lane» and «cycle path or otherwise» are independent, the reasoning behind them is different and apply to different categories of users. Furthermore, in principle it is quite possible to envisage providing both a lane and path simultaneously.

#### ■ Cycle lane on the edge of the circular roadway

Briefly, the following selection criteria could come down in favour of a cycle lane :

- the roundabout dimensions – especially the circular roadway width – and the ensuing accident risks (see above) ;
- the type (casual or experienced) and number of cyclists in the area ;
- the type of facility provided or otherwise for cyclists riding in the normal section (lane, path, etc.) ;
- any need to boost the visibility of cyclists riding on the circular roadway.

#### Small roundabouts

In the case of small roundabouts (R £15 m) circular roadway width is narrow (at the most 7 m). Bicycles can be ridden in the traffic flow quite safely without any special provisions.



*The natural position of the cyclist is in the centre of the circular roadway (Cete Méditerranée)*

#### Major gyratory systems (R >25 m)

The circular roadway of these roundabouts tends to be wide (>9 m) and enables two traffic lanes to be marked out. In practice cyclists are prompted to keep to the right (which is preferable), at the edge of the circular roadway. Thus, it is important to materially represent their presence and protect their entries and exits. A cycle lane is specifically recommended as well as banana-shaped separators at the entrance and exit of each of the spur roads (see § 9.3.3.). Note : the provision of separator islands must not have the effect of increasing roundabout dimensions as this would further reduce the safety of the whole device.



*The separator fulfils its protection role well (DDE 38)*

In the case of excessively big roundabouts, reducing the roadway width on the circle may be an option : in principle it would be easier to enlarge the central island, but it would be preferable, from the safety angle, to reduce the circle's radius by reducing its outer diameter.

### Medium-size roundabouts (radius < 25 m and circular roadway width ≤ 8 m)

Refer to the previous section on major gyratory systems for medium-size roundabout with a circular roadway width in excess of 8 m.

The circle roadway widths of medium-size roundabouts tend to be 7 or 8 m.

Two-lane marking is not recommended. The main point is that there is no unique, one-size-fits-all solution.

### Summary of recommendations

| Current or expected cycle →                       | Fairly low                | Rather high                                                     | Comments                                                                   |
|---------------------------------------------------|---------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------|
| Small radius 12–15 m<br>circular roadway ≤ 7 m    | nothing                   | nothing                                                         | Including when a cycle lane is on a link section                           |
| Medium radius 15–25 m<br>circular roadway 7 à 8 m | nothing                   | Possibly cycle lane<br>(+ separator advised if $20 < R < 25$ m) | Logically there should be a cycle lane on a link section if high occupancy |
| Big radius > 25 m<br>circular roadway ≥ 9 m       | Cycle lane<br>+ separator | Cycle lane<br>+ separator                                       | Regardless of the normal section provisions                                |

### Technical characteristics of cycle lanes

Cycle lanes need to be handled using the same constraints and following the same recommendations as on link sections, especially as regards traffic signing, road markings and the use of colour.

Width will depend on circular roadway width – it could be 1 m for an 8 m roadway and 1.5 m for a 9 m roadway.

These widths enable capacity to be maintained at satisfactory levels in most cases. The cycle lane lateral slope (banking) should be identical to that of the roadway, thus normally tilting outwards.

**But attention** must be paid to reciprocal visibility of all users : cyclists riding on the circle must be in the line of sight of vehicles entering the roundabout.

If the lane leads to cyclists riding outside this line of sight, the lane is a dangerous solution.

### ■ Entries and exits

#### Continuity with link sections

If the route has cycle lanes before and after the roundabout, they should be continued along the slip roads.

In the case of hardstrips however, extending this unedged curb lane would increase the carriageway width at the entry, and thus the effective entry radius, so encouraging private cars and HGVs to cut across cyclists' paths.

Generally installing edges at both entries and exits provides several advantages for the sustainability of the intersection, with primarily an unchanging restricted entry and exit lane width, that largely compensates for any cleaning-related shortcomings : an area that needs regular cleaning because of gravel accumulation.

While curtailing the shoulders 15–20 metres ahead of the roundabout is advised, that does not mean that the presence of cyclists is overlooked.

Depending on the observed or expected traffic flow on these roundabouts or the general cycle-friendly policy intended, the planner will choose between :

- merging the cyclists into the general traffic flow, which supposes that level is low and that merging is possible without too many risks ;
- accommodating them on cycle lanes that continue around the roundabout circumference ;
- directing them to outer paths, especially if they are family groups or schoolchildren.



*(DDE of Reunion Island)*



*Lanes without separators (DDE 38)*

If cycle lane continuity is desired and there is a risk of light vehicles encroaching on them or the entry lane becoming too wide, the space for cyclists should be protected by banana-shaped separators.

### **Banana-shaped separators**

**Definition :** Banana-shaped separators are long separators installed at roundabout entries or exits

where the branch and circular roadway meet. By separating the cycle lane or hardstrip traffic flow, they protect cyclists from the risks of accidents from vehicles coming in too close when entering or leaving the roundabout.

They must be laid out to be compatible with the intended roundabout design. They must not lead to roundabout enlargement which would have bad safety repercussions for all users including cyclists. In practice, the minimum roundabout radius of roughly 20-22 m enables separators (entry/exit) to be satisfactorily installed.

When badly maintained, it will be impossible to use these driving areas that are intended to protect cyclists : regular manual sweeping is required.



*The cycling space is clearly identified and respected (optional green colour) (FFCT J. Fourna)*

Banana-shaped islands should be visible unambiguously both day and night by all road users : they should be light coloured girded with drop-down, non-aggressive bevelled edges, painted white. They should be signalled in advance by white marking (solid line) announcing their imminence.

The cyclist figure could be used to remind users that this space is dedicated to cyclists. J5 type markers should be excluded, except in special cases. The J11 marker could possibly be placed in the middle of the separator nose (context-dependent).

Rubber log separators often found in towns are not recommended for the interurban context : they are not hard enough, in rainy weather they are potentially dangerous for certain motorised two-wheelers, snow ploughs tend to wrench them off.

#### **Minimum width between edges and banana-shaped separators**

Widths narrower than cycle lanes can be envisaged as the cycles are segregated from the general traffic flow. However, the wall effect of the lanes is limited because the edges are low. By making the widths as close to 1.3 m as possible, use by other vehicles is avoided, yet cleaning vehicles can still drive through them.

#### ■ **Cycle paths round roundabout edges**

The existence or otherwise of a cycle path on a link section on one or two spur roads will primarily dictate how useful it will be to install one around a roundabout.

It also depends on the type of cyclists expected on the route (experienced or inexperienced).

Naturally, continuity of the route must be ensured if the path extends beyond the roundabout along one of the spur roads.

#### **Use of peripheral cycle paths**

Regardless of how cycle paths are used on a link section, peripheral cycle paths will be two-way to make allowance for usages as the cyclists will take the shortest route between their entry and exit points.

#### **Cycle path widths**

The planner will make every effort to apply the recommended dimensions for two-way paths on a link normal section, namely 3 m. Narrower widths may be tolerated occasionally on space-restricted sites to maintain seamlessness or when the path runs adjacent to a pedestrian area at least 1.4 m wide.

#### **Crossing spur roads**

*Location* : cycle paths must cross roundabout approach roads, close to the circular roadway, in the same way as pedestrian crossings as this limits route lengthening and concentrates the conflict zone to a single point. A 5-m recess for positioning the pedestrian/cycle crossing gives queuing space for one car and users better mutual visibility.

#### **Roundabout entries and exits**

When the roundabout configuration, traffic flow and speeds permit, the path may feed directly onto the circular roadway.

# 10 Entering, leaving and crossing small conurbations

The French Highway code definition of the word «conurbation» is used in this document. It restricts the meaning to designate *«a space where residential blocks are clustered together and whose entries and exits are signalled by specific signs placed along roads that cross or border it»*. Article L282-2 of the French Environment Code, for its part, stipulates that cycle facilities must be constructed whenever the urban road network is renewed, whatever the size of the town (see § 3.3.4.) Any built-up area that matches the Highway Code definition is involved, however small it is.

A proportionally higher number of accidents occur in small conurbations, primarily those located along heavy traffic routes, than in larger communities where cyclists feel insecure.

The expression «conurbation crossing» is commonly used to imply that the route's main function is to pass through a conurbation. A «conurbation crossing» is a **road** with all its conventional local life support functions : the flow of through traffic is only one of its functions, but it is the one that creates the most insecurity and nuisances. Finding solutions to reduce these nuisances has to arrive at a compromise between reducing through traffic speeds and handling pedestrian crossing points, local traffic and short-term parking appropriately, and cyclists must not be overlooked in this process.

## 10.1. Cyclists' needs

### ■ Cyclists entering or leaving a built-up area

Buildings tend to be more spaced out, arterial roads wider and traffic speeds higher on the outskirts of towns. The road networks break cycling continuity. Cyclists' mobility takes a heavy toll : the distances forced on them are longer, the use of routes is limited by the feeling of insecurity.

Every obstacle is experienced as a constraint and any mitigating reaction may lead to dangerous situations : crossing outside of specific crossing provisions, crossing barriers, cycling the wrong way down the road, etc. Thus, cyclists must be offered more convenient routes with continuous signage - by equipping a number of major arteries with cycle paths or at least cycle lanes, surfacing shoulders, taking up every opportunity to create greenways offered by the presence of disused railway tracks, towpaths and so on.



*A chicane breaks the straight line of travel but islands ensure the space reserved for cyclists is seamless (FFCT J. Fournia)*

### ■ Cyclists crossing small conurbations

They want to take advantage of the most direct route, namely the road. Shared carriageway use is the rule if the actual measured speed is about 30 kph. However cycle lanes or paths are preferable where speeds are higher or there is heavy HGV traffic.

Cyclists must not be trapped by traffic calming devices such as roundabouts, islands or chicanes. Crossings must always enable a slow-moving cyclist to be safely and comfortably overtaken by a car even in 30 kph restricted zones.

## ■ Cyclists living in small conurbations

Special thought must be given to children travelling to and from school, the elderly, etc. and how crossing a road forces a break. Consequently signs will direct them to adjacent roads where the prevailing conditions are acceptable or improved. Cyclists living along this main artery or who have no other route open to them are better served by a cycle lane or path route when traffic speed cannot be effectively reduced to 30 kph.

Making cyclists and pedestrians share the same pathway must be avoided because of the differences in behaviour and speeds, and because it contravenes the Highway Code that permits children under eight only to cycle on the pavement : a path can only be delimited on the pavement if it is wide enough.



*This solution presents disadvantages for all users*

## 10.2. Recommended method

The right solutions for all users come out of the quality of the preliminary study, examining usages and the overall approach to problems when creating a cycling scheme as in any other urban road planning scheme.

By force, taking cyclists into account implies considering the available land space and the needs of the other traffic modes. It is generally easy to introduce cyclists into the general traffic flow

when efforts have been made to reduce speed, make intersections simple, legible and when compact, facilities have been designed to make the best of public space, improve the visibility and legibility of routes.

It is important to keep an all-embracing view of the cross-conurbation route and in which the crossing takes on board how all the conurbation's crossings at other angles between the town's entry and exit are managed.

## 10.3. Planning tools

The following elements are included for the record : refer to the Certu and Setra documents quoted in the bibliography for technical recommendations and areas of use.

### 10.3.1. Speed retarding tables, cushions and humps

Technical guides describe them (bibliography 8) and standards govern their conditions of use. They reduce car driving speeds very effectively.

Cyclists particularly like cushions that only raise part of the roadway.

### 10.3.2. Cycle lanes for conurbation crossings

The inclusion of a cycle lane must not lengthen pedestrian crossings and so undermine the effort to slow down motorised vehicles.

Thus cycle lanes should not be invariably introduced into the cross section, especially if by doing so, there has to be a trade-off in the form of narrow lanes, for they will force cyclists to ride in the gutter, brush parked vehicles or be brushed by passing vehicles.

Once again the choice of facility stems directly from the preliminary requirements study : which categories of cyclists are involved ? Have vulnerable users (children, families, the elderly, etc) been forgotten ?

When cycle lanes precede or succeed crossings, a lane protector island can be placed. It will have the effect of slowing down speeds before it interrupts the lane, channelling cyclists into calmed mixed traffic or converting the lane into cycle path in the crossing :

- by leaving the cyclists in the carriageway segregated by a separator between them and the general traffic flow, which effectively maintains slower motorised vehicle speeds ;
- by making cyclists mount the pavement, if it is wide enough (see § 3.2.)...

Another possibility is to provide a space on the carriageway that although too narrow to be assigned for use by cyclists alone, is visually differentiated from the rest, making cyclists free to choose their position.



*Only if there is little traffic because of limited clearance for overtaking and car doors opening (DDE 42)*

### 10.3.3. Cycle paths on pavements

This type of facility can be considered on wide pavements rarely used by pedestrians or when there is no better solution for passing a particular point. The legal texts relating to reduced-mobility persons and good accessibility (see July 1975 Act and the August 1999 decrees and the February 2005 Act and its application decrees), set aside 1.8-2 m free of obstacles - the minimum accessible width for pedestrians being 1.4 m.

This leads to widths of 3 m or more in either direction so that the dedicated pedestrian and cyclist spaces can run side-by-side.

When a cycle path is laid out on a pavement, serious thought must be applied to car parking to ensure that the cycle path is not illegally squatted by cars.

As the carriageway is open to public flows, cycle path upkeep and snow-clearance must be easy to carry out on a regular basis by the road owner (see § 3.3.2.).



*Few house frontages and wide pavements - a good opportunity for a pavement cycle path (Certu)*

### 10.3.4. Creating islands

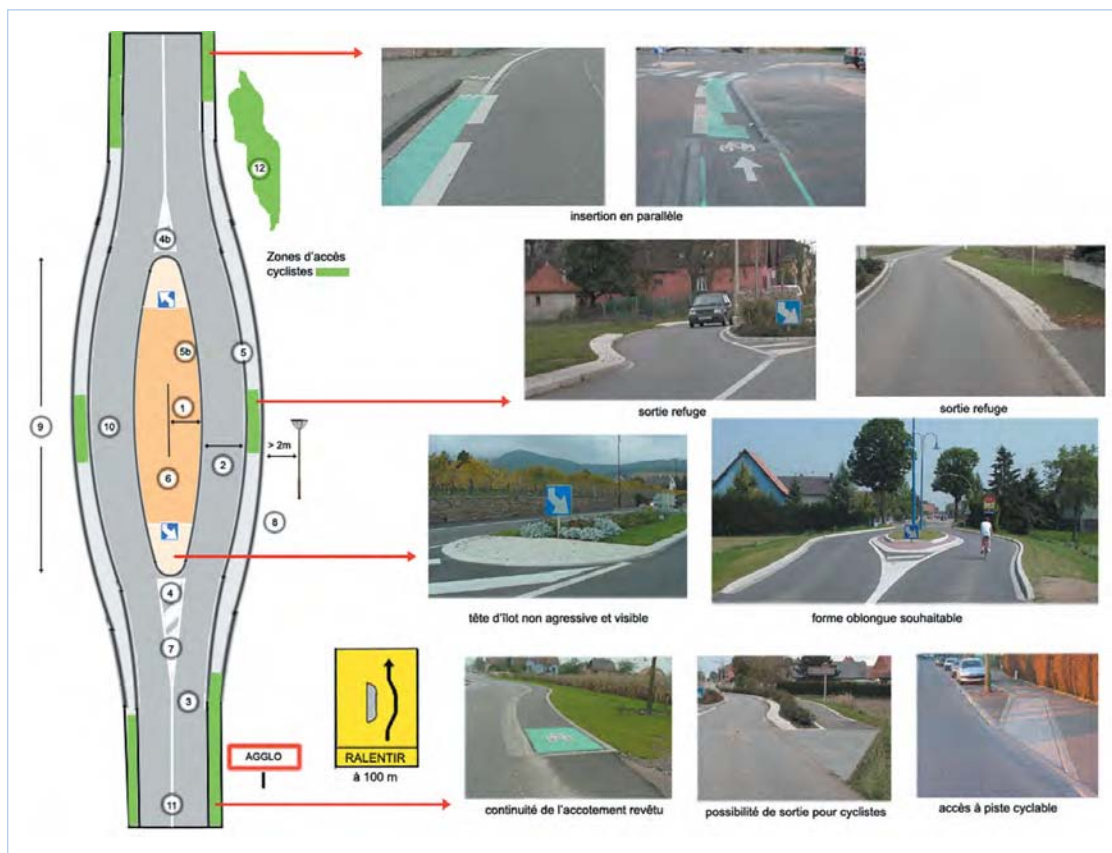
#### ■ Central refuge islands at conurbation entrances

These islands usually signal arrival at the conurbation entrance, and contribute to slowing down speeds and thus more safety for all users.

However, many cycling associations complain that entry chicanes are dangerous. It must be admitted that a number of undisciplined drivers, put cyclists at peril by trying to overtake them even though there is not enough space between the road edges.

#### Design dimensions

The efficiency of a chicane is primarily governed by the entrance and exit deflection, and the island



*No one-size-fits-all solution (CG 97)*

buildout and length, and only very slightly by the road curb lane.

Road width will tend to be in the range 3.5–3.75 m, or even 4 m for deflections of 3.4 m or more (to be verified by swing calculation software).

HGV and snowploughs clearance requirements need to be taken into account for driving through the whole chicane : 3.20 m minimum between edges. It should also be pointed out that a 4 m width can offer refuge for cyclists when a car is breathing down their necks, unless they have the option to get onto a pavement path, safe access to which is achieved by reducing kerb level to zero at the beginning of the chicane.

### Combined chicane–intersection

As free land space tends to be limited at conurbation entrances, one or more accesses to the chicane often have to be provided, or even an

existing or future intersection with a local road (for example, a planned housing development).

Combining the chicane and intersection by building the latter into the chicane – lowering the central island to zero (possibly domed paved areas) keeping the constraining configuration of the island approach noses at both chicane ends – is better than pushing the chicane too far ahead of the conurbation entrance, or laying out a conventional left-hand turn ahead of the entrance for the new access. Sometimes the planned straight section of the central island will have to be extended to allow emergency rescue vehicles and delivery trucks through as a result of running a check on their turning circles. In cases where there is a need to improve the storage capacity in the central island by a few vehicles to increase throughput, consideration could be given to lengthening the central island by 10–20 m without significantly reducing the effectiveness of the entry chicane. However, if it is impossible to organise minimum vehicle stacking on

the central island, safety is not compromised if a waiting vehicle fully or partly encroaches the carriageway along the straight part of the central reservation, if the open countryside part of the entry chicane is properly managed (efficient deceleration).

By comparison with a conventional left-hand turn, this sort of device (chicane with integrated intersection) not only makes for slower speeds at the conurbation entrance but makes turning movements safer because the main traffic flow is calmed.

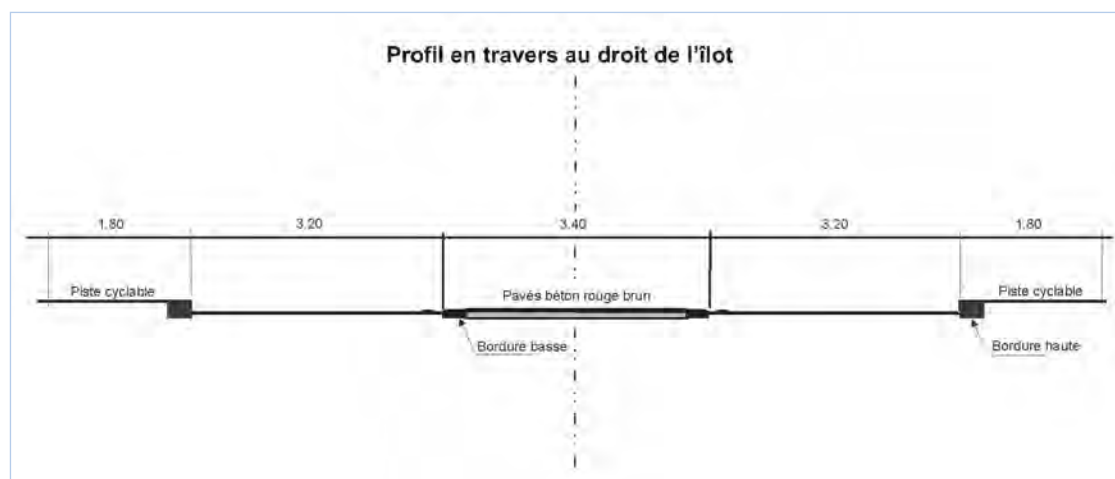
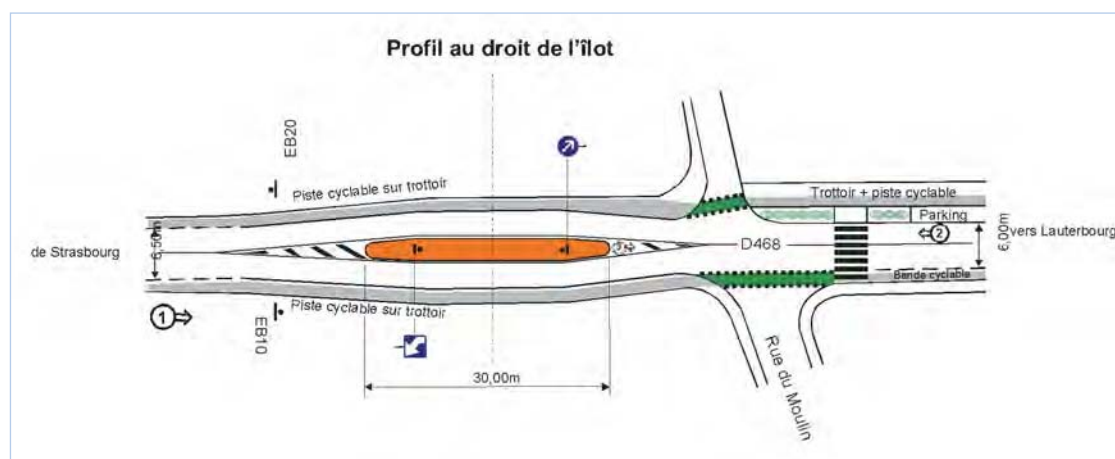
### Converting cycle lanes to paths

Where there are cycle lanes along the roadway ahead of the chicane (open countryside), one solution is to extend the cycle lane by a cycle path on the pavement (3 % gradient with dropped kerbs) from the start of the kerb work ahead of the chicane.

Where small towns are concerned, if cycle and pedestrian occupancy rates are not too high, the useful width of the pavement path will be around 1.5 m clear of all obstacles (lampposts, bollards, etc.) for a one-way lane and 2-2.2 m for a two-way lane. Greater width should be provided in tourist areas. Cycle paths that start at village entrances run to the following intersection. Cyclists merge with the main traffic as if they were coming out of the intersection.



*Cycle lane outside a conurbation turns into a cycle path inside the conurbation*



*Basic design diagrams - see diagram on p 66 for the island itself*

### **Making allowance for seasoned, yet vulnerable cyclists**

Because of the inherent danger, any other solution consisting of forcing cyclists to return to the roadway at the pinch-point created by the chicane should be avoided. If the through road is redeveloped over a long length, this cycling seamless principle could be kept for the whole section especially if the majority of cyclists are schoolchildren or senior citizens. Some cyclists prefer to stay on the carriageway despite the chicane pinch points, especially when merging with the traffic is difficult. But even in the presence of a well-designed cycle corridor on the edge of the chicane, it is advisable to offer a minimum curb lane so that those cyclists who still opt to stay in the chicane are not over-exposed. A good lane width is 3.5-4 m. This type of curb lane does not reduce chicane efficiency provided central island deflection and the chicane entry and exit buildouts are well designed and create enough trajectory inflection. The edges may be low profile on the outer edge except at the two pinch points.

On the way out of the conurbation, cycle-friendly devices are less expedient if the through road geometry calms speeds sufficiently up to the actual conurbation exit point. Nonetheless, the constraint symmetry thwarts any attempt by careless motorised users at avoidance.

### ■ **Continuous central reservation across a conurbation**

Its main purpose is to keep driving speeds down. It may or may not be possible to cross it. Unlike an isolated island, a continuous central reservation that cannot be crossed, makes cyclists feel insecure. Cyclists reckon that motorists caught up behind them are prepared to wait about ten seconds before impatience gets the better of them. If the central reservation is over sixty metres long, and cyclists cannot take cover along the length in question, they tend to get «pushed along» by motorists trying to overtake them. In

contrast, a central area that can be crossed (painted, coloured space, domed paving, low edges, etc.), enables cyclists to be overtaken. This solution is preferable.



*The island reinforces the straight-line effect to the detriment of cyclists (Cete Méditerranée)*

### ■ **Lateral islands or buildouts**

Their purpose is to slow down vehicles by bending their route and they need to be designed with allowance for cyclists.



*The deceleration island does not disturb cycle travel (ST Chalon-sur-Saône)*

# 11 Cycling facility and route signage

The signage regulation applicable to cycling facilities and routes is a relatively complex subject that has been handled in a specific Certu document (bibliography 24). The basic principles are recalled here.

Road signage is a language, a rapid means of communicating with the user.

Any misunderstanding or hesitation on the part of a driver, motorised or otherwise, may cause an incident.

That explains why the signage principles are part of a strict national framework and are obligatory for all road managers.

Good signage is defined by nationwide uniformity of signs and usage rules, the search for simple, clear messages so that essential information can be conveyed to inform, direct and make cyclists safe without proliferating the number of signs.



*This is essential data for the users (Florence L.)*

## 11.1. Road signs

### 11.1.1. Basics principles

The nature of signs authorised on the public highway, and the conditions and rules for installing them are exclusively stipulated by the inter-ministerial directive on road signs designated by the IISR abbreviation in this document (see § 3.4.1.). There are five efficiency criteria for cycling facility design (safety, coherence, directness, appeal and comfort) and thus five efficiency criteria for signage :

- uniformity, guaranteed by the exclusive use of statutory signs ;
- homogeneity, guaranteed by the use of signals of the same value and scope, in identical conditions, installed according to the same rules ;
- simplicity, guaranteed by keeping the number of messages down to the essential, by concentrating these messages and making the most of them ;
- visibility, guaranteed by observing placement rules and regular servicing ;
- legibility, which summarises all the others since it enables users to adapt their driving immediately to the message transmitted.

An additional criterion needs to be added to these five for directional signage : the continuity of signalled directions.

## 11.1.2. The main signs used

| Scheme and number                                                                                                                                                                 | Definition                                                                                     | Comments                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| A21                                                                                              | Cyclists emerging from the right or left                                                       | It is placed as an advanced warning sign* and is addressed at motorists                                                             |
| C113   C114     | Indication of the beginning and end of the recommended cycle path or lane, reserved for cycles | The cycle facility is optional for cyclists and set aside for them : driving, parking and stopping of other vehicles is forbidden   |
| B22a  B40     | Indication of the beginning and end of the compulsory cycle path or lane, reserved for cycles  | The cycle facility is compulsory for cyclists and set aside for them : driving, parking and stopping of other vehicles is forbidden |
| B9b                                                                                            | No access for bicycles                                                                         | Mopeds are authorised                                                                                                               |
| B9g                                                                                            | No access for mopeds                                                                           | Cycles are authorised                                                                                                               |
| B1+M9v1                                                                                        | No entry for vehicles other than cyclists                                                      | Sign and explanatory plate placed at the end of a two-way street with one lane reserved for cyclists                                |
| C24a  C24c  | Special driving conditions : cyclists in contra-flow lane                                      | Placed at the other end of the road to indicate the presence of cyclists riding against the traffic flow                            |
| B7b                                                                                            | Access forbidden to all motorised vehicles                                                     | Not to be mistaken for B1, no entry or B0 signs, prohibited to all vehicles in either travelling direction                          |
| C109                                                                                           | Pedestrian zone                                                                                | Cyclists authorised to ride at walking pace                                                                                         |

(\*) Warning signs have no position sign equivalent.

NB : a new C type panel is to be introduced to identify greenways

### 11.1.3. The main explanatory plates in use

The following categories of explanatory plates are used to signal cycling facilities :

| Category | Messages                                                            | Explanatory plates                                            | Examples                                                                                                                                                                       |
|----------|---------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| M1       | Distance between the sign and its point of application              |                                                               |                                                                                             |
| M2       | Length of the section covered by the sign                           |                                                               |                                                                                             |
| M3       | Arrow indicating the location or road direction covered by the sign | M3a1 M3a2 (example)<br>M3b1 M3b2 M3b3 M3b4                    |                                                                                            |
| M4       | User affected by signal                                             | M4d1 (example) : cycles<br>M4d2 : mopeds<br>M4p : pedestrians |                                                                                           |
| M9       | Miscellaneous indications                                           | M9v1 (example 1) :<br><br>M9v2 (example 2) :                  | <br> |

### 11.1.4. The main road markings

The only statutory and compulsory road marking is white.

Green may sometimes supplement the white road marking. The reference of the green colour to be used is known as «statutory green» or «signage green», also used in France for all direction signs, regardless of whether they are «cycle direction» DV signs or long-distance indication signs for all vehicles.



*In the Lower Rhine, a green band supplements the white road marking*

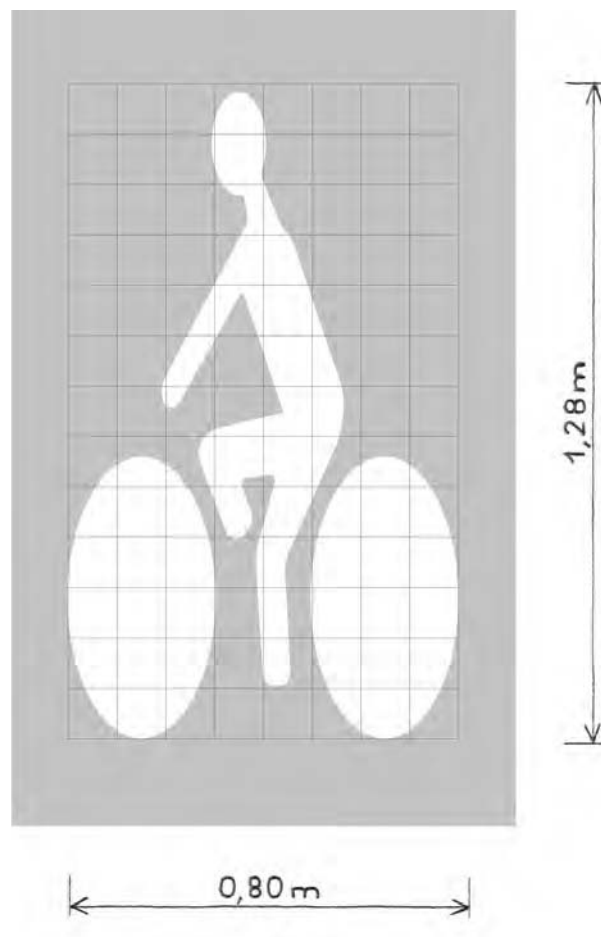
The inter-ministerial circular of 15.05.96 (Official Journal no 138, dated 15 June 1996) relating to the use of colour on the road sets out the following guidelines :

- the regulations must be strictly observed to avoid reducing its value or leading to confusion ;
- the facility should be analysed in its context : any decision on using colour must take into account the issue of its absence in similar facilities especially in the vicinity ;
- continuity of surface requirements, primarily, road holding and uniformity.

This same circular reserves green for cycle facilities while indicating that this colouring is optional : that means that the colour supplements the statutory marking but does not replace it. Limiting its use to specific zones such as car park or filling station exits on city outskirts, complex intersections and dangerous bends reinforces the warning message given to users. The orientation of the cyclist pictogram is regulated : the figure looks at the roadway, not at the gutter or the pavement.

The cyclist figure must be white : it appears smaller (optical illusion) and becomes more slippery if it is surrounded in green, and experience shows that the green colour wears off with time.

The use of resin instead of paint has the considerable advantage of offering much better wear over time : thus, it is advised to use it at least at special points.



### Signage of various facilities

| Facility   | Vertical signs               | Road marking               |
|------------|------------------------------|----------------------------|
| Hardstrip  | nothing                      | nothing                    |
| Cycle lane | C113 (in special cases B22a) | T3 5u + cyclist pictogram  |
| Cycle path | C113                         | cyclist pictogram optional |
| Greenway   | B7b                          | nothing                    |

Summary chart of statutory road marking (as per IISR art.113.2 and 114.3)

|                                                      | Use of lines                                                                                                                                                | Type of line                                                                                                                                                                      |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lengthwise lines<br>(normal section)                 | <i>ONE-WAY CYCLE PATHS</i>                                                                                                                                  | nothing or T2 3u (u = 3 cm) nearside lines<br>waiver, u=5 or 6 cm for mid-height path kerbs                                                                                       |
|                                                      | <i>TWO-WAY CYCLE PATHS</i><br>- centreline marking<br>in normal section (optional)                                                                          | 2u continuous or T1 2u (u = 3 cm) broken or T'1<br>2u in conurbation (not compulsory)                                                                                             |
|                                                      | - centreline marking on a bend,<br>- near intersection,<br>- poor visibility, etc.                                                                          | 3u (u=3 cm) continuous                                                                                                                                                            |
|                                                      | <i>PAVEMENT PATHS</i><br>- cyclist / pedestrian separation marking                                                                                          | 3u (u=3 cm) continuous                                                                                                                                                            |
|                                                      | <i>MID-HEIGHT PATHS</i><br>- If edge marking necessary                                                                                                      | 3u (u=3 cm) continuous                                                                                                                                                            |
|                                                      | <i>CYCLE LANES</i> demarcation<br>- normal section / general<br><br>- normal section / special cases<br>(fast-moving traffic, bend, poor<br>visibility,...) | T3 5u (u = 6 cm for heavy traffic flow roads,<br>5 cm on other roads)<br><br>3u continuous                                                                                        |
| Intersections                                        | <i>CROSSING bisecting road or carriageway</i><br>↳ by <b>priority</b> cycle lane or cycle path                                                              | If the cycle lane or cycle path has priority<br>or give way is marked on the other road.<br>T3 5u demarcation and centreline marking<br>where it exists continue on the crossing. |
|                                                      | ↳ traffic light-controlled intersection and<br>intersection with priority on the right                                                                      | Marking interrupted (by pictogram or nothing)                                                                                                                                     |
|                                                      | ↳ by non-priority cycle lane or cycle path                                                                                                                  | No marking on crossing<br>(only a few pictograms if marking really needed)                                                                                                        |
| Transverse lines<br>of cycle paths<br>or cycle lanes | - Give way<br>- STOP                                                                                                                                        | - 25 cm x 25 cm square<br>- 50 cm continuous                                                                                                                                      |
|                                                      | <i>OTHER CASSES</i><br>- beginnings and ends<br>of cycle lane or path                                                                                       | - nothing or oblique marking 3 m long, 5u wide                                                                                                                                    |
|                                                      | - demarcation of stacking buffers                                                                                                                           | - 2 T'2 15 cm traffic light stop lines or 1 line and<br>a pedestrian crossing with access lane                                                                                    |

## 11.2. Direction signs

### 11.2.1. The cycle sign master plan

Good coherence will be sought between the cycle route sign master plan and existing road sign master plans in the project footprint. The network to be marked out includes «all the routes that link centres that interest cyclists», regardless of whether or not these routes have been developed. Examples of these centres are :

- service amenities : railway station and intermodal transport hubs, post offices, swimming pools, etc ;
- tourism centres and major landmarks : castles, monuments, tourist offices, etc. ;
- cycle parking facilities ;
- identified communities and districts located in the study area ;
- other identified centres outside the study area.

On reserved lanes, cyclists should be informed of all the services they may find nearby, primarily shops, accommodation, repair workshops and catering establishments. The best way to present this information is to group it on an Orientation Post.

The links are chosen on the basis of safety, comfort and simplicity criteria and include orientations of the mobility planning documents such as the Urban Mobility Plans, traffic plans, traffic calming plans, etc.

As far as possible, the distances involved will be indicated in kilometres.

The following principles must be applied when choosing the wording :

- do not repeat wording when it already exists for motorists ;
- when cyclists are addressed by wording, stay with them providing continuity until they reach their destination.

### 11.2.2. Direction signs for cyclists

The reference for the Dv standard that came out at the beginning of 2005 is XP 98 532 8.

Dv (French abbreviation for cycle direction) panels have a white background, and green margins, lettering and arrows. Their precise description is given in the Order of 24 November 1967, amended, on road and motorway signage.

These panels may be placed either at the location (Dv 20), or as advanced warning (Dv 40) or to confirm an intersection (Dv 60) depending on the type used.

A cyclist figure (Sc2 symbol) is depicted on the panel or is placed at the top of a set with a block comprising the symbol and name of the circuit if it exists.



Signage informs and reassures users (FFCT J. Fournia)

Because of their cycling speed, there is no need to warn cyclists automatically in advance of all direction changes. It is more important to seek the best position for the signs on the basis of intersection configuration and bearing in mind the available space.

Whenever possible, existing direction signs should be used : the indications directed at cyclists are then placed below the other panels, if possible separated by a 10-cm gap. If the cyclist is on a route already signposted for the general traffic flow, then when arriving at a roundabout, the existing D42 panel can be supplemented by a DV44 insert to give specific indication to cyclists.

### ■ Cycle route feeder

When outside a cycle route, it indicates the direction to follow to reach the cycle route. It is addressed at all types of users, both cyclists and also motorists wishing to get to a car park to leave their cars there and continue their journey by bicycle.

That explains why this feeder takes the form of conventional D20 and D43 direction signs with white backgrounds and black margins and lettering. Only the SC2 is green.

### ■ Tourist signage

As type H20 signs (tourist trail markers with a brown background) are also used for other vehicles, they will be topped by a Dv11 sign when they are used for a dedicated cycling touring trail.

# Underpasses and overpasses 12

Since the enactment of the French Clean Air Act in 1996, (see. § 3.3.4.), there is a legal obligation to make allowance for travel by cyclists and other non-vehicular users in the urban environment, right from the highway design stage (roads, road crossings, motorways, interchanges, etc.) and, as the State reminded its services in its directive of 31/10/2002 and its circular of 9/8/2004 (see§ 3.6.) this necessity applies everywhere. It is obviously much cheaper to integrate facilities for environment-friendly transport on roads and engineering works at the design stage than make changes at a later date. Nonetheless, and particularly on conurbation exit roads, the routing of cyclists is more often than not interrupted by breaks that are hard to cross. Therefore, improvements must be made to cross or get around obstacles to provide seamlessness and avoid sending cyclists on lengthy detours.

In many situations, general traffic flow calming is of benefit to all users regardless of whether or not they are motorised : traffic calming, lay-bys for motorists who have broken down and continuity for cyclists and pedestrians.

- giving easy access to these non-motorised users and making mobility convenient : the access edge will be tapered to the stream line (zero threshold) ; domed profiles and grooved coatings will be avoided.

Cyclists will be able to choose between using the road or a safer space, suitable for families and novice cyclists.



*Too steep for rollerbladers and people with reduced mobility (Cete S.O.)*

## 12.1. Footbridges

When this solution cannot be adopted, construction of special footbridges should meet several needs by :

- not interfering with traffic flow on the roads crossed (motor vehicles and also waterways transport : vertical clearance and draught) ;
- being wide enough to allow shared use without segregation : pedestrians, rollerbladers, persons with reduced mobility, cyclists and also maintenance and emergency rescue vehicles. The width is governed by the length : for a particular point over a short distance, a narrower than recommended standard width may be accepted.



*A small ramp enables bicycles to be pushed effortlessly along a staircase (Certu)*

## 12.2. Underpasses

When the construction of a short passage under a road, motorway, interchange or railway line, etc. is planned at the same time as the road to be crossed, not only is this more cost-effective than carrying out works at a later date, but the structure is usually better suited to its purpose and more convenient.

Gradients at the entrance and exit must be kept as gentle as possible, the end must be visible from the entrance and the passage should preferably be aligned with the access path.



*The road project must re-establish continuities (CG 67)*

Light-coloured facing and surfaces are recommended. Unless the passage is very short, straight and on a very gentle gradient, lighting can be used to make it safer and more attractive.

Sharp corners at the entrance to an underground passage will be signalled using light-reflecting materials.

When designing an underground passage, cross-sections should be designed as they would be for bridges and footbridges to match the number and type of users (including maintenance vehicles). Thus, the minimum section recommended for cyclists alone is 2.5 m wide and 2.5 m high, with comfort criteria of 3.5 m and 2.75 m respectively. When pedestrians also use the passage, a width of 5 m will prevent users from getting in each others' way.



*The bridge is accessible to persons with reduced mobility by a ramp with landings (ST Toulouse)*

Gently sloping ramps have to be built on either side (2 to 4 % for an elevation of 5 m) to pass over or around the structure. In the case of gradients over 4 %, the access rules applicable to persons with reduced mobility PRM require the addition of horizontal landings at 10 m intervals.

A 5 % slope is a threshold value, particularly for inexperienced rollerbladers. In this case, a handrail should be added, at a height of 0.90 m, and the route widened by 0.20 m to 0.50 m to give cyclists and rollerbladers enough room to negotiate the curve.

Sharp bends should be avoided to ensure safety and comfort. If no alternative can be found, they should be clearly signed and marked with separate lanes for travel in each direction.

If the site layout precludes the use of a ramp to pass a structure, a stairway may be considered provided that it has a handrail for rollerbladers, a rail to make it easier to wheel bicycles by hand – or even a dual channel for pushchairs. These solutions rule out access for people with reduced mobility and should only be used when the options are very limited.

# Restraining systems and 13 other équipement

There is no obligation to equip cycle routes as a matter of course. Where sections are already equipped, some thought needs to be given to whether the systems are compatible with putting them back into service, in the case of disused railway lines, and increased use by cyclists. However, on unequipped parts, it is advisable to take care that the section or route is homogenous so as not to take users by surprise or mislead them in the event of drops or major inclines.

## 13.1. Barriers

Barrier heights must be compatible with the uses and risks actually run. The «Recommendations for cycle facilities» mentioned a 1.4 m barrier height recommended in certain countries. French experience in this area primarily acquired by creating many greenways on disused railway lines, can be used to distinguish situations :

- in most cases, danger is minimal and the 1-m height stipulated in the XP P 98 405 standard is adequate for pedestrians alone ;
- along a narrow cycle path, in a space to be shared with other modes, on arteries with many family riders, grounds for using the maximum barrier height provided for by the standard, namely 1.2 m for cyclists riding close to barriers can be claimed as cyclists have a slightly higher centre of gravity than pedestrians or because of the dynamic effect ;
- in exceptional circumstances, erecting barriers up to 1.4 m can be considered where they are made up of elements similar to those used for safety screens where loose objects are a danger. This solution could be used for a two-way narrow path along a high-elevation structure. Accordingly, the efforts on barrier elements are those set by the standard and the high-elevation part

could be designed using the recommendations of the technical guide already quoted (bibliography 10).



*1-m barrier sufficient, however surface unsuitable for rollerblading (FFCT J. Fournat)*

## 13.2. Crash barriers between cycle paths and road traffic

When crash barriers are present (bibliography 11) and installed between the main carriageway and cycle paths, allowance must be made for the danger to cyclists' legs from brackets or other rear parts of metal crash barriers. That is why Gierval, double or GS barriers with continuous stringers linking the mount post heads or MVL or DBA concrete barriers are preferable (bibliography 10 and 11).

## 13.3. Joints

Expansions joints must be placed at the ends of structures, however provision must be made to ensure that they can be safely crossed.

Technical notices published by Setra provide technical assessments of most products available on the market. A commission comprising the administration and the manufacturers of expansion joints for road bridges are responsible for writing these appraisals. They are furnished to project owners to clarify them in their work and in choosing or applying these products.

The issue of cyclists' safety as they ride over expansion joints is covered in every technical notice. The project owner should refer to the conclusions of the appropriate paragraph in the technical notice to gauge whether or not the proposed type is acceptable or not. If the type is unsuitable, it will either have to be adapted to offer risk-free riding, or failing that, resort to another type of joint will have to be made.

# Carriageway structures and road surfaces 14

Cycling facility improvements are generally carried out using conventional roadbuilding techniques. Nonetheless, there are three specific parameters that call for very special attention : the quality of the surface or wearing course, the bearing capacity and type of road foundation material.

## 14.1. The carriageway structure

Car drivers and even HGV drivers tend to park their vehicles on **stabilised shoulders**. If this is the case, no new structure is needed but a light upgrade can be carried out (scraping off the surface, levelling with untreated aggregate and compacting) before laying the wearing course to turn them into hardstrips.

The structure of **cycle lanes** is generally the same as the roadway as they are an allocated lane on an existing carriageway, and have the same wearing characteristics. While the creation of cycle lanes calls for road widening, effort should be made to extend the existing structure to avoid creating a weak point at the edge, especially on narrow carriageways that take heavy HGV traffic. HGVs may be forced to drive across them to park on the

shoulder, regularly if parking is authorised, or occasionally in the event of an emergency stop, even if they should not drive on them.

The issue of discontinuity between hardstrip and cycle lane structures and the surface joints should be carefully handled.

The first parameter to establish for **dirt tracks** is the type of bearing capacity comprising the supporting soil and any improved subgrade that will accommodate the track.

### ■ The sub-grade

PF1 bearing capacity (dynamic module 20-50 MPa or deflection >150/100 mm) is insufficient for laying a road foundation without in situ treatment involving the addition of materials or hydraulic binder treatment, or even laying a thick enough sub-grade layer possibly on geotextile.

PF4 bearing capacity (dynamic module >200 MPa or deflection <50/100 mm often found on disused railway lines) is generally enough to dispense with the road foundation. The wearing course can therefore be laid directly onto the sub-grade once the profile has been cleaned and made good with a 5-10 cm thick layer of untreated aggregate leveller.

The sub-grade will be 0.6 m wider than the lane width (+0.3 m either side of it).

### ■ The road foundation

Road foundation geometry and type must withstand the stresses engendered by special heavy wearing course-laying plant (materials transport, grader traffic) and also regular maintenance and cleaning vehicles without undergoing irreversible damage.



*A trap for cycle wheels (FFCT J. Fournà)*

## ■ Materials

The following materials are most frequently used for the road foundation layer :

- Class B, Category 2 untreated aggregate (GNT) : maximum particle size 20 mm (French standard NF EN 13 285) and minimum layer thickness 15 cm ;
- materials treated with hydraulic binders described in French standard NF EN 14 227, namely cement sand-gravel aggregate, gravel-slag mixture, fly-ash and lime, hydraulic ash mixed with sand-gravel, sand-gravel with special road-grade binder. Their compulsory mechanical strength must be class G1 or G2 ;
- class 1 or 2 or NF P 98 138-grade sand-gravel mixed with bitumen : minimum layer thickness 7-9 cm ;
- cement concrete of minimum compliance with class S2,0 of French standard NF EN 13 877.



*A concrete surface for Chambéry's green corridor (E. Metzger)*

## 14.2. The wearing course

The choice of wearing course is of great importance for the safety and comfort of cyclists. They are very sensitive to its integrity, uniformity defects, spalling cracks due to breaks between structures and defective road surface joints, swelling caused by tree roots (poplars, aspen, willow, acacia, etc.) and water seepage, rutting, potholes and various inclusions : gully gratings, rails, etc. Furthermore, the macroroughness of the surface must provide

good road-holding quality without modifying ride comfort or being aggressive in the event of a fall (for instance loose chippings are dangerous).

The wearing course must be impervious, uniform, with no profile or surface unevenness over time. That calls for care in designing the surface and also drainage, collection and removal of run-off water and the surrounding vegetation (species with creeping roots should be banned) for each project. It should be remembered that water spray during rainy weather, is a cycling hazard.

As has been mentioned with reference to hardstrips (see § 8.2.1.) consideration can be given to optically differentiating the cycling surface from lanes reserved for motorised vehicles by colouring. In that case, the jointing between the carriageway and the hardstrip must be perfectly smooth.

In the case of greenways, the best wearing surfaces for cyclists and rollerbladers tend to be those that are also the most comfortable for pedestrians to walk on. The use of untinted asphalt surfacing for greenways, for example, combines wear comfort, design and maintenance affordability with being easy-to-clean.

Given these requirements, we propose the following criteria of choice : travelling comfort, road-holding, ease of upkeep and repair. The adjacent chart gives an estimate of the most frequently used materials on the basis of these criteria. It is not comprehensive.

The strengths of all these materials are compatible with occasional use by motorised heavy maintenance vehicle traffic.

There follow brief comments about the various products :

- **bitumen-based materials**, in particular bituminous concretes, are traditionally used and more flexible. Bituminous concretes, cold-poured bituminous concretes and asphalts can be easily tinted to differentiate space allocation optically to the various users. Creep can make asphalt slippery in the first months after application.

- **surface coatings** are unpopular with town and sports cyclists for reasons of comfort and safety (loose chippings) ;
- **cement concrete** that comprises both the road foundation and the wearing course ; different surface treatments are available and they are easy to tint ; ride comfort is highly dependent on how well the expansion joints are made ;
- mechanically or hydraulic **binder-stabilised** soils are prone to rain damage and occasional heavy traffic can form ruts ; thus they require

more upkeep than asphalt or concrete and rule out certain users (rollerbladers, etc.) ; however, they may provide solutions in areas with extreme environmental problems ;

- **resin-based slurries and mortars** call for smooth, water-resistant substrates and are generally complicated to apply ;
- **modular materials**, such as paving blocks or slabs should be set aside for odd work in public spaces as they are not particularly comfortable for either pedestrians or cyclists.

### Cycle paths, pedestrian zones

Chart taken from the *Public Space Structures and Surfacing Guide*

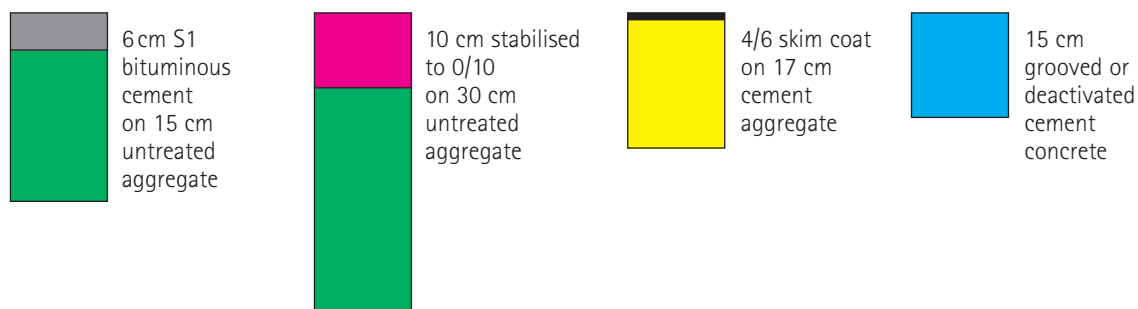
| Criteria                                                                                                                      | Surface coating | Bituminous cement |        | Cold-mix. or Slurry | Asphalt |        | Concrete       | Stabilised soils |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------|--------|---------------------|---------|--------|----------------|------------------|
|                                                                                                                               |                 | black             | tinted |                     | black   | tinted |                |                  |
| Optical differentiation (apart from variation in constituents)                                                                | -               | -                 | +      | -                   | 0       | ++     | + / ++<br>(**) | +                |
| Ride or walking comfort                                                                                                       | 0               | ++                | ++     | +                   | ++      | ++     | +              | + / 0            |
| Road-holding                                                                                                                  | +               | +                 | +      | 0                   | 0       | 0      | +              | -                |
| Adaptation to urban application conditions and being easy to repair, includes ditch repairs (can be worked in small sections) | 0               | +                 | -      | 0                   | +       | 0      | 0              | +                |
| Withstands occasional traffic (provided substrate is suitable)                                                                | +               | +                 | +      | +                   | +       | +      | +              | -                |
| No particular expertise required                                                                                              | +               | +                 | +      | 0                   | 0       | 0      | 0              | 0                |
| Material does not show dirt or is easy to clean                                                                               | -               | +                 | 0      | +                   | +       | 0      | +              | Not applicable   |

(\*) Zones with no motorised vehicle traffic

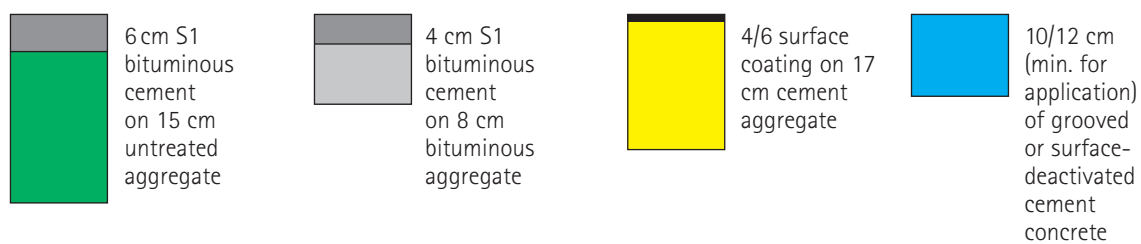
(\*\*) depends on surface treatment

## Examples of cycle path or greenway structures

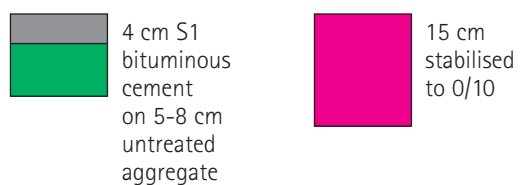
### On PF2 sub-grade



### On PF3 sub-grade



### On PF4 sub-grade



This data is produced by Struct-urb software (bibliography 13).



P A R T F O U R

# Maintenance, assessment, communication

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How many routes are unused because they are poorly maintained or because the population are unaware of them ? A good facility can become dangerous through lack of regular monitoring and intervention by the maintenance services. Admittedly, the expertise must be accompanied by good communication with the public and also by regularly listening to the users in order to measure the work carried out, correct it and improve it.

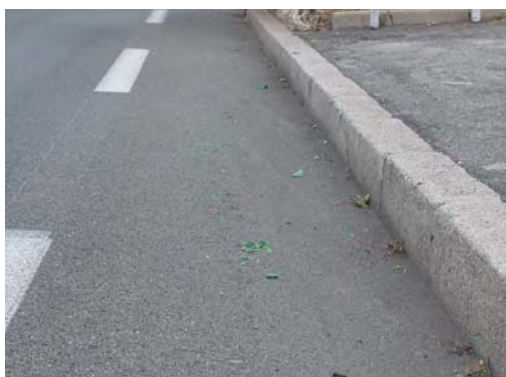
# 15 Maintenance of cycle routes

Too many cycle facilities and routes are infrequently, wrongly or never used due to the fact that they are insufficiently maintained by the managers who have responsibility for them. The regular maintenance needs are however familiar to everyone. The cycling part of a facility can easily be reduced to 30 to 50 % of its original width by the wall effects caused by vegetation or even by concentrations of rubbish of all kinds. For a lane, path, greenway or simply a verge to remain in use by cyclists, it is necessary to carry out two distinct but very complementary types of maintenance.

An action plan comprising general maintenance and major maintenance ensures, among other things, that a standard quality of maintenance is carried out across the entire cycle network :

- repair of the carriageway ;
- drainage ;
- sweeping and cleaning ;
- structure inspection ;
- grass-cutting ;
- pruning and felling of trees at risk ;
- maintenance of furniture ;
- maintenance of road signs and road markings.

Regular inspection and minor maintenance rounds ensure timely sweeping operations after a storm, maintenance of the signage, timely pruning, etc.



*Broken glass prevents cyclists from riding on the verge (FFCT J. Fournia)*



*Two pitfalls : shrubs conceal cyclists at a junction ; when not maintained, a path is unusable (Claude Got)*

## 15.1. General maintenance includes :

- **mowing** : mowing the verges of cycle facilities is identical to the mowing carried out for all departmental roads. It must be carried out across a 1-metre width on either side of the cycle facility.  
*Note : In order to facilitate the job of the maintenance teams, the information signs indicating the beginning and end of cycle paths (signs C113/C114) will be placed in covers so that they can be easily lifted and replaced during mowing or brush-clearance operations ;*
- **sweeping** : this must be carried out regularly and after each stormy period. Two types of sweeping are recommended : systematic sweeping of the entire route once a month and regular sweeping of the major accumulation points (bends, near quarries, roundabouts, etc.) ;
- **rubbish collection** : waste bins should be emptied and rubbish abandoned along the cycle path picked up. It is by offering a spotless environment that one will limit as far as possible the amount of rubbish left in the countryside. This rubbish collection must be done regularly along the entire length of the route ;
- **maintenance of the furniture** : repair of signs, RISs [relais-information-services : orientation posts], furniture at stopping areas ;
- **regular renewal of road markings** for cycle lanes.



Would a tree be left on a road like this without immediate intervention ? (CG 69)

## 15.2. Major maintenance or repairs

Maintaining the quality of the cycling surface (distortions due to roots, bad weather, lorries stopping, etc.) and regular pruning of the verges serve to preserve the initial width. Repairing certain areas of subsidence in the carriageway, levelling manhole surrounds and drain grates, replacing a kerb, repairing markings and strengthening a barrier are all maintenance and safety operations that should be carried out regularly.

When these maintenance operations are subcontracted to a supplier, it is important to monitor the quality of the services provided. A well designed but poorly maintained cycle facility will be a source of discomfort or even insecurity and will not be used.

Each cycling master plan, whether local, intermunicipal, departmental or regional, must be supplemented by a technical guide covering the various procedures for implementing cleaning operations, along with their frequency, the type of service and the allocation of responsibilities. It is also essential to check whether this specifications document is being respected as time goes by.

A budget line which is separate from the traditional road network maintenance line serves to provide responses tailored to the specific needs of cyclists. Appointing patrols that travel by bicycle and are responsible for identifying malfunctions is also a «plus» for monitoring the state of the cycle network.

**Rainwater dispersal and collection of waste-water from the roadbed** are mentioned in the highway maintenance code as a fundamental requirement as regards maintaining the asset. If this subject is not developed here, this is particularly because it concerns all roads and paths. Waste-water collection frequently means a ditch which collects the rainwater and carries it to an outlet ; sometimes it is also used to drain the stratum. This ditch is often situated between the carriageway and the cycle track whose water it may also collect. Its characteristics (openness, depth), which play a role in the level of safety for both motor vehicles and cyclists, must be determined in accordance with the rules defined in the technical reference guide and works.

**Road surface** : this may become damaged by tree roots, by subsidence or landslips, or by the passage of a heavy vehicle where this was not allowed for in the sizing of the structure.

**Inspection and refurbishment of engineering structures** : may require major, expensive works that need to be scheduled.

**Dredging of ditches** : the ditches that run alongside the cycle paths must be monitored regularly, since these have a tendency to silt up and to become blocked by a variety of plant debris, thus running the risk of no longer being able to perform their water removal role.

In summary, the maintenance and exploitation of cycle routes requires the same method of organisation as for ordinary roads : monitoring and triggering of general maintenance or major repair operations.



Maintenance operation on a greenway (Cete S.O.)

# 16 The evaluation tools

Being aware of the changes in activity levels makes it possible to know the customers better, determine the routes used most often, refine the service offerings (accommodation, rentals, etc.) and therefore optimise the investments. The partners need to have access to accurate data to support their policies in favour of soft modes of transport.

## 16.1. Counting mechanisms

On site counting of bicycles on a track is fairly easy. There are various systems : piezoelectric detection, hydroacoustic detection, photoelectric cell detection, etc.

It is worthwhile supplementing these systems with manual counting systems which provide detailed knowledge of the segmentation of uses (percentage of roller-bladers, pedestrians, cyclists, horse riders, etc.). The satisfaction surveys carried out on site show whether the objectives in terms of activity level have been achieved or exceeded and therefore whether the treatment of the route and its maintenance are meeting the expectation of the users. These surveys also make it possible to readapt the cycle offering after a few years.

In order to count cyclists amongst general traffic, several local authorities have for a while been testing a very sensitive automatic detector for identifying bicycles in the midst of other vehicles. This detector, developed by the South-West region Cete, takes the form of an electromagnetic loop which can be encased in the carriageway or even simply stuck onto it. Coupled to a traditional counter, it takes the place of the «vehicle» detector and can then count the bicycles.

These counters should become valuable tools for all local authorities who wish to evaluate their cycle traffic across their entire territory or over certain routes.



*The cycle detector is linked to a magnetic loop (ZELT)*

## 16.2. Accident monitoring units

Recommended in the context of the new PDUs, monitoring units for accidents involving cyclists should be extended to the sectors that have benefited from cycle facilities. In fact, it is essential to monitor the safety level of a facility in the months following its implementation in order to correct it, supplement it, or indeed roll it out more widely. Tools linked to geographic information systems (Système d'information géographique, or SIG) facilitate this monitoring : the Concerto software, for example, was specifically designed for cartographic monitoring of accidents.

# Awareness campaigns and 17 promotion of facilities

To complement the directional signage used for the cycle lane on the routes, promotion of cycle facilities is essential.

This may be implemented by :

- setting up orientation posts (RISs) at judiciously chosen locations ;
- printing a map of the cycle routes.

The information and services listed on these tools must be targeted at the expectations of cyclists : distances and changes in altitude, water and supply points, site plans and visiting times for tourist sites, parking areas, rental and repair points, bus service timetables, etc.

The sources of information must be easily accessible.

The tourist offices are effective channels for dissemination : they are often the first organisations contacted by people trying to organise a trip or an excursion.

Regular updating of the data is essential : it contributes to the quality of the route.

But promotion of the facilities also takes place through actions that raise the population's awareness of cycling : training associations for young children for teaching them how to ride a bicycle, and bike-bus operations that complement the walking-bus operations for going to school in a group and reducing the number of mothers operating a taxi service are both services that should be developed in order to overturn the generally accepted ideas about the risks incurred on bicycles and to encourage all those who are still reluctant to change their mode of transport.



An advertising campaign to change one's mode of transport (ST Lille)



## Conclusion

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Even though some changes can be seen in the practice of cycling in the major towns, most French people continue to use their cars in towns, even over short distances. By contrast, for their leisure activities or on holiday, increasing numbers are taking to their bikes. Short trips to go to the market or the baker's at the weekend, or longer rides to get out of the towns and renew contact with nature or with the ecological or historical heritage of a region – the motivations are varied. But the expectations are common : safety, comfort, attractiveness, routes without unnecessary diversions, coherence of the routes.

Territorial authorities wish to satisfy the users' desires as far as possible. Families often prefer to travel on routes reserved exclusively for non-motorised vehicles while cyclotourists tend to seek routes on secondary roads. In order to offer tailored facilities to suit all needs, local authorities

must follow a concerted planning and scheduling approach, construct a linked network of routes, combine all types of facility and also publicise and evaluate their actions. This work shows that a cycle policy that is set for the long term, in the form of a scheme or a charter, is as important as creating the facilities themselves. Facilitating the exit and the crossing of villages and small towns and linking the town to the countryside means changing to a more equitable sharing of the public space in favour of cyclists and pedestrians, and rediscovering high quality routes and sites and enhancing the territory in a sustainable way. This work shows that safety improvements in favour of cyclists contribute to the general safety of a road network. It is now time to respond to the public's request and create «comprehensive» routes that can accommodate motorised vehicles, pedestrians and cyclists – in a spirit not of segregation but of peaceful coexistence –.

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## Recommendations for bicycle routes

The increase in cycling for leisure has made it necessary to publish a reference work adapted to the difficulties faced by small municipalities and the circulation of cyclists on interurban roads. This work is a complement to the guide titled «recommendations for developing bicycle routes» concerning the integration of bicycles in conurbations.

Representatives from government, general councils and users' associations met to produce these «recommendations for bicycle routes» on a collegial basis. This work, devoted to the interurban environment for cyclists, mainly addresses the elected representatives and technical staff of regional authorities, government services, engineering offices and representatives from associations.

It makes use of the regulatory framework – which encompasses cycling on roads – and relies on the technical doctrine governing road and roundabout design, to present the methods and tools used to build bicycle routes that combine comfort, safety and attractiveness.

## Recomendaciones para los itinerarios ciclistas

El aumento de la práctica de la bicicleta en tiempo libre ha hecho emerger la necesidad de publicar una obra de referencia adaptada a los problemas de los pequeños municipios y a la circulación de los ciclistas por las carreteras interurbanas, además de la guía «recomendaciones para los acondicionamientos ciclistas» (RAC) relativas a la integración de la bicicleta en las «Aglomeraciones».

Representantes del Estado, consejos generales y usuarios se reunieron para presentar colegialmente «recomendaciones para los itinerarios ciclistas». Este «CIR», dedicado al medio «Interurbano» está destinado principalmente a los cargos electos y técnicos de las colectividades territoriales, a los servicios del Estado, a las oficinas de proyectos y a los representantes del mundo asociativo.

A partir del contexto reglamentario –del que dependen los desplazamientos para bicicletas– y basándose en la doctrina técnica que regula la concepción de carreteras y cruces, esta guía presenta métodos y herramientas para realizar itinerarios ciclistas que combinen confort, seguridad y poder de atracción.

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