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## Controlling speed through design

The purpose of this information sheet is to make known a number of design measures for controlling vehicle speeds in built-up areas, together with their conditions of implementation.

*It describes these different measures according to the design techniques or equipment of the road.*

The decree of 29 November 1990 defines the rules relating to traffic calming and control: «30 kph zones», general 50 kph speed limit and «70 kph sections» (see Safety and hierarchy of urban roads). This is referred to in Articles R 411-4 and R 413-1 to 4 of the French highway code.

More than just a regulatory measure, it is a concept that defines the link between the speed limit, the design of the road and the social function of the street, with the aim ensuring safety for all modes of transport.

In other words, a road design that is consistent with the imposed speed limit will play an essential role in ensuring a better understanding and perception, as well as better compliance with the speed limit by users. Enforcement measures by the police will be necessary if speeds do not slow.

The planning tools for controlling speeds vary according to the design and equipment of the road.

### Space structuring

We can talk about structure both in relation to the organisation of spaces and buildings and in relation to activities and practices.

Changing the structuring of the space may encourage users to adapt their speed to the environment. The options are, in particular:

- to vary the attention of road users, whether pedestrians, cyclists or motorists, during their journeys or activities;
- to change road users' behaviour by playing on variations of the visual surroundings, and the meaning of visual scenes (sequences);
- to create environments that are conducive to the development of urban activities;
- to bring about a rebalancing of spaces in favour of local life;
- to use junctions as space-structuring elements (as an end of sequence, a feature, etc.) .

### Reducing traffic lane width

There are three factors that must be considered when determining traffic lane widths: vehicle width, the margin for manoeuvre and the safety margin. The average width of a light vehicle is 1.80 m and the maximum width defined by the highway code for a heavy vehicle is 2.55 m (2.60 m for refrigerated transport) excluding wing mirrors.

However, when two vehicles cross one another, they require both a margin for manoeuvre and a safety margin. The first applies to fixed objects, such as kerbs, parked vehicles and obstacles. It induces the notion of wall effect. The second relates to the presence of other users, such as spaces between vehicles when crossing one another or overtaking.

This margins increase more or less linearly with speed.

Thus, in the simple case of a two-lane road (without central reserve, cycle lane or kerbside parking, etc.), assuming average vehicle widths of 1.80 m for a light vehicle and 2.55 m for a heavy vehicle, there are a number of conceivable road cross sections, depending on lane hierarchy and the type of traffic. All of these seek to minimise the «driving space» and thus reduce the speed of flow without compromising capacity:

⇒ **on a 5.00 m wide road:**

- two light vehicles can cross under satisfactory conditions at 50 km/h;
- a light vehicle and a heavy vehicle can cross at walking pace
- there is insufficient space for two heavy vehicles to cross one another (without driving onto the pavement (footpath) or encroaching into the cycle lane).

⇒ **on a 5.50 m wide road:**

- two light vehicles will cross one another easily and freely at speeds of the order of 50 km/h;
- heavy vehicles will cross one another at walking pace.

⇒ **on a 6.00 m wide road:**

- heavy vehicles will cross one another at slow speed.

In all cases, the selected lane widths must be compatible with the desired speed reduction.

When using the following measures («Deflection of trajectory» or «Variation of longitudinal cross section»), it is important to properly control approach speed (in particular where speed retarders are used) and additional speed calming devices must be provided by law.

## Deflection of trajectory

Deflections of trajectory are a basic urban planning and road user behaviour control measure. When used, reference should be made to the existing recommendations, in particular regarding the siting requirements, marking and signposting.

⇒ **Chicane:** a device serving essentially to reduce speeds (see diagram below).

The following recommendations only apply to chicanes in urban areas with a maximum speed limit of 50 kph.

The specific requirements of chicanes at the entry to built-up areas will be covered in a future information sheet.

A chicane consists of an offset in the line of the road to force vehicles to slow. The impact of this offset on the speed will be greatest if it is significant ( $d > 2m$  recommended) but must not result in excessively narrow pavements (L 1, L 2).

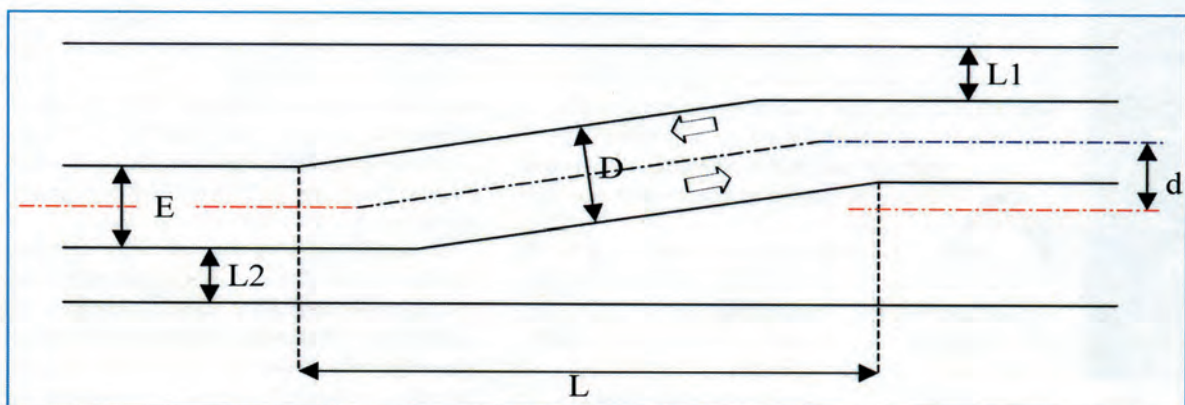
In all cases, the rules relating to the accessibility of persons with reduced mobility must be complied with.

In general the line of trajectory requires the width to be greater at D than at E.

Satisfactory trials have been conducted with values of L varying from 1 in 10 (L is then equal to the offset of the axis «d» in metres multiplied by 10) to 1 in 15.

There are many types of arrangements, the best known being:

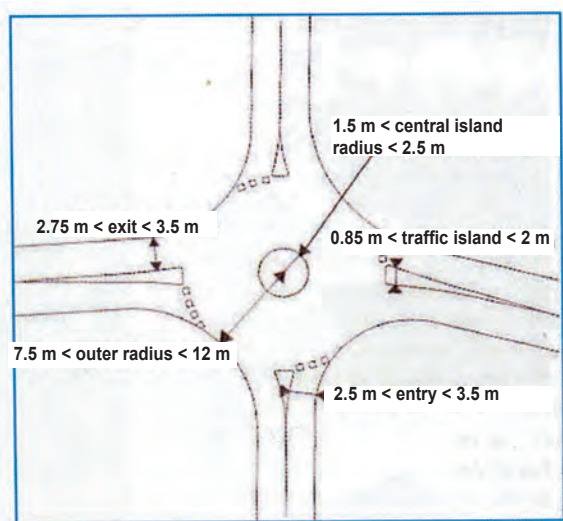
- the simple chicane with a left-hand offset;
- chicanes with a central island or reserve;
- narrowing of the road from double to single lane (alternate);
- chicanes formed by alternate parking.



Changes of trajectory will only have a limited impact in the absence of accompanying measures to ensure better perception and better integration within the site.

⇒ **Mini-roundabouts** (Article R 110-2 of the French highway code).

Mini-roundabouts are exclusively reserved for urban areas where speeds are limited to 50 kph or less, and particularly in sectors where calm driving is required, such as in 30 kph zones. Their characteristics make them well suited for access roads. The recommendations regarding the (transversable) spherical central island (or «blob») specify a maximum height of 15 cm in the general case and 12 cm in the presence of low-floor busses.



### Variation of longitudinal section

This involves using the longitudinal section (project height measurements) to indicate to users a different mode of operation and help to control speeds.

There are various types of calming device that use changes in the longitudinal profile to cause a discomfort that remains acceptable for the users, without constituting a hazard.

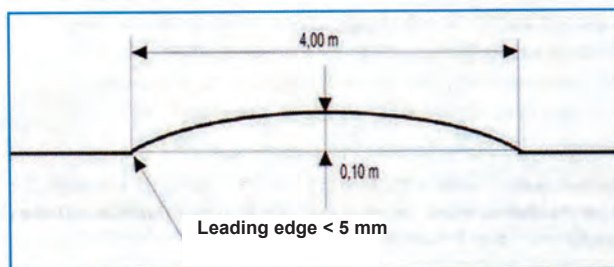
For this, it is essential to comply with the technical recommendations and siting requirements for each of these devices, in particular marking, signposting and limiting the speed to 30 kph.

⇒ **Speed retarders** (AFNOR standard NF P 98-300 of 16 May 1994, decree No. 94-447 of 27 May 1994, annex to the decree).

The decree imposes siting restrictions for this device.

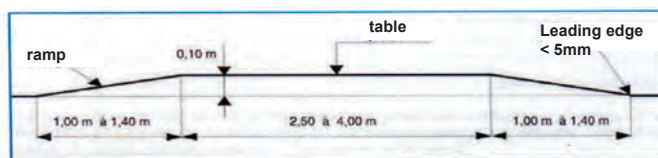
⇒ **Round-top speed hump**

This device has a circular longitudinal section. It cannot be used with a pedestrian crossing.



⇒ **Trapezoidal speed retarder**

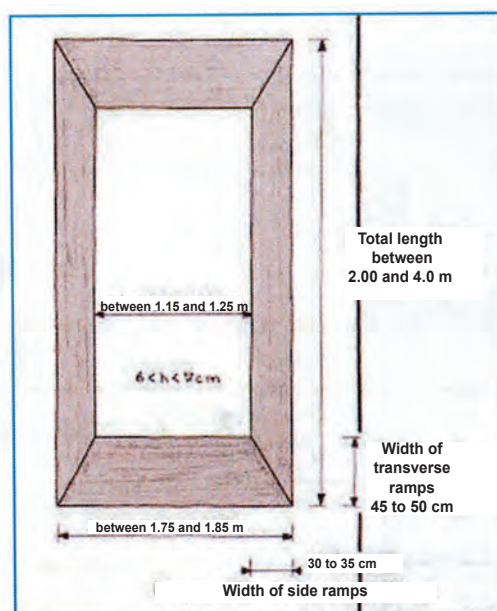
Its longitudinal section comprises a raised flat section and two sloping sections, called the ramps. It must carry a pedestrian crossing.



The rules regarding the accessibility of persons with reduced mobility must also be complied with in this case.

⇒ **Speed cushion**

The existing recommendations define siting locations to be avoided



## Trials

The speed cushion is a hump that does not extend the full width of the road. It thus attenuates the effect of the hump for public transport vehicles and heavy vehicles. Only light vehicles, by virtue of their more closely spaced wheels, are obliged to drive over the raised section with one of their wheels. Motorcycles and bicycles can continue their route on the right without running over the cushion.

### ⇒ Speed table

The speed table is a raised section of road that extends over a certain distance and covers the full width of the road between pavements. In addition to ensuring compliance with the speed limit, it also aims to give a particular legibility of the space so that the users adjust their speeds accordingly, as well as ensuring a balance between all modes of transport to enable the road to be shared safely and easily, in particular by vulnerable users.

The level of the table is 2 cm below that of the pavement, but not more than 15 cm high. The 2 cm difference in level is intended to clearly visually mark the pavement, in particular for children, and to enable it to be detected by the blind and visually impaired. The gradient of the access ramps must be between 5% and 10%.

These raised sections come in four different configurations:

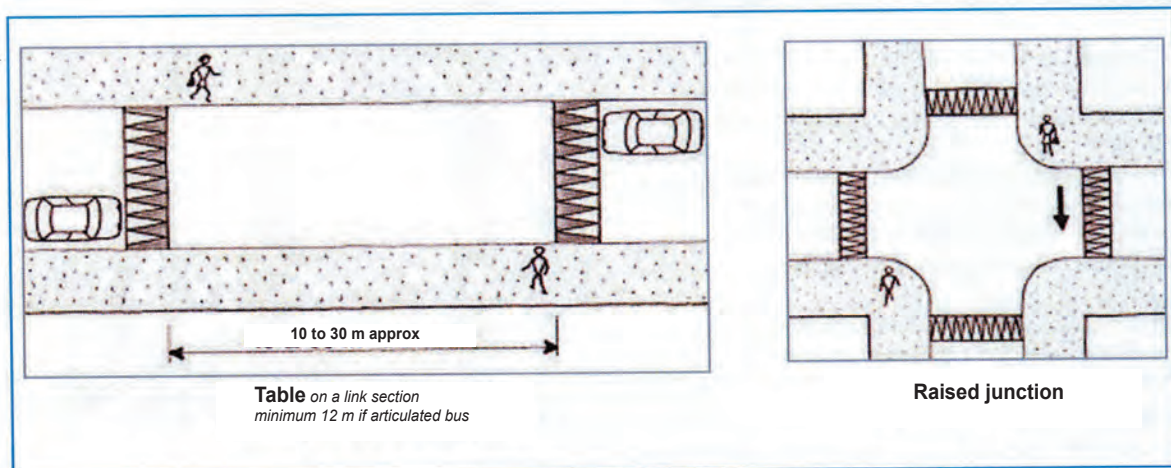
- mid link;
- at junctions;
- at pavement build-outs;
- at roundabout exits.

Whatever the type of arrangement chosen, temporary trials can be envisaged in order to check the feasibility and measure the efficiency of the solution against the desired objectives.

It is very easy to simulate a device using lightweight methods (chicanes using mobile barriers, pre-fabricated devices, etc.).

These trials also allow detailed adjustments to be made before the final installation.

Finally, they can provide an opportunity to inform the users and local inhabitants of the type of amenity provided.







## Associated subjects

- Speed and urban functioning
- Safety and hierarchy of urban roads
- General comments regarding at-grade junctions

## Bibliographic references

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- AFNOR standard NF P 98-300 of 16 May 1994.
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  - Decree of 29 November 1990.

The «Basic Road Safety» series of information sheets has been produced as part of the MPSR (Management et Pratiques en Sécurité Routière – Road safety management and practices) programme by the RST workgroups under the direction of the Certu for urban areas and by the Sétra for inter-urban areas.

This series of documents is intended only to constitute a compilation of experience.

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These sheets can be downloaded from the following websites:

- Certu (<http://www.certu.fr>)
- DSCR road safety «job portal» (<http://securite-routiere.metier.i2>)
- Sétra (intranet: <http://catalogue.setra.i2> and website: <http://catalogue.setra.equipement.gouv.fr>).

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