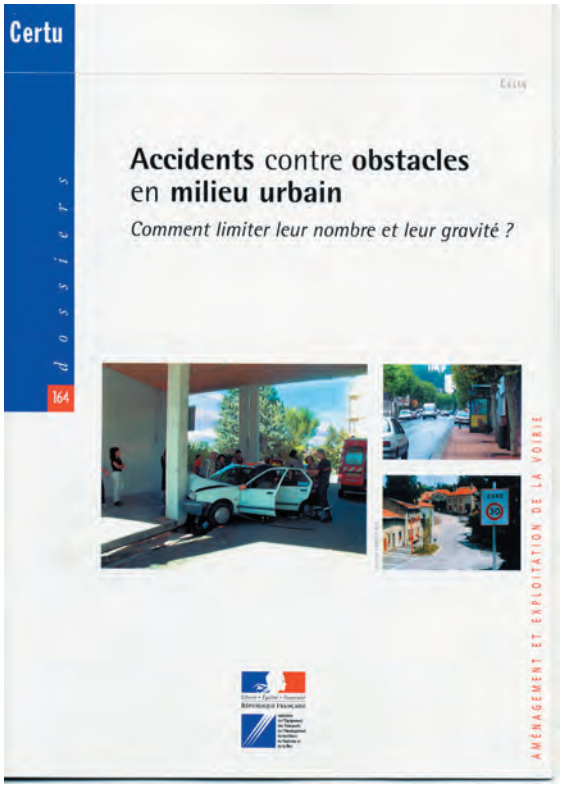
Certu

Road development and operation

Accidents involving obstacles in urban environments

Reducing accident numbers and severity

English version



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RÉPUBLIQUE FRANÇAISE

MINISTÈRE DE L'ÉCOLOGIE,
DU DÉVELOPPEMENT
ET DE L'AMÉNAGEMENT
DURABLES

Accidents involving obstacles

> Loss of control at low speed (40 kph) on a narrow street with poorly-parked cars. Impact against a pillar at an estimated speed of 20 kph; 1 person slightly injured. (Source: INRETS MA)

> Loss of control at a roundabout at an estimated impact speed of 15 kph; 1 person slightly injured. (Source: INRETS MA)

> Driver impeded at a junction, causing their vehicle to strike the kerb at 45 kph and roll over. (Source: INRETS MA)

> Vehicle that left the road by a railway line.

> House damaged by a heavy goods vehicle.

> Fatal accident in which a vehicle lost control and struck a lamppost. Side impact at an estimated speed of 40 kph.

The many objects found in the street

What constitutes an obstacle?

According to the generally-accepted definition, an obstacle is «any roadside object or structure capable of causing an out-of-control vehicle to decelerate rapidly enough to seriously injure its occupants».

Most obstacles are urban objects. Certain poorly-located or inappropriate restraining devices can also become obstacles.

1 Accidents involving obstacles in urban environments – A national issue

Signposts, street lamps, trees, buildings and masonry structures are among the many objects that make up our urban landscape. When an out-of-control vehicle strikes such objects, they become obstacles with potentially serious consequences. Our approach to obstacles is a major safety issue, and urban situations call for specific analysis.

This CERTU document has four aims:

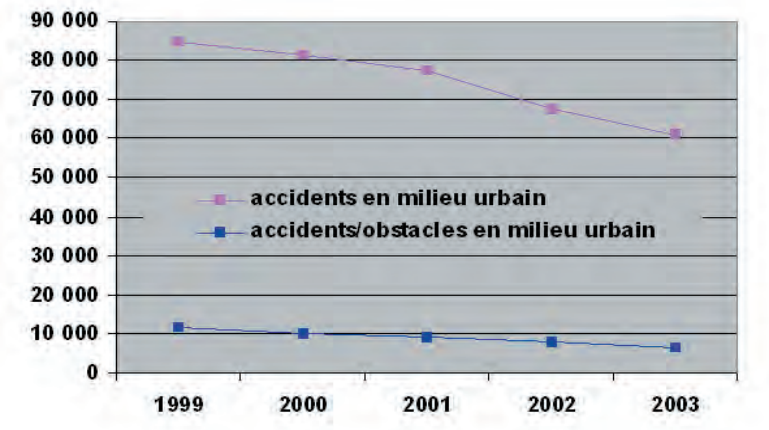
- To inform about the phenomenon and the issues at stake,
- To provide a method for identifying obstacles,
- To provide tools to facilitate diagnostics and action,
- To tackle the problem preventively at the design stage of urban planning projects.

1.1] Worrying urban accident figures

Injuries resulting from road traffic accidents that end with an impact against an obstacle are a major road safety concern. Statistics for the last five years:

- **3,431 people killed by obstacle impacts, i.e.:**
  - **34 % of road deaths in urban surroundings**
  - **10 % of all road deaths in France**
- **These accidents involving obstacles account for:**
  - **1 in 3 road deaths**
  - **1 in 8 road accidents**
  - **1 in 8 road injuries**

(Source: Certu / France 1999/2003 data



The total number of road accidents has been declining steadily for several years, but the figure for accidents involving obstacles is falling more slowly.

1.2] Factors specific to towns

> In open countryside, effective solutions are implemented to decrease the number and severity of road accidents involving obstacles:
• First and foremost, speed restrictions and the related enforcement measures cut road accidents of all types;
• Roadside obstacles can often be removed, set back from the carriageway or isolated.

> In town, such measures are harder to adopt. Even with the standard 50 kph speed limit, striking a static obstacle can have serious consequences. The potential gain achievable by generalising the use of 30 kph zones remains an ideal. Reducing traffic speeds is not enough on its own to offset the risks generated by the urban environment's complexity:
- multiple travel and parking modes,
- dense traffic,
- numerous, complex road junctions,
- lack of space for emergency manœuvres,
- multiple static, inflexible objects along the roadside. These objects generally serve a legitimate purpose, but their positioning makes them potentially hazardous obstacles.

1.3] A wide variety of obstacles

1.3.1] Urban objects

In town, the objects most commonly struck in road accidents resulting in injuries are walls and buildings, traffic islands and kerbs, urban furniture (planters, advertising hoardings, etc.), miscellaneous posts and supports (electricity and telephone poles, lighting masts, traffic lights and signposts), as well as trees, ditches and embankments, not forgetting parked vehicles, which form a category apart and are not dealt with in this document.

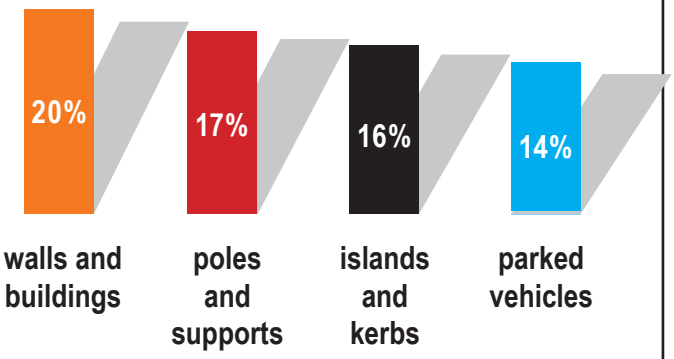
The urban landscape features many roadside objects

The commonest and most serious road accidents involving obstacles tend to occur as vehicles travel through small built-up areas at higher speeds than in dense urban areas. In larger towns, the worst road accidents tend to happen on the main traffic-carrying roads.

> The most hazardous obstacles

Not all obstacles are hazardous to the same extent. The severity of a road accident varies according to the type of object struck, the vehicle type and the impact speed. The road accident statistics reveal the main hazards

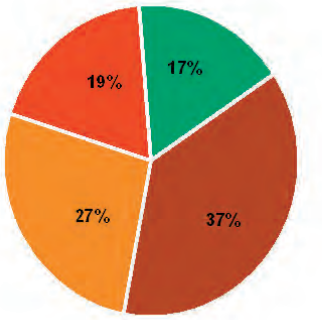
Struck obstacles



1 in 2 accidents involves one of 4 types of obstacle

walls and buildings, poles and supports, islands and kerbs, or parked vehicles

Obstacle-related road deaths



2 in 3 deaths involve one of 3 types of obstacle:

walls and buildings, poles and supports, or trees

• Cars, which are involved in 75 % of obstacle-related road accidents, most often hit trees, poles and buildings.
• Bicycles and motor cycles, involved in 22 % of obstacle-related road accidents, mainly collide
with parked vehicles, kerbs and islands.

Lamp post very close to a busy road

Projecting corner of a house

Core legislation

• Government order of 3 May 1978 pertaining to general conditions for the approval of road signalling, safety and operating equipment, which states: "To ensure that road signalling, safety and operating equipment is of uniform quality, only equipment that complies with an officially-approved type specification may be used on motorways and public highways".

• Decree no. 2002-1251 of 10 October 2002 pertaining to road equipment and amending France's roads and highways legislation (the Code de la Voirie Routière), which defines road equipment and classifies it into three categories: signalling, protection of users and operation.

• The NF EN 1317 standards (1 to 6), which specify performance classes for all highway restraining devices, whether intended for vehicles or pedestrians. For example, in the case of roadside safety barriers, the standard NF EN 1317-2 lists several levels of restraint according to the speed involved and to whether private cars or goods vehicles are concerned.

1.3.2] Safety features

> Restraining devices – Originally designed to make open country roads safer

Restraining devices are designed to mitigate the consequences of a vehicle accidentally leaving the road. They restrain or change the path of an out-of-control vehicle, thereby protecting vehicle occupants and local residents alike. The main types of restraining device include safety barriers, hand rails, impact attenuators and arrester beds.

This highly-regulated field is subject to standards and approval memoranda that stipulate performance levels, specifications and deployment conditions for permitted restraining devices.

> Safety needs specific to urban situations

In urban areas, the use of restraining devices is largely restricted to major transit roads and internal link roads. They are most often found in more sparsely built-up areas and on the approaches to towns, on roads with speed limits of 50 or 70 kph.

They serve three purposes:

- Restrain out-of-control vehicles, by isolating crossing structures, nearby waterways and railway lines, parallel roads, drops, ditches, posts and poles or sensitive neighbouring areas (school playgrounds, gas storage facilities, etc.).
- Separate traffic streams,
- Protect or keep separate streams of vulnerable road users such as pedestrians, cyclists and motorcyclists.

In practice, these devices are often installed in urban areas in debatable conditions:

- Either the device is poorly chosen and unsuitable for the context or existing traffic (vehicle numbers and types).
- Or else the device is installed in less-than-ideal conditions, which do not comply with guidelines, or in inappropriate locations, for example.

As a result, the device may be ineffective or even represent an additional hazard for pedestrians, cyclists or vehicle occupants, as well as often being visually unappealing.

This wooden barrier prevented the planter from obstructing a vehicle

2 Addressing the risk

2.1] Giving priority to new practices

Faced with these challenges, the appropriate response is not to champion the systematic removal of objects (obstacles), but to create a context that helps to reduce accident numbers and their severity, limit the number of urban objects and rethink how and where they are installed.

To improve safety and enhance residents' quality of life, the road through this village has been designated as a 30-kph zone.

This can be achieved through efforts in four areas:

- Helping to control speed in town, by means of special road features, extended 30 kph zones and regular speed controls. This is the prime objective.
- Make certain particularly risky places safer: town approaches, main thoroughfares, steeply sloping roads, large avenues, junctions, bridges, overhanging areas, etc.
- Engineer the properties of objects to prevent them from becoming "hazardous obstacles".
- Promote best practices in the area of restraining devices, in particular by ensuring that they are suitable for all types of road user.

2.2] A method for more effective action

Considering improvements in the area of urban obstacles is a process rarely undertaken by urban authorities. There are few specific regulations, and they are not widely known. Solutions are not easy to define. An enquiring, common-sense approach is required. Removing or mitigating the danger represented by obstacles involves many factors that must be analysed methodically.

2.2.1] Defining the scope of action

It is useful, particularly the first time such an exercise is undertaken, to limit the scope of action to a particular spatial or thematic priority.

> Spatial approaches may consider a complete town or city, or focus on a particular area, a section of road, a route, a particular type of road…

> Thematic approaches vary according to the competencies of and opportunities afforded to the town's operational departments. Examples include street lighting, signs, traffic, roads, transport, utilities, refuse collection, advertising and green spaces.

Example showing features to restrict speed in an area crossed by many pedestrians

2.2.2] Assessing the risk in order to reduce it more effectively

Analysing a site makes it possible to reach a diagnosis and then define proposals for action.

> A three-step process

SITUATION ANALYSIS

This step of the process involves identifying the obstacle and measuring the hazard it represents, based on the characteristics of the obstacle, the road and the traffic.

DIAGNOSTIC ANALYSIS

The analysis provides a useful rationale for subsequent discussions with partners, and for defining and scheduling remedial work. It can be useful to consult the record of local accidents.

PROPOSALS

Four types of action can be envisaged for a particular obstacle:

REMOVE | MOVE | MODIFY | ISOLATE

Priority 1 ***Priority 2***

SITUATION ANALYSIS

> *Obstacle*	> *Road*	> *Traffic and Speed*
Obstacle type: MASONRY Separation: gutter only *Location:* 0.30 m from roadside *Function:* used to marshal parking and as a planter	*Road type:* main road *Environment:* dense residential, town centre *Road profile:* two lanes Characteristics: steeply sloping curve	*Speed limit:* 50 kph *Traffic type:* transit, distribution, local access and residents *Modes:* all modes, pedestrians and public transport

DIAGNOSTIC ANALYSIS

> The obstacle is very near the roadside, aggressive (particularly for cycles and motorcycles), of little value in improving road «legibility», located right on the edge of the road on the outside of a bend in a sloping main road

PROPOSALS

~~REMOVE~~ | ~~MOVE~~ | MODIFY | ~~ISOLATE~~

> Lower the height (<20 cm) of the masonry structure and make it less aggressive (by eliminating the projecting corner)

SITUATION ANALYSIS

> *Obstacle*	> *Road*	> *Traffic and Speed*
Obstacle type: TREE *Separation:* kerb *Location:* 1 m from roadside *Function:* formerly for shade and decoration	*Road type:* main road *Environment:* town centre *Road profile:* two lanes, one-way *Characteristics:* wide, straight road	*Speed limit:* 50 kph, often exceeded *Traffic type:* transit, distribution, local access and residents *Modes:* all modes

DIAGNOSTIC ANALYSIS

> Dead tree of no value from a landscaping perspective

PROPOSALS

REMOVE | ~~MOVE~~ | MODIFY | ~~ISOLATE~~

> Remove the obstacle or replace it with a sound tree and a separating feature (pavement kerb) and reduce the lane width

SITUATION ANALYSIS

> *Obstacle*	> *Road*	> *Traffic and Speed*
Obstacle type: SUPPORT *Separation:* island kerb *Location:* on traffic island from roadside *Function:* advertising	*Road type:* main road *Environment:* residential, business, services *Road profile:* junction *Characteristics:* Y-junction	*Speed limit:* 50 kph, often exceeded *Traffic type:* transit, distribution, local access and residents *Modes:* all modes

DIAGNOSTIC ANALYSIS

> Solid billboard support on a traffic island, at the roadside in an area of serious potential conflicts

PROPOSALS

REMOVE | ~~MOVE~~ | ~~MODIFY~~ | ~~ISOLATE~~

> Remove the billboard support from the traffic island

2.2.3] Acting according to the obstacle

Road accidents resulting in death and injury mainly involve seven types of obstacle (whether urban objects or restraining devices). The actual or potential frequency with which they are involved can help to set priorities. Based on the type of obstacle, the planner's response can be oriented towards particular categories of specific solution appropriate to the type of road concerned.

Obstacle type	Accident factor % of accidents involving obstacles	Road death factor % of deaths in accidents involving obstacles	Suggested solutions (for guidance only)
Buildings, walls and bridge piers	20.3 %	27.3 %	- Isolate - Remove any obstacles that could obstruct a vehicle (fill spaces between piers supporting engineering structures) - Maximise the distance between the edge of the road and «aggressive» structures - Change masonry to preclude obstruction
Poles and other supports	17.3 %	19 %	- Bury operators' networks - Use wall mountings - Use shared supports - Restrict the use of supports at junctions and on bends - Place supports as far from the roadside as possible - Avoid oversizing supports - Remove useless signs - Use breakaway supports where appropriate
Trees and plantations	9.4 %	17.4 %	- Choose low-lying vegetation and shrubs at vulnerable sites - Avoid in-line plantations too near to the carriageway - Restrict plantations near specific road features such as junctions, engineering structures, bends and pedestrian crossings - Isolate plantations using an appropriate, approved solution
Urban furniture, other pavement obstacles, ditches, embankments and rock faces	14.3 %	13 %	- Aim for multi-functionality (bus shelter + bicycle shed + advertising + telephone) - Avoid aggressive shapes and materials (height, sharp corners, etc.) - Install as far from the roadside as possible
Islands, lay-bys, bollards, kerbs and other carriageway obstacles	16.1 %	12.8 %	- Avoid aggressive shapes and materials (height, sharp corners, etc.) - Ensure clear «legibility» by day and night
Restraining devices	8.2 %	5.5 %	- These devices are designed to mitigate the consequences of vehicles leaving the road. They are subject to specific regulations (cf. pages 16 and 17)
Parked cars	14.4 %	5 %	- Take tough action to ensure that visibility is maintained at the approaches to junctions, and parking regulations are indicated - Heed guidelines relating to road widths, cycle paths and pavements NB.: Parking areas can also be used intelligently, to cut speed and protect pavements.

2.3] Making urban objects safer

The table below uses real examples to illustrate what action can be considered for various types of obstacle in a particular context. These suggestions do not constitute formal recommendations. They are intended as starting points for analysis and discussion with the technical community, and where relevant, with equipment manufacturers.

OBSTACLES	SUGGESTED TREATMENT	
Buildings, walls and bridge piers		
	~~REMOVE~~ ~~MOVE~~ **MODIFY** ISOLATE	~~REMOVE~~ ~~MOVE~~ **MODIFY** ~~ISOLATE~~
	> Bridge piers on central reservations are highly-aggressive obstacles. Cast an uninterrupted small concrete wall	*> Reduce the carriageway width and create a pavement (footpath), which will enhance pedestrian accessibility.*
Poles and other supports		
	REMOVE **MOVE** ~~MODIFY~~ ~~ISOLATE~~	**REMOVE** **MOVE** **MODIFY** ~~ISOLATE~~
	> Pole immediately adjacent to the carriageway. Bury utilities wherever possible, or else move the obstacle against the wall.	*> Junction on a tram line: limit the proliferation of obstacles by choosing multi-functional supports.*
Trees and plantations		
	REMOVE ~~MOVE~~ ~~MODIFY~~ ~~ISOLATE~~	~~REMOVE~~ ~~MOVE~~ **MODIFY** ~~ISOLATE~~
	> Remove the isolated tree immediately adjacent to the carriageway.	*> Limit speed by reducing the carriageway width.*

SATISFACTORY TREATMENT — OBSTACLES

Buildings, walls and bridge piers

> No risk of obstructing an out-of-control vehicle.

> Bridge piers at a satisfactory distance on the central reservation and separated from the carriageway by high kerbs.

Poles and other supports

> Supports far enough from the roadside on this boulevard.

> Mounting lighting supports on walls is a good solution.

Trees and plantations

> Trees at a satisfactory distance and separated from the carriageway by a kerb and bus lane.

> Trees at a satisfactory distance and separated from the carriageway by a kerb.

OBSTACLES	SUGGESTED TREATMENT	
Urban furniture, ditches, embankments, rock faces and other footpath obstacles		
	REMOVE MOVE ~~MODIFY~~ ~~ISOLATE~~	~~REMOVE~~ ~~MOVE~~ MODIFY ~~ISOLATE~~
	> Planters and a barrier located right on the edge of a road with a 70kph speed limit; this also represents an obstacle to pedestrian accessibility.	*> Masonry structure with a projecting corner: lower the structure and make it less aggressive (cf. detailed example on page 10).*
Islands, lay-bys, bollards, kerbs and other carriageway obstacles		
	REMOVE ~~MOVE~~ MODIFY ~~ISOLATE~~	REMOVE MOVE ~~MODIFY~~ ~~ISOLATE~~
	> Hard-to-see masonry structure on a central island in the path of vehicles.	*> The traffic light control unit on a traffic island should be moved, away from junctions, to the pavement.*
Traffic signals		
	~~REMOVE~~ ~~MOVE~~ MODIFY ~~ISOLATE~~	~~REMOVE~~ MOVE MODIFY ~~ISOLATE~~
	> Temporary road sign base installed at the roadside. As before, this greatly impedes pedestrian accessibility.	*> Unisolated post: study the possibility of locating it on the building side.*

SATISFACTORY TREATMENT

OBSTACLES

> The traffic light control unit has been moved away from the roadside and placed against the wall.

> Combined bus shelter and lighting support, at a safe distance from the roadside.

Urban furniture, ditches, embankments, rock faces and other pavement obstacles

> Low, less aggressive kerbs.

> Ends of the high kerbs lowered by the tram station to prevent any risk of obstructing vehicles.

Islands, lay-bys, bollards, kerbs and other carriageway obstacles

> Wall-mounted signals are a good solution where clearance is limited.

> Wall mountings release space, particularly for pedestrians.

Traffic signals

2.4] Choosing appropriate restraining devices

As with urban objects, it is possible to implement a strategy to improve the quality of the restraining devices used in urban environments.

Six basic rules

Rule 1 Before installing a restraining device always check that it is really necessary. Eliminating or moving back the obstacle is always preferable, and priority should be given to the feasibility of doing so.

Rule 2 Select a device appropriate to the risk to be covered.

Rule 3 The chosen device must not represent a greater hazard than the obstacle it is supposed to isolate.

Rule 4 Devices are only effective if located and used correctly.

Rule 5 Devices of different types must be interfaced correctly, to ensure uninterrupted protection and avoid creating hard spots.

Rule 6 Only use devices that have been approved or certified, or have been granted permission for use.

Suggested solutions based on examples

Rule	INAPPROPRIATE TREATMENT	SATISFACTORY TREATMENT
RULE 1	 *> The shrubbery hedge is not an obstacle. There is no need to isolate it by installing a barrier.*	 *> The safety barrier is intended to isolate a river in a periurban environment. It is installed in accordance with the relevant standards, and will therefore serve its purpose by keeping cars on the road.*
RULE 2	 *> Where the drop is at its greatest, the only device installed is a hand rail. Such a device is totally unsuited to the purpose of restraining vehicles.*	 *> On a crossing over a railway line, a BN4 barrier has been installed, extended to either side of the structure by a metal barrier. The two devices have been correctly joined, allowing them to function without interruption, and will prevent vehicles from falling onto the railway line.*

Rule	INAPPROPRIATE TREATMENT	SATISFACTORY TREATMENT

RULE 3

> On this trunk road, the safety barrier has been installed the wrong way round. This makes it an obstacle more hazardous than the one it is supposed to isolate.

> The concrete barrier prevents the risk of falling into the river, and separates the cycle path from the motor traffic. This device is an appropriate choice.

RULE 4

> This safety barrier, installed to isolate the lamp-posts on a boulevard is an approved device. However, it is installed too close to the lamp-post to function correctly, and could cause a vehicle to be obstructed by the post.

> The double barrier is an approved device, well-suited to the purpose of dividing traffic flows. Its end is rightly deflected downward and buried in the island, thereby ensuring that the device functions effectively.

RULE 5

> Two different devices are installed but not linked: a vehicle would not be prevented from falling into the river. Furthermore, there is a risk of the end of the guard rail obstructing a vehicle.

> On an urban expressway, linking the two devices in a manner compliant with the applicable standards will prevent a vehicle from being obstructed by the end of the concrete barrier.

RULE 6 ***> All restraining devices must comply with applicable regulations.***

3 Imagining urban road safety solutions for the future

Making the towns and cities of tomorrow safer places will require a more disciplined approach than in the past. We have seen how a fresh approach can help us rethink the way we install certain urban objects. This exercise requires a little time and a few simple analytical tools.

More broadly, the devices best-suited to use in tomorrow's cities will emphasise:

- Effectiveness: As in other countries, deformable supports such as energy-absorbing masts and lamp-posts will be used in France,
- The aesthetics of the urban landscape: devices such as coloured concrete car restraining walls, which blend into their surroundings, may be used,
- Respect for all categories of road user, and in particular pedestrians, cyclists and motorcyclists,
- Ease of operation and maintenance,
- Compliance with safety standards.

Note: New devices can only be used on an experimental basis, subject to prior approval from France's road traffic and safety department (Direction de la Sécurité et de la Circulation Routière).

Examples of innovative products

> Breakaway electricity pole. (Finland)

> Energy-absorbing deformable support.

> Deformable temporary road sign base near a school entrance in Sweden.

> Result of an impact test at 100 kph against an energy-absorbing lamp-post: the vehicle cabin is only slightly deformed – passengers wearing seatbelts would escape injury. (Sweden)

> Energy-absorbing deformable lamp-post. (Sweden)

4 Bibliography

Guides, special reports and catalogues

• Certu special report- *Accidents en milieu urbain. Sorties de chaussée et chocs contre obstacles latéraux* (Accidents in urban environments. Vehicles leaving the road, and impacts involving roadside obstacles) December 2001
• Certu information leaflet - Les chocs contre obstacles en milieu urbain (*Impacts involving obstacles in urban environments*) November 1999
• GC technical guide collection published by Sétra:
- Corniches (*Coast roads*) 1994
- Protection contre la corrosion - Equipements latéraux des ponts (*Corrosion protection – Bridge-side equipment*) 1996
- Garde-corps (*Guard rails*) 1997
- Barrières de sécurité pour la retenue des poids lourds (*Heavy goods vehicle restraining safety barriers*) 1999
- Barrières de sécurité pour la retenue des véhicule léger (*Car restraining safety barriers*) 2001
- Choix d'un dispositif de retenue en bord libre d'un pont en fonction du site (*Choosing bridge-side restraining devices according to the site*) 2002
- Certu file: La normalisation de mobilier urbain - Recueil des références des textes (*Standardisation of Urban Furniture – References of regulatory texts*) June 1999

Main regulatory texts

• Government order of 3 May 1978 pertaining to general conditions for the approval of road signalling, safety and operating equipment,
• Decree no. 2002-1251 of 10 October 2002 pertaining to road equipment and amending France's roads and highways legislation (*Code de la Voirie Routière*),
• Memorandum 88-49 of 9 May 1988 pertaining to the approval and conditions of use of restraining devices intended to prevent vehicles from accidentally leaving the road.

Non-exhaustive list of standards

• P 98-405: Barrières de sécurité routières – Garde-corps pour ponts et ouvrages de génie civil – Conception, fabrication, mise en œuvre (*Road safety barriers – Guard rails for bridges and civil engineering structures – Design, manufacture and use*).
• P 98-430: Séparateurs et murets en béton coulés en place – Définitions, fonctionnement et dimensions (*Cast-in situ concrete walls and separators – Definitions, operating principle and dimensions*).
• NF EN 1317 (1 - 6): Dispositifs de retenue (*Restraining devices*).
• NF EN 12767 relating to structures accommodating passive-safety highway equipment.

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.

Special report collection N°196

Documents providing an update on a fairly restricted, specific topic, which may be either a new technique or a new problem not covered in the existing literature. These documents are primarily aimed at experienced professionals.. Certu guarantees the content in the french version.

Certu also publishes the following collections: Debates, References, Study Reports, Surveys and Analyses.
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Working group

This file is the result of the work undertaken by a group led by Hubert Trève (CERTU-Safety, highways and public spaces department), with contributions from Cyrille Laroche (CETE Lyons), Claude Abignoli, Frank Monti and Gérard Siddi (CETE Mediterranean).

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CERTU

Centre d'Études sur les Réseaux, les Transports, l'Urbanisme et les constructions publiques
Centre for studies on urban planning, transportation and public facilities

In France, the total number of road traffic accidents in town is declining steadily. However, one category of accidents, responsible for more than a third of road deaths, is falling more slowly than the others: accidents involving obstacles. Although limiting driving speeds is a key area for progress, it is not enough on its own. The host of objects and safety devices currently invading the urban landscape can be managed within a framework that helps to ensure effective risk prevention.

The purpose of this special report is to raise awareness of this problem and offer ideas for possible solutions. It is primarily aimed at local authority technical departments and project managers, as well as design offices and contractors regularly involved in urban road improvement projects.

The document describes a method, illustrated with a selection of practical examples. It is divided into two sections. The first section covers the appropriate action for the objects most commonly found in the street, such as traffic islands at junctions, masonry structures, poles, signposts, plantations and urban furniture. The second section focuses more specifically on restraining devices, barriers and safety barriers. The document concludes with an outlook for the future, outlining measures that could help to further improve urban safety.

Cf. Synthèse du contenu en français à la fin du document.
Ver la sintesis de la obra traducida al espanol al final del libro.

OTHER DOCUMENTS ON THE SAME TOPIC

Accidents contre obstacles en milieu urbains : sorties de chaussée et chocs contre obstacles latéraux (Vehicles leaving the road, and impacts involving roadside obstacles) 2001
La normalisation du mobilier urbain (Standardisation of urban furniture) 1999
Les chocs contre obstacles en milieu urbain (Accidents involving obstacles in urban environments) Leaflet published in 1999

CERTU (*Centre d'Etudes sur les Réseaux, les Transports, l'Urbanisme et les constructions publiques*) is a technical organisation operating under the authority of France's Ministry of Infrastructure, Transport, Tourism and the Sea. CERTU's mission is to develop new knowledge and expertise in all areas relating to urban life. The centre works closely with local authorities, businesses and public organisations, promoting a professional approach to all aspects of urban planning and development.

Certu Accidents involving obstacles in urban environments.

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Road Development and Operation
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