

Chapter 20 Traffic Calming and the Control of Speed

20.1 Introduction

Speed is a significant factor in about one third of accidents in the United Kingdom. This is particularly so in urban areas, where speeding vehicles also adversely affect the quality of life of many communities. This does not necessarily imply that vehicles simply exceed the speed-limit applying in the area in question, although many often do, but rather that the speed is inappropriate for a particular section of road or set of conditions. For example, all roads within a 30 miles/h limit are not suitable for speeds of 30 miles/h, regardless of the time of day, state of the weather, level of pedestrian activity or prevailing traffic conditions. However, speed-limits are often interpreted this way by drivers. The speed perceived as appropriate at any time depends also on the viewpoint of the individual ie as a driver, as a local resident or as a vulnerable pedestrian or cyclist.

The quality of life in towns and villages can be adversely affected by growing volumes of traffic and traffic travelling at inappropriate speeds. The demand for on-street parking often competes with the need for delivery facilities and space for pedestrians. Many urban roads were not built to accommodate the level and speed of traffic to which they are now subjected. Pedestrians, especially children, the elderly and the disabled, and cyclists are particularly intimidated by traffic travelling too fast in urban areas. Not only does traffic speed increase the potential for accidents but it also creates a barrier that divides communities.

Road layout can give drivers the impression that they are travelling at a safe speed, even when exceeding the speed-limit, but alterations to layout, which emphasise the overall environment of a street, can change and correct such mistaken perceptions. Blanket speed-limits of 30 miles/h or 40 miles/h are often applied but are not widely respected and create heavy demands for enforcement on police resources. Roads with generous dimensions encourage, rather than inhibit, speed. The link between speed and accidents is discussed in Chapter 16.

The largest single contributory cause of accidents (95%) is human error. The attitude, culture or behaviour which leads to such errors can be influenced not only by physical changes to the road



Photograph 20.1: Calmed traffic and enhanced environment – Teignmouth, Devon.

layout (see Photograph 20.1) but also by enforcement, education, training and publicity .

To be effective, the management of speed has to include the different elements of:

- traffic calming;
- speed-limits;
- enforcement; and
- education, to change attitudes to speeding.

20.2 Traffic Calming

The term 'traffic calming' covers a range of traditional and new techniques, designed to reduce the adverse effect of traffic in urban streets. The Buchanan Report (Buchanan *et al*, 1963), in defining 'environmental areas', advanced the concept of applying traffic management techniques, on an area-wide basis, to achieve safety and environmental targets. Traffic calming has given that concept a renewed emphasis.

Powers to construct traffic-calming measures are detailed in The Traffic Calming Act 1992 (HMG, 1992), which amended the Highways Act 1980 (HMG, 1980) [Sa], by the addition of sections 90G, 90H and 90I, which allow works to be carried out "...for the purposes of promoting safety or preserving or

improving the environment through which the highway runs" [NIa]. Other powers contained in Part V of the Highways Act 1980 [Sa] include those under sections 64 (roundabouts), 68 (pedestrian refuges), 75 (variations in relative width of carriageways and footways) and 77 (alteration of the level of a highway). The Highways (Traffic Calming) Regulations 1993 (HMG, 1993) [NIb] [Sb] and The Highways (Road Humps) Regulations 1996 (HMG, 1996) also apply in England and Wales (see Chapter 13) [NIc] [Sc].

Where a traffic-calming feature is not covered by the Traffic Calming or Road Hump Regulations, or where a highway authority is uncertain whether existing powers would allow the installation of certain traffic calming measures, applications for 'Special Authorisation' can be obtained from the Department of Transport [NId] [Wa]. However, this should seldom be necessary, as the Regulations cover a wide range of measures.

Traffic calming in the UK owes much to earlier continental European practice and experience, especially in Denmark, the Netherlands and Germany. The shared-space 'Woonerf' design was pioneered in the Netherlands and uses unkerbed level paving shared by both vehicles and pedestrians and is designated with a special sign indicating that the surface is shared. However, the high cost associated with Woonerfs has constrained their widespread use. Many continental schemes in major cities involve the reallocation of highway space and these have been particularly successful where wide roads or avenues existed previously. There are now numerous excellent examples of shared surfaces in the UK (CSS, 1994) (see Photograph 20.2).



Photograph 20.2: Shared surface – Sidmouth, Devon.

20.3 Speed-Control and the Environmental Objectives Of Traffic Calming

The advent of traffic calming, including the extensive use of speed-reduction and speed-control techniques, marked a significant change in the approach to traffic engineering. The traditional approach was to design road layouts to accommodate increasing volumes of traffic and this led to an open-road impression which, outside congested periods, allowed excessive speeds and has contributed to the domination of urban roads by motor vehicles. Traffic calming has allowed this approach to be re-examined, leading to schemes which benefit all road-users. In this context, 'road-users' includes pedestrians, disabled people, cyclists, buses, commercial vehicles, delivery vehicles, local residents, shop-keepers, those who work in the area and those using the area for rest, play or entertainment, as well as private cars.

The objectives of traffic calming include:

- improvement of the environmental quality of streets;
- general improvement of safety and reduction of accidents
- improvement in safety and convenience specifically for vulnerable road-users (including people with impaired mobility, elderly people, pedestrians, children and cyclists);
- reduction in noise, disturbance and anxiety;
- restoration of communities divided by speeding traffic;
- enhancement of the appearance of streets;
- discouragement of the use of unsuitable routes by heavy vehicles and 'through' traffic;
- changes to the attitude of many drivers towards speed; and
- tangible demonstration that streets are for people as well as for traffic.

20.4 Policy Framework

Traffic-calming schemes should not be designed in isolation but need to be part of an overall policy framework for an urban area and should fit within the overall transportation strategy for that area.

The Policy Framework should be reflected in a planned road hierarchy (see Chapter 11), taking account of the incidence of accidents, safety and environmental targets and the management of speed. The guidelines for Urban Safety Management produced by The Institution of Highways & Transportation (IHT, 1990) give advice on a structured

approach to the development of such a policy framework. Further advice can be found in Traffic Calming Guidelines, published by Devon County Council (DCC, 1991), and Traffic Calming in Practice (CSS, 1994).

When developing a road hierarchy for an area, account should also be taken of current and planned development in the area. The function of each road should be examined in the context of traffic needs, environmental sensitivity, type and layout of road, pedestrian usage, the presence of schools and shops and its place in the overall approach to road safety measures for the area. It is essential that all types of road-users are considered, not just drivers of vehicles. The sensitive development of a road hierarchy can promote many of the traffic calming objectives and can play a major role in ensuring that the dominance of vehicles is reduced, in those roads where such a reduction would provide maximum benefit. As land-use is taken into account in its development, the hierarchy then forms the basis of future land-use, transport and development control policy and should influence the design of new roads and estates roads (see also Chapter 11).

Once a carefully considered policy-framework has been established, a strategic approach can be adopted in the investigation, not only of traffic-calming schemes but also of local safety schemes, street-lighting design and layout, maintenance standards, management of the environment and the allocation of resources. Such a framework is a prerequisite for the justification of 'package bids'.

20.5 Specific Policy Issues

Traffic calming can be a way of resolving potential conflicts and competition for road-space but it has to be developed in an integrated way, taking account of the needs of all users of the roads in question. Specific policy issues which arise when traffic calming schemes are being designed are addressed below.

Buses

Specific attention needs to be paid to the design of traffic-calming measures on bus routes and early consultations need to be held with the bus operators (see Chapter 24). The buses need to be able to negotiate the routes safely at a reasonable operating speed. The following guidelines should be adopted when introducing road humps on bus routes, although legislation may allow different design criteria:

- ❑ the hump height should not exceed 75 mm (in the case of raised junctions, 100 mm may be

acceptable but, with flatter ramp gradients, 10% may be desirable);

- ❑ the ramp gradient generally should not exceed 10% for flat-topped humps;

- ❑ the plateau length should not be less than the largest wheelbase of any public service vehicle likely to use the route, with a six-metre minimum length;

- ❑ speed cushions can be a preferable alternative to full width humps on bus routes; and

- ❑ ramp gradients for speed cushions should not exceed 12% and side ramps should not be steeper than 25%.

The design may also need to incorporate those requirements that give priority to public transport. Information is given in Current Issues in Planning Vol. 2 (Trench, 1995).

Pedestrians and Cyclists

One of the main objectives of traffic calming is to improve conditions for pedestrians and cyclists and to encourage these modes as alternatives to travel by car. Care is needed in the design of measures, if these objectives are to be achieved (see Chapters 22 and 23).

Wherever possible, provision should include:

- ❑ adequate widths and special routes, often giving priority to pedestrians and cyclists;
- ❑ central islands and clearly designated crossing arrangements;
- ❑ footways that maintain the same level at formal pedestrian road-crossings, such as flat topped road humps, together with tactile surfaces;
- ❑ designated cycle facilities throughout routes and as bypasses at pinch points; and
- ❑ arrangements to make access for mobility impaired people as easy as possible.

Vulnerable Road-Users

The introduction of traffic-calming measures should provide facilities to assist and protect vulnerable road-users, such as children, the elderly and mobility-impaired people. Traffic-calming measures, which distract the attention of these vulnerable road-users from their purpose of either crossing or walking along the road, may become hazards which cause accidents rather than reduce them. Care in the detail of layout and design is essential.

Emergency Services

It is important to maintain good access and a rapid response time for emergency services. Consultations are required with the emergency services for road humps (HMG, 1996) [Sc]. For other measures, under the Highways Act 1980 (HMG, 1980) [Sa] and the Highways (Traffic Calming) Regulations 1993 (HMG,

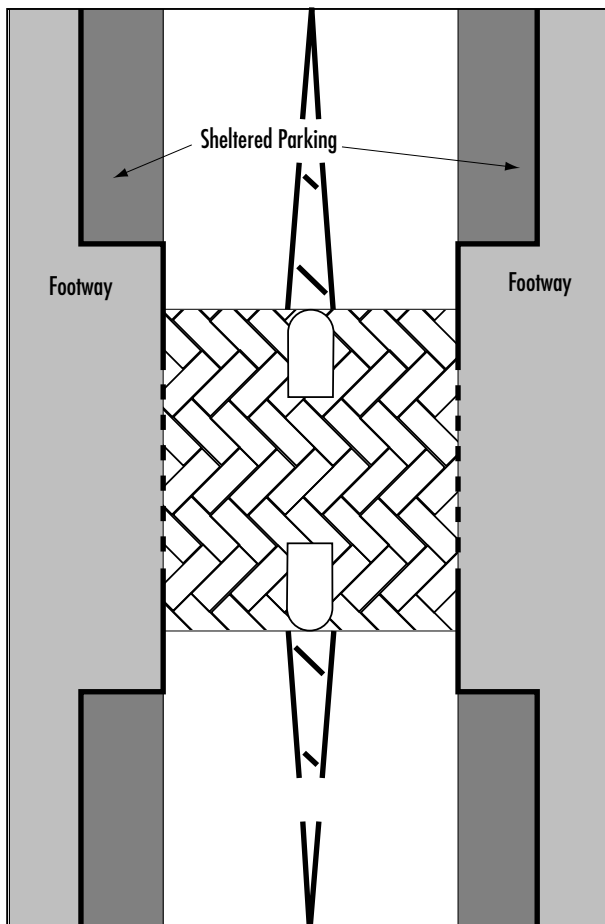


Figure 20.1 Footway build-outs reduce the distance for pedestrians to cross, improve visibility and can provide sheltered parking.

1993) [Sb], consultation is required with the police, although other services would also normally be consulted [NIe]. The improvement of road safety is a common goal and the emergency services and the local Highway Authorities should work together in setting and achieving accident-reduction targets. Advice on a code of practice and on consultations with the fire and ambulance services is given in Department of Transport Traffic Advisory Leaflet 3/94 (DOT, 1994) [Sd], which emphasises the need to identify strategic routes.

Routeing of Heavy Goods Vehicles (HGVs)

Heavy Goods Vehicles should be encouraged, by road signs, to remain on the highest available category of route for as much of their journey as possible. Traffic calming can be used to control speeds but the largest size of vehicles involved needs to be taken into account. In every case, the environmental impact of heavy goods vehicles should be reduced to a minimum (see Chapter 25).

On-Street Parking

Provision for the required levels of on-street parking should form an integral part of the design of all traffic

calming and parked vehicles themselves can sometimes assist in reducing traffic speeds, if they are located in appropriate locations. Footway build-outs can be used to define parking areas and at road crossing points, to improve visibility for pedestrians. Care must be taken, perhaps by paving demarcation, to discourage pedestrians from standing too close to the carriageway where they might be at risk of being struck by projections from passing vehicles (see Figure 20.1). Planting can also be used to reduce the visual intrusiveness of parked vehicles. However, care must be taken to avoid planting schemes which, in themselves, may obscure pedestrians.

Traffic Restraint

The promotion of, and provision for, alternative forms of transport to private cars are unlikely to provide a solution to urban transportation problems, in isolation. Complementary measures to manage demand for use of private cars, and to maximise the use of alternative forms of transport, are necessary as part of an overall strategy (see Chapter 21) [NIf]. However, traffic calming, applied over wide areas of a town, can have a considerable effect on the overall demand for car-use, as part of a traffic restraint policy, and can contribute to changing public attitudes to car-use, safety and the environment.

The Environment

Traffic-calming schemes are likely to be more successful and popular where the overall appearance of the street scene is improved. The objective must always be to achieve an environmentally sympathetic scheme, which complements highway safety requirements and does not give rise to maintenance problems. This requires working across disciplines and organisations and with the local people (DOT, 1995b) [Sd]. The appearance and design of streets should make drivers aware that slow speeds and tolerant behaviour are necessary. An improved environment allows pedestrians, cyclists and residents to enjoy the freedom that traffic calming offers and encourages more social activities in residential and shopping areas (see also Chapter 11). Particular attention to design is needed in environmentally sensitive areas, such as historic centres and conservation areas (EHTF, 1994). Investigations are being carried out, by the DOT and TRL, into the effects of traffic calming on vehicle emissions. No conclusive evidence has yet been obtained but it seems clear that schemes need to be designed to encourage smooth driving behaviour, without excessive acceleration and deceleration.

Economic Development

Traffic-calmed areas have potential for economic growth and development and this can be a positive

encouragement to shopping and other commercial activity, as the progressive pedestrianisation of town centres has demonstrated.

When development takes place, it often places an extra burden on the existing highway infrastructure, which can be mitigated by measures to improve the capacity of the network. However, new accesses and junctions, with their attendant visibility splays, require more land to be taken into the highway, sometimes to the detriment of the environment. In some instances, it may be possible to reduce visibility splays and sight lines by introducing traffic calming on the existing highway, so that lower speeds prevail and tighter geometric design standards can be adopted, but care is required to ensure that the measures will actually result in reduced speeds and that appropriate visibility splays are adopted.

Within new development, whether commercial or residential, opportunities exist for the introduction and financing of traffic-calming measures that are integral with the design process, and not merely extras added at a later stage. As a result, the road layout may look significantly different from traditional designs. For instance, frequent changes of direction and a lateral shift of road alignments can be incorporated, allowing for the inclusion of well-designed areas of landscaping at an early stage, rather than added later to infill spare spaces (see Part IV).

Walking and Cycling

The main aim of PPG 13 (DOE/DOT, 1994) is to plan for less travel, especially by car [Nig] [Se] [We]. The provision of alternative modes of transport, such as bus, train, cycling or walking, are seen as being necessary for new development to be acceptable. However, cycling and walking will only be attractive in a pleasant environment, where cars are not allowed to dominate. Communities severed by wide, fast and busy roads can be 're-united' by imaginative and well designed traffic-calming schemes that involve the reduction of traffic speeds. This serves the aim of PPG13 [Se], by making walking and cycling more attractive (see Figure 20.2).

Traffic Calming on Main Roads

Successful traffic calming requires a road-hierarchy framework. It has to be recognised that the function of major routes and main distributor roads is to carry the majority of the traffic. However, despite this main function as a traffic route, traffic-calming techniques may still be appropriate where drivers need to be encouraged to proceed at a pre-defined speed in a calm and safe manner. Pedestrians, cyclists and vulnerable road-users need protection with the provision of specific facilities, such as road crossings, and where a main road passes through a small village centre there may be a case for comprehensive traffic calming. The Village Speed Control Study (Wheeler,

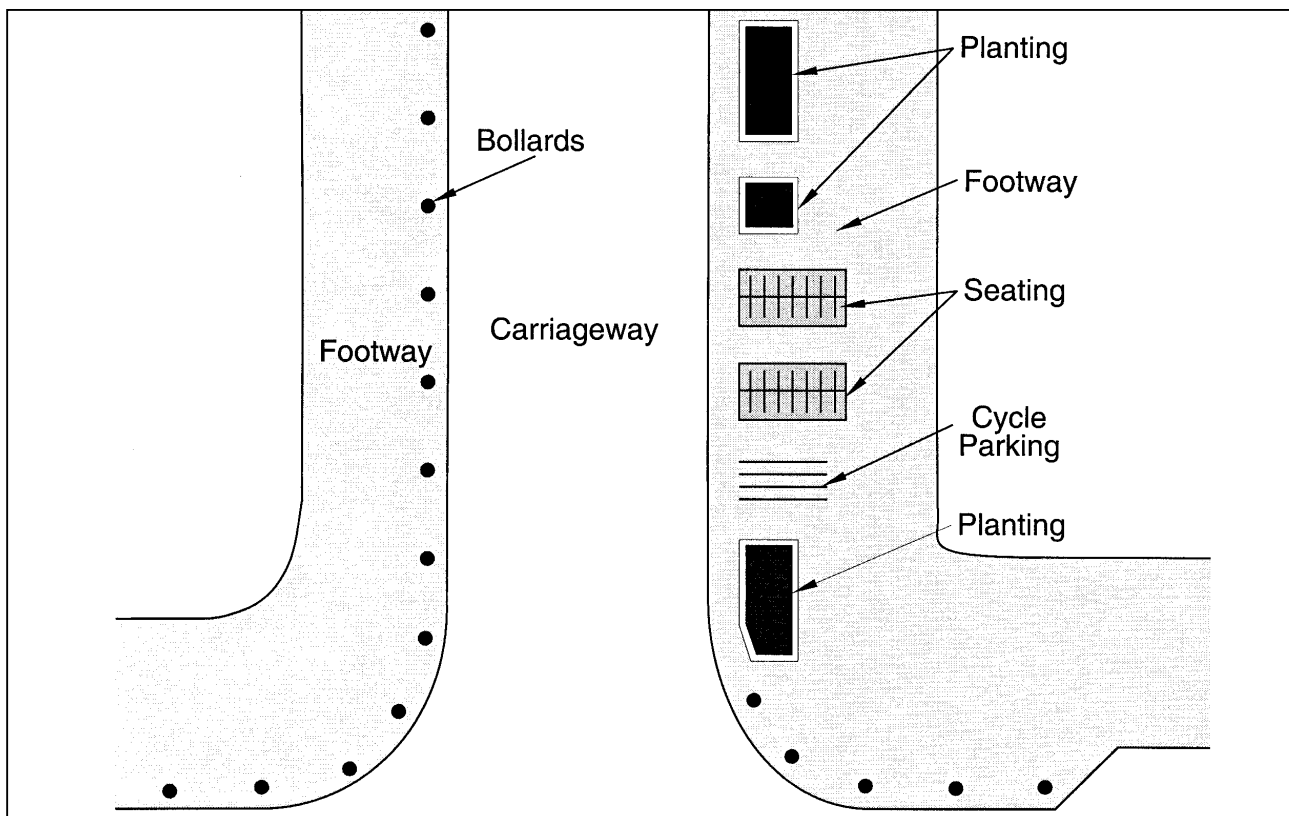


Figure 20.2: Facilities added to the street scene and reduced space for vehicles.

1994) concluded that modest traffic calming had a limited effect. The TRL Report on Craven Arms, Shropshire (Wheeler *et al*, 1996) gives examples of the more extensive type of traffic calming that can be adopted but, clearly, the particular character of each village must be respected.

Motorcyclists

Balance and control are essential for the safety of motorcyclists and obstructions or low-speed deviations, posed by traffic-calming measures, can be difficult to negotiate. Conversely, some measures, such as humps and chicanes, may tempt some motorcyclists to negotiate them with high acceleration and disregard for other road-users.

Safe Routes to School

Community representatives and school authorities should be consulted to ensure that traffic-calming proposals can assist children on their journey to school. 'Safe-Routes-to-School' programmes can be developed that include the introduction of traffic-calming measures.

20.6 Public Participation and Consultation

Public participation, consultation and dialogue are all particularly important in the context of traffic calming, not least because of the public interest in the measures. To be successful, traffic-calming schemes need to fit into their local environment, be locally distinctive and be locally 'owned', in the sense that they are regarded by local occupiers and users as an asset and not a liability.

The most successful approaches to public involvement are those where local people and users feel that they are genuinely involved in the conception and design of the scheme. Care must be taken at the start by defining the problem with the help of local people, to avoid presenting them with the solution as a *fait accompli*. However, the approach to consultation should be appropriate to the size and significance of the scheme, the type of community in which it is sited and the numbers and types of affected users. It should be appreciated from the outset that the costs of consultation can be high, even for relatively small schemes (see Chapter 10).

Depending on the nature and extent of the scheme involved, appropriate approaches could include:

- starting with a clean sheet of paper, as far as proposals or options are concerned, and involving the public in discussion, comment, suggestions and the evolution of the scheme, by providing

alternative plans, accident data, route information and traffic flows to inform the debate;

□ spending time consulting on the problems of the wider area;

□ encouraging discussion through a consultation steering group, which should include representatives of all affected sectors of the community; and

□ adopting a standard consultation approach, including publicity and a display of draft proposals or options.

A consultative steering group might involve appropriate representation by some of the following:

- the County Council or Unitary Authority;
- the District Council;
- the Town or Parish Council;
- local residents;
- traders or business people;
- school staff and pupils;
- the ambulance service;
- the fire brigade;
- the police;
- bus companies;
- taxi operators;
- cycling organisations;
- road haulage associations;
- civic societies;
- the chamber of trade and commerce; and
- an official with multi-disciplinary experience.

However, it must be stressed that consultation with appropriate interest-groups should be considered even where the nature and/or scale of the scheme does not warrant a full 'steering group' approach.

In each situation, the key to success is to keep all the 'players' informed about what is happening and also to ensure that all those who live or work in the area have an opportunity to express a view. Objectives need to be agreed, targets set and measurements taken and reported both before and afterwards (see also Chapter 17).

Although bus companies and emergency services should be engaged in the debate, this should be to ensure only that their concerns are properly considered, as important inputs to the overall balance of the scheme.

20.7 Scheme Design

To be successful, the 'design team' should be multi-disciplinary and, for larger schemes, may need to call upon the skills of some or all of the following professionals:

- ☐ a design engineer;
- ☐ a maintenance engineer;
- ☐ a town planner;
- ☐ a road safety practitioner;
- ☐ a landscape architect;
- ☐ a listed building expert; and
- ☐ an artist.

The team should include representation from the District Council, as well as from the Highway Authority, where the scheme is not in a Metropolitan District, London Borough or Unitary Authority. Before work begins on a specific scheme, the Highway Authority should be clear about the function of the affected street in the proposed local road hierarchy. The objectives of the proposal should be defined and a broad approach developed which should then be the subject of consultation and iteration, until the optimum design is achieved. Input to the process includes traffic characteristics, safety issues, environmental factors, physical characteristics of the site and an overall evaluation of the scheme and any alternatives.

The success or otherwise of a scheme will be judged not only by the resultant accident and speed reductions but also by the overall environmental feel and quality of the scheme and its acceptability by the local population. Attention to detail is, therefore, essential, in terms of the appropriateness of the materials, their technical performance and the practicalities of future maintenance.

Some specific policy issues that need to be taken into account during the design process are dealt with in Section 20.5. Other issues to be addressed are:

- ☐ 'noise', which can be a problem near residential properties;
- ☐ 'signing', which should not be too intrusive, whilst still retaining its function;
- ☐ 'narrowings', if the gap is kept to a minimum length the incidence of drivers attempting to beat each other through the gap may reduce;
- ☐ 'gateways', which often result in a decrease in speed at the gateway but this is not always sustained through the rest of the scheme, so that additional features may be needed;
- ☐ 'visual narrowing', using natural materials such as hedges and planting, can sometimes be more acceptable than hard kerb-extensions but may have a limited effect on speed;
- ☐ 'cycle routes', which require careful design; and
- ☐ 'attention to detail', which is essential, in order to gain public acceptance.

Changes in the character of noise can be annoying, even if the overall level is reduced. Hence, it is



Photograph 20.3: Build out and sheltered parking.

important to encourage smoothly flowing traffic at low speeds. Speed-cushions should be located so that they are generally straddled by vehicles rather than partly over-run. Rumble-strips are not recommended in urban areas.

Responsibility for the maintenance of the various elements of the scheme should be agreed in advance by the relevant authorities. Schemes should be designed for ease of maintenance, with particular attention being given to the drainage of the carriageway, following the introduction of horizontal and vertical variations, to accessibility for sweepers, gully-emptyers and paving machines and to the possibility of damage to signing and other street furniture.

Attention to detail in design is important as schemes often include a number of different materials. The siting of street furniture, and the surface laid around and under it, needs careful consideration to ensure that maintenance problems do not arise.

20.8 Traffic-Calming Measures

Effective traffic-calming schemes are made up of a combination of measures. Care must be taken to ensure that the measures used are appropriate to the site and to the defined objectives. Details on the types of measures may be found in CSS (1994), in DCC (1991) and other references (see Sections 20.15 and 20.16). An alphabetical listing of most of these is set out below.

Bar Markings, although mainly used to draw attention to an approaching junction or roundabout

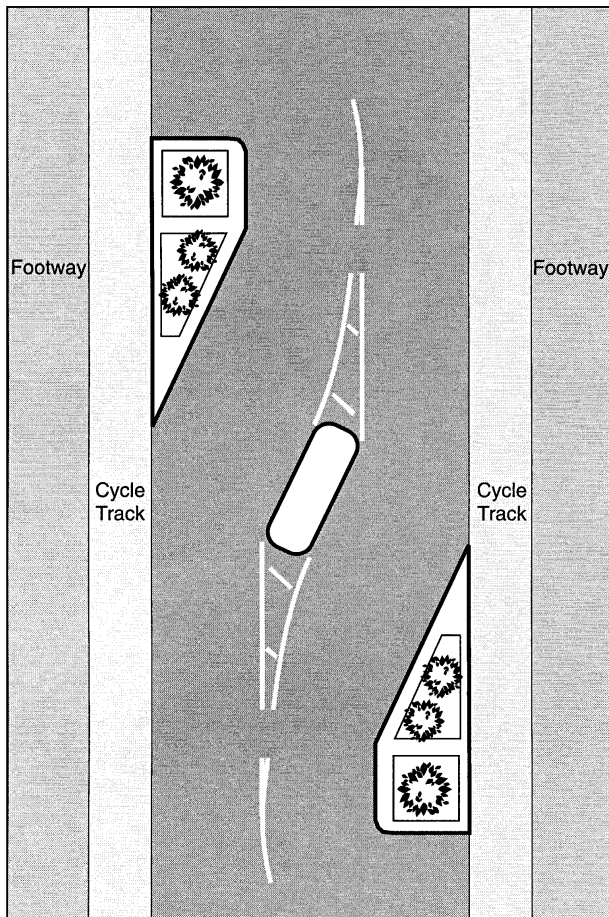


Figure 20.3: Specific cycle-lanes and central refuge island included in the design of a chicane.

on high speed roads, in the form of yellow transverse bar markings, are sometimes used prior to a change in speed-limit, possibly combined with, or part of, a 'gateway' feature. Yellow transverse bar-markings require special authorisation [NIh] but other bar-markings generally fall within the powers provided under the Highways (Traffic Calming) Regulations (HMG, 1993) [Sb].

Build-Outs are a narrowing of the carriageway, constructed on one side of the road as an extension to the verge or footway, and are often combined with sheltered parking or flat-topped crossing facilities (see Photograph 20.3).

Chicanes consist of two or more build-outs on alternate sides of the road, but not opposite one another, and create horizontal deflections. Speed cushions may be used in conjunction with chicanes to make the chicane more effective, by precluding a 'racing' line.

Cycle Measures are not specific traffic-calming measures but are features that should be provided to ensure the safety of cyclists, when negotiating particular traffic-calming measures, such as cycle-lanes or cycle tracks by-passing chicanes or pinch points (see Figure 20.3).

Entry Treatment consists of a change of surface, a ramp, a narrowing or some other features at a junction or change of road characteristic (see also gateways).

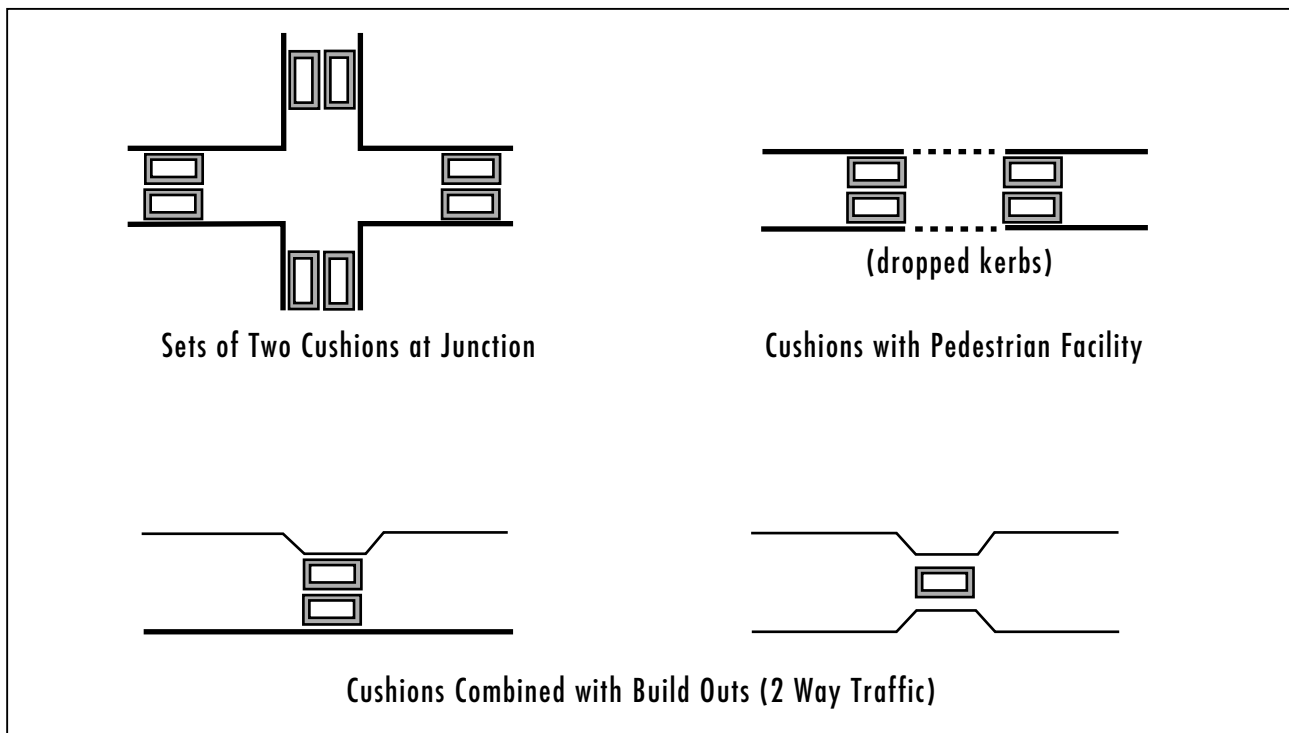


Figure 20.4: Speed cushions.



Photograph 20.4: Gateway with over-run areas.

Environmental Road Closures can be used as part of an area-wide scheme to reassign traffic.

False Roundabouts involve the creation of a small roundabout where there is no actual road junction and its purpose is to modify traffic speed. Legislation does not permit mini roundabouts, formed by road markings, to be used for this purpose.

Footway Crossovers are the continuation of an existing footway across the mouth of a side-road, with vehicles allowed to cross the footway but giving way to pedestrians.

Footway Widening, often as part of the redefinition of road space, is used to give more space to pedestrians or for planting. It may be part of a build-out and can be particularly effective at formal or informal pedestrian crossing points.

Gateways are combinations of natural or man-made features at the entry to, or exit from, areas where the rules or drivers' expectations change, such as at the introduction of speed-limits.



Photograph 20.5: Pedestrian refuge at a school.



Photograph 20.6: Pinch point with flat-topped road humps and priority signing.

Horizontal Deflections occur at build-outs, chicanes and pinch points, often with priority signing.

Islands usually take the form of a longitudinal island, built in the carriageway, with or without facilities for pedestrians, to improve lane-discipline, restrict overtaking or lower vehicle speeds by reducing lane-width and separating cyclists from other vehicles.

Junction Priority Changes are used as part of an area scheme to interrupt long stretches of 'through' road. Care is needed in signing when introducing a change such as this.

Junction Treatments can incorporate a variety of measures as part of an overall scheme, including flat-topped road humps, narrowing and removal of excess areas of carriageway and the introduction of ramps, chicanes, horizontal deflections and tight curves.

Mini-Roundabouts are used at junctions on long straight roads to break up the road into shorter sections which slows traffic; also used at T or Y junctions to reduce the dominance of one particular flow.

Narrowings consist of short or long pinch points, often combined with priority signing.

One-Way Streets may be used as part of an area-wide scheme to break up a road into short sections and indirect routes. By creating detours, they can discourage 'rat running' but may encourage higher speeds because of the absence of opposing traffic. Contra-flow bus lanes or cycle routes may be incorporated.

Over-run Area is a part of the road which is textured

or coloured, so that it appears to narrow the carriageway but can be used by large vehicles to complete turning manoeuvres; but attention needs to be paid to the needs of cyclists and pedestrians should be discouraged from waiting on these areas before crossing (see Photograph 20.4).

Parking involves redefining the road space to provide defined parking and to reduce the area of carriageway.

Pedestrian Refuges are used to aid pedestrians' crossing movements, by allowing a carriageway to be crossed in two stages. They are also used to control overtaking and to improve lane-discipline (see Photograph 20.5).

Pinch Point consists of a pair of build-outs on opposite sides of a road to create a narrowing, thus helping to modify vehicle speeds and to reduce the risk to pedestrians when they cross the road (often combined with speed cushions and priority signing) (see Photograph 20.6).

Planting can be used to change the perceived width of a road, to define a gateway and to improve the overall environment.

Raised Junctions consist of a plateau or flat-topped road hump, built across the whole area of a junction.

Red Light Cameras are automatic cameras, which record red traffic light violations – 'red-running'.

Reallocation of Road Space entails the definition of road space to accommodate all users of the space in question, so as to reduce the dominance by motor vehicles.

Road Humps are used to reduce vehicle speed and, in the case of flat-topped humps, may provide a level surface for pedestrians to cross.

Road Markings are used to hatch out areas of carriageway, to define traffic lanes and to create the visual effect of narrowing of the carriageway.

Rumble Devices are part of a carriageway made of materials which create a noise or vibration as vehicles pass over. They are useful as an alerting device before a hazard but may not reduce speed. They may attract objections when sited close to houses.

Shared-Use Roads are short lengths of road, mostly in new estates, which can provide an attractive appearance in living areas. When used in shopping streets, it may be preferable to have a 25mm kerb upstand, except at crossing points, to assist pedestrians who are visually impaired.

Sheltered Parking consists of parking spaces protected by a build-out and can be in-line, angled or in echelon form (see Photograph 20.4).

Speed Cameras are automatic cameras, which record speed violations in excess of a pre-set threshold value.

Speed Cushions are a form of road hump, occupying only part of a traffic lane, which, generally, can be spanned by buses and HGVs but not by cars and can be used in conjunction with chicanes (see Figure 20.4).

Street Furniture, properly used, can help to redefine road space, create the visual effect of narrowing and contribute to gateways and other features.

Surface Treatments consist of change in the colour or texture of a carriageway, to denote where the character or use of the area changes (see also gateways).

'**Thumps**' are thermoplastic road humps not less than 900mm wide and 30mm to 40mm high.

20.9 Speed-Limits

Introduction and Legislative Framework

The speed of vehicles is an emotive issue, which often generates intense local concern and debate, partly because the perception of appropriate speed often differs greatly between, for example, drivers, pedestrians and cyclists. Measures for influencing the speed of vehicles generally fall into two categories, legislative and physical. However, there is an emerging third category, namely, influencing driver behaviour through education and social peer-group pressure, although this must be viewed in a longer timescale.

Powers to restrict vehicle speeds are provided in Part VI of the Road Traffic Regulation Act 1984 (HMG, 1984) [Nli] and Schedule 6 of that Act defines maximum speeds for motor vehicles of certain classes [Nlj]. The procedure for a highway authority in making a speed-limit Order is laid down in The Local Authorities Traffic Orders (Procedure) (England and Wales) Regulations 1989, as amended (HMG, 1989) [Nik] [Sf]. Advice on speed-limits is provided in Department of Transport Circular Roads 1/93 (DOT, 1993) [Sg] and Traffic Advisory Leaflet 1/96 (DOT, 1996) [Sd].

Before deciding to change an existing speed-limit, the appropriate authority must consider all the relevant factors. The police view is important and account should also be taken of the characteristics of the road, such as its alignment, the level and type of frontage

activity, the accident record and the degree of severance caused to a community by the speed of vehicles. In urban areas, speed-limits should fit into a rational and easily understood hierarchy if they are to be observed by drivers (see Chapter 11).

Before introducing a speed-limit for the first time, at a particular location, highway authorities need to consider the benefits and the disbenefits. Factors which should be included in such an assessment are:

- ☐ expected accident savings;
- ☐ improvement to the environment;
- ☐ improvement in amenities;
- ☐ reduction in public anxiety;
- ☐ improved facilities for vulnerable road-users;
- ☐ delays to traffic;
- ☐ costs of implementation;
- ☐ costs of engineering measures and their maintenance; and
- ☐ costs of enforcement, especially where the speed-limit is regarded as unreasonable by the drivers.

General Principles

Local speed-limits are normally unnecessary where the character of the road, in practice, limits the speed of most vehicles to a level appropriate to the conditions. Also, mandatory speed-limits should not be used to solve the problem of isolated hazards, such as a single road junction or a bend.

Safety should be a major factor in determining the need to impose a speed-limit and can often help to justify the cost of engineering measures. While speed-limits may be introduced because of a poor accident record, care should be taken to assess the underlying causes, as this may well indicate other more effective measures. For example, the provision of a footway may be a more effective means of ensuring pedestrian safety than a speed-limit. Also, speed-limits should be lowered only when a consequent reduction in vehicle speeds can reasonably be expected and when the police consider that the lower limit is enforceable.

Speed-limits, on their own, cannot be expected to reduce vehicle speeds, if they are set at a level substantially below that at which the majority of drivers would otherwise choose to drive. It is not necessarily the case that a lower speed-limit will result in lower speeds. However, current research suggests that, when speed-limits are backed-up by extensive publicity and education campaigns, more disciplined driving results.

The most important factor when setting a speed-limit

is how the road looks to drivers. Any feature which provides drivers with a perception of increased risk is likely to result in a reduction in their speed. The road geometry, ie width, sightlines, bends, frequency of crossings and the environment through which it passes, such as rural, residential, shop frontages and schools, all influence a driver's choice of speed.

If lower speeds are to be achieved, the character of the road will need to be altered so that drivers will perceive more potential risks and reduce their speed accordingly. Additional measures, other than signing, are required if speeds are to be reduced to a level where drivers perceive and accept the need for the limit. Police enforcement can then target the irresponsible minority of drivers.

There is little point in establishing a speed-limit, however desirable from an environmental or safety point of view, if it is not going to have a significant effect on actual vehicle speeds.

The Department of Transport recommend a staged approach to determine the appropriate speed limit for any road (DOT, 1993), as follows:

- ☐ consider the desirable speed-limit, taking into account the general environment of the road, its place in the proposed road hierarchy and its recent accident history;
- ☐ if the measured 85 percentile speed is within either 7 miles/h or 20% of the desired speed-limit (whichever is the smaller), then it would be appropriate; but
- ☐ if the measured 85 percentile speed is outside this acceptable range, then either:
 - ☐ impose a higher speed-limit; or
 - ☐ alter the road layout and environment so as to reduce speeds to within the acceptable range of the desired limit.

Measures to control vehicle speeds are broadly of two types; those that involve changes to the road geometry, such as narrowings, build-outs and chicanes, and those that involve variations to the carriageway surface, such as road humps and speed cushions. It should be noted that the use of some of these measures has legal implications and reference should be made to the appropriate Department of Transport Circulars and Advice Notes (see Section 20.16).

20.10 20 miles/h Speed-Limit Zones

Full-time 20 miles/h speed-limit zones are most appropriately used in areas where an urban safety strategy has been applied, including traffic-calming

measures. These are often residential in character although, increasingly, shopping streets are being treated in a similar manner. Zone signs have to be erected at every entrance into the area and should normally be used in conjunction with the creation of gateways. Zones should not be too large nor should they impede access to hospitals or fire-stations. There should also be alternative routes available for 'through' traffic. Proposed schemes have to be submitted to the Department of Transport for approval [Wb]. Speed-control in the zones should be self-enforcing and it is necessary to demonstrate that the average vehicle speed, following the introduction of speed reducing features, will be 20 miles/h or less (DOT, 1990).

Specific signs, which differ considerably from normal terminal signs associated with speed-limits, have to be erected at each entrance and exit to the zone. A degree of flexibility of design and colour is permitted, to reflect the local distinctiveness of the area. Emergency services and bus operators have to be consulted and their responses have to be included in the submission to the Department of Transport [Wc] for the Speed-Limit Order (see Chapter 13) [NII].

20.11 Variable Speed-Limits

Section 45 of the Road Traffic Act 1991 (HMG, 1991) [Sg] amends section 84 of the Road Traffic Regulation Act 1984 (HMG, 1984) (speed-limits on roads other than restricted roads) to remove the requirement that a single speed-limit must apply to each section of road [NIIm]. Thus, it is possible for speed-limits to vary by time of day or according to traffic flow conditions. Typical uses would be outside schools, when children are going to school or returning home, or as part of a speed/flow management scheme on heavily trafficked roads. Proposed schemes have to be submitted to the Department of Transport for approval [NII] [Wd].

20.12 Enforcement of Speed-Limits using Cameras.

The Road Traffic Act 1991 (HMG, 1991) extended the powers available to the police for the detection of moving offenders, by allowing a photograph of an offence to be used as evidence in court uncorroborated by a police officer at the scene [NIn]. The provisions of the Act enable enforcement cameras to be used as a means of influencing driver behaviour and improving road safety. Advice regarding implementation of the Act has been produced in the Home Office Circular 38/1992 (HO, 1992) [Sh] and the Department of Transport Circular – Roads 1/92 (DOT, 1992) [Si].

Speed Cameras

Local authorities are generally responsible for selecting the location of speed camera sites and for installing and maintaining sites. Such sites are based on Department of Transport Guidelines given in Circular Roads 1/92 (DOT, 1992). The police are responsible for the provision of speed camera and radar equipment installed at the fixed sites and for the collection and processing of the speeding offence evidence.

Site selection considerations include:

- ☐ a history of speed-related accidents;
- ☐ police agreement on site location and operation;
- ☐ large numbers of vehicles travelling in excess of the speed-limit; and
- ☐ site conditions which would affect radar operation, such as gradients, the presence of parked cars, high voltage power-lines and metal fencing.

Special carriageway markings must be laid near the camera cabinet to enable the police to provide a secondary means of checking the accuracy of the radar equipment.

The police install a radar unit, a flash-camera control unit and a camera at each site. Two photographs are taken of each offence at 0.5 to 1.0 second intervals. The built-in flash unit allows the camera to be used at night or in poor visibility conditions. The radar uses the 'doppler' principle to measure closing/opening speed and calculates the true speed of the target vehicle at a 20° offset. The film is periodically removed by the police and analysed to identify offending vehicles. The registered keeper of the vehicle is then issued with a 'Notice of Intended Prosecution'. Offending drivers receive a 'Conditional Offer of Fixed Penalty' or a 'Summons' depending on the severity of the offence. Trigger speeds for the camera are set by the police.

Due to the cost of camera equipment, it is normal practice for the police to 'rotate' the camera equipment between a number of fixed camera sites. Experience has shown that a ratio of 1 camera to 6 fixed sites is preferred, although 1 to 8 is acceptable. Dummy flash equipment can also be installed at the fixed sites to enhance the deterrent effect. Dummy units can be used to record the number of infringements and thus help to monitor driver behaviour.

Results have shown that speed cameras have a significant effect on vehicle speeds and accident rates. Cameras have been found to influence driver behaviour not only at the site but both upstream and

downstream as well. In addition, the use of both fixed and portable speed cameras has been shown to influence overall driver behaviour. More importantly, results have shown a significant reduction in the number of vehicles travelling well in excess of the speed-limit, ie 15 miles/h or more above the limit. The reduction in the number of vehicles travelling at these higher speeds, so called 'fliers', is known to reduce accident-rates significantly.

Red-Light Cameras

Automatic enforcement cameras are very effective in reducing accidents attributed to drivers failing to comply with a red signal. Although there may be a slight increase in the number of rear-end collisions, this does not outweigh the overall benefit. The camera takes two photographs at one second intervals after a predetermined period of red signal. The second photograph ensures that the driver proceeds through the junction and is not turning right.

Top priority sites for these cameras are those sites with a high 'failure-to-comply' accident record. However, these accidents also occur at other signal-controlled junctions and a highway authority should also consider the installation of cameras at 'high profile' sites, perhaps accompanied by warning signs, in order to achieve a change in drivers' behaviour.

20.13 Signing for Speed and Red-Light Cameras

The purpose of the informatory sign is to warn drivers that speed and/or traffic-signal cameras are present and operating in the areas through which they are driving.

Experience indicates that the effectiveness of cameras in reducing speeds and traffic signal violations is enhanced by the introduction of informatory signs. However, the erection of signs is optional and the absence of signs does not invalidate enforcement founded on speed-detection and signal-violation cameras. Highway authorities have flexibility in the use of the signs but should not use them indiscriminately. Information on this is given in DOT Circular – Roads 1/95 (DOT, 1995a) [Sj].

While it is important that signs are used to supplement cameras, some of the effectiveness is lost if signs are erected only at or near camera sites. The signs are best used on an area-wide or route basis. It is not possible to define precisely the extent of the area, but it should normally relate to the geographical area covered by the cameras. Generally, an area will

be the whole, or part, of an urban area, which has a number of camera sites within it. In such cases, signs would be sited at the boundary of the area, with repeater signs within the area, where appropriate. If a number of cameras are used along a route, then the route should be regarded as the 'area' and signs should be erected accordingly.

When static or portable speed-detection cameras are used at road works on a temporary basis, the road works site should be considered as the 'area' and signs provided accordingly, using the standard black on white signs.

20.14 Framework for Influencing Drivers' Behaviour

Potentially, the most productive way to overcome the problems of excess speed is to influence drivers' behaviour by making speeding socially unacceptable. Ways of achieving this range from national campaigns to local initiatives. Topics suitable for national campaigns might include the level of injury at different speeds, persuading car manufacturers to direct advertising away from top speed and acceleration, Insurance Companies taking more note of speeding convictions in setting premiums, restricting new drivers to lower speed levels and ensuring that fleet operators do not set schedules or offer incentives which encourage speeding. Local initiatives could include campaigns which encourage local communities to become involved in the process of identifying the nature and extent of speeding, by setting up their own 'community response team' and involving employers in sponsoring community-inspired schemes. The aim should be to create a culture in which any violation of speed-limits is regarded as socially unacceptable.

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