
Traffic calming

Introduction

Traffic calming describes a range of techniques used to manage road users and the road environment to ensure speeds are appropriate to the local environment and the safety of other road users. When implemented correctly, traffic calming offers advantages to active road users, promotes modal choice and helps manage travel demand.

The number of pedestrians and cyclists killed when hit by a car reduces as vehicle speed is reduced. A study in Sweden concluded that the risk of fatal injury at 50kph is twice as high as at 40kph and five times as high as 30kph (Rosén and Sander, 2009).

In London, the introduction of 20mph zones has led to a 42% reduction in road casualties after correcting for underlying trend, with the greatest reduction in serious injuries and deaths of younger children (Grundy, 2009).

The visual appearance of any street should make it clear to a driver what is expected of them and what speed is reasonable, although sometimes traffic calming relies uniquely on signs to reduce speeds.

Before any choice can be made about the type of measure to be used or even the suitability of traffic calming, it is necessary to determine the purpose for which the technique is intended.

Traffic calming features can be combined together as a package but generally fall into the following groups:

- vertical features
- horizontal features
- traffic management and control
- traffic signs and road markings
- zonal treatments.

Once the designer understands the purpose of the scheme and the characteristics of the location, different measures can be considered. This is the point at which it is often invaluable to involve the local community.

Objective

To control or influence traffic speeds and/or volumes so as to:

- improve road safety
- reduce actual and perceived risk to active road users to encourage the uptake of these modes of travel
- improve the local environment.

By altering travel speeds and travel times and controlling ease of access, other modes can be made more attractive, thus promoting modal choice.

Benefits

Safety

Traffic calming reduces the speed at which vehicles pass through certain areas such as residential streets and shopping precincts. For this reason it makes such areas safer for pedestrians, cyclists other active mode users. It also reduces the incidence and severity of crashes.

Liveability and use of active modes

Residents in neighborhoods with good street environments tend to walk and cycle more, take public transport more and drive less than comparable households in other areas. One study found that residents in a pedestrian-friendly community walked, cycled or took public transport for 49 percent of work trips and 15 percent of their non-work trips, 18- and 11-percentage points more than residents in a comparable car-oriented community.

Environment

Lower vehicle speeds and volumes lead to reduced noise, vibration and emissions in the environment.

Support land use policy

In the long term, traffic calming can support land use patterns that reduce private car use and dependency such as more local shops and services.

Strategic interventions for traffic calming

Vertical features

Road humps

The term 'road hump' is generic. Road humps are constructed to different sizes and shapes to cater for different locations and situations. Indeed, any traffic calming scheme can contain a variety of hump types. Humps can be rounded and flat topped or be used to raise the level of a road at an intersection to the height of the footway (intersection plateau). Sinusoidal approach ramps make humps more comfortable for buses, cyclists and emergency services to travel across. (Also see topic 1 'Walking' and topic 2 'Cycling'.)

Humps are rarely used individually but tend to form a series on a street or as an area-wide treatment to maintain uniform speeds.

Speed cushions



Speed cushions are small rectangular humps, resembling a seat cushion in shape. They are approximately the width of a car and usually placed in rows of 2 or 3 across the road width. Cushions are rarely used individually but tend to form a series on a street or across as an area-wide treatment to maintain uniform speeds. Cushions are particularly good at offering traffic calming benefits without significant adverse effects on bus or emergency service access.

Strategic interventions for traffic calming contd

Horizontal features

Road narrowing	Reducing the available road space for drivers can lower traffic speeds. Narrowing the road by re-allocating space to pedestrians and/or cyclists is one way of doing this.
Traffic islands	Islands reduce traffic space and slow traffic. Pedestrian refuges, splitter islands, etc all achieve this and have additional benefits in segregating other modes from the car or offering a crossing facility.
Footway build-out	Footway build-outs can improve conditions for pedestrians by narrowing crossing widths, reducing traffic speeds and offering better visibility. However, build-outs are inappropriate where they would adversely affect cyclists by creating pinch points.
Pinch points	When build-outs are established opposite each other, they pinch road widths. Pedestrian crossing widths are shorter and traffic speeds lowered. However, unless traffic speeds are $\leq 30\text{km/h}$, cyclists' needs must be considered during design.
Chicanes	Placing build-outs on either side of the road, but offset, creates a chicane. The width between build-outs, the stagger length and the amount of traffic deflection will determine the size and speed of vehicles on the road. Vertical features can be incorporated into chicanes (eg speed cushions) when accommodating larger vehicles such as buses, but this may undermine the speed management aspects for cars. Again cyclists' needs must be considered during design.
On-road cycle lanes	On-road cycle lanes visually narrow the road and push motorised vehicles closer together, both of which may result in lower traffic speeds.
Mini roundabout	These are small roundabouts, which are sometimes simply painted intersection controls. Central islands can be flat or raised. Where these are used to slow traffic before reaching other traffic calming features, the amount of deflection will determine the speed reduction gained.
Rumble strips	Rumble strips are a series of closely spaced raised individual bars or patches that alert drivers, visually and audibly, of the need to slow down. Again, cyclists' needs should be considered in the design of rumble strips.
Rumble wave	In a similar style to rumble strips, the surface pattern of rumble waves can be varied using a sinusoidal profile to generate horizontal vibration in the vehicle but very little external noise. The profile of the pattern can be varied to match the desired speed.

Strategic interventions for traffic calming contd

Traffic restriction and control

Parking management

Restricting on-street parking can contribute to traffic calming and help manage the road environment. Well-positioned parking will reduce conflict between motor vehicles and pedestrians, cyclists and motorcyclists. In urban areas, where parking demand is high, waiting and loading restrictions combined with controls on parking duration and cost may be appropriate.

One-way systems

One-way systems can rationalise the number of side road accesses, improve capacity and parking and maintain safety in narrow streets. They may also be used to restrict access to particular modes, while other traffic takes a longer journey.

Vehicle restrictions and access

Restricting access to particular vehicles, may, depending on the vehicle type, allow design changes such as tighter corner radii and narrower streets etc. Conversely, promoting access to an area by particular vehicle types (eg buses in a CBD or cyclists in a pedestrian area) offers greater penetration and time/distance savings.

Access to such lanes or areas can be established legally, with the associated signs etc or by width constraints or rising bollards controlled by permitted vehicles. 'Bus gates' are a device used to permit access to buses only and controlled by loops, bus transponders and rising bollards. Bus gates give buses an advantage, such as priority access to traffic signals via a short parallel road in congested areas.



Lower Cuba Street, Wellington where pedestrians have priority over vehicles

Strategic interventions for traffic calming contd

Signs and road markings

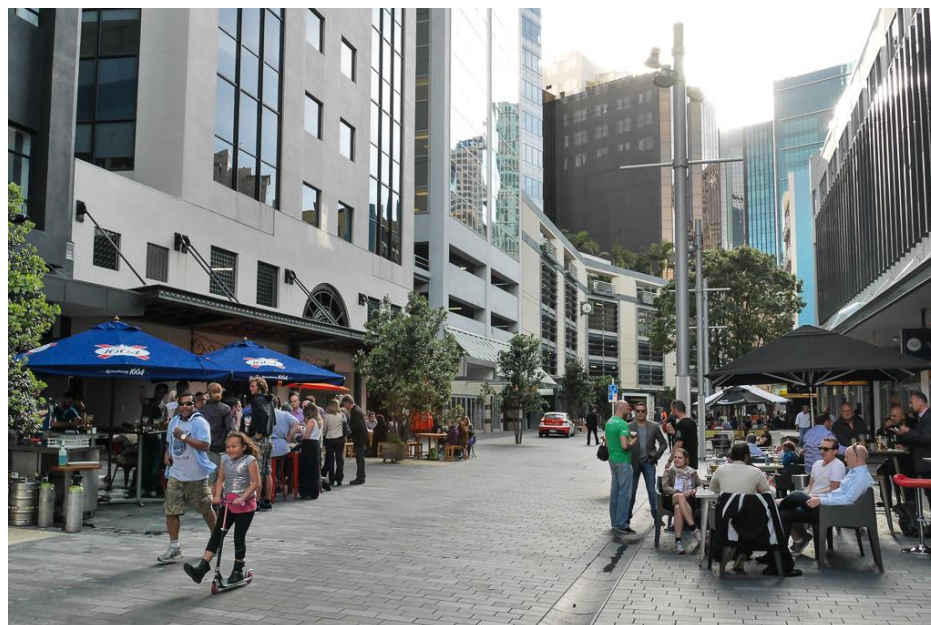
Signs	Road signs are widely used to manage and control traffic. Permitted signs are detailed in the Land Transport Rule: Traffic Control Devices 2004 (TCD) and the <i>Manual of traffic signs and markings</i> part 1 (2007) (MoTSAM). Signs often supplement other traffic calming features, but, used alone, it is not clear how effectively they calm traffic.
Electronic signs	The use of electronic signs that give feedback to drivers is becoming increasingly common. Such signs generally alert drivers to their speed in relation to the speed limit, or to the need to slow down because of a hazard ahead. Electronic signs supplement standard signs, rather than replace them, and they are often used at locations where speed is known to contribute to a poor safety record, eg a bend or intersection. Normally such signs follow other unsuccessful attempts to address the issue. Driver speed feedback signs (displaying vehicle speeds to drivers) are used to influence driver behaviour and these have more value when sited after gateway and threshold (see below) treatments where there is a need to maintain lower speeds.
Road markings	Road markings are used to warn drivers of hazards on the highway and to separate traffic streams. Permitted signs are detailed in the Land Transport Rule: Traffic Control Devices 2004 (TCD) and <i>Manual of traffic signs and markings</i> part 2 (2008) (MoTSAM). Conversely, in some situations, removing road markings can create a calmer road environment. In some rural village locations where traffic volumes are low, the delineation and segregation that centrelines offer can encourage high speeds. As with road signs, road markings have a significant role to play in many traffic calming projects, but generally have little effect if used in isolation.
Gateways and thresholds	Gateways and thresholds draw the driver's attention to a significant change in the road environment ahead. Gateways and thresholds can bring together a number of techniques to have a greater impact on driver behaviour. For example, signs, markings, road narrowings, cycle lanes and coloured surfacing all combine to alert the driver. Some details relating to thresholds are contained in the Land Transport Rule: Traffic Control Devices 2004 (TCD) and the <i>Manual of traffic signs and markings</i> part 2 (2008) (MoTSAM).
Colour and surfacing	Colour (most often red or green) may be used to indicate a point of change or to raise awareness of a more risky location. Markings placed on coloured patches also seem to have a greater visual impact. Colour can be added to existing features to extend their life, but it should be used sparingly so that it retains its value at the locations where the most effect is desired. Surfacing types can also be varied to reinforce a combined environment for different users (eg a block-paved flat-topped hump to reinforce its informal use as a pedestrian facility to both pedestrians and drivers).

Strategic interventions for traffic calming contd

Zonal treatments

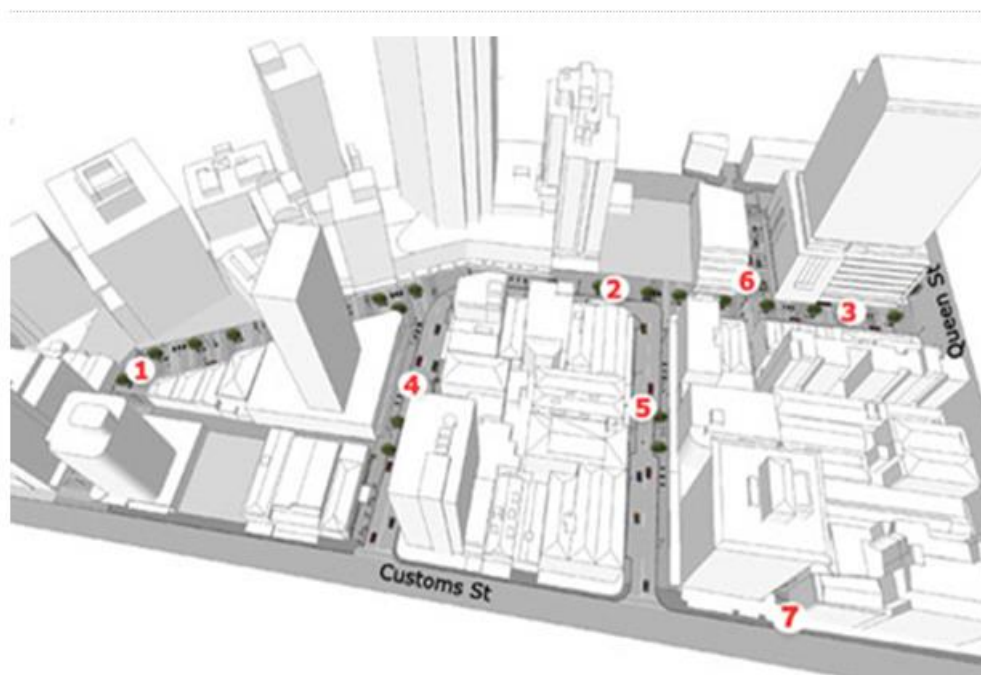
Pedestrian zones Pedestrian areas can be established by limiting vehicle access to a street or series of streets. The decision must then be made about what kind of access should be allowed for other modes, such as cycles, public transport, service vehicles, etc. Very few areas are exclusively pedestrian and good urban design is central to giving vehicle drivers the message that they are guests in a pedestrian-dominated environment. The Walking section of this document has more information on the effects of pedestrian zones.

Lower speed zones Establishing lower speed zones has significant benefits for road safety, the environment, public spaces, community wellbeing and the promotion of active modes. For example, a 30km/h CBD zone, supported by traffic calming, public transport facilities and good urban design, will enhance the economy and attractiveness of any urban environment.



Fort Street, Auckland, New Zealand

Case study – Shared space, Fort Street, Auckland



Shared Spaces in Auckland

Auckland's City Centre Master Plan 2012 and the 10-year CBD upgrade programme together set out a vision to transform the city's central business district into an international business and cultural centre. Developing shared spaces in key locations that create a low-speed environment where pedestrians have priority, is an important part of this programme.

Fort Street

While the Fort Street area is located in the heart of the CBD, near restaurants, shops and other facilities, prior to the upgrade it felt rather run down. It was used mainly as a thoroughfare for both pedestrians and vehicles, rather than as a destination in its own right.

To address this, four areas in and around Fort Street were identified for development into shared spaces: Jean Batten Place, Fort Lane, and two sections of Fort Street – between Queen and Commerce Streets, and between Gore Street and Customs Street East.

The types of treatment undertaken include:

- removal of kerbs to create a single level of paving across full street width
- minimal use of traffic control devices such as signs, barriers, bollards and road markings

Results

- spending increased by 65 percent and hospitality spend in the area has increased by over 400 percent
- vehicle speeds reduced by more than 25 percent
- vehicle volumes dropped by over 30 percent
- foot traffic increased by 50% during peak hours (comparing pre-works in

2008 to post-works in 2011)

- 91 percent of surveyed users and stakeholders were very positive about the new shared space environment, compared to only 17 percent pre-upgrade
- over 75% of property owners believed that it was valuable being sited near or adjacent to a shared space
- 75 percent of delivery services found it 'much easier' to make their deliveries.

For further information, see:

<http://www.aucklandcouncil.govt.nz/EN/planspoliciesprojects/plansstrategies/ccmp/Pages/fortstreetarea.aspx>

Case study –Point England self-explaining roads project, Auckland

Introduction The concept of self-explaining roads originated in the Netherlands. It involves aligning the 'look and feel' of a road with its function in order to elicit appropriate road user behaviour.

The key principles underlying the self-explaining roads concept are as follows:

Functionality	A road hierarchy with a very clear functional emphasis at each level
Homogeneity	Equality in speed, mass and direction of road users (or separation when they are not equal)
Predictability	A recognisable road environment that helps to reinforce road user expectations
Forgivingness	Injury limitation through a forgiving road-user environment
State awareness	Specific measures to deal with altered awareness states (drunk/drugged, fatigued, inexperienced)

Between 2006 and 2010, a partnership between TERNZ, Waikato University, and Auckland City Council, planned, designed, constructed and evaluated an area-wide self-explaining road (SER) retrofit of urban local and collector roads in Point England, Auckland.



Template development The functional elements of the existing network and the outlying problem areas were identified, and a SER template was developed for the area with the help of a significant public involvement process. The desired outcomes included 30 km/hr local roads, and distinctly different and recognisable local and collector roads.

Project Several distinct changes in road use emerged following this SER construction:

outcomes

- on local streets, mean speeds dropped considerably to around 30 km/hr
- on collector roads speeds have remained at around 50 km/hr
- variations in speed on all treated roads is now much lower -previous common speeds of 70 km/hr and higher are now almost non-existent
- there is now less through traffic and more pedestrian movement on local roads. Video data reveals that pedestrians are less constrained, with vehicles often giving way to pedestrians
- residents rate the 'look and feel' of their street more highly than they did prior to SER construction.

A key benefit of the Point England SER project is that it was delivered with comparable costs to traditional speed hump treatments, which are generally less effective and are less favoured by residents. Further development of the SER process and its practical implementation is likely to yield further savings and even better designs..

Case study – State Highway 1, Te Horo, Wellington region

Introduction Much of the state highway road network acts as a means of moving longer-distance travellers and freight. Sometimes the state highway network runs through communities in rural settings where traffic speeds are higher than is appropriate for traditional traffic calming techniques.

In such speed environments (>70km/h), the techniques employed are based around visually changing the road's appearance to reinforce the slightly lower speeds in these communities. This will involve road markings, threshold signing, warning signs and possibly electronic signs.

Te Horo State Highway 1 runs through a number of rural communities, including Te Horo, just south of Otaki.

Here, Te Horo sits in a rural 100km/h area and the residents and businesses sought a lower speed for their community. An 80km/h speed limit was introduced, supported by visual changes to the road layout. These included:

- central road markings to narrow the road and provide for right-turn vehicles
- consistent and adequate shoulder widths to narrow the road, but also to cater for cyclists
- gated threshold signs at the entry to Te Horo
- warning signs to alert motorists of pedestrians
- footway provision where appropriate.



Case study – Project for Public Spaces – North America

Introduction Project for Public Spaces (PPS) is a non-profit organisation dedicated to helping people create and sustain public spaces that build stronger communities. Founded in 1975, PPS embraces the insights of **William (Holly) Whyte**, a pioneer in understanding the way people use public spaces. Today, PPS has become an internationally recognised centre for best practice, information and resources about urban design.

PPS has developed a toolkit for traffic calming in North America. It is founded on the idea that streets should help create and preserve a sense of place where people can walk, meet, play, shop and even work alongside cars, without being dominated by them. Techniques used lessen the impact of motor vehicle traffic by slowing it down, or literally calming it. This helps build human-scale places and an environment friendly to people on foot.



Case study – Project for Public Spaces – North America

continued

Traffic calming

Traffic calming improves the liveability of a place and can be applied inexpensively and flexibly. The strategies outlined below in *The traffic calming toolbox* can be employed by painting lines, colours and patterns, using planters, bollards and other removable barriers, eliminating or adding parking or installing footpath extensions or similar structures with temporary materials.

Features covered include:

- diagonal parking
- changing one-way streets to two-way
- widening footpaths/narrowing streets and traffic lanes
- bulbs – chokers – neckdowns
- chicanes
- roundabouts
- traffic circles
- raised medians
- tight corner curbs
- diverters
- road humps, speed tables, and cushions
- rumble strips and other surface treatments.

www.pps.org/

www.pps.org/info/placemakingtools/casesforplaces/livememtraffic



Complementary measures

Many features used to provide for specific road users are actually also forms of traffic calming. For example, providing a pedestrian facility in the form of a central pedestrian refuge island also represents a road narrowing and traffic calming device. With this in mind, it can sometimes be advantageous to promote a feature like a bus or cycle lane as a speed management tool through road narrowing rather than a means of providing for a minority road user group.

Other complementary measures include:

- walking and cycling facilities
- urban design and land-use planning
- public transport
- parking management
- urban renewal.

What other policies may this address

Walking and cycling

Public transport

Priority lanes

Parking management

Land use

Other external policies

Safer Journeys – New Zealand’s Road Safety Strategy 2010-2020

Health

Environment

Economic

Crime

Equity and equality

Treaty of Waitangi

Further info and relevant research

International sites

Department for Transport (2007) *Manual for streets*. Wetherby: DfT Publications.
www.dft.gov.uk/pgr/sustainable/manforstreets/ (accessed 20 January 2010)

Institute of Transportation Engineers
www.ite.org (accessed 20 January 2010)

North Shore City Council (2009)
Design of Streets – a reference handbook for high quality streets

Project for Public Spaces (USA)
www.pps.org (accessed 20 January 2010)

San Francisco
www.sfgov.org/site/dpt.index.asp?id=13563 (accessed 20 January 2010)

Traffic calming 101
www.pps.org/info/placemakingtools/casesforplaces/livememtraffic
(accessed 24 September 2013)

Victorian Transport Policy Institute, TDM Encyclopedia
<http://www.vtpi.org/tdm/tdm4.htm> (accessed 24 September 2013)
