D. Traffic Calming

Photo by Dan Burden

Photo by Dan Burden

Photo by Cara Seiderman

Traffic calming is a way to design streets, using physical measures, to encourage people to drive more slowly. It creates physical and visual cues that induce drivers to travel at slower speeds. Traffic calming is self-enforcing. The design of the roadway results in the desired effect, without relying on compliance with traffic control devices such as signals, signs, and without enforcement. While elements such as landscaping and lighting do not force a change in driver behavior, they can provide the visual cues that encourage people to drive more slowly.

The reason traffic calming is such a powerful and compelling tool is that it has proven to be so effective. Some of the effects of traffic calming, such as fewer and less severe crashes, are clearly measurable. Others, such as supporting community livability, are less tangible, but equally important.

Experience throughout Europe, Australia, and North America has shown that traffic calming, if done correctly, reduces traffic speeds, the number and severity of crashes, and noise level. Research on traffic-calming projects in the United States supports their effectiveness at decreasing automobile speeds, reducing the numbers of crashes, and reducing noise levels for specific contexts. Looking at a sample of various speed studies shows that typical speed reductions of 5 to 15 percent at the 85th percentile speed can be realized by the use of traffic-calming measures — including speed tables, mini-circles, speed humps, and other standard traffic-calming devices.(1) Use of several of the traffic-calming measures have also resulted in substantial reductions in motor vehicle crashes. For example, the implementation of traffic mini-circles in Seattle has resulted in a reduction of approximately 80 percent of intersection accidents.(1)

The Institute of Transportation Engineers has arrived at the following definition of "traffic calming," which is often used in the United States:

"Traffic calming" is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for non-motorized street users.

There are certain overall considerations that are applicable to both traffic management and traffic calming:

- Vehicle speed is more critical than volume in terms of safety and should be addressed first where there are monetary constraints.
- Neighborhood involvement is important to successful implementation. Rationale for traffic-calming and management measures should be explained clearly to community residents and installation of these treatments should incorporate public input.Please see Chapter 5: Implementation and Resources for a discussion of public process.
- Traffic-calming and management measures should fit into, and preferably enhance, the street environment.
- Traffic-calming designs should be predictable and easy to understand by drivers and other users.

Photo by Peter Lagerwey

This midblock crossing is in Kalamazoo, Michigan. The landscaping and textured crosswalk are visually appealing and provide a clear message about where pedestrians can be expected to cross the street.

- Devices that meet multiple goals are usually more acceptable. For example, a raised crosswalk may be more understandable to motorists than a speed hump. The former has a clear goal, whereas the latter may be perceived as a nuisance.
- Treatments need to be well designed and based on current available information on their applications and effects. Information on U.S. experiences with various traffic-calming measures can be found in ITE's *Traffic Calming: State of the Practice*.(1)
- Devices should accommodate emergency vehicles.
- Traffic-calming areas or facilities should be adequately signed, marked, and lit to be visible to motorists.
- Treatments need to be spaced appropriately to have the desired effect on speed — too far apart and they will have a limited effect, too close and they will be an unnecessary cost and annoyance. Devices usually need to be spaced about 91 to 152 m (300 to 500 ft) apart. If they are spaced too far apart, motorists may speed up between them. This is particularly the case where the devices are added onto the street (e.g., speed humps). Whole street designs are usually able to create an environment that supports slower speeds for the entire length.
- Facilities should not be underdesigned or they will not work. Keeping the slopes too gradual for a speed table or curves too gentle for a chicane will not solve the problem and will appear as a waste of money and may ruin chances for future projects.
- Traffic-calming measures should accomodate bicyclists and pedestrians with disabilities.
- If a measure is likely to divert traffic onto another local street, the areawide street system should be considered so as not to shift the problem from one place to another.
- Devices should be thought of as elements of a traffic-calming system and be placed to improve pedestrian conditions throughout an area.

Photo by Dan Burden

Traffic-calming improvements need to include input from and coordination with neighborhoods that are impacted.

Traffic-calming tools may be used in combination and are often most effective this way. The tools in this guide are organized into the following categories:

- Roadway narrowing.
- Lateral or horizontal shifts in the roadway.
- Raised devices (vertical devices).
- Complementary tools (landscaping and paving).
- Whole-street designs.

Some tools fall into multiple categories; however, for simplicity, they are listed only once.

Trials and Temporary Installations for Traffic Calming

In communities trying traffic calming for the first time, it may be useful to lay out a new design with cones or temporary markings to test it. This provides emergency vehicle drivers, residents, and others with an opportunity to test the design to ensure that they are comfortable with it. Some communities have constructed elaborate temporary devices with concrete or plastic ("jersey") barriers. These can instill a negative reaction in the community due to their unaesthetic appearance and they do not generally have any significant benefits over the simpler test devices. Another option is to install more aesthetic test devices, such as painted flexible curbs that are bolted into the pavement and can easily be adjusted or removed.

19. Curb Extensions

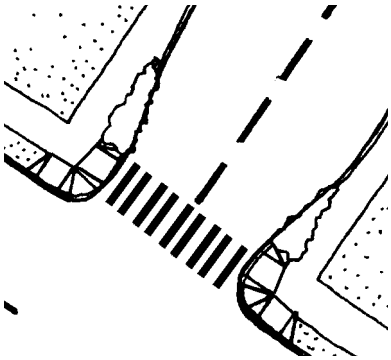
Curb extensions — also known as bulb-outs or neckdowns — extend the sidewalk or curb line out into the parking lane, which reduces the effective street width. Curb extensions significantly improve pedestrian crossings by reducing the pedestrian crossing distance, visually and physically narrowing the roadway, improving the ability of pedestrians and motorists to see each other, and reducing the time that pedestrians are in the street.

Curb extensions placed at an intersection essentially prevent motorists from parking in or too close to a crosswalk or from blocking a curb ramp or crosswalk. Motor vehicles parked too close to corners present a threat to pedestrian safety, since they block sightlines, obscure visibility of pedestrians and other vehicles, and make turning particularly difficult for emergency vehicles and trucks. Motorists are encouraged to travel more slowly at intersections or midblock locations with curb extensions, as the restricted street width sends a visual cue to motorists. Turning speeds at intersections can be reduced with curb extensions (curb radii should be as tight as is practicable). Curb extensions also provide additional space for curb ramps and for level sidewalks where existing space is limited.

Curb extensions are only appropriate where there is an on-street parking lane. Curb extensions must not extend into travel lanes, bicycle lanes, or shoulders (curb extensions should not extend more than 1.8 m (6 ft) from the curb). The turning needs of larger vehicles, such as school buses, need to be considered in curb extension design.

Photo by Dan Burden

This curb extension in Venice, Florida, reduced motorist turning speeds by 9.7 to 12.9 km/h (6 to 8 mi/h). Pedestrian crossing distance and time exposed to traffic was also reduced.



Making Streets That Work, Seattle, 1996

Purpose:

- Improve safety for pedestrians and motorists at intersections.
- Increase visibility and reduce speed of turning vehicles.
- Encourage pedestrians to cross at designated locations.
- Prevent motor vehicles from parking at corners.
- Shorten crossing distance and reduce pedestrian exposure.

Considerations:

- Curb extensions can provide adequate space on narrow sidewalks for curb ramps and landings.
- Curb extensions should only be used where there is a parking lane, and where transit and bicyclists would be traveling outside the curb edge for the length of the street.
- Midblock extensions provide an opportunity to enhance midblock crossings. Care should be taken to ensure that street furniture and landscaping do not block motorists' views of pedestrians.
- Where intersections are used by significant numbers of trucks or buses, the curb extensions need to be designed to accommodate them. However, it is important to take into consideration that those vehicles should not be going

Photo by Peter Lagerwey

A curb extension on an arterial street in Seattle, Washington. The crossing distance for pedestrians is substantially reduced by the installation of this device. The extension is limited to 1.8 m (6 ft) to allow bicyclists to pass safely.

Photo by Peter Lagerwey

A curb extension on a residential street in Seattle, Washington. In addition to improving pedestrian safety at this intersection, the extension provides additional sidewalk space for a bicycle rack and accessible curb ramp.

at high speeds, and most can make a tight turn at slow speeds.

- It is not necessary for a roadway to be designed so that a vehicle can turn from a curb lane to a curb lane. Vehicles can often encroach into adjacent lanes safely where volumes are low and/or speeds are slow. Speeds should be slower in a pedestrian environment.
- Emergency access is often improved through the use of curb extensions if intersections are kept clear of parked cars. Fire engines and other emergency vehicles can climb a curb where they would not be able to move a parked car. At midblock locations, curb extensions can keep fire hydrants clear of parked cars and make them more accessible.
- Curb extensions can create additional space for curb ramps, landscaping, and street furniture that are sensitive to motorist and pedestrian sightlines; this is especially beneficial where sidewalks are otherwise too narrow.
- Ensure that curb extension design facilitates adequate drainage.

Estimated Cost:

Curb extensions cost from $2,000 to $20,000 per corner, depending on design and site conditions. Drainage is usually the most significant determinant of cost. If the curb extension area is large and special pavement and street furnishings and planting are included, costs would also be higher. Costs can go up significantly if something major, such as a utility pole or controller box, is moved.

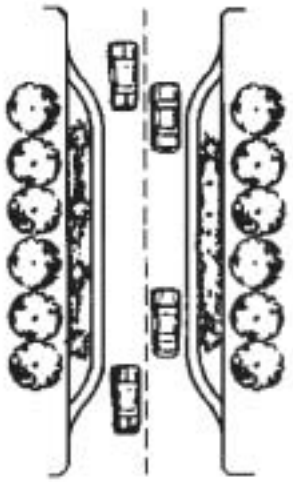
20. Chokers

Chokers are curb extensions that narrow a street by widening the sidewalks or planting strips, effectively creating a pinch point along the street. Chokers can be created by bringing both curbs in, or they can be done by more dramatically widening one side at a midblock location. They can also be used at intersections, creating a gateway effect when entering a street.

Chokers can have a dramatic effect by reducing a two-lane street to one lane at the choker point (or two narrow lanes), requiring motorists to yield to each other or slow down. In order for this to function effectively, the width of the travelway cannot be wide enough for two cars to pass: 4.9 m (16 ft) is generally effective (and will allow emergency vehicles to pass unimpeded). This kind of design is usually only appropriate for low-volume, low-speed streets.

Photo by Dan Burden

This choker on a two-way roadway in Seattle, Washington, narrows the street from two lanes to one. Traffic is forced to slow down and, in some cases, wait for an approaching vehicle to pass before proceeding.



Adapted from *Making Streets That Work*, Seattle, 1996

Purpose:

- Slow vehicles at a mid-point along the street.
- Create a clear transition between a commercial and a residential area.
- Narrow overly wide intersections and midblock areas of streets.
- Add room along the sidewalk or planting strip for landscaping or street furniture.

Considerations:

- If two travel lanes are maintained on a two-way street and/or the travel-lane widths are unchanged (at the location of the choker), it will have a minimal effect on speed.
- Consult with local fire and sanitation departments before setting minimum width.
- Ensure that bicyclist safety and mobility are not diminished.

Estimated Cost:

$5,000 to $20,000, depending on site conditions and landscaping. Drainage may represent a significant cost.

21. Crossing Islands

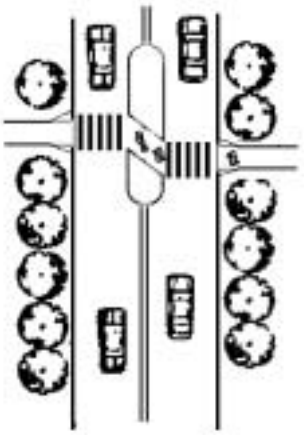
Crossing islands — also known as center islands, refuge islands, pedestrian islands, or median slow points — are raised islands placed in the center of the street at intersections or midblock to help protect crossing pedestrians from motor vehicles. Center crossing islands allow pedestrians to deal with only one direction of traffic at a time, and they enable them to stop partway across the street and wait for an adequate gap in traffic before crossing the second half of the street. Where midblock or intersection crosswalks are installed at uncontrolled locations (i.e., where no traffic signals or stop signs exist), crossing islands should be considered as a supplement to the crosswalk. They are also appropriate at signalized crossings. If there is enough width, center crossing islands and curb extensions can be used together to create a highly improved pedestrian crossing. Detectable warnings are needed at cut-throughs to identify the pedestrian refuge area.

This kind of facility has been demonstrated to significantly decrease the percentage of pedestrian crashes.[2] The factors contributing to pedestrian safety include reduced conflicts, reduced vehicle speeds approaching the island (the approach can be designed to force a greater slowing of cars, depending on how dramatic the curvature is), greater attention called to the existence of a pedestrian crossing, opportunities for additional signage in the middle of the road, and reduced exposure time for pedestrians.

Curb extensions may be built in conjunction with center crossing islands where there is on-street parking. Care should be taken to maintain bicycle access. Bicycle lanes (or shoulders, or whatever space is being used for bicycle travel) must not be eliminated or squeezed in order to create the curb extensions or islands.

Photo by Dan Burden

Crossing islands allow pedestrians to be concerned with one direction of traffic at a time. The roadway markings in the design shown here also help make motorists aware that a pedestrian may be crossing.



Adapted from *Making Streets That Work*, Seattle, 1996

Purpose:

- Enhance pedestrian crossings, particularly at unsignalized crossing points.
- Reduce vehicle speeds approaching pedestrian crossings.
- Highlight pedestrian crossings.

Considerations:

- Do not squeeze bicycle access.
- Illuminate or highlight islands with street lights, signs, and/or reflectors to ensure that motorists see them.
- Design islands to accommodate pedestrians in wheelchairs. A cut-through design such as depicted in the diagram works best if the pedestrian refuge area is identified by detectable warnings.
- Crossing islands at intersections or near driveways may affect left-turn access.

Estimated Cost:

Costs range from $4,000 to $30,000. The cost for an asphalt island or one without landscaping is less than the cost of installing a raised concrete pedestrian island with landscaping.

22. Chicanes

Chicanes create a horizontal diversion of traffic and can be gentler or more restrictive depending on the design.

Diverting the Path of Travel. Shifting a travel lane has an effect on speeds as long as the taper is not so gradual that motorists can maintain speeds. For traffic calming, the taper lengths may be as much as half of what is suggested in traditional highway engineering.

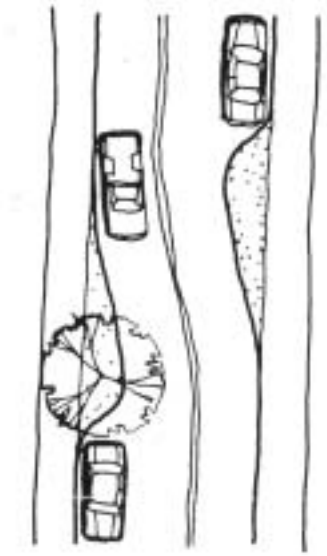
Shifts in travelways can be created by shifting parking from one side to the other (if there is only space for one side of parking) or by building landscaped islands (islands can also effectively supplement the parking shift).

Diversion Plus Restriction (Angled Slow Points). Diverting the path of travel plus restricting the lanes (as described under "Chokers") usually consists of a series of curb extensions, narrowing the street to two narrow lanes or one lane at selected points and forcing motorists to slow down to maneuver between them. Such treatments are intended for use only on residential streets with low traffic volumes.

If there is no restriction (i.e., the number of lanes is maintained), chicanes can be created on streets with higher volumes, such as collectors or minor arterials.

Photo by Peter Lagerwey

The chicanes pictured above narrow this residential street to one lane and require traffic to move slowly.



City of Cambridge, MA

Purpose:

- Reduce vehicle speeds.
- Add more green (landscaping) to a street.

Considerations:

- Chicanes may reduce on-street parking.
- Maintain good visibility by planting only low shrubs or trees with high canopies.
- Ensure that bicyclist safety and mobility are not diminished.

Estimated Cost:

Costs for landscaped chicanes are approximately $10,000 (for a set of three chicanes) on an asphalt street and $15,000 to $30,000 on a concrete street. Drainage and utility relocation often represents the most significant cost consideration.

23. Mini-Circles

Mini-circles are raised circular islands constructed in the center of residential street intersections (generally not intended for use where one or both streets are arterial streets). They reduce vehicle speeds by forcing motorists to maneuver around them. Mini-circles have been found to reduce motor vehicle crashes by an average of 90 percent in Seattle, WA.[3] Drivers making left turns are directed to go on the far side of the circle (see diagram at right) prior to making the turn. Signs should be installed directing motorists to proceed around the right side of the circle before passing through or making a left turn. Mini-circles are commonly landscaped (bushes, flowers, or grass), most often at locations where the neighborhood has agreed to maintain the plants. In locations where landscaping is not feasible, traffic circles can be enhanced through specific pavement materials.

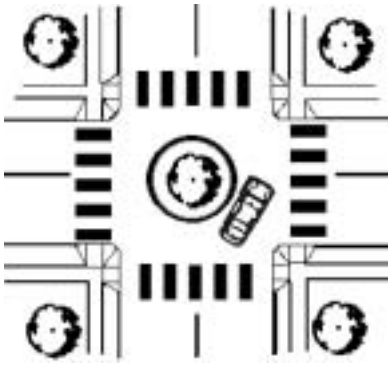
Mini-circles are an intersection improvement as well as a traffic-calming device and can take the place of a signal or four-way stop sign. Many unwarranted four-way stop signs are installed because of the demand for action by the community.

Mini-circles must be properly designed to slow vehicles and benefit pedestrians and bicyclists. Right-turning vehicles are not controlled at an intersection with a mini-circle, potentially putting pedestrians and bicyclists at risk. Therefore, short curb radii should complement this treatment to discourage fast right-turn maneuvers. Traffic circles with cuts in splitter islands make crossing easier for pedestrians, especially wheelchair users, and control vehicle movements entering the intersection, but require more space. Pedestrians with vision impairments will find fewer cues to identify a gap to cross when traffic does not stop.

The occasional larger vehicle going through an intersection with a traffic circle (e.g., a fire truck or moving van) can be accommodated by creating a mountable curb in the outer portion of the circle.

Photo by Dan Burden

A traffic mini-circle helps reduce vehicle speeds, but still allows cars and emergency vehicles to pass through the intersection with little difficulty.



Adapted from *Making Streets That Work*, Seattle, 1996

Purpose:

- Manage traffic at intersections where volumes do not warrant a stop sign or a signal.
- Reduce crash problems at the intersection of two local streets.
- Reduce vehicle speeds at the intersection.

Considerations:

- Do not make generous allowances for motor vehicles by increasing the turning radii — this compromises pedestrian and bicyclist safety.
- Larger vehicles that need access to streets (e.g., school buses and fire engines) may need to make lefthand turns in front of the circle.
- Use yield, not stop, controls.
- Mini-circle landscaping should not impede the sight distance.
- Treat a series of intersections along a local street as part of a neighborhood traffic improvement program.

Estimated Cost:

The cost is approximately $6,000 for a landscaped traffic mini-circle on an asphalt street and about $8,000 to $12,000 for a landscaped mini-circle on a concrete street.