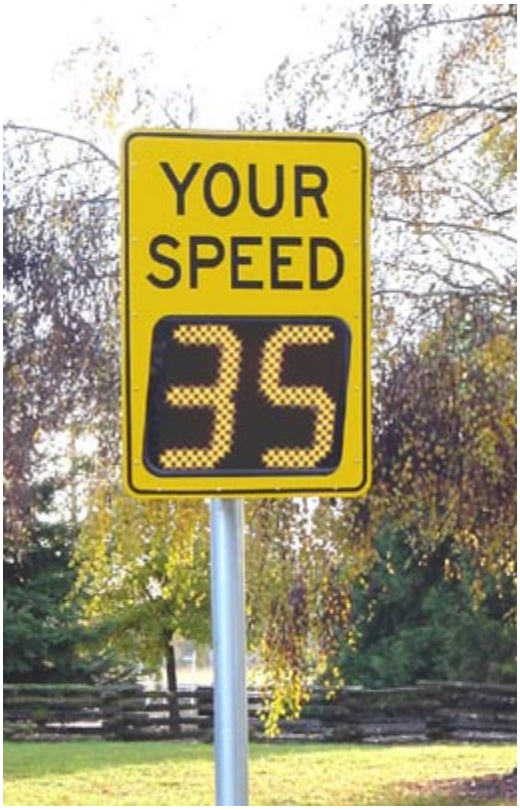

Traffic Calming Measures

Center Island Narrowing
Chicane
Choker
Closure
Neighborhood Traffic Circle
Raised Intersection
Rumble Strip
Speed Hump
Speed Table

- 2 -Traffic Calming Measures:

Center Island Narrowing

Description:

- Raised islands located along the centerline of a street hat narrow the travel lanes at that location.
- Sometimes called midblock medians, median slow points, or median chokers.

Applications:

- Are often nicely landscaped to provide visual amenity and neighborhood identity.
- Can help pedestrianize streets by providing a mid-point refuge for pedestrian crossings.
- Sometimes used on wide streets to narrow travel lanes.
- Work well when combined with crosswalks.

Potential Impacts:

- May reduce parking and driveway access
- Reduces pedestrian crossing width
- May visually enhance the street through landscaping, but may also limit visibility of pedestrian crossings.
- Bicyclists prefer not to have the travel way narrowed into the path of motor vehicles.
- Collision, speed, and volume data are not available.

Emergency Response Issues:

- Preferred by fire department/emergency response agencies to most other traffic calming measures.

Typical cost:

- Reported costs range between $5,000 and $15,000 (1997 dollars).

Traffic Calming Measures:

Chicane

Description:

- A series of narrowings or curb extensions that alternate from one side of the street to the other, forming S-shaped curves.
- Also called deviations, serpentines, reversing curves, twists, and staggerings.

Applications:

- Appropriate for midblock locations only.
- Most effective with equivalent volumes on both approaches.
- Typically, is a series of at least three curb extensions.
- Can use on-street parking to create chicane.

Design/Installation issues:

- Unless well designed, chicanes may still permit speeding by drivers cutting straight paths across the centerline.
- European manuals recommend shifts in alignment of at least one lane width, deflection angles of at least 45 degrees, and center islands to prevent drivers from taking a straight “racing line” through the feature.

Potential Impacts:

- No effect on access
- Limited data available on their effect on speed, volume, and collisions.
- Street sweeping may need to be done manually.
- Can impact parking and driveway access.
- Provides opportunity for landscaping.

Emergency Response Issues:

- Limited data available on their effect on delay to emergency response.
- Emergency response typically prefers two-lane chicanes to speed humps.

Typical cost:

- Reported costs range between $5,000 and $15,000 (1997 dollars).

Traffic Calming Measures:

Choker

Description:

- Curb extensions at midblock or intersection corners that narrow a street by extending the sidewalk or widening the planting strip.
- Can leave the cross section with two narrow lanes or with a single lane.
- At midblock, sometimes called parallel chokers, angled chokers, twisted chokers, angle points, pinch points, or midblock narrowings.
- At intersections, sometimes called neckdowns, bulbouts, knuckles, or corner bulges.
- If marked as a crosswalk, they are also called safe crosses.

Applications:

- Local and collector streets
- Pedestrian crossings
- Main roads through small communities
- Work well with speed humps, speed tables, raised intersections, textured crosswalks, curb radius reductions, and raised median islands

Design/Installation issues:

- Some applications use an island which allows drainage and bicyclists to continue between the choker and the original curb line
- Typically designed to narrow road to 20 feet for two-way traffic; typically avoid the use of widths between 13 and 17 feet
- Adequate drainage is a key consideration
- Provides opportunity for landscaping
- Vertical delineators, bollards, or object markers are often used to make visible to snowplow operators

Potential Impacts:

- Can impact parking and driveway access
- Reduces pedestrian crossing width and increases visibility of pedestrian
- Speeds have typically been reduced on average by four percent for two-lane chokers and 14 percent for one-lane chokers

- Minor decrease in traffic for two-lane and 20 percent reduction for one-lane chokers
- Collision data not available
- Bicyclists prefer not to have the travel way narrowed into path of motor vehicles

Emergency Response Issues:

One-lane chokers rely on regulatory signs and driver courtesy to work

Typical cost:

- Approximately $7,000 to $10,000 (1997 dollars).

Traffic Calming Measures:

Closure

Applications:

- Closures are typically applied only after other measures have failed or been determined to be inappropriate.
- For all types of closures, provisions are available to make diverters passable for pedestrians and bicyclists.
- Often used in sets to make travel through neighborhoods more circuitous – typically staggered internally in a neighborhood, which leaves through movement possible but less attractive than alternative (external) routes.
- Closures have been used as a crime prevention tool.

Descriptions:

- **Diagonal diverters** are barriers placed diagonally across an intersection, blocking through movement; they are sometimes called full diverters or diagonal road closures.
- **Half closures** are barriers that block travel in one direction for a short distance on otherwise two-way streets; they are sometimes called partial closures, entrance barriers, or one-way closures (when two half-closures are placed across from one another at an intersection, the result is a semi-diverter).
- **Full-street closures** are barriers placed across a street to completely close the street to through-traffic, usually leaving only sidewalks open; they are sometimes called cul-de-sacs or dead-ends.
- **Median barriers** are raised islands in the centerline of a street and continuing through an intersection that block the left turn movement from all intersection approaches and the through movement at the cross street.

Design/Installation issues:

- There may be legal issues associated with closing a public street.
- Can be placed at an intersection or midblock.
- Barriers may consist of landscaped islands, walls, gates, side-by-side bollards, or any other obstruction that leaves an opening smaller than the width of a passenger car.

Potential Impacts:

- Concern over effects on emergency response, street network connectivity and capacity, and parallel local streets that carry diverted traffic.
- May divert significant traffic volumes.
- No significant effect on vehicles speeds beyond the closed block.

Emergency Response Issues:

- Half-closures allow a higher degree of emergency vehicle access than full closure or diagonal diverters.
- All three types of closures can be designed to allow emergency vehicle access.

Typical cost:

- Costs range between $2,000 for a simple half-closure and $35,000 for a highly landscaped diagonal diverter (1997 dollars).

Traffic Calming Measures:

Neighborhood Traffic Circle

Description:

- Raised islands, placed in intersections, around which traffic circulates.
- Motorists yield to motorists already in the intersection
- Require drivers to slow to a speed that allows them to comfortably maneuver around them
- Sometimes called intersection islands.
- Different from roundabouts

Applications:

- Intersections of local and collector streets
- One lane each direction entering intersection
- Not typically used at intersections with high volume of large trucks and buses turning left.

Design/Installation issues:

- Typically circular in shape, though not always.
- Usually landscaped in their center islands, though not always.
- Often controlled by YIELD signs on all approaches, but many different signage approaches have been used.
- Key design features are the offset distance (distance between projection of street curb and center island), lane width for circling the circle, the circle diameter, and height of mountable outer ring for large vehicles such as school buses and trash trucks.

Potential Impacts:

- No effect on access
- Reduction in midblock speed of about 10 percent. Area of influence tends to be a couple hundred feet upstream and downstream of intersection.

- Only minimal diversion of traffic
- Intersection collisions have been reduced on average by 70 percent, and overall collisions by 28.
- Can result in bicycle/auto conflicts at intersections because of narrowed travel lane.

Emergency Response Issues:

- Emergency vehicles typically slow to approximately 13 mph; approximate delay of between five and eight seconds per circle for fire trucks.
- Fire trucks can maneuver around traffic circles at slow speeds provided vehicles are not parked near the circle.

Other/Special Considerations:

- Large vehicles may need to turn left in front of the circle (which would be unsafe at higher volumes); legislation may be required to legally permit this movement.
- Quality of landscaping and its maintenance are key issues.
- Landscaping needs to be designed to allow adequate sight distance.
- Care must be taken to avoid routing vehicles through unmarked crosswalks on side street approach.

Typical cost:

- Approximately $3,500 to $15,000 (1997 dollars)

Traffic Calming Measures:

Raised Intersection

Description:

- Flat raised areas, covering entire intersections, with ramps on all approaches and often with brick or other textured materials on the flat section and ramps.
- Sometimes called raised junctions, intersection humps, or plateaus.

Applications:

- Work well with curb extensions and textured crosswalks.
- Often part of an area wide traffic calming scheme involving both intersecting streets.
- In densely developed urban areas where loss of parking would be unacceptable.

Design/Installation issues:

- Typically rise to sidewalk level.
- May require bollards to define edge of roadway.
- Canadian installations typically have gentle 1:40 slopes on ramps.
- Storm drainage modifications are necessary.

Potential Impacts:

- Reduction in through movement speeds at intersection.
- Reduction in midblock speeds typically less than 20 percent.
- No effect on access.
- Make entire intersections more pedestrian-friendly.
- No data available on volume or safety impacts.

Emergency Response Issues:

- Slows emergency vehicles to approximately 15 miles per hour.

Typical cost:

- Reported costs range between $15,000 and $50,000 (1997 dollars).
- Expected life cycle of 10 to 15 years.

Traffic Calming Measures:

Rumble Strips

Description:

- Grooves are cut into pavement to create a strip that causes a vehicle to rumble as it drives over them. The combination of noise and vibration for the drivers causes them to slow down.
- Amount of speed reduction is a function of how deep and wide the grooves are cut.

Applications:

- Should only be used on relatively straight portions of roads between intersections, avoiding sharp curves.
- Spacing of rumble strips is 200 to 500 feet for maximum effectiveness.

Potential Impacts:

- Vehicles are slowed from one to five mph, depending on how deep and wide the grooves are cut.
- Driver's attention is alerted to heighten safety.
- Low to high level of noise pollution for adjacent residents, depending on how deep and wide the grooves are cut.
- Increases cost of pavement maintenance, and would have to be re-cut after pavement repairs are made.

Typical cost:

- Cost of $800 per strip, with an expected life cycle of eight to ten years.

Traffic Calming Measures:

Speed Hump

Description:

- Round raised areas of pavement typically 12 to 14 feet in length.
- Often placed in a series (typically spaced 300 to 600 feet apart).
- Sometimes called road humps or undulations.

Applications:

- Residential streets
- Not typically used on major roads, bus routes, or primary emergency response routes.
- Midblock placement, not at an intersection
- Not on grades greater than 8 percent
- Work well with curb extensions

Design/Installation issues:

- Typically 12 to 14 feet in length; other lengths (10, 22, and 30 feet) reported in practice in the U.S.A.
- Speed hump shapes include parabolic, circular, and sinusoidal.
- Hump heights range between three and four inches, with the trend toward three to three and one half maximum.
- A series of humps has been found to be more effective than a single installation, and their effectiveness diminishes 200 to 300 feet either side of them. Therefore, in order to obtain speed control results, the devices should be placed between 300 and 600 feet apart.
- Difficult to construct precisely; may need to specify a construction tolerance (e.g. + or – 1/8 inch) on height.
- Often have signage (advance warning sign before first hump in series and warning sign or object marker at hump).
- Typically have pavement marking (zigzag, shark's tooth, chevron, zebra).
- Taper edge near curb to allow gap for drainage.
- Some have speed advisories.

- Bicyclists prefer that it not cover or cross a bike lane.

Potential Impacts:

- No effect on non-emergency access.
- Speeds determined by height and spacing; speeds between humps have been observed to be reduced between 20 and 25 percent on average.
- Based on a limited sample of sites, typical crossing speeds (85^{th} percentile) of 19 mph have been measured for 3 ½ inch high, 12 foot humps and 21 mph for 3 inch high, 14 foot humps; speeds have been observed to rise to 27 mph within 200 feet downstream.
- Speeds typically increase approximately 0.5 mph midway between humps for each 100 feet of separation.
- Studies indicate that traffic volumes have been reduced on average by 18 percent depending on alternative routes available.
- Studies indicate that collisions have been reduced on average by13 percent on treated streets (not adjusted for traffic diversion).
- Most communities limit height to 3-3 1/2 inches, partly because of harsh ride over 4-inch high bumps.
- Possible increase in traffic noise from braking and acceleration of vehicles, particularly buses and trucks.

Emergency Response Issues:

- Concern over jarring of emergency rescue vehicles.
- Approximate delay of between three and five seconds per hump for fire trucks and up to 10 seconds for ambulance with patient.

Typical cost:

- Approximately $2,000 (1997 dollars) per hump, with an expected life cycle of 10 to 15 years.

Traffic Calming Measures:

Speed Table

Description:

- Long raised speed humps with a flat section in the middle and ramps on the ends. Sometimes constructed with brick or other textured materials on the flat section.
- Sometimes called flat top speed humps, trapezoidal humps, speed platforms, raised crosswalks, or raised crossings.

Applications:

- Local and collector streets
- Main roads through small communities
- Typically long enough for the entire wheelbase of a passenger car to rest on top.
- Work well in combination with textured crosswalks, curb extensions, and curb radius reductions.
- Can include a crosswalk

Design/Installation issues:

- Typically 22 feet in the direction of travel with 6-foot ramps on each end and a 10-foot flat section in the middle. Other lengths (32 and 48 feet) reported in U.S. practice.
- Most common height is between three and four inches (and reported as high as six inches).
- Ramps are typically six feet long (reported up to 10 feet long) and are either parabolic or linear.
- Careful design is needed for drainage.

Potential Impacts:

- No effect on access.
- Speeds are reduced, but usually to a higher crossing speed than at speed humps (typically between 25 and 27 miles per hour).

- Traffic volumes have been reduced on average by 12 percent depending on alternative routes available.
- Collisions have been reduced on average by 45 percent on treated streets (not adjusted for traffic diversion).
- Reported to increase pedestrian visibility and likelihood that driver yields to pedestrian.

Emergency Response Issues:

- Typically preferred by fire departments over 12 to 14-foot speed humps.
- Generally less than three seconds of delay per hump for fire trucks.

Typical cost:

- Approximately $2,500 (1997 dollars) for asphalt tables; higher for brickwork, stamped asphalt, concrete ramps and other enhancements sometimes used at pedestrian crossings.