Appendix A

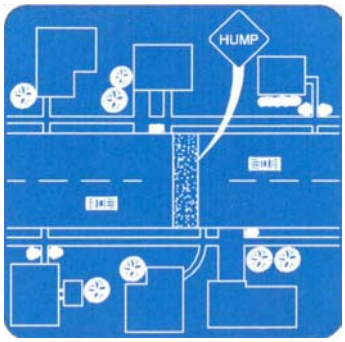
Traffic Calming Measures

Traffic calming involves slowing or reducing automobile traffic to improve safety and to enhance the livability of the environment adjacent to a roadway. By compelling drivers to slow down, the negative effects of motor vehicle use can be reduced and conditions can be improved for pedestrians and bicyclists. Two primary techniques are used in traffic calming: those that primarily reduce speed and those that primarily divert or reduce traffic volumes.

Speed control techniques can be used to decrease vehicle speeds and volume reduction techniques are designed to reduce cut-through traffic. However, there is often an overlap in the results of both measures, because they can both simultaneously slow traffic and reduce volumes. As a result, roadway safety improves and the number of collisions will decrease. In most cases, traffic calming involves changes in the roadway geometry or street alignment, as outlined below.

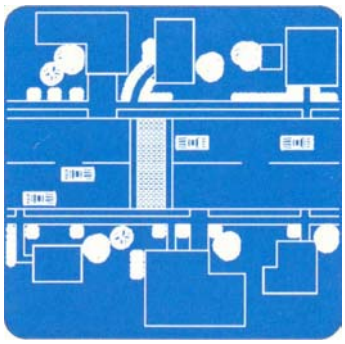
Techniques that primarily reduce speed (speed control measures):

1) Speed humps: Speed humps are rounded and raised areas placed across a roadway. They are usually 3"-4" high, and are tapered at the curb to allow drainage. Speed humps are designed to reduce speeds, are compatible with bicycle use, and are inexpensive. However, they can cause jarring for automobile drivers and can slow large vehicles and trucks. Also, they may cause increased noise and air pollution.



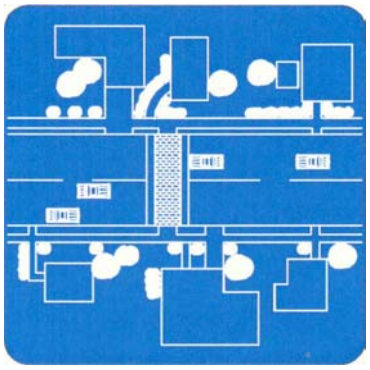
   Results: About a 20% decrease in speed (from 35 mph to 27 mph) and about an 11% decrease in accidents (from 2.7 to 2.4 accidents per year). These figures are for a 12-foot long speed hump.

2) Speed tables: Speed tables are flat-topped speed humps that are often constructed of brick or other textured materials on their flat section. On a speed table, the ramps are often more gently sloped than on a speed hump, and the entire wheel-base of the vehicle can rest on the flat section. They are smoother to drive over than speed humps and can reduce speeds, although not as much as speed humps. They are often more expensive than speed humps, and may increase noise and pollution by causing vehicles to slow down and then accelerate.



   Results: About an 18% decrease in speeds (from 36.7 mph to 30.1 mph), and a 45% decrease in accidents (6.7 to 3.7 per year). These figures are for a 22-foot long speed table.

3) Raised crosswalks: These are basically speed tables which serve as crosswalks at pedestrian crossings. By raising the level of the crossing, the crosswalk is more apparent to motorists, causing cars to slow down. Therefore, raised crosswalks improve safety for both pedestrians and vehicles. In addition, raised crosswalks can enhance aesthetics at an intersection. They may also increase noise and pollution. For visually impaired individuals, it is recommended that a small lip or curb be placed on entry to the raised crosswalk, so as to define the street edges for the individual.

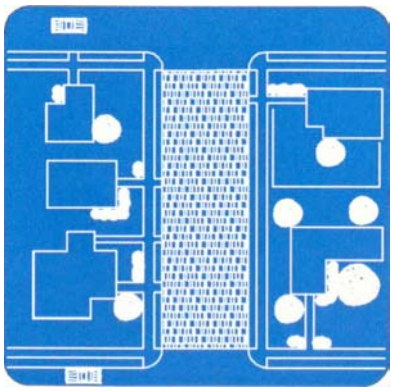


Results: The same as for speed tables – an 18% decrease in speeds (36.7 mph to 30.1 mph) and a 45% decrease in accidents (6.7 to 3.7 per year). Again, this is for a 22-foot speed table, which is similar to a raised crosswalk.

4) Raised intersections: A raised intersections consists of a flat raised area which covers an entire intersection. A sloped incline exists on all sides, usually raising the roadway to the level of the sidewalk. Textured material is often utilized. These are implemented in areas of substantial pedestrian activity. They can improve safety for both pedestrians and vehicles, will slow traffic on two streets at once, and may improve aesthetics.

Results: Speeds are reduced slightly, averaging about 1% (from 34.6 to 34.3 mph). Impacts on drainage need to be considered, and a small lip needs to be created to distinguish the intersection from the sidewalk for the visually impaired.

5) Textured pavements: Types of textured pavements include those made of brick, paving stones, and cobblestones. They create an uneven surface for vehicles, causing them to slow down. However, depending on the material, their uneven surface may also make them difficult for bicycles, carriages, wheelchairs, and even pedestrians to utilize. They can also be noisy.



Results: Textured pavements can reduce speed and can add visual diversity which improves aesthetics. However, they can be difficult for wheelchair users and other impaired individuals.

6) Traffic circles: Traffic circles are raised islands in intersections which force traffic to circulate around them. They can slow traffic and reduce traffic volume while

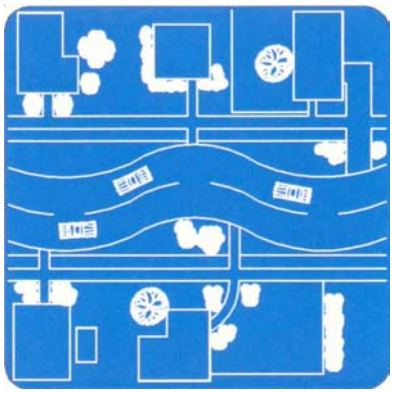
improving safety in areas where large traffic volumes are not expected. However, they can be difficult for large vehicles to navigate and may require additional maintenance, such as landscaping. Also, they may cause cars to encroach on the adjacent sidewalk at intersections and may result in a loss of on-street parking.

Results: Traffic circles lead to an 11% decrease in vehicle speeds (34.1 to 30.2 mph) and a significant 27% decrease in accidents (5.9 to 4.2 accidents per year).

7) Roundabouts: Often called rotaries, these are much larger than traffic circles and require the entire flow of traffic to circulate counterclockwise around a center island. These are used at high-volume intersections. They can moderate traffic speeds at an intersection and have been shown to be safer than traffic signals. At moderate traffic volumes, they can minimize vehicle delays at intersections and are less expensive than signals. However, they may by difficult for larger vehicles to navigate and they may cause the removal of on-street parking and an encroachment of the roadway into sidewalk areas.

Results: Roundabouts lead to a 29% reduction in accidents (9.3 to 5.9 accidents per year). However, they may lead to higher vehicle speeds and decrease pedestrian safety if poorly designed.

8) Chicanes: This type of traffic calming involves converting a straight-away road into a curved S-shaped roadway by causing traffic to twist around an extended curb. Chicanes can also be created by alternating on-street parking from one side of the road to another. By causing traffic to deviate on the otherwise straight roadway, chicanes reduce vehicular speeds. In contrast to speed humps, they do not cause increased noise and are relatively easy to maneuver by trucks. However, they must be designed so that drivers do not cross the center-line, and curb realignment can be costly. A loss of on-street parking may also result.



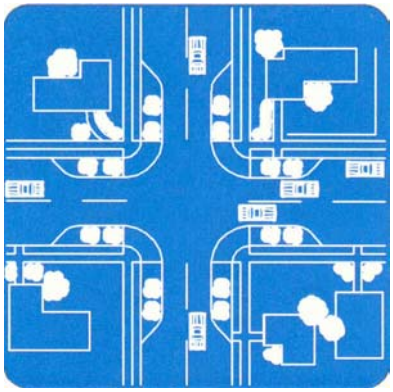
Results: No data has been compiled on the effects of chicanes on traffic.

9) Realigned intersections: This involves turning an intersection to create a curve so that traffic slows down as it either approaches or as it negotiates the turn. These can be used in T-intersections and can be effective in reducing speeds and improving safety.

However, they may require loss of part of an adjacent sidewalk or property, in order to achieve the desired deflection in the road.

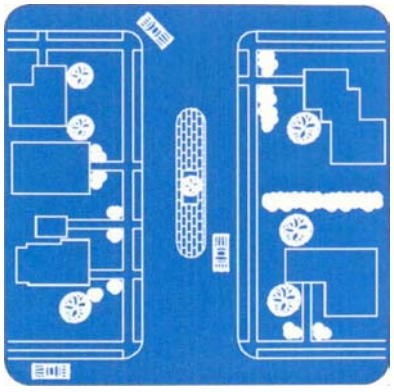
Results: No data has been compiled on the effects of realigned T intersections on traffic.

10) Neckdowns: These are also called bulb-outs or "intersection narrowings." Neckdowns involve reducing roadway width from curb to curb, shortening pedestrian crosswalks and reducing curb radii at the corners of intersections. They are effective in reducing speeds at intersections with substantial pedestrian activity and improve the realm of the pedestrian. They reduce speeds for right-turning vehicles while allowing unimpeded left turning movements. They can also be used to delineate on-street parking spaces, but may result in the loss of the parking space adjacent to the intersection. Also, they may force bicyclists to merge into the traffic lane at an intersection.



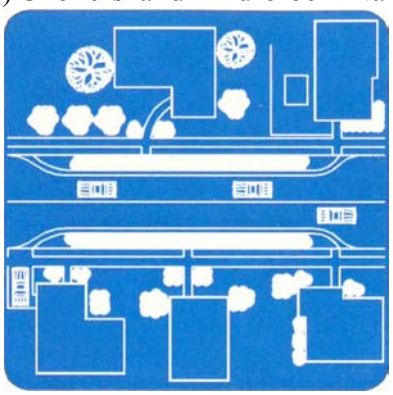
Results: Neckdowns lead to a 4% decrease in traffic speeds (34.9 mph to 32.3 mph).

11) Medians and Center Island Narrowings: Medians can be placed to narrow a wide roadway, thereby reducing speeds and improving pedestrian safety. Also, they can be landscaped to provide green space in the roadway. When a crosswalk is delineated in a center island or median, it can serve as a place of pedestrian refuge. Strategically placed medians can result in reduced traffic volumes. However, medians can lead to a loss of on-street parking.



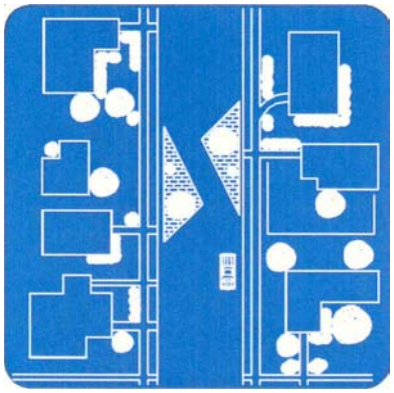
Results: The figures for neckdowns apply – an average 4% decrease in speeds (from 34.9 mph to 32.3 mph).

12) Chokers and Mid-block Narrowings: A choker is a curb extension in a mid-block location that narrows the road while maintaining the straight-away. They result in a loss of on-street parking, but can reduce vehicle speeds and lead to lower traffic volumes. Chokers can be easily negotiated by large vehicles and trucks, since the travel lane is not reduced in width. However, a choker may force bicyclists to merge into traffic.



Results: The figures for neckdowns apply – an average 4% decrease in speeds (34.9 to 32.3 mph).

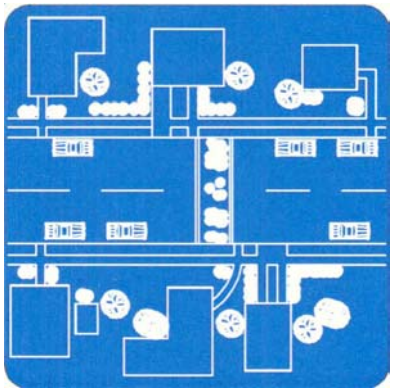
13) Other speed control measures: Intersection jiggle bumps, hammerhead islands, and angle point chicanes are alternative methods to slow traffic, narrow a roadway, or to divert fast-flowing traffic. Other examples of speed reduction devices include the "Lateral Shift," which is a chicane that deviates once and does not return to the original centerline, the "Split Median," which creates a median just at an intersection, the "Median Choker," which puts a median and an extended curb at an intersection, and the "Half Circle," which deviates traffic on only one side of a roadway at an intersection.



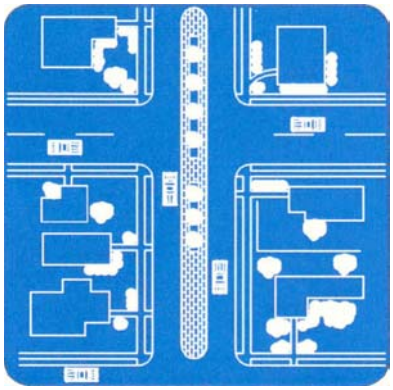
Techniques that primarily divert traffic (volume control measures)

1) Full closures: This involves closing a street to vehicular traffic while maintaining a pedestrian and bicycle connection. Often, barriers are placed in the middle of the roadway. This is an extreme measure that requires legal action and that may cause circuitous traffic patterns in neighborhoods. However, closures can result in a major decrease in traffic volumes.

   Results: There is an average 44% decrease in traffic volumes resulting from a street closure.



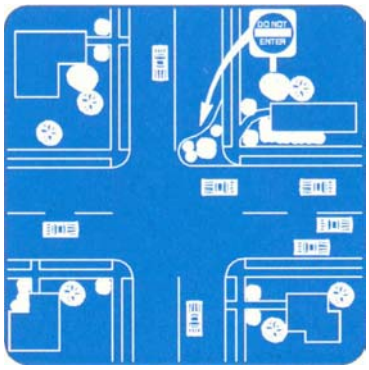
2) Median barriers: These are islands in the middle of a street than continue through an intersection, preventing through movement of vehicles that would otherwise cross the road. They can improve safety by preventing dangerous turning movements and reduce cut-through traffic where it is desired. However, they also limit access for local residents and for emergency vehicles. In Newton, large sections of Route 9 have a median barrier. For example, the north end of Walnut Street is separated from the south end by a barrier on Route 9. On some parts of Route 9, there is a tall fence so that pedestrians do not have the temptation to cross this road away from well-marked crosswalks or grade separated intersections.



   Results: Median barriers result in an average 31% decrease in traffic volumes.

3) Half closures: These are barriers that block travel in one direction on an otherwise two-way street, while allowing pedestrian and bicycle access. However, they may pose an impediment to emergency vehicles and they can result in circuitous routes for local

residents. Also, drivers can illegally circumvent the barrier. An example of a half-closure in Newton is located at the westbound portion of Washington Street in Newton Corner as it approaches Newton Corner and the Massachusetts Turnpike. Motorists from Brighton can continue westbound across the bridge over the Massachusetts Turnpike and then on to Newtonville. However, drivers are prevented from traveling eastbound by a half-closure of Washington Street, just at the intersection.



Results: Half closures have been associated with a 42% decrease in traffic volumes.

4) Forced Turn Islands: These are small raised islands at intersections that divert traffic to one side and that block certain movements. Because of their shape, they are also known as "pork chops." They can be used to block left turns at intersections where a left turn would be undesirable or unsafe. By prohibiting dangerous turning movements, Forced Turn Islands can improve safety. They can also reduce traffic volumes. In some cases, however, a driver can illegally circumvent this barrier. This traffic calming technique has been implemented in various places in Newton. A recent implementation has been at the intersection of Walnut Street and Dedham Street, near the Countryside School. Another place where a "pork chop" has been inserted is at the northern end of Walnut Street, where it merges with Crafts Street.

Results: There is an average 31% decrease in traffic volumes.

5) Diagonal Diverters: These are placed diagonally across an intersection, blocking through movements and creating two L-shaped streets. They can have a dual effect of diverting traffic and forcing it to seek an alternate route through the neighborhood, but also discourage non-local traffic from using the street. Full pedestrian and bicycle access can be maintained. Diverters can reduce traffic, but they may also require reconstruction of corner curbs and may impede emergency vehicles.

Results: Diverters result in an average 35% decrease in traffic volumes.

6) Other volume control measures: These include "Star Diverters," which are similar to Diagonal Diverters in that only right turns are permitted at intersections, "One Way – Two Way Islands," which are forced turn islands that convert a street form one way to

two way, "Truncated Diagonal Diverters," which leave a gap on one side of the diverter to allow an additional right turn, and "Diverter Closures," where a diverter effectively closes the road past an intersection.

Summary

In some cases, combinations of traffic calming methods may be used. For example, two speed reduction techniques may be used together, such as a neckdown with a raised crosswalk or a speed table with a choker. In another example, a speed reduction technique may be combined with a volume reduction technique. This is seen in a case where a forced turn island ("pork chop") is used along with a textured pavement crosswalk..

Although some forms of traffic calming may be more appropriate in one location over another, the City of Newton endorses the use of traffic calming techniques in areas where their implementation will result in safety, pedestrian, and traffic improvements.

Primary Reference and Credits:

Jack Peers and Steve Brown, The Traffic Calming Group at Fehr & Peers Transportation Consultants, San Francisco, CA. www.trafficcalming.org (accessed December 12, 2004).