Suburban Residential Traffic Calming

BY C. EDWARD WALTER

Traffic calming or slowing is frequently referred to as reverse traffic engineering. Instead of easing and speeding traffic flow, traffic calming uses geometric changes or designs that passively regulate travel speed. Europeans take traffic calming very seriously: In residential areas they try for 20 miles per hour (mph) speeds to reduce injury severity. In commercial areas, where there are shared traffic zones between vehicles and pedestrians, they strive to achieve speeds of 10 mph to 15 mph. Traffic calming measures are generally retrofitted onto existing streets. However, having once recognized the need for traffic calming, these ideas have led to new hierarchies of residential street classifications and design principles in England and Australia.[1]

In the Washington, D.C.-Baltimore, Md., suburban areas, postwar residential development frequently was modeled along the Columbia, Md., residential plan of long curving residential streets with numerous cul-de-sacs. These nonlinear street plans have led to longer trip lengths. At the same time these new residential patterns were developing, local governments developed minimum design standards setting width, curvature and frequently vertical grades based on street classification. In Howard County, Maryland, which lies between Baltimore and Washington, a 35 mph design speed was used for residential streets with a 30 ft to 36 ft roadway width. Frequently 2,400-ft to 3,000-ft long cul-de-sac streets were approved; it is little wonder that despite 25 mph speed limits, 85th percentile speeds of 38 mph to 40 mph are routine in such residential areas.

Residential speeding is a major community concern. Speeding has become a way of life for many; although residents may pass their own property within the speed limit, they have no hesitation in zipping past their neighbors' property as fast as possible. Police with limited resources undertake periodic enforcement on request, but such enforcement efforts are spotty at best. These situations have given rise to the development and success of traffic calming measures in existing residential neighborhoods.

Traffic engineers in the metropolitan counties surrounding Baltimore and Washington have formed the Maryland Traffic Engineers Council to solve joint problems. Several of the jurisdictions have been working with community groups on traffic calming measures. In 1992, the council formed a traffic calming subcommittee to share information on ways to reduce speed in suburban residential communities. This article presents the results of that effort.

Vertical Alignment Modification

Vertical changes to roadway geometry offer guaranteed speed reduction.[2] Speed humps, developed in England and sometimes referred to as "insomniac policemen," control speed by adjusting the height and spacing of the hump. They introduce a vertical acceleration factor to the vehicle. The Watt's Profile Speed Hump, as developed in England, is a portion of a 12 ft-long cylinder rising 3 inches (in) in height (see Figure 1). In 1990, Howard County placed seven of these humps on Baltimore Avenue near Laurel, Md. The 85th percentile speed

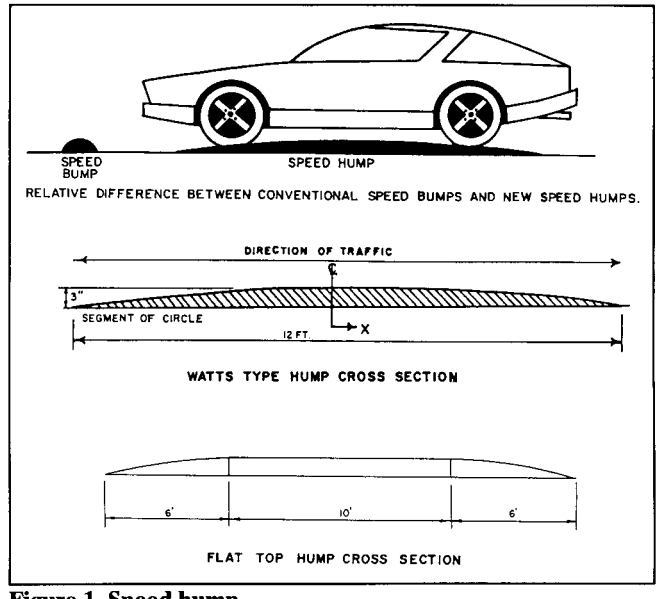

Figure 1. Speed hump.

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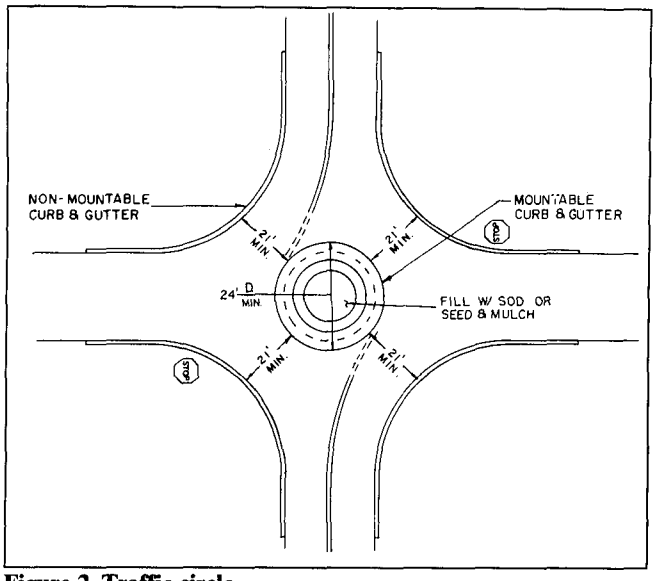

Figure 2. Traffic circle.

before placement was 38 mph and the speed limit 25 mph. Immediately afterward (and continuing to the present day), 85th percentile speeds were 27 mph to 29 mph between humps and 15 mph at each hump. The series of humps replaced two multiway stops and had the concurrence of 75 percent of residents. There have been no accidents in the four years since the humps were placed vs. four accidents in the two years immediately before hump construction.

A year later Howard County placed four humps on Dogwood Drive, a narrow residential street between two arterial roadways. The 85th percentile speed before construction of the humps was 40 mph; after construction, it dropped to 28 mph. There also has been a 24 percent reduction in traffic volumes on Dogwood Drive as vehicles diverted to other routes.

The Watt's Profile Speed Hump frequently has been limited in its application to roadways with 3,000 vehicles per day (vpd) or fewer, although Dallas permits its use on streets handling up to 8,000 vpd.[3] A flat top speed hump 22-ft long with a center 10-ft flat section was pioneered in the United States by Seminole County, Florida,[4] where it has been used on collector roads with more than 12,000 vpd. In England, flat top humps are used on collector roads and also frequently serve as pedestrian crossings.

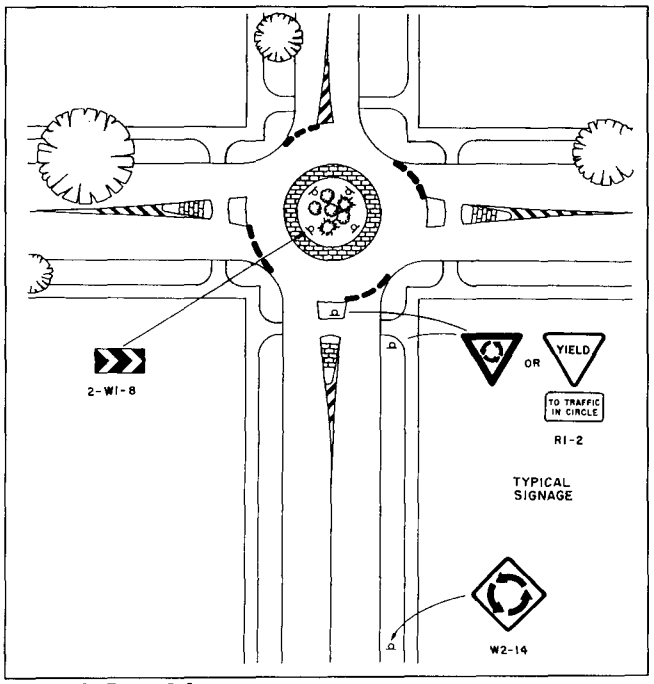

Figure 3. Roundabout.

Two flat top humps were installed in 1993 on Shaker Drive in Howard County, where the 85th percentile speed was reduced from 43 mph to 29 mph. Remarkably, the speed between humps and at humps are essentially the same. (Seminole County found similar operating experience.) This characteristic has led to its adoption in Howard County as the preferred hump design.

The City of College Park, Md., recently completed construction of four raised pedestrian crossings as part of a road rehabilitation. The cross section is similar to a flat top speed hump with a 3-in rise. The city added visual impact to the crossings by constructing the flat top portion with concrete and brick.

The Institute of Transportation Engineers has published a proposed recommended practice on speed humps. It was prepared by the Technical Council Speed Humps Task Force, which is currently evaluating comments before a final decision on adoption.[5]

Horizontal Alignment Changes

Traffic Circles and Roundabouts

The City of Seattle, Wash., pioneered the U.S. concept of installing small traffic circles in existing intersections to slow traffic through residential areas. From a small beginning in 1978, Seattle has now constructed more than 800 traffic circles on residential streets.[6] Their pioneering experience has been adopted elsewhere, including suburban Maryland counties. Traffic circles have been installed in Maryland as both temporary and permanent installations. Some of the temporary installations have been redesigned as permanent ones and some have been removed at the request of residents. Anne Arundel and Montgomery counties have each installed several circles (see Figure 2).

The success of traffic circles in reducing residential travel speeds is related to the amount of horizontal deflection required as a vehicle moves around the circle.[7] Both Anne Arundel and Montgomery counties have designed considerable deflection in their circles, effectively prohibiting intersection traffic from traveling more than 18 mph to 20 mph. Operationally, side roads stop for traffic on the main route. Most left-turning cars will make a 270-degree turn around the circle. Some of the circles have been constructed with a mountable curb and 4 ft concrete ring to accommodate trucks. However, large trucks cannot operate within the turning radius of the circles and therefore make left turns in front of the circle. This could be considered a dangerous practice except volumes are low and the circles are designed with good visibility.

Because of the problem of trucks turning in front of the circles, Prince Georges County has constructed several roundabouts. Roundabouts are similar to traffic circles but have splitter islands that effectively prevent trucks from turning in front of the circle.[8] Generally the islands are formed with concrete or asphalt curb, but occasionally they are painted (see Figure 3). Operationally, traffic entering a roundabout yields to traffic in the circle, and there is no major road/minor road consideration as at normal intersections. Roundabouts large enough to accommodate trucks must have a total inscribed diameter of approximately 100 feet (ft). This is frequently difficult to achieve in residential intersections without acquiring additional right-of-way.

Both roundabouts and traffic circles are very effective as intersection traffic calming devices. They have been used with considerable success in Montgomery County for isolated intersection calming, where 85th percentile speeds have been reduced from

more than 40 mph to 20–22 mph. Along a residential route they must be repeated at regular intervals to maintain "calm" traffic speeds throughout. Circles have also been constructed between intersections to calm traffic.

Roadway Restrictions

Roadway restrictions can also be effective traffic calming devices. Many residential streets are considerably wider than required. On such streets, cars parked opposite each other in mid-block act as a temporary roadway restriction. This phenomenon can be created by constructing pedestrian peninsulas at intersections or chokers at mid-block (see Figure 4). The pavement width between chokers can be built for one traffic lane or two. Likewise the restriction can be either parallel to the travel way or twisted to the direction of travel (see Figure 5, next page). Downtown Market Street in York, Pa., is an excellent example of a one-way street narrowed to two lanes with a twist introduced at each end of a long block in order to reduce travel speeds.

Medians also can be used for road narrowings. Medians 20 ft to 50 ft or more in length have been constructed in Anne Arundel County in advance of intersections. Roadway widths each side of the medians are 11 ft. However, unless cars regularly park along the street, median construction by itself does little to reduce traffic speed. To compensate for this, Anne Arundel County is constructing small bulb-outs (peninsula projections into the roadway) to force drivers to make a lateral deflection as they approach and enter median-calmed area. Studies indicate that islands have reduced 85th percentile speeds by 2 mph to 5 mph. Islands without lateral deflection have the least speed reduction.

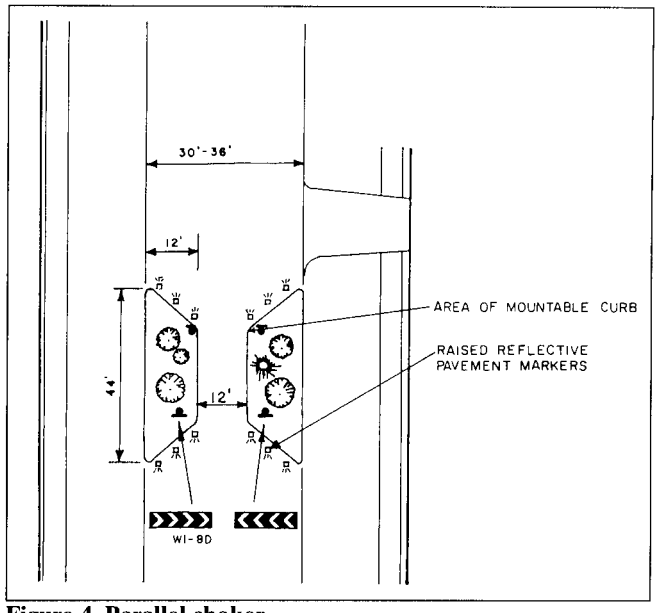

Figure 4. Parallel choker.

A variation on roadway restrictions has been constructed at two Prince Georges County intersections, where offset small medians force vehicles to go through a lateral deflection in one direction of travel only. In the next block a similar median forces similar deflection for the other direction of traffic.

Both Anne Arundel and Howard counties have painted

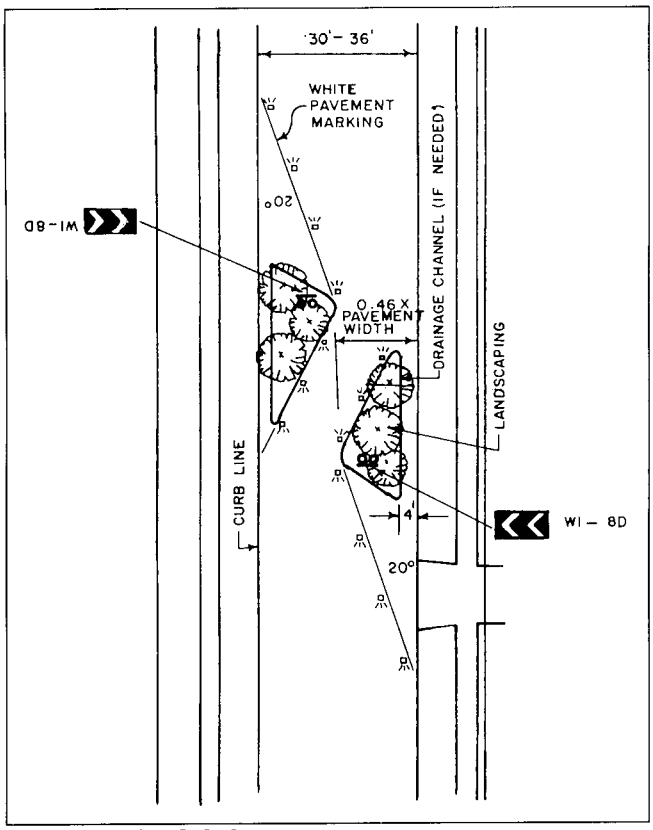

Figure 5. Twisted choker.

parking lane lines without centerline striping on residential streets. This visually narrows the available roadway and has resulted in reductions of 3 mph to 4 mph in vehicle travel. This narrowing can be reinforced with several pedestrian peninsulas and speed humps. Such combinations of traffic calming measures are used extensively in Europe to achieve desired speed reductions.

Traffic Calming Criteria

Tentative criteria have been developed governing the installation of traffic calming devices. Roadways considered for traffic calming must be primarily residential streets with a majority of residential homes and driveways fronting on the street. Existing 85th percentile speeds must be 10 mph or more above the speed limit and there must be 1,000 vpd or more using the residential street. Each of the metropolitan jurisdictions study traffic calming measures after neighborhood complaints. They then work with the community to quantify and define the problem, and specific recommendations are made to the community. Maryland has found resident acceptance is paramount, and is best facilitated by working with a traffic committee from the community, which can then sell the project to the community at large. Howard County requires 60 percent of residents to approve recommendations by petition before construction.

Conclusions

Traffic calming can be an effective means of reducing speeds in established residential neighborhoods. Speeding generally occurs along the entire length of a street, may extend over several streets, and requires the regular repetition of traffic calming measures. The specific measures to be used for traffic calming are determined by roadway characteristics, cost restraints and resident acceptance. Speed reductions ranging from 3 mph to 24 mph have been obtained depending on the specific traffic calming devices utilized. Regular repetition of calming devices at 400 ft to 600 ft intervals is required to maintain slower speeds along the length of a street.

References

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