TRAFFIC CALMING GUIDE
FOR
LOCAL RESIDENTIAL STREETS

Traffic Engineering Division
Virginia Department of Transportation
Richmond, Virginia

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PREFACE

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Since the late 1980s, the Virginia Department of Transportation (VDOT) has concerned itself with neighborhood traffic problems on streets and roadways in the state's operated and maintained highway systems.

1. The **Restricting Through Trucks on Secondary Highways Policy**, which was adopted in September 1988, states in part that "the Commonwealth Transportation Board (CTB), in response to a formal request by a local governing body, may prohibit or restrict the use by through trucks of any part of a secondary highway". Approval authority is by the Commissioner on Secondary routes and the CTB on Primary routes,

2. The **Control of Residential Cut-Through Traffic Policy**, adopted in March 1989 and most recently revised in 1996, says in part that "VDOT will recognize the problems associated with residential cut-through traffic and implement appropriate measures wherever possible." Approval authority is by the District Administrator on both Primary and Secondary routes.

3. Pursuant to a 1997 General Assembly amendment to the Code of Virginia regarding the installation and maintenance of "signs alerting motorists that children may be at play nearby", VDOT implemented procedures effective July 1, 1997, that allows counties to request **"Watch for Children**" signs. Approval authority is by the District Administrator on Secondary routes and the State Traffic Engineer on Primary routes.

4. Pursuant to a 1999 General Assembly amendment to the Code of Virginia regarding the "maximum speed limits in certain residence districts, penalty", VDOT implemented procedures on June 17, 1999, that allows local governing bodies to request signs on local residential streets, collector streets, and minor arterials with a posted speed limit of 35 mph or less advising motorists of a maximum punishment of **$200 for exceeding the speed limit**. Approval authority is by the District Administrator on both Primary and Secondary routes.

The ***Traffic Calming Guide for Local Residential Streets***, which was adopted in June 2001, provides communities with a traffic management tool dealing specifically with speeding, with the goal being to slow speeders in residential neighborhoods on streets classified as local. Approval authority is by the District Administrator on both Primary and Secondary routes.

These five traffic management tools have been combined under the Department's **Residential Traffic Management Program**. Neighborhoods, through their local governing bodies, are encouraged to choose one or more of these tools to resolve traffic problems on their local streets and highways. For more information contact the

local office of VDOT or the Department's Traffic Engineering Division at the address below.

Traffic Engineering Division
Virginia Department of Transportation
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TRAFFIC CALMING GUIDE FOR LOCAL RESIDENTIAL STREETS

I. INTRODUCTION

In mid 2001, VDOT implemented the Traffic Calming Guide for Local Residential Streets that provides communities with a traffic management tool dealing specifically with speeding. The guide is based on the premise that the county and VDOT are partners in addressing a speeding problem. For purposes of this guide, the goal of traffic calming is to slow speeders in residential neighborhoods on streets classified as local. The focus is on subdivision streets. Certain collector streets that have many of the characteristics of local residential streets may also qualify for traffic calming measures.

It is important to note that traffic calming efforts generally slow traffic without restricting access. Traffic calming measures are appropriate for slowing traffic when cut-through traffic is not the problem; that is, neighborhoods typically do not qualify for the cut-through traffic program when the majority of the traffic and speeding problems are generated from within the neighborhood.

The county will initiate and take the lead role in coordinating the traffic calming process and VDOT staff will provide technical support. The county and VDOT will determine who is responsible for a particular task where the responsible agency is not specified. For traffic calming, VDOT is represented by the local resident engineer, except in Fairfax, Prince William, and Loudoun Counties where it is the district traffic engineer.

Although this guide is intended for existing streets only, there is concern about preventing traffic problems from developing on new subdivision streets. In its process for reviewing subdivision development plans, participating counties should identify and address potential traffic calming as well as other traffic management concerns that may result from a new development. The review process should ensure that the developer of a new subdivision place emphasis on and address the need to design street geometric concepts that make streets less desirable for speeding and cut-through traffic. In the subdivision design review process, VDOT should also exert its discretionary authority in applying geometric standards to discourage speeding and cut-through traffic. The county should consider planning, enforcement, and transportation together in a comprehensive approach to managing residential traffic.

Ideally, potential traffic calming concerns in new developments should be addressed with roadway design geometry changes, especially roadway width (narrowing) and road curvature. In lieu of or in addition to these geometric changes, traffic calming measures that generally serve to narrow the travel way include pavement markings delineating parking, shoulder, or bike lanes, or mini-roundabouts, chokers, crosswalk refuges, and short medians. The county or subdivision developers should consult with VDOT prior to submitting a plan specifying traffic calming measures on newly developed streets

II. THE RESIDENTIAL TRAFFIC CALMING PROCESS

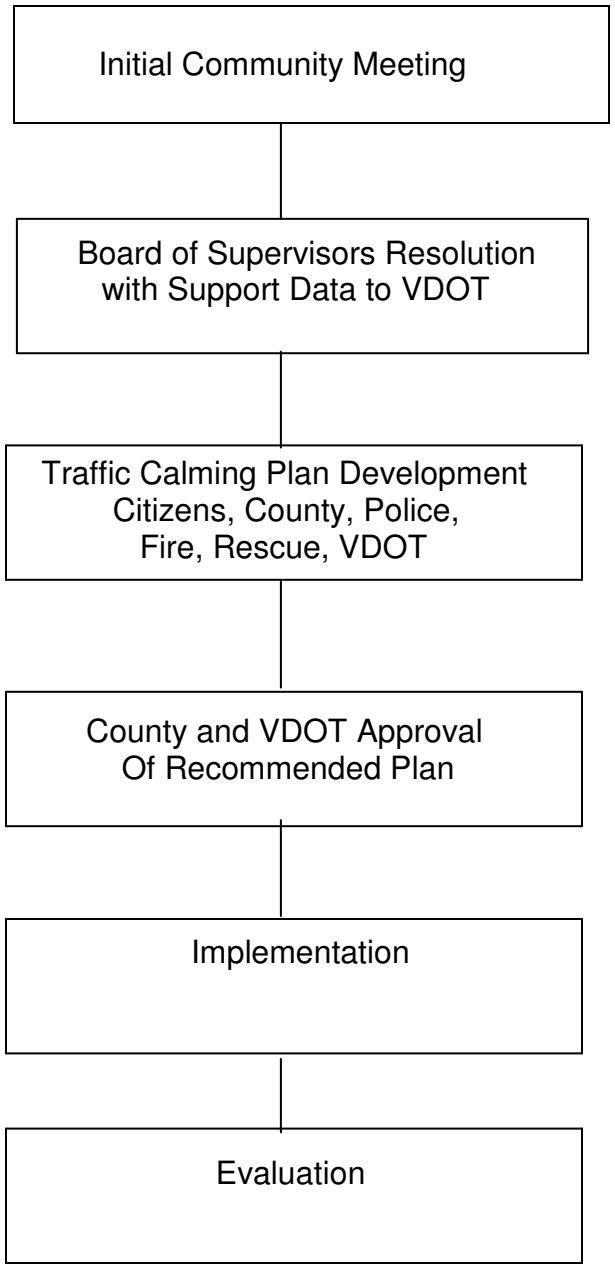


Figure 1. The Residential Traffic Calming Process

A. Initial Community Meeting

The County and VDOT may employ a number of methods to publicize the traffic-calming program, and more generally, residential traffic management tools. VDOT, in cooperation with County staff, is available for an initial community

meeting. All-inclusive participation (community leaders and residents, local politicians, law enforcement, fire, and emergency personnel, and county and VDOT staff) is essential for proper problem solving. Presentations made at the meeting should enhance the community's understanding about the traffic calming process, including the amount of community involvement required and the advantages and disadvantages of traffic calming. The meeting is an opportunity for the County and VDOT to learn more about the concerns of the community as well as to help the community assess its traffic concerns. County staff arranges the meeting and determines its size and scope. At this initial meeting, all participants can work together to develop a plan for continuous involvement by and communication with the community during the traffic calming process.

B. Board Resolution with Support Data Requirements

The Board of Supervisors initiates the traffic calming process by forwarding to VDOT a resolution that requests the initiation of a traffic calming project along with the following information:

- Street functional classification
- Average daily traffic volumes
- Average speed
- Description of petition area
- Description of impacted areas
- Petition with signatures

The support data provided by the county should verify that the following requirements are met:

1. Eligible Streets: Local residential streets are eligible for traffic calming provided the posted speed limit does not exceed 25 mph. A local residential street provides direct access to abutting residences and serves only to provide mobility within the neighborhood. Traffic on these streets is expected to be entering or exiting from the residences.

Certain residential collector streets, although classified as collector roads, have the characteristics of local residential streets. Collector streets may be considered for traffic calming measures if they meet the following conditions:

- 25 mph posted speed limit
- Two-lane roadway
- Minimum of 12 dwellings fronting the street per 1,000 feet of roadway, including both sides

Eligible streets are functionally classified as a local or collector street by VDOT.

2. Documented speeding problem: The average speed is at least 5 mph over the speed limit. Accordingly, the average speed should be at least 30 mph to qualify.

3. Petition for traffic calming: Once the proposed street meets the above technical criteria, a petition requesting traffic calming and signed by at least 75 percent of the total occupied households within the petition area must be obtained. The petition area includes residences on the proposed street section, and residences on all streets that have major access onto the proposed study street section. The county, in cooperation with VDOT, will define the petition area and provide a petition form. The impacted area typically includes the surrounding collector or arterial roads but should be defined by the county in cooperation with VDOT. The county will verify that the petition is valid.

The resolution and appropriate attachments should be sent to VDOT.

C. Plan Development

The traffic calming plan should be developed by a group that includes representatives from the petition area, impacted area, homeowner associations, the board of supervisors, local transportation/planning staff, police, fire, rescue, VDOT, and others as appropriate.

Because the impact of traffic calming measures will extend beyond the petition area, it is important to involve representatives from the larger, impacted area.

The Board of Supervisors and homeowner associations are responsible for scheduling and facilitating meetings. VDOT staff will provide technical support and advise the community of the potential advantages and disadvantages of calming measures. Educating participants about residential traffic management and traffic calming is key to a successful program.

The proposed plan shall be presented to residents at a public meeting, or through some other method such as a petition, to inform and measure support for the plan. This will allow the Board of Supervisors to assess whether community support exists for the proposed measures.

D. Approval and Implementation

The final plan and method of implementation must be jointly approved by the Board of Supervisors and VDOT. The final plan must identify the source of funding for implementation.

E. Evaluation

A follow-up evaluation should be performed to ensure that the traffic calming measures are effective. The Board of Supervisors in cooperation with VDOT will determine the method to disseminate the findings and recommendations to those involved in the plan development and obtain feedback as appropriate.

If the county decides to remove the traffic calming measures, then funding for removal should be from the same funding sources as implementation. If an unforeseen safety problem develops, VDOT may decide to remove the traffic calming measures.

III. TRAFFIC CALMING MEASURES

Community awareness and education is an important first step. The residents should be made aware of the speeding concerns and should be reminded of the importance of driving safely in their neighborhood. VDOT staff is available to speak to homeowner associations about traffic calming measures and to help raise community awareness about advantages, disadvantages, costs, and funding options.

Enforcement is traditionally the primary means of addressing speeding problems. Local police officers monitor and enforce the posted speed limit. Enforcement efforts should be undertaken as much as possible prior to implementation of traffic calming measures.

Non-physical measures are low-cost measures that do not physically restrict driver maneuvers, such as pavement markings to narrow travel lanes (See Figure 2).

Physical measures are designed to reduce speed by creating a vertical or horizontal shift in the roadway or travel lanes (See Figure 2 and Section V).

Alternative actions should be considered when traffic volumes on the study street exceed 4,000 vehicles per day. A network analysis is suggested to thoroughly examine the road network in the area and identify potential improvements on major routes that may provide relief to the “study” street.

IV. TRAFFIC VOLUMES AND TRAFFIC CALMING MEASURES

Traffic volumes on the residential street will determine the appropriate traffic calming measures as follows:

- **Fewer than 600 vehicles per day**
  - education
  - enforcement
  - non-physical measures
- **600- 4,000 vehicles per day**
  - education
  - enforcement
  - non-physical measures
  - physical measures
- **More than 4,000 vehicles per day**
  - education
  - enforcement
  - alternative actions only
  - no traffic calming measures

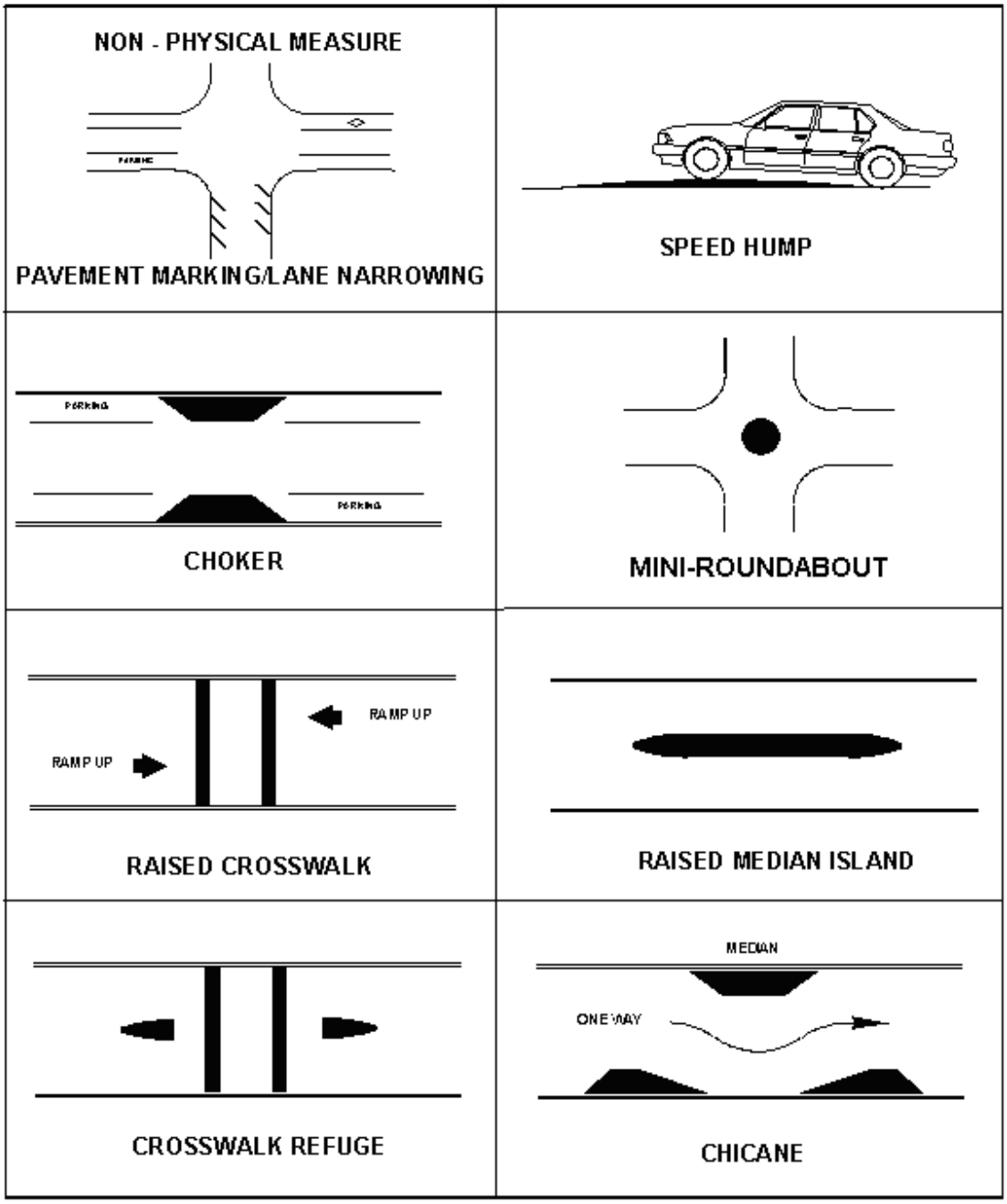


Figure 2. Typical Physical and Non-Physical Traffic Calming Measures

V. PHYSICAL MEASURES FOR TRAFFIC CALMING

The following measures have been effective in slowing traffic in neighborhoods. To ensure minimum delay in emergency response time, the installation of speed humps and raised crosswalks is discouraged on major emergency routes. Costs are provided only as rough estimates; actual construction costs will depend on the number of measures constructed, related signing and pavement markings, and the extent of aesthetic provisions. The estimated costs are derived from Institute of Transportation Engineering's *Traffic Calming State of the Practice* and revised based on VDOT's experience with some of the measures. Physical measures are shown in Figure 2. More details are provided in the "Implementation Guide for Traffic Calming Measures" in the Appendix.

A. Speed Hump

Description: a raised hump in the roadway with a parabolic top, extending across the road at right angles to the traffic.

Placement: spacing should be about 500 feet, clearly visible for 200 feet, and placed at least 200 feet from intersections; should include warning signs.

Advantages: reduces speeds.

Disadvantages: increases emergency response times and slows emergency vehicles and buses, potential drainage problems, increases noise, increases maintenance costs.

Estimated cost: $2,000-$3,000 per speed hump.

B. Choker

Description: a physical constriction built at the curb side of the roadway to reduce the width of the travel lane.

Placement: normal turning radii should be accommodated; should include advance warning signs and delineation.

Advantages: reduces speeds, provides parking protection, shortens pedestrian crossing distance.

Disadvantages: potential drainage problems, maintenance costs.

Estimated cost: $7,000-$10,000 per pair.

C. Raised Crosswalk

Description: a raised hump in the roadway with a 10-foot flat top, extending across the road at right angles to the direction of traffic flow.

Placement: where significant number of pedestrians cross the roadway; should include advance warning signs.

Advantages: reduces speeds, provides improved visibility and safety for pedestrians.

Disadvantages: increases emergency response times and slows emergency vehicles and buses, potential drainage problems, increases noise, increases maintenance costs.

Estimated cost: $2,500-$8,000 per raised crosswalk. The higher estimate includes the construction of two curb ramps.

D. Mini-roundabout

Description: elevated area in the middle of the intersection that provides circular, counterclockwise traffic flow.

Placement: street grades approaching the intersection should not exceed 10 percent and entrances should be a minimum of 100 feet away on all approaches.

Advantages: reduces speeds, reduces left-turn accidents, can be visually attractive.

Disadvantages: placement of center island may reduce parking spaces and require additional right of way.

Estimated cost: $3,500-$15,000 each.

E. Crosswalk Refuge

Description: a raised median in the middle of the roadway with a cut provided for the crosswalk.

Placement: where a significant number of pedestrians cross the roadway.

Advantages: reduces speeds, provides refuge for pedestrians crossing roadway.

Disadvantages: increases maintenance costs.

Estimated cost: $5,000-$15,000 per crosswalk refuge.

F. Raised Median Island

Description: a raised median in the middle of the roadway.

Placement: should accommodate normal turning radii near intersections where applicable; placed in the middle of the roadway with proper warning signing and delineation.

Advantages: reduces speeds, shortens pedestrian crossing time and distance.

Disadvantages: drainage problems, maintenance costs, expensive.

Estimated cost: $5,000-$15,000 per island.

G. Chicane

Description: alternating constrictions built curbside to create a bend in a formerly straight street, forcing vehicles to negotiate the narrowed street in a snake-like fashion.

Placement: should accommodate normal turning radii; sets are to be placed 400-600 feet apart; should include advance warning signing and delineation; used only on roadways divided with a median.

Advantages: reduces speeds, shortens pedestrian crossing time and distance.

Disadvantages: limited to divided roadways, potential drainage problems, maintenance costs.

Estimated cost: $5,000-$15,000 per set.

VI. OPTIONS FOR COUNTIES

A. County-Specific Modifications

The *Traffic Calming Guide for Local Residential Streets* is applicable to all counties. However, if a particular county believes that minor modifications are necessary to serve the needs of its citizens, modifications may be requested. The request should be addressed to VDOT.

VDOT has received requests to use All Way Stop Control (AWSC) as a traffic calming measure. AWSC is acceptable as a measure under the "County-Specific Modifications" provision if the criteria defined in the "All Way Stop Control Criteria for Traffic Calming" in Chapter V of the Appendix are satisfied.

B. Point System for Prioritizing Projects (Optional)

The point system in Table 1 is provided as an option for counties to use in prioritizing projects eligible for physical measures. The point system is based on speeds, volumes, and accident history. VDOT will work with the locality to help develop a county-specific method of prioritization.

Table 1. Optional Point System for Prioritizing Projects

Speed Related Accidents		**Traffic Volume**		**Speeds**	
Accidents / Year	Points	Average Daily Traffic	Points	Average Speed	Points
1	1.0	600-1,000	0.5	30-34	1.0
2	2.0	1,001-3,000	1.0	35-39	2.0
3+	3.0	3,001+	1.5	40+	3.0

VII. FUNDING

Traffic calming measures may be funded using one of the following:

- 100 percent exclusively county-generated or other funds (no VDOT funding).
- Revenue sharing funds with 50 percent exclusively county-generated or other funds and 50 percent VDOT funds.
- Secondary road construction funds; a maximum of 2 percent of the county's secondary road construction funds can be used with a three-year limit on its accumulation.

Maintenance will be funded through the county's VDOT secondary road maintenance funds. Implementation and maintenance of optional landscaping will be provided by the community

REFERENCES

For further information on traffic calming, see the following sources.

1. Federal Highway Administration. *Manual on Uniform Traffic Control Devices For Streets and Highways (MUTCD)*, Washington, D.C., 1988. (The Millennium Edition of the Manual, which is scheduled for release in 2001, will replace the 1988 version. For information, see the following web page: http://mutcd.fhwa.dot.gov/kno-proposed2000.htm.

2. Institute of Transportation Engineers and Federal Highway Administration. *Traffic Calming: State of the Practice*, Washington, D.C., August 1999. (Available for downloading at http://www.ite.org/traffic/tcstate.htm#tcsop .)

3. Institute of Transportation Engineers. *Traffic Engineering Handbook*, Fifth Edition, Chapter 9, "Traffic Calming Applications", Washington, D.C., 1999.

4. Institute of Transportation Engineers. *Transportation Planning Handbook*, Second Edition, Chapter 17, "Traffic Calming", Washington, D.C., 1999.

5. Institute of Transportation Engineers. *Guidelines for the Design and Application of Speed Humps*, A Recommended Practice, Washington, D.C., 1997.

6. Pat Noyes & Associates. *Traffic Calming Primer*, Boulder, CO, 1998.

7. South Western Regional Planning Agency. *Traffic Calming Toolbox, Traffic Calming: Devices, Applications, & Program Management*, Norwalk, CT, June 1998.

8. Texas Transportation Institute. *Handbook of Speed Management Techniques*, Research Report 1770-2, College Station, TX, September 1998.

9. Virginia Transportation Research Council. *An Operating Guide for the Control of Residential Cut-Through Traffic*, B. H. Cottrell, Jr., Charlottesville, VA, 1990. (Appendix contains "Guidelines for Use of Speed Humps".)

10. Washington State Department of Transportation, *A Guidebook for Residential Traffic Management*, Olympia, WA, 1994.

Traffic Calming Internet Web Sites

1. The Institute of Transportation Engineers has a comprehensive internet web site at: http://www.ite.org/traffic/index.htm.

   The site (which contains the downloadable Reference # 4 above) includes an overview of traffic calming and calming measures, a searchable library of references including a topical index (many of which are downloadable), a listing of other traffic calming web sites, and downloadable seminar materials (PowerPoint presentation).

2. The City of Portland has an excellent internet web site describing its traffic calming program at:
   http://www.trans.ci.portland.or.us/Traffic_Management/trafficcalming/

APPENDIX

IMPLEMENTATION GUIDE FOR TRAFFIC CALMING MEASURES

CHAPTER I
INTRODUCTION

The purpose of residential traffic management is to address traffic problems in residential neighborhoods. Traffic calming is intended to reduce speeds without restricting access. This "Implementation Guide for Traffic Calming Measures" will:

- Explain the difference between traffic control devices and traffic calming measures
- Give lessons learned in the planning process
- List things to consider before and during measure installation
- Show typical design standards and specifications

Traffic control devices are frequently confused with traffic calming measures. Traffic control devices are signs, signals, and markings that are designed to regulate, warn, guide, and inform. Traffic calming measures are usually physical measures in the roadway used to slow traffic. Although a traffic control device and a traffic calming measure could share the goal of slowing motorists, the purpose of a traffic control device is to attempt to communicate, while the traffic calming measure is a part of the design of the street or intersection. A traffic control device may, however, supplement a traffic calming measure.

CHAPTER II
DO'S OF TRAFFIC CALMING

1. **Quantify the problem.** Identify the real problem(s). Speed, volume and noise are frequent complaints, but often the real problem on a street is just one of these.

   Undertake traffic counts, speed studies, and accident data analyses.

   Remember that you are hearing mostly from people who are dissatisfied. There are other aspects to the situation that you are not likely hearing about.

2. **Involve the community.** Do not develop or implement a plan without the community's involvement. Regardless of how technically sound a plan might be, it will not work as well if the community is not involved.

3. **Educate decision makers.** Avoid uninformed (often political or emotional) decisions.

4. **Look at the arterial network first.** No one uses a short-cut unless there's a reason to. The reason is often congestion on nearby arterials.

5. **Favor self-enforcing measures.** "Self-enforcing" measures maintain a 24-hour presence and are effective without police enforcement.

6. **Consult with all services.** Police, fire, ambulance, transit, sanitation services, and snow plow operators should be involved from the beginning.

7. **Sign and delineate.** Install appropriate warning signs, and delineate the traffic calming measures.

8. **Implement measures on an area wide basis.** Avoid creating more problems or relocating a problem. Always consider the impacts on adjacent local streets and arterial roads. Identify groups of measures to be implemented in stages if funding for the entire transportation management plan cannot be secured at once.

9. **Monitor and follow-up.** Report back to the community as to the success of traffic calming measures. This helps to justify additional expenditures and enhances the credibility of the traffic management program.

   Implement measures as demonstrations if decided by consensus.

10. **Remember that everybody drives differently.** Some motorists will drive around or over some calming measures and some may not readily understand Mini-roundabouts regardless of how well they are signed.

    Some people resist change.

11. **Expect problems.** Some problems (such as regional traffic issues) cannot be addressed by a neighborhood wide plan.

    Some problems cannot be resolved at a reasonable cost. For example, it may simply be too expensive to acquire property to widen an intersection or a road.

    Refer other problems to the appropriate agency, such as the planning department, the police, etc.

CHAPTER III
DESIGN AND INSTALLATION

A. Key Points with Design

1. Some designers appear to focus solely on traffic calming measures rather than using traditional traffic management and traffic calming measures in combination.
2. Speed humps are an effective means of speed reduction but are often opposed by bus operators and emergency services. In some situations, it should be possible to achieve a sufficiently effective scheme without the need for vertical deflections.
3. While speed humps slow traffic, they can attract criticism because of the inconvenience, discomfort, and vehicle damage.
4. Narrowing travel lanes can be very effective, particularly when the two-way traffic volume is high. Lanes need adequate signing and marking.
5. If systematic monitoring takes place, it will be easier to decide which measures are appropriate for different circumstances.

B. Design Aspects of Residential Traffic Calming Measures

1. **Visibility.** Measures should be clearly visible day and night. Reflectors, buttons, highly reflective paint, or illumination should be used as appropriate to ensure visibility. Additionally, traffic calming measures should not be placed where drivers do not have adequate stopping sight distance for the operating speed of the road.

2. **Signing.** Advance signs should warn motorists of upcoming traffic calming measures and, to the extent possible, guide the motorists' response to such measures.

3. **Streetscape.** Traffic calming measures should blend naturally with the streetscape and enhance the appearance and feel of the street. They should alert drivers that they are in or entering a residential place.

4. **Design vehicles**. Traffic calming measures should be designed to accommodate emergency service and other large vehicles at an acceptable speed.

5. **Maintenance.** Long-term maintenance needs should be anticipated in the design process and minimized to the extent possible. Some jurisdictions contract with the neighborhood to maintain plantings or simply eliminate landscaping in the absence of a willingness on the part of residents to participate.

6. **Parking.** On-street parking in residential areas creates a sense of activity; some jurisdictions encourage on-street parking for this reason. However, in some instances, on-street parking also creates sight line restrictions, which may be unsafe for drivers who are speeding.

7. **Speed control.** Traffic calming measures should be located and designed to limit speeds in residential areas.

C. Do's of the Design Process

1. Consider installing temporary traffic calming measures and monitor them for a period of time before installing the permanent measures.

2. Have an organized program including public involvement with plans and policies approved and supported by the local government.

3. Involve the local service agencies, including fire, police, and emergency medical service personnel from the beginning.

4. Consult with fire department and EMS personnel to develop the design, particularly with speed humps and Mini-roundabouts. Set up Mini-roundabouts with cones and have the fire trucks and other emergency vehicles drive around them. This will help determine what radius is best for the types of emergency vehicles found in different areas. The same process can be used in the design of speed humps.

5. Review traffic patterns in the neighborhood as a whole. Avoid solving the problem on one neighborhood street by shifting the traffic to another neighborhood street.

6. Make certain that all signing and channelization are in accordance with the *Manual on Uniform Traffic Control Devices* (MUTCD), the Supplement to the MUTCD, and the American Association of State Highway and Transportation Officials (AASHTO) *Policy on Geometric Design of Highways and Streets*.

7. Check sight distances for vehicles, pedestrians, and bicyclists. Sight distance is to meet the requirements of the AASHTO *Policy on Geometric Design of Highways and Streets*.

8. Check sight distances by visiting the site before and after installation. Do parked cars obstruct sight distances? Does landscaping (now or after it grows) or other features obstruct sight distance?

9. Review the on-street parking. Will parked cars block access of emergency vehicles through or around the proposed neighborhood traffic calming measures? Add additional no parking zones where needed.

10. Review the site for utility conflicts. Is there a fire hydrant? Does it need to be moved? Are there utilities in the way?

11. Check the storm water drainage. Will the storm drain system need to be moved or revised? Can the runoff get through or around the measure?

12. When installing traffic calming measures on streets without curbs, supplemental features (e.g., bollards, delineators) may be necessary to keep vehicles within the traveled way.

13. Traffic calming measures may need to be adjusted on streets with grades of greater than 10 percent.

14. Traffic calming measures should be installed on curving, winding roads with limited sight distance only if reduced speed limits and adequate warning signs are used in conjunction with the measures.

15. Traffic calming measures should be away from driveways.

D. Checklist for the Installation of Residential Traffic Calming Measures

As a minimum, the following items should be reviewed by the design professional for each residential traffic calming measure installation:

Geometrics

- Turning radius
- Horizontal and vertical alignment
- Super elevation
- Major geometric features such as sidewalks, curbs, etc.
- Roadway width
- Sight distances

Safety

- Channelization
- Illumination
- Signing
- Clear zone (the total roadside border area starting at the edge of the travel way available for safe use by errant vehicles)
- Crosswalk locations

Utilities

- Water and sewer
- Franchise utilities (such as gas, power, telephone, etc.)
- Storm drainage
- Location of hydrants

Design Vehicles

- Local emergency vehicle characteristics
- Minimum design vehicle - bus, single-unit truck, or passenger car
- Public transit and school bus stops and routes
- Bicycles and wheelchairs

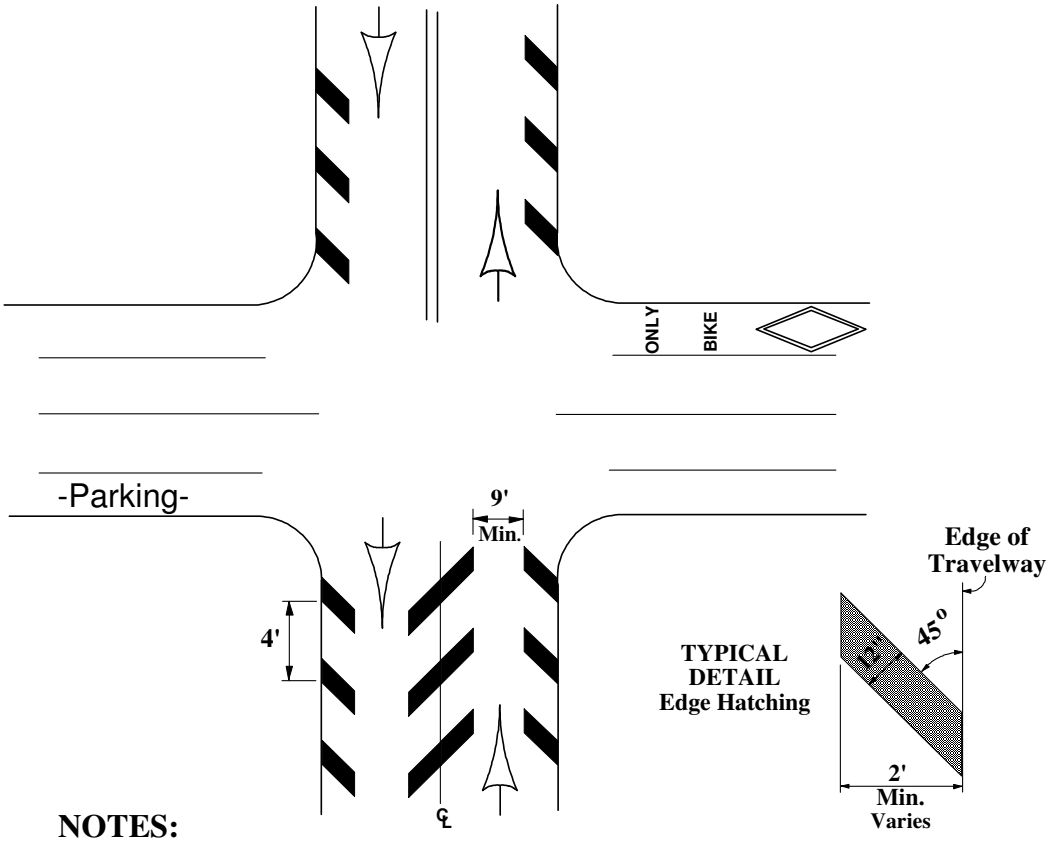
Other

- Landscaping
- Pedestrians and bicycles
- Access for the mobility impaired
- Parking
- Mail delivery routes
- Emergency access

CHAPTER IV
RESIDENTIAL TRAFFIC CALMING MEASURES

TRAFFIC CALMING MEASURE

Figure A-1. NON-PHYSICAL MEASURE
PAVEMENT MARKING / LANE NARROWING



NOTES:

1) Markings shall be in accordance with the MUTCD, VDOT's Road and Bridge Standards and Specification, and Road Design Manual, Sec A5.

2) Narrowing Design Options:
   a) Hatching
   b) Parking Lanes
   c) Bike Lanes

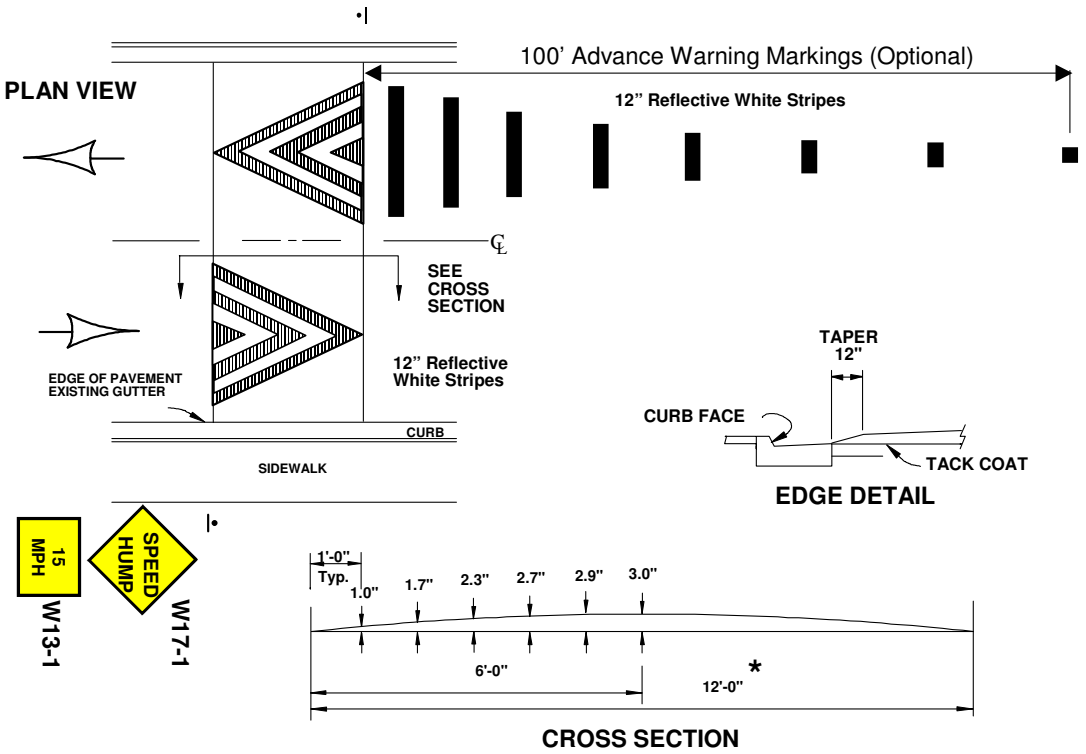
3) The amount of hatching as well as widths, lengths and spacing to be determined by the Engineer. Centerline hatching optional.

4) Travel lanes not to be less than 9' in width.

5) Engineer to modify design to accommodate field conditions while conforming to AASHTO publications and acceptable engineering practices.

TRAFFIC CALMING MEASURE

Figure A-2. SPEED HUMP



NOTES:

1) Signs and Markings shall be in accordance with the MUTCD & ITE practices.

2) Advance signing at each location is optional when part of an area wide scheme.

3) Cross-section shows approximate elevation for 3" (maximum) speed hump.

4) Design Options:
   a) 22' section (See Raised Crosswalk for cross-section.)

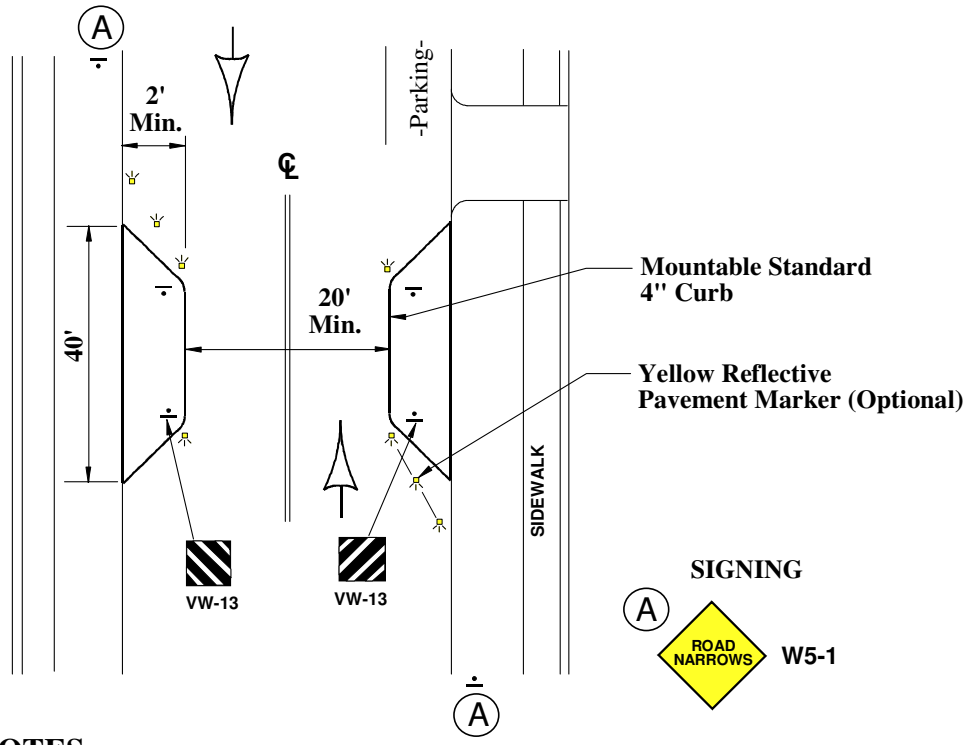
5) Speed Humps shall not be placed over manholes, watergates, junction chambers, etc.

6) Speed Humps must be placed at locations approved by Engineer.

7) Engineer to modify design and location to accommodate field conditions (ex. drainage) while conforming to VDOT's Road and Bridge Standards and Specification manuals, AASHTO publications and acceptable engineering practices.

TRAFFIC CALMING MEASURE

Figure A-3. CHOKER



NOTES:

1) Signs and Markings shall be in accordance with the MUTCD.

2) Advance signing at each location is optional when part of an area wide scheme.

3) Landscaping designs, if any, to be determined by the community and approved by the Engineer. Sight distance shall not be impacted by landscaping. Fixed objects shall not be placed in any portion of the measures that are within the clear zone.

4) The transition of the approach curb, and accompanying raised pavement markers, shall be in conformance to the design speed.

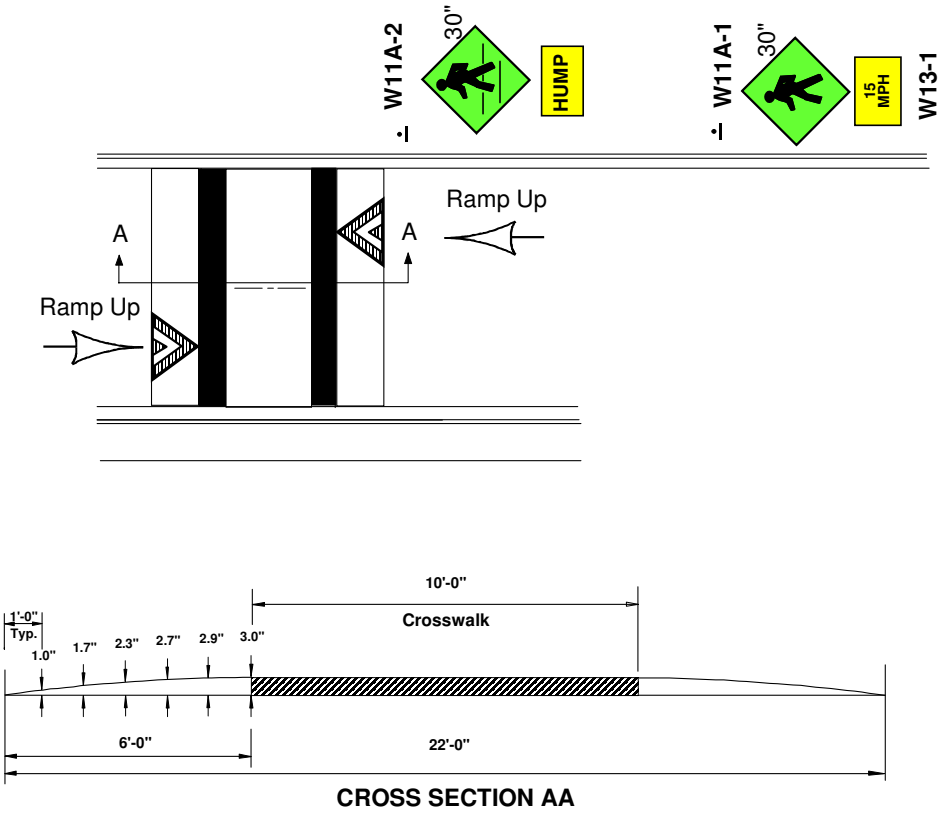
5) Design Options:

a) Intersection or Mid-block
b) One-side or Two-side
c) Combined with Raised Crosswalk

6) Engineer to modify design and location to accommodate field conditions (ex. drainage) while conforming to VDOT's Road and Bridge Standards and Specification manuals, AASHTO publications and acceptable engineering practices.

TRAFFIC CALMING MEASURE

Figure A-4. RAISED CROSSWALK



CROSS SECTION AA

NOTES:

1) Signs and Markings shall be in accordance with the MUTCD.

2) Advance signing at each location is optional when part of an area wide scheme.

3) Cross-section shows approximate elevation for 3" (maximum) raised crosswalk.

4) Design Options: can be combined with choker.

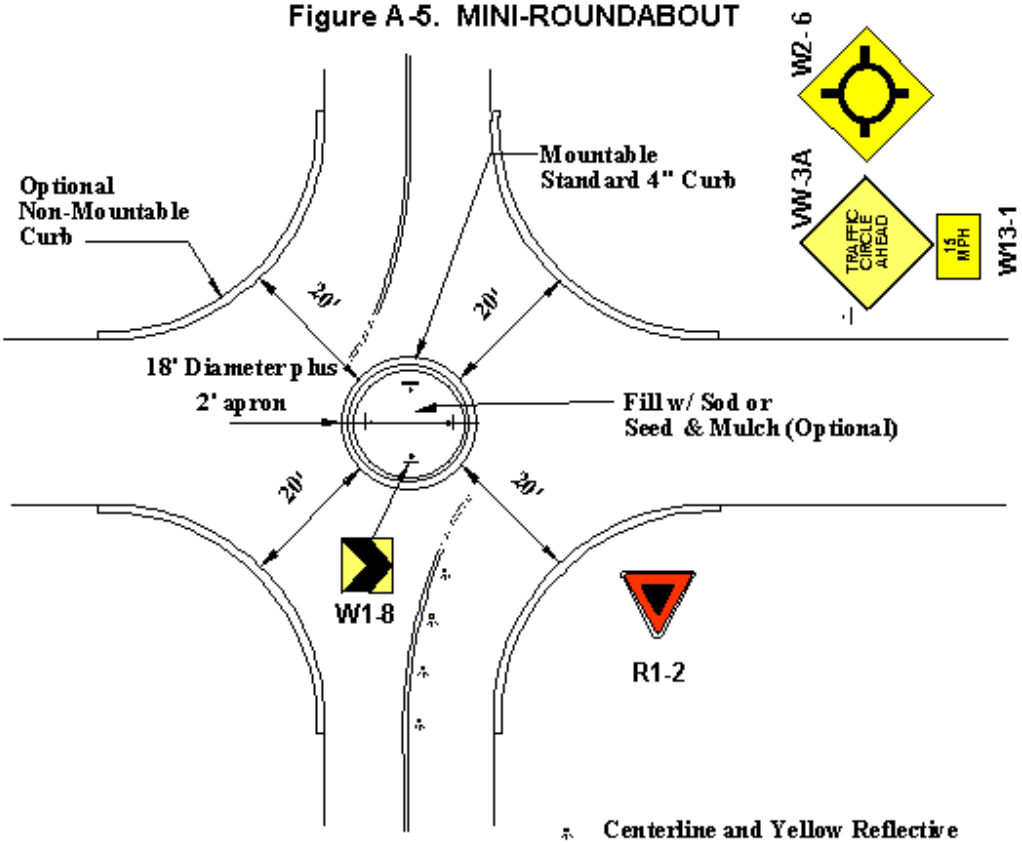
5) Raised Crosswalks should be located mid-block (edge of ramp at least 20' from intersection) and shall not be placed over manholes, watergates, junction chambers, etc.

6) Raised Crosswalk material and placement to be approved by Engineer.

7) Engineer to modify design to accommodate field conditions (ex. drainage and curb cuts) while conforming to VDOT's Road and Bridge Standards and Specification manuals, AASHTO publications and acceptable engineering practices.

TRAFFIC CALMING MEASURE

Figure A-5. MINI-ROUNDABOUT



NOTES:

1) Signs and Markings shall be in accordance with the MUTCD.

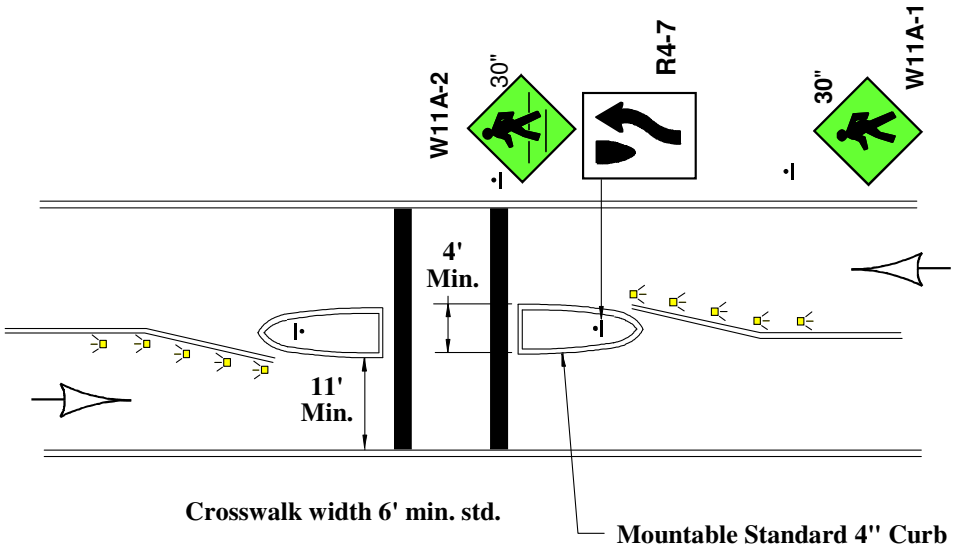
2) Advance signing at each location is optional when part of an area wide scheme.

3) Landscaping designs, if any, to be determined by the community and approved by the Engineer. Sight distance shall not be impacted by landscaping. Fixed objects shall not be placed in any portion of the measures that are within the clear zone.

4) Engineer to modify design to accommodate field conditions (ex. drainage) and available ROW while conforming to VDOT's Road and Bridge Standards and Specification manuals, AASHTO publications and acceptable engineering practices.

TRAFFIC CALMING MEASURE

Figure A-6. CROSSWALK REFUGE



Yellow Reflective Pavement Marker (Optional)

NOTES:

1) Signs and Markings shall be in accordance with the MUTCD.

2) Advance signing at each location is optional when part of an area wide scheme.

3) Landscaping designs, if any, to be determined by the community and approved by the Engineer. Sight distance shall not be impacted by landscaping. Fixed objects shall not be placed in any portion of the measures that are within the clear zone.

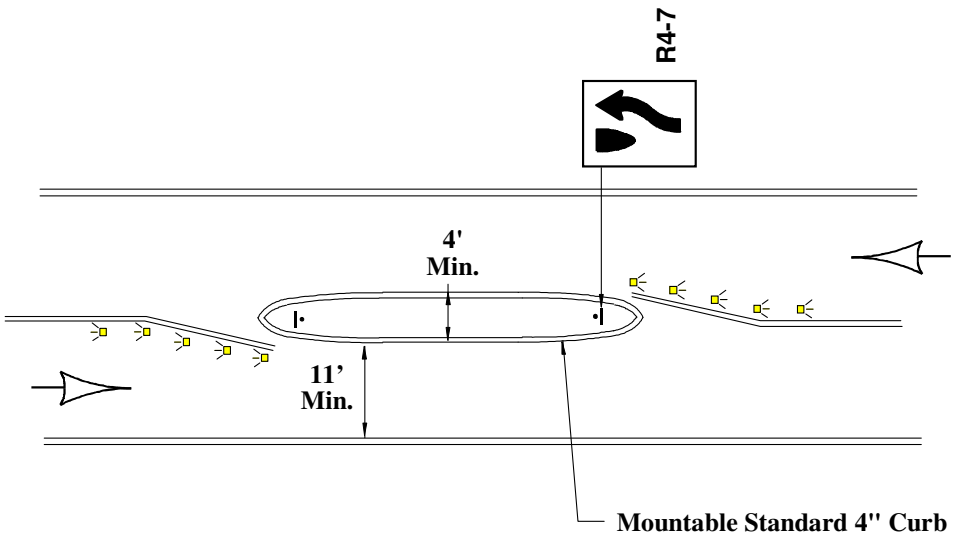
4) Design Options:
   a) Intersection or Mid-block.
   b) Combined with Raised Crosswalk.

5) The transition of the approach curb, and accompanying raised pavement markers shall be in conformance to the design speed.

6) Engineer to modify design and location to accommodate field conditions (ex. drainage) while conforming to VDOT's Road and Bridge Standards and Specification manuals, AASHTO publications and acceptable engineering practices.

TRAFFIC CALMING MEASURE

Figure A-7. RAISED MEDIAN ISLAND



Yellow Reflective Pavement Marker (Optional)

NOTES:

1) Signs and Markings shall be in accordance with the MUTCD.

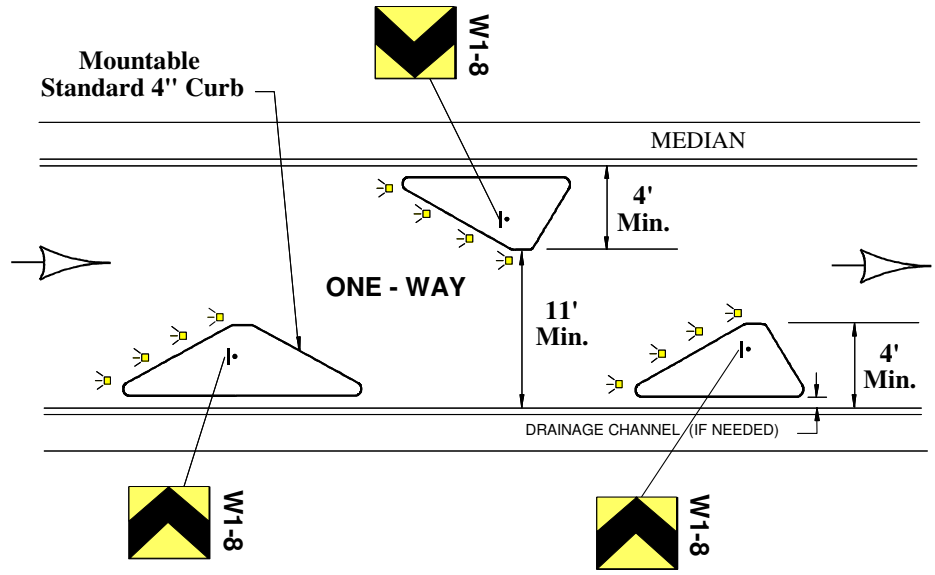
2) Landscaping designs, if any, to be determined by the community and approved by the Engineer. Sight distance shall not be impacted by landscaping. Fixed objects shall not be placed in any portion of the measures that are within the clear zone.

3) The transition of the approach curb, and accompanying raised pavement markers, shall be in conformance to the design speed.

4) Engineer to modify design and location to accommodate field conditions (ex. Island length and drainage) while conforming to VDOT's Road and Bridge Standards and Specification manuals, AASHTO publications and acceptable engineering practices.

TRAFFIC CALMING MEASURE

Figure A-8. CHICANE



Yellow Reflective Pavement Marker (Optional)

NOTES:

1) Signs and Markings shall be in accordance with the MUTCD.

2) Advance signing at each location is optional when part of an area wide scheme.

3) Landscaping designs, if any, to be determined by the community and approved by the Engineer. Sight distance shall not be impacted by landscaping. Fixed objects shall not be placed in any portion of the measures that are within the clear zone.

4) The transition of the approach curb, and accompanying raised pavement markers, shall be in conformance to the design speed.

5) Engineer to modify design and location to accommodate field conditions (ex.drainage) while conforming to VDOT's Road and Bridge Standards and Specification manuals, AASHTO publications and acceptable engineering practices.

CHAPTER V
ALL WAY STOP CONTROL CRITERIA FOR TRAFFIC CALMING

General Criteria

1. As described in Section VI. A. of the *Traffic Calming Guide for Local Residential Streets*, the County must request and VDOT must agree to the use of All Way Stop Control (AWSC) as a traffic calming measure as a county-specific modification.

2. The use of AWSC must result from the application of the residential traffic calming process outlined in Section II of the *Traffic Calming Guide for Local Residential Streets* and be included as a part of the traffic calming plan that is developed.

3. AWSC should be used in combination with other traffic calming measures in the traffic calming plan.

Site Specific Criteria

4. The volume criteria for eligibility of AWSC at an intersection are a minimum of 1,000 vehicles per day entering the intersection and a 3:1 or less ratio of the main street to minor street volume measured in vehicles per day. This ratio is equivalent to a minimum of 25 percent of the total volume entering from the minor street. These criteria serve to provide some sense of balanced flow between the intersecting streets and to avoid intersecting streets with extremely imbalanced volumes.

5. AWSC intersections should be at least 1,200 feet apart.

6. Geometrics such as sight distance and grade must be considered as a factor in determining if AWSC is appropriate.

7. The proposed use of AWSC must be approved by the District Traffic Engineer (DTE). The DTE or his designee should have been a part of the traffic calming plan development. The DTE and the Resident Engineer should cooperate and coordinate on this effort.