District Department of Transportation

DDOT TRAFFIC CALMING ASSESSMENT APPLICATION

DDOT Transportation Safety Team

Friday, April 13, 2012

TRAFFIC CALMING ASSESSMENT APPLICATION

Purpose of a Traffic Calming Assessment

A Traffic Calming Assessment is an evaluation conducted by DDOT staff that responds directly to targeted citizen concerns regarding vehicular speed, volume, and concerns that impact their neighborhoods. This review will assess all the various issues such as driver behavior, cut through and aggressive driving. The Traffic Calming Assessment is primarily aimed at developing short-term, high-impact measures to manage and/or tame traffic flow in areas where problems are observed. Traffic Calming Assessments are performed within clearly defined geographic areas such as blocks in sequence (e.g. 300 to 500 block on a specific street) or parallel blocks (e.g. 400 blocks on three adjacent streets). Desired outcomes of the Traffic Calming Assessment process may include a reduction in traffic speed, enhanced residential comfort, and improved general safety for all motorist, pedestrians and bicyclists.

A Traffic Calming Assessment is intended to evaluate a focused area with the complete traffic calming tool kit in mind. Traffic Calming Assessments consider a variety of methods to mitigate problems, including traffic control devices, roadway design measures, and traffic calming tools (like chicanes, curb extensions, and speed tables).

Therefore, the Assessment application is different than DDOT's *Speed Hump Installation Request Form* in that it considers a variety of measures, rather than one specific measure that residents have requested.

Traffic Calming Assessment Application Procedures

A citizen or stakeholder group may request a Traffic Calming Assessment by responding to the following application questions and submitting the form online, via email or through the mail. Please note that in order for an application to be complete, a signed petition must be included (electronic or hard copy). Once the petition is filled out, DDOT staff will require site visit with the petitioner and the ANC official to gather information pertaining to the requested traffic calming assessment. They will also discuss impacts to adjacent streets and look for ways to mitigate impacts. The attached petition must include signatures of at least 75 percent of the households on the street segment / blocks proposed for

assessment. Please note that this application is a formal request for an **evaluation**, not for specific traffic calming measures.

DDOT staff will perform a comprehensive evaluation to determine what traffic calming measures, if any, will be applied to the Assessment area. The comprehensive evaluation would be based on several factors, including but not limited to existing traffic counts, speed study, collision data, parking, location of schools, houses of worship (church), recreational centers, etc. and field observations. After the evaluation is completed, DDOT staff will submit a Notice of Intent for some of the recommendations to the ANC to allow a 30-day public comment period for the planned actions.

Traffic Calming measures recommended by a DDOT Assessment or other technical evaluation do not require a second round of residential petition or approval. However, DDOT will afford great weight to the official position of the ANC, should one be issued during the public comment period.

What Traffic Calming Measures are available for Residential Neighborhoods in the District?

Traffic calming can involve changes or additional traffic signage, reduction in speeds, installation of Driver Feedback Signs (DFS), street alignment, installation of barriers, and other physical measures, such as curb extension, chicanes, chokers, traffic circles, speed humps and raised crosswalks, to reduce traffic speeds and/or cut-through volumes and maximize pedestrian and bicycle safety.

Traffic calming utilized design strategies to achieve vehicle speed control and traffic volume control and increase visibility and safety of pedestrians and bicyclists. Speed control measures are intended to reduce the speed of the motorists while the volume control measures are intended to discourage cut-through traffic. The following physical traffic calming measures, defined below, may be installed in residential neighborhoods in the District of Columbia:

Speed Control Measures

The primary purpose of speed control measures is to reduce the speed of vehicles, especially in residential neighborhood and school zones, and discourage motorist speeding. There are mainly two types of traffic calming measures that control the speed of vehicles on the streets:

1. Vertical measures

   Vertical measures rely on forces of vertical rise acceleration to discourage speeding. Vertical speed control measures include:

   - Speed humps
   - Speed bumps
   - Speed tables
   - Raised crosswalks
   - Raised intersections
   - Rumble Strips
   - Gateways/Entry Treatments

2. Horizontal measures

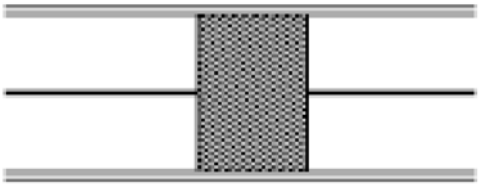
   Horizontal measures rely on forces of lateral shift acceleration to discourage speeding. Horizontal speed control measures include:

   - Bulb-outs/Curb extensions
   - Chicanes
   - Choker
   - Neighborhood traffic circle
   - On-street parking

Speed Humps

Speed humps are narrow, raised sections of pavement that are placed across the roadway to force motorists to slow down to a virtual stop. They are generally 10-14 feet long (in the direction of travel) and 3-4 inches high. The profile of a speed hump can be circular, parabolic, or sinusoidal. They are often tapered as they reach the curb on each end to allow unimpeded drainage.

Speed humps have a more gradual slope than traditional speed bumps, which are often found in parking lots. Speed humps are more effective at slowing traffic than speed bumps because the driver actually benefits from traveling at slower speeds. Speed bumps typically jar the motorist regardless of speed. The best speed hump designs employ a very gradual slope, such as a 3.66 m (12 ft) long speed hump with a 101 mm (4 in) vertical elevation change, to reduce jarring and potential vehicle damage. Speed humps are effective in reducing traffic speeds and are relatively inexpensive. Speed humps typically cost between $1500-$2000.



Speed Hump Eligibility Criteria

In order to install speed hump(s) on a particular street, that street must meet the following criteria:

1. The street must be classified as a "local" street.
2. The street grade must not exceed 8%.
3. The posted speed limit must be 30 MPH or less.
4. The street must NOT be a primary bus route or truck route
5. The street must NOT be a primary emergency vehicle route (such as a main approach to a hospital or fire house)
6. The Fire and Police Departments must be notified prior to installing Speed Humps (for comment and so that they may adjust their response routes if necessary).
7. The 85th percentile of measured vehicle speeds must substantially exceed the posted speed limit (guideline: by at least 25 percent).

Appropriate Locations

They are appropriate on local streets with volumes less than 3,500 ADT and posted speeds of 30 mph or less. They are mainly used at mid-block locations and typically placed 250-550 feet apart.

Signings and Markings

- Traffic signage should include speed hump warning sign (MUTCD W8-1, W17-1) with an optional advisory speed plaque (W13-1)
- Pavement marking designs in the MUTCD section 3B.27 may be used

Advantages

- Self-enforcing measures that effectively reduce vehicle speeds
- Increase traffic and pedestrian safety
- Relatively inexpensive compared to the other traffic calming measures

Disadvantages

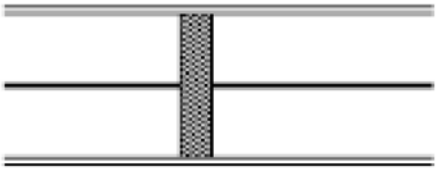
- Cannot be installed on streets with a grade exceeding 5%
- May generate noise at cushion when traversed by large trucks or buses
- May generate discomfort for short wheel-based vehicles

Important Note

Speed humps have previously been used as an "exclusive" traffic calming measure to address speeding and cut-through traffic issues in residential neighborhoods within District of Columbia. However, speed humps are primarily intended to reduce vehicle speeds and are not stand alone alternative for other traffic calming issues. Hence, DDOT staff would perform comprehensive evaluation to determine the most appropriate traffic calming measures to the Assessment area.

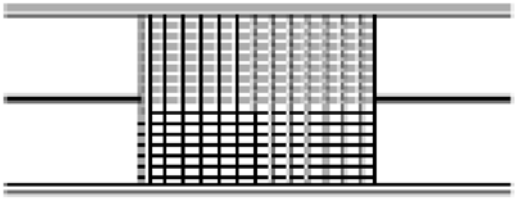
Speed Bumps

Speed Bumps are narrow mountable obstructions installed on the pavement surface, across the traveled lanes, and intended to cause vehicles to slow to almost stop. Speed bumps are usually less than 14 inches wide and 4 inches high and have same requirements and applications as of the speed humps. Speed bumps typically cost $1000.



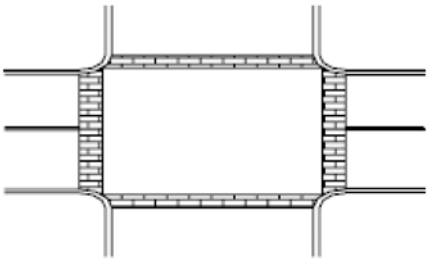
Speed Tables

Speed tables are long raised speed humps with flat section in the middle and ramps at the ends. They typically generate discomfort when vehicles exceed the speed limit. The flat section is often constructed with brick or other textured materials which improves their appearance to draw attention. Speed tables are typically long enough for the entire wheelbase of a passenger car to rest on the flat section. They have same applications, advantages and disadvantages as of speed humps and speed bumps. The cost of speed table varies greatly depending upon the width of the street and drainage considerations. Typical costs are between $2,000 - $4,000.



Raised Crosswalks

Raised crosswalks are Speed Tables outfitted with crosswalk markings and signage to channelize pedestrian crossings, providing pedestrians with a level street crossing. Also, by raising the level of the crossing, pedestrians are more visible to approaching motorists. They are typically placed perpendicular to the traffic flow. Raised crosswalks are good for locations where pedestrian crossings occur at haphazard locations and vehicle speeds are excessive. The typical cost for raised crosswalk is $20,000.



Appropriate Locations

- They are appropriate on local streets and minor collectors, with less than 10,000 ADT
- They are appropriate at both signalized and unsignalized intersections

Signings and Markings

- Traffic signage should include "Pedestrian Crossing Warning" (W11-2 or W11A-2) sign along with an optional warning sign location plaque
- Pavement marking designs in the MUTCD section 3B.17 may be used

Advantages

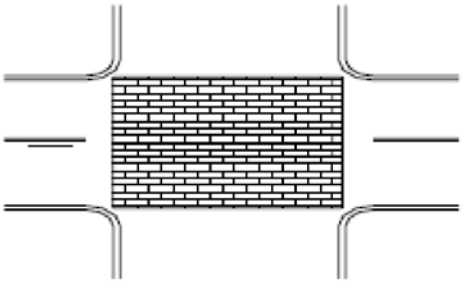
- Reduce vehicle speeds
- Increase pedestrian visibility
- Very effective in areas with significant pedestrian crossing activity and higher crashes involving pedestrians and fast moving vehicles

Disadvantages

- May not be installed on primary emergency access routes
- May cause vehicle acceleration and deceleration noises

Raised Intersection

Raised intersections are flat raised areas that cover the entire intersection with ramps on all the approaches. The flat areas usually comprise of bricks or other textured materials. They are raised to the level of the sidewalk, or slightly below to provide a "lip" that is detectable by the visually impaired. By modifying the level of the intersection, the raised crosswalks provide better view of pedestrians at the intersection and usually perceived as "pedestrian territory" by the motorists. Raised intersections are good for intersections with substantial pedestrian activity, and urban areas where other traffic calming measures would be unacceptable because of the limited on-street parking. The cost of raised intersections varies from $50,000 to $200,000 depending upon the drainage considerations.



Appropriate Locations

They are appropriate for all classification of streets and can be located either at mid-block or at intersections.

Signings and Markings

Traffic signage should include regulatory "Stop" (R1-1) sign and "Keep Right" (R4-7) sign.

Advantages

- Provide safe landing area for pedestrians and increase pedestrian visibility
- Provide pedestrian and bike accessibility at locations with narrow sidewalks
- Reduces vehicle speeds in the most critical areas and reduces vehicular conflicts

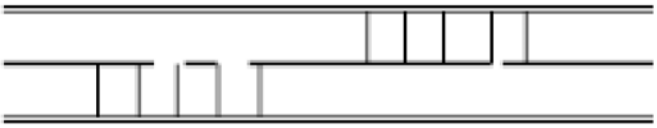
Disadvantages

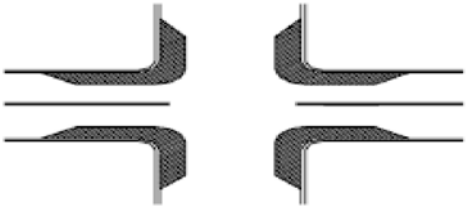
Relatively more expensive and maintain to build compared to other traffic calming measures

Rumble Strips

Rumble strips are strips of painted, ridged or grooved road surfaces that alert the inattentive motorists to potential danger by causing vibration and audible rumbling, transmitted through the wheels into the car body. A rumble strip is usually either applied in the direction of travel along an edge or centerline to alert the motorists when they drift from their travel lanes. Rumble strips can also be applied along the

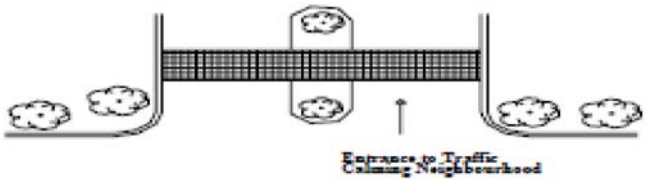
entire with of the traveled lane to warn drivers of a stop ahead, school zones, construction zones or railroad crossings. Highly reflective rumble strips provide bright night illumination to motorists even under wet conditions. Rumble strips are effective in reducing both vehicle speeds and traffic volumes. The cost of rumble strips is at least $6,000.





Gateways / Entry Treatments

Gateways include use of bricks, stamped concrete, or other colored materials to create alterations in the pavement surface to signal drivers they are entering a residential neighborhood or community that requires slower speeds. Gateways are used to emphasize either an entire intersection or a pedestrian crossing, and are sometimes used along the entire street blocks. Gateways are appropriate at locations with higher pedestrian traffic. The cost of speed table varies greatly depending upon the width of the street and drainage considerations. At a minimum, the cost to install gateways is at least $15,000.



Advantages

- Reduce vehicle speeds
- Increase pedestrian visibility and safety

Disadvantages

Relatively more expensive to build and maintain than other traffic calming measures

Bulb-out / Curb Extension

Bulb-out or curb extension measure extends the sidewalk and shortens the pedestrian crossing. It increases the pedestrian visibility at intersections where vehicles parked in a parking lane would otherwise block the visibility. Curb extensions typically cost from $5,000 to $25,000 per corner

depending on site and design conditions. Curb extensions should not be used where bus routes need to complete a turn. Also, where bus stops are nearside or farside of the intersection, attention needs to be paid to the design. The bulb out should be long enough to accommodate both the front and back doors of the bus opening onto the bulbout (~30 feet from the bus stop flag).

Advantages

- Reduce vehicle speeds, particularly fast turning traffic from major road to minor street
- Provide additional visibility and protection for pedestrians at pedestrian crossings
- Protect passengers embarking and disembarking public transportation system
- Reduce pedestrian crossing distance and interval

Disadvantages

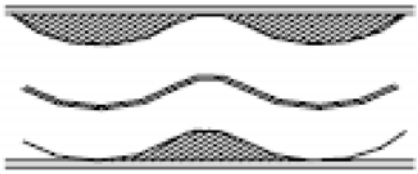
- Reduces on-street parking
- Requires other traffic calming measures to effectively reduce vehicle speeds

Chicanes

Chicanes are series of fixed objects, usually extensions of the curb, that alternate from one side of the street to the other, forming S-shaped curves. Chicanes discourage high speeds by forcing horizontal deflection. They are also called as deviations, serpentines, reversing curves, twists, and staggerings. There are many variations of traffic calming chicanes, but they generally fall into one of two broad categories:

- single-lane working chicanes, which consist of staggered build outs, narrowing the road so that traffic in one direction has to give way to opposing traffic
- two-way working chicanes, which use build outs to provide deflection, but with lanes separated by road markings or a central island.

Costs for landscaped chicanes are approximately $10000 (for a set of three chicanes) on an asphalt street and $15000 to $30000 on a concrete street. Chicanes should not be used on the bus routes.



Appropriate Locations

They are mostly appropriate on local streets that have ADT volume less than 3,500 vehicles.

Signings and Markings

Signage should include "Winding Road" (W1-5) sign with appropriate "Advisory Speed" (W13-1) sign.

Advantages

- Very effectively reduce vehicle speeds when used in series
- Reduces pedestrian crossing distance and improves pedestrian visibility
- Increases pedestrian and bicyclist safety by reducing vehicle speeds

Disadvantages

- Not very effective at locations with significantly unbalanced traffic volumes
- May not be appropriate in areas with high truck traffic
- Potential loss of on-street parking within the chicane

Choker

Chokers are curb extensions at midblock locations that narrow a street by extending the sidewalk or widening the planting strip. If marked as crosswalks, they are also known as safe crosses. Chokers at midblock are called as parallel chokers, angled or twisted chokers, pinch points or midblock crossings. Chokers at intersection are called as neckdowns, bulb-outs or corner bulges. Two-lane chokers leave the street cross section with two lanes that are narrower than the normal cross section. One-lane chokers narrow the width to allow travel in only one direction at a time, operating similarly to one-lane bridges. Installation costs of a pair of chokers can cost $4,000 and up depending on the size, placement, and roadway drainage

Appropriate Locations

They are most appropriate at mid-block locations with significant pedestrian activity, school children, senior citizens and transit routes.

Advantages

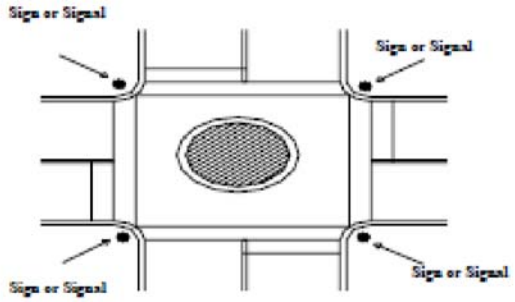
- Effectively reduce vehicle speeds, average decrease of 7% in 85th percentile speeds
- Prevent passing of faster moving vehicles from slower moving vehicles
- Easily negotiable by large vehicles, such as fire trucks
- Work well with speed humps, speed tables, raised intersections, textured crosswalks, curb radius reductions, and raised median islands

Disadvantages

- Reduces on-street parking
- Requires other traffic calming measures to effectively reduce vehicle speeds

Neighborhood Traffic Circle

Traffic circles are raised circular islands, usually less than 26 feet in diameter, used in the middle of intersections and intended to force vehicular traffic to slow and negotiate around it. They are very effective in traffic calming at intersections, especially within neighborhoods, where large vehicle traffic is not a major concern but speeds, volumes, and safety are problems. When used in residential areas, they can be landscaped for aesthetic or barrier purposes, and may have mountable curbs to facilitate movement of emergency vehicles. A full landscaped traffic circle typically costs from $6,000-$12,000.



Appropriate Locations

They are appropriate at intersections of local streets with relatively low pedestrians and left-turning traffic volumes. The ADT volumes on local streets should not exceed more than 3,500 vehicles.

Signings and Markings

- Traffic signage should include "Pedestrian Crosswalk" (W11-2) sign, "Pedestrian Crosswalk Location" (W16-7P) sign, "Circular Intersection" (W2-6) sign and "Yield" (R1-2) sign
- Pavement marking should consistent with those outlined in the Section 3B.24 of MUTCD

Advantages

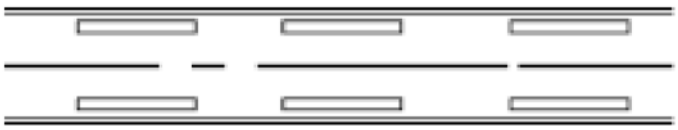
- Reduce 85th percentile speeds by 11% and the area of influence is few hundred feet upstream and downstream of the intersection
- Reduce intersection collisions by 70% and overall collisions by 28%

Disadvantages

- Not appropriate for intersections having significant bus and truck traffic
- Require significant right-of-way (ROW) as compared to other traffic calming measures

On-Street Parking

On-street parking creates a buffer between moving traffic and individuals walking on the sidewalks, increasing pedestrian safety and reducing the level of perceived noise. On-street parking also serves as effective traffic calming measure reducing the speed of vehicles traveling adjacent to the parked vehicles.



Appropriate Locations

They are only appropriate on local streets within residential neighborhoods.

Advantages

- Very effective in reducing vehicle speeds due to shared usage of right-of-way by all motorists
- Increase traffic safety and pedestrian safety within residential neighborhood

Disadvantages

- Expensive to retrofit existing streets with on-street parking
- May cause difficulties for emergency vehicles to access local streets
- Limited application in sub-urban areas

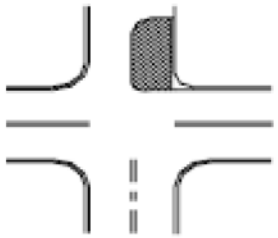
Volume Control Measures

The primary purpose of volume control measures is to divert traffic and discourage cut-through traffic. A detour through a residential neighborhood encourages motorists to utilize residential cut-through as their normal route of travel. The volume control measures that will divert traffic and reduce the cut-through traffic include:

- Half street closures/Semi-diverters
- Median barriers
- Forced turn islands

Half Closures/ Semi-diverters

Half street closures are barriers that block travel in one direction for a short distance on otherwise two-way streets. They are good for locations with extreme traffic volume problems and where other non-restrictive measures have been unsuccessful. They are also called as partial closures, entrance barriers, one-way closures and semi-diverters (when two half-closures are placed across from one another at an intersection, the result is a semi-diverter).



Appropriate Locations

- They are appropriate only on local streets with documented cut-through traffic issues
- They should be only used at local road intersections with collector or arterial streets, since they can accommodate the diverted traffic
- They may be used on streets with volumes up to 3,500 ADT
- Alternate exit or entry routes should be identified to maintain the flow of traffic

Signings and Markings

Signs, delineation, painted curbs should be included to enhance the visibility of half street closures. Traffic signage should include regulatory signs “Do Not Enter” (R5-1) and “Stop” (R1-1) signs.

Advantages

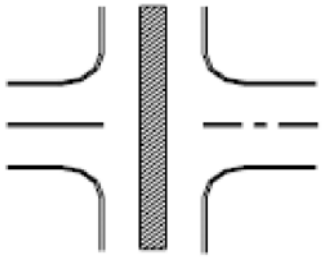
- Very effective in reducing traffic volumes; average decrease of 40% in traffic volumes
- Can fully accommodate pedestrians, bicyclists and people with disabilities

Disadvantages

- May create circuitous routes for local residents
- Cannot be installed on major emergency response routes and transit routes
- May limit access to the businesses on local streets
- Enforcement may be required to keep motorists from violating the directional closure

Median Barriers

Median barriers are raised islands located in the centerline of a street and continuing through an intersection. Median barriers are implemented to block cut-through movement of motor vehicle traffic at a cross street. Median barriers also block left turning motorists from all the intersection approaches, which can benefit pedestrians. They are also called median diverters or island diverters. Median barriers cost approximately $10,000-20,000.



Appropriate Locations

They are appropriate on arterials and collectors intersections with minor streets where through traffic in residential areas is a continual problem

Advantages

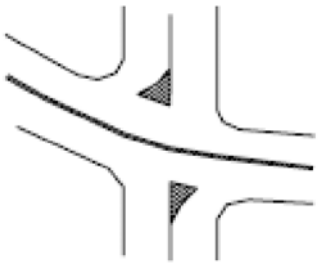
- Very effective in channelizing vehicular traffic and restricting prohibited turning movements
- Gaps can be incorporated in barriers to allow access to pedestrians and bicyclists
- Provide pedestrian refuge and increase visibility of pedestrian crossing points to motorists
- Decrease speeds of vehicles within the residential neighborhoods

Disadvantages

- May create inconvenience to local residents trying to access their driveways
- Cannot be installed on primary fire and emergency response routes
- Potential loss of curb-side parking
- Should be included as part of broader traffic calming that identifies measures at the adjacent local street intersections that would be impacted by the diverted traffic

Forced Turns

Forced turn islands are traffic islands or curbs specifically designed to prevent traffic from making certain movements at an intersection or to force the traffic into specific patterns. They are also referred to as "pork chops" or right-turn islands. Installing forced turns on bus routes needs considerations for design. Forced turns typically cost between $5,000 to $10,000.



Appropriate Locations

They are appropriate on arterials and collectors intersections with local streets where cut-through traffic is a primary concern within residential neighborhood

Signings and Markings

Traffic signage should include "Right Turn Only" (R3-5R) sign at the right-turn islands.

Advantages

- Increase traffic safety and circulation by eliminating through and left-turning traffic
- Increase pedestrian safety by eliminating critical left-turns and cut-through traffic
- Crosswalks can be integrated to accommodate wheelchairs
- Can include traversable curbs to allow access to the emergency vehicles
- Self-enforcing measures that effectively reduce both vehicle speeds and traffic volumes

Disadvantages

- Potential loss of street parking near the corners
- Should be included as part of broader traffic calming that utilizes other measures on an area-wide basis to reduce cut through traffic

Leading Pedestrian Interval (LPI)

Leading Pedestrian Interval (LPI) is a signal timing strategy that releases pedestrian traffic in advance of turning vehicles, protected or permissive, at the intersection. Generally, the pedestrian signal phasing provides WALK interval concurrently with the green interval of vehicular traffic on the adjacent street which can create conflicts between pedestrians and turning vehicles. Also, a significant percentage of pedestrian-vehicle collisions result from the left-turning and right-turning vehicles.

The LPI extends the all red clearance phase, typically by 3-5 seconds, during which the WALK indication is displayed for the direction which will receive the next green phase. This allows pedestrians to proceed into the crosswalk prior to any turning vehicles, making them more visible to drivers. DDOT has used LPI at selected locations, like 15th Street NW and U Street NW, in the District.

Appropriate Locations

LPI signal timing strategy is appropriate at intersections with high pedestrian volumes, high turning vehicle volumes, and no-turn-on-red control prohibition for turning vehicles. It is recommended at intersections that have higher conflicts between pedestrians and turning vehicles.

Advantages

- Inexpensive treatment because the signal controller can be retimed relatively easily
- LPI's can be complemented by geometric design changes that shorten crossing distances
- Very effective in reducing pedestrian-vehicle conflicts
- LPI's are most effective when combined with the no-turn-on-red restrictions

Disadvantages

- Only applicable at signalized intersection
- May increase delay for the vehicular traffic

Barnes Dance

Barnes Dance, also known as protected pedestrian signal phase and pedestrian scramble, is a signal timing strategy that provides an all-red phase for all directions of traffic at an intersection. Pedestrians are allowed to cross in any direction, including crossing diagonally, at the intersection during the all-red phase. Typically, the pedestrian signal heads on each corner of the intersection display WALK intervals in three directions, one for each standard crosswalks and one for the diagonal crosswalk.

The exclusive pedestrian phasing should be used in conjunction with the no-turn-on-red prohibitions. Accessible Pedestrian Signals (APS) should be used on all the corners of the intersection with the exclusive pedestrian phasing to alert the pedestrians with vision impairments that the pedestrian crossing phase has begun. The Manual on Uniform Traffic Control Devices (MUTCD) includes a special crosswalk marking pattern for the intersections with exclusive pedestrian phasing.

Appropriate Locations

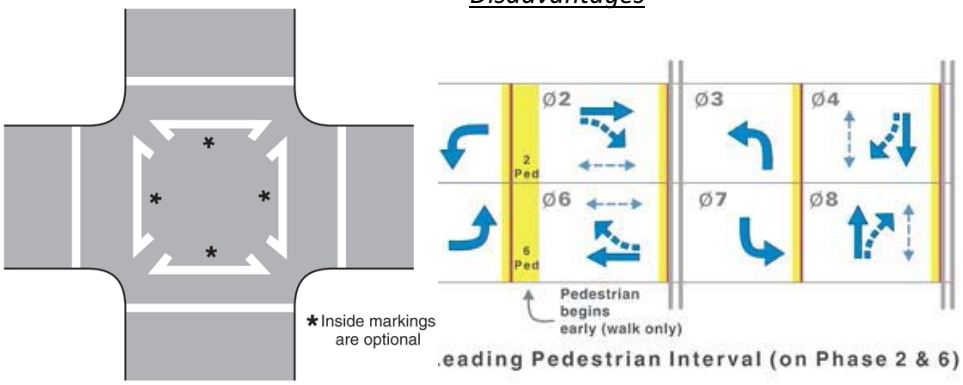
Barnes Dance or exclusive pedestrian phasing is appropriate only in locations with significantly high pedestrian activity and where key destinations create demand for pedestrians to cross diagonally.

Advantages

- Inexpensive treatment because the signal controller can be retimed relatively easily
- Very effective in reducing pedestrian-vehicle at intersection with significant turning traffic creating conflicts with pedestrians and where vehicular speeds are high

Disadvantages

- Only applicable at signalized intersection
- Reduces the capacity of the intersection and increases delays for the vehicular traffic

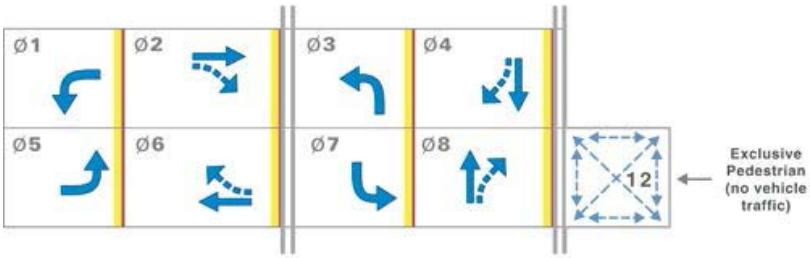


Crosswalk Markings for Barnes Dance

Enhanced Crosswalks

Crosswalks are parts of the roadway designated for the pedestrians to use in crossing the street. Crosswalks can be used at mid-block crossing or intersections. Legal crossings without painted lines or other markings are known as unmarked crosswalks and motorists are required by law to stop for pedestrians at these locations. Marked crosswalks are distinctly indicated for pedestrian crossing by lines or other pavement markings. Crosswalk markings delineate the pedestrian path of travel across the roadway and alert drivers to the crosswalk location.

Enhanced crosswalks are defined as the marked crosswalks combined with additional pedestrian treatments, such as signing, traffic calming or other measures, to alert motorists of a designated pedestrian crossing point across roadways at locations that are generally not controlled by traffic signals or STOP or YIELD signs. The 2009 DDOT Pedestrian Master Plan has established engineering treatments that can be applied to marked crosswalks on roadways with posted speed of 30 mph or less. **Table 1** from the 2009 DDOT Pedestrian Masters Plan describes guidelines for selecting the appropriate engineering treatments at a given roadway in the District.



c) Exclusive Pedestrian Phase (Barnes' Dance)

TABLE 1 - UNCONTROLLED CROSSWALK ENGINEERING TREATMENTS

Table 1 - Proposed DC Uncontrolled Crosswalk Engineering Treatments

For roadways posted 30mph or less

Roadway Configuration	1,500 - 9,000 vpd	9,000 - 12,000 vpd	12,000 - 15,000 vpd	> 15,000 vpd
2 Lanes[1]	A	A	A or B	B or C
2 Lanes with CTL[1]	A	A	B	B or C
2 Lanes One Way	B	B	C	C
4 Lanes w/Raised Median[2]	B	B	C	C
3 Lanes No Median[3]	B	B	C	C
5 Lanes w/Raised Median[3]	B	B	C	C
6 Lanes w/Raised Median[4]	B	B	C	D
4 Lanes No Median[4]	B	B or C	C	D
5 Lanes No Median[3]	B	B or C	D	D
6 Lanes No Median[4]	B	B or C	D	D

Volumes below 1,500	Parallel Crosswalk and/or W11-2 as sembly
Treatment A	High Visibility Crosswalk and Side of Street Ped Law Sign
Treatment B	In Street Stop For Peds Sign and/or Traffic Calming (See Traffic Calming Guide)
	Advance Stop Line Should be Used for all Multi Lane Crossings
Treatment C[5]	Activated Pedestrian Device (Rapid Flash Beacon, Flashing Beacon, In-Roadway Lights)
Treatment D	Signal (Pedestrian Hybrid, Full Signal) or Grade Separation

Notes:

1. This assumes a two-way road with 1 lane in each direction at the crossing location.

1. This assumes a two-way road with 1 lane in each direction at the crossing location.

3. The road may be one way or two-way with unbalanced lanes at the crossing location.

4. The road may be one way or two-way at the crossing location.

5. The volume, lane, and speed relationships for "C" treatments require additional evaulation to determine their effectiveness as these features are relatively new devices.

6. Lane configuration should be determined at peak hour vehicular volume conditions.

Parallel Crosswalk with Pedestrian Warning Sign

Parallel crosswalk markings are the standard striping treatment for low-volume signalized intersections and low-volume pedestrian uncontrolled crossing locations. The crosswalk lines should be white and a minimum of 6-inches wide. The advance warning sign for pedestrians would include pedestrian sign (W11-2, 2009 MUTCD) with a downward diagonal arrow plaque (W16-7, 2009 MUTCD) and an AHEAD plaque (W16-9, MUTCD).

High Visibility Crosswalk and Side of Street Pedestrian Law Sign

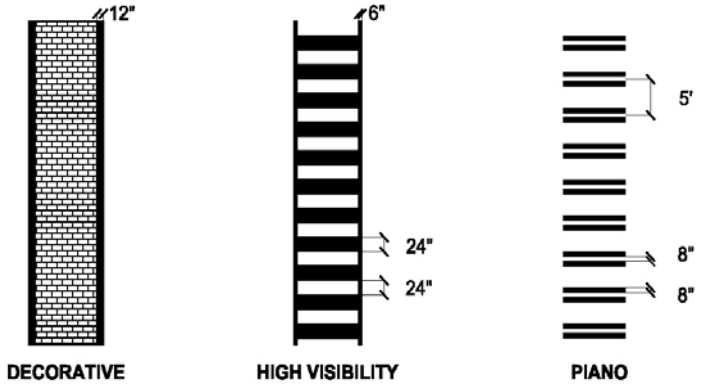
Parallel Crosswalk

W11-2 sign, W16-7 plaque and W16-9 plaque

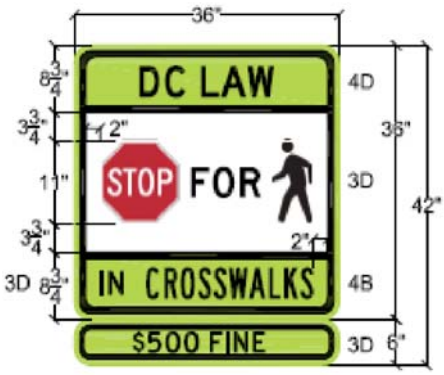
Per DDOT standards, the high visibility marking style consist of white longitudinal stripes 24 inches wide and spaced 24 inches apart bounded by 6 inch parallel white lines. High visibility marking are the standard marking at all uncontrolled crosswalks and all crosswalks (including signalized or stop-controlled crosswalks) leading to a block with a school, within a designated school zone area, along a designated school walking route, on blocks adjacent to a Metro station, or at locations with high pedestrian activity. Crosswalks can also be constructed of decorative materials to include 12 inch wide reflective white lines along the boundary of the crosswalk to maximize visibility. However, pedestrian policy recommendations in the 2009 DDOT Pedestrian Master Plan strongly recommend high visibility markings over the decorative markings because they are easier to observer by the motorists.

The side-of-street pedestrian crossing sign (R1-6a(1)) shall be utilized to alert motorists of the stop for pedestrians law controlling right-of-way at an uncontrolled pedestrian crosswalk. The sign shall be placed over the roadway at the location of the high visibility crosswalk. On multi-lane roadways the signs shall be posted on the left and right sides of the travel way. At locations with medians or pedestrian refuge islands, the signs shall be posted on the left and right sides of each vehicular traveled way.

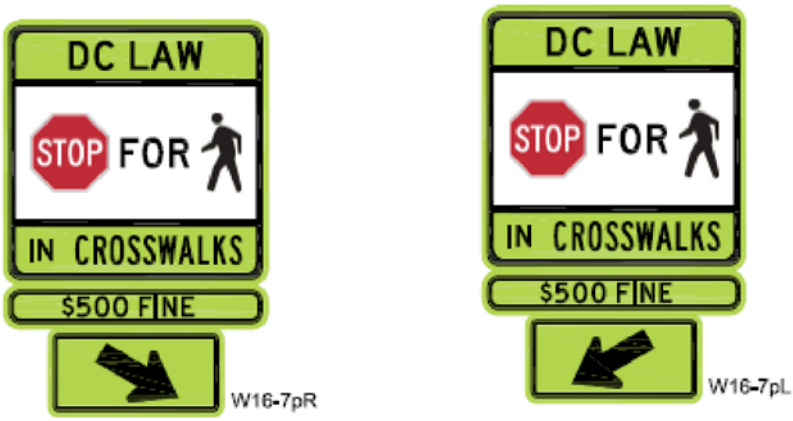
When used at the crossing, the side-of-street pedestrian crossing shall be supplemented with a diagonal downward pointing arrow (W16-7p, 2009 MUTCD) plaque showing the location of the crossing. In addition, a plaque displaying the motorist fine established by the DC law may be utilized below the regulatory R1-6(a)1 sign. The side-of-street sign shall not be used at a signalized intersection.



Markings for High Visibility and Decorative Crosswalks



Side of Street Pedestrian Crossing Sign R1-6a(1)



Side of Street Pedestrian Crossing Sign with Plaque for Diagonal Downward Arrow and Motorist Fine

Pedestrian Pylon and Traffic Calming

Pedestrian pylon, also known as in-street stop for pedestrian, (R1-6a, 2009 MUTCD) is a regulatory sign that reminds the motorists of laws for the pedestrian right-of-way at an unsignalized pedestrian crosswalk. The regulatory sign is generally placed on the roadway at the crosswalk location.

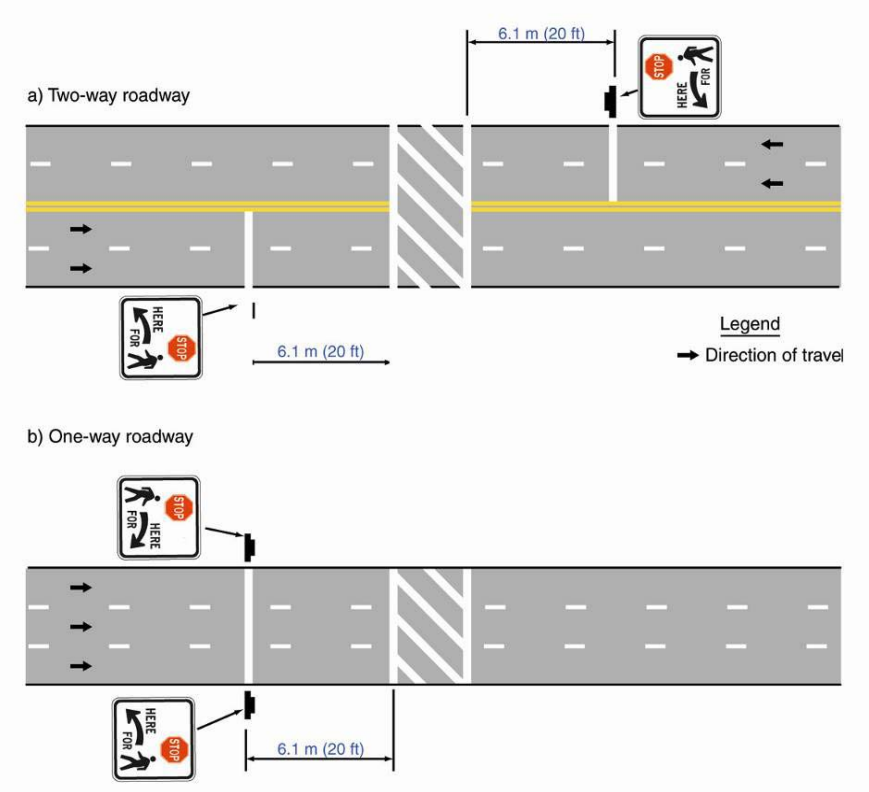
The pedestrian pylon combined with the appropriate traffic calming alternative can be very effective in reducing in slowing down the vehicles and provide safe access for pedestrians to cross. The sign can also be placed as pedestrian pylons at the locations of preferred traffic calming alternatives to enhance pedestrian safety.

Pedestrian Pylon R1-6a(1)

Advance Stop Lines

Crosswalks on multi-lane roadways create multiple-threat conflicts for pedestrians as they have cross to more than one lane in each direction. The motorists yielding to the pedestrians at crosswalks on the multi-lane roadways can screen the view of the pedestrians crossing in front of them. This puts pedestrians at risk from vehicles traveling in the adjacent lanes.

The advance stop line in conjunction to the "Stop Here for Pedestrians" sign (R1-5c, 2009 MUTCD) are placed in advance of the pedestrian crosswalk, particularly at mid-block and uncontrolled crossings, to alert the motorists to stop further back from the pedestrian crosswalk. The 2009 MUTCD recommends that advance stop lines used at uncontrolled multi-lane crossings be placed 20 to 50 feet in advance of the crosswalk. The advance stop lines promote enhanced visibility of pedestrians to the motorists and are very effective in reducing multiple-threat conflicts between pedestrians and vehicles on the multilane roadways.



Criteria for placing Advance Stop Lines

Stop Here for Pedestrian Sign

Flashing Beacons

A flashing beacon is a traffic control signal with one or more signal sections that operate in a flashing mode. Flashing beacons are generally used to supplement other traffic control devices where additional emphasis and warning for drivers is desired, e.g. flashing beacon application at pedestrian crossing that has limited visibility due to inadequate sight distance. The beacons are flashed at a rate of 60 periods per minute. It is typically includes a single light but can also be installed in other combinations, e.g. adding flashing amber signal to the top of a pedestrian warning sign to provide warning of a pedestrian crossing. The flashing beacons have also been used on the overhead signs at crosswalks and in school zones during specific hours of the day.

Flashing Beacon

Pedestrian detection, either active or passive, can be used to activate the flashing beacons. Pedestrians must press a pushbutton for flashing beacons with active pedestrian detection. Flashing beacons may also have passive infrared detection or include bollards with motion sensors.

Rectangular Rapid Flash Beacon (RRFB)

The Rectangular Rapid Flash Beacon (RRFB) is a device using LED technology (instead of the traditional incandescent bulbs) in combination with the crosswalk warning signs. The RRFB features two rectangular shaped high-intensity amber LED clusters that are activated with push buttons at the crosswalk and only flash when a pedestrian needs to cross. The beacons flash in a wig-wag "flickering" pattern at a rate of 70-80 periods per minute. The RRFB design differs from the flashing beacon by utilizing:

- A rapid flashing frequency
- Brighter light intensity
- Ability to aim the LED lighting

RRFB

Additionally, pauses can be incorporated at chosen intervals to create patterns and increase motorist recognition of accompanying information. The RRFB can be constructed using solar power to simplify installation. They are currently not included in the MUTCD but are similar in concept to in-roadway lighting, which is permitted in the MUTCD. RFBs have been used on crosswalk signs in a number of locations around the US including Boulder, Colorado and St. Petersburg, Florida. Many jurisdictions have tested the effectiveness of the device and the results indicate that this device increases motorist compliance to a much higher percentage than the standard flashing beacon.

RRFB combined with standard pedestrian crossing warning and markings are a lower cost alternative to traffic signals and hybrid signals for increasing driver yielding behavior at crosswalks. They are much more effective at increasing driver yielding rates to pedestrians and the traditional overhead beacons. The typical cost is approximately $10,000-$15,000 for purchase and installation of two RRFB units, one on either side of the street.

Lighted Pedestrian Crosswalks

Lighted pedestrian crosswalks consist of a series of lighting units enclosed in durable light fixtures and embedded in the pavement parallel with the marked crosswalks. The lighting units when activated by pedestrians, either by pushbutton or passive detection, start displaying flashing yellow lights towards the approaching motorists warning them to slow down or come to a stop. Lighted pedestrian crosswalks are referred as In-Roadway Warning Lights (IRWL) in the 2009 Manual on Uniform Traffic Control Devices (MUTCD).

Lighted pedestrian crosswalks are relatively newer traffic calming devices and are costly relative to the traditional warning devices. Hence, they should be only installed after detailed evaluation of pedestrian and traffic volumes at the location. The lighted crosswalk systems cost between $10,000 and $20,000 for a four-lane road, plus installation.

Appropriate Locations

The location being considered for an IRWL must have an identified pedestrian safety problems e.g. high pedestrian volume, pedestrian accidents, inadequate sight distance or excessive speeding. In addition, the location must have a marked crosswalk with applicable warning signs. They are appropriate at locations that have 100 pedestrians per day or at least 40 pedestrians during each of any 2 hours during a 24-hour period.

Advantages

- Self-enforcing measures that warn motorists of pedestrians
- Increase pedestrian visibility and safety

Disadvantages

- IRWL's can be only used at marked crosswalks
- Liability associated with giving the pedestrian a possible false sense of security in that a right-of-way and the motorist will stop may be assumed
- Expensive to install and maintain

Lighted Pedestrian Crosswalk

Pedestrian Hybrid Signal (HAWK)

As shown in Section 40.2.4 of the *Design and Engineering Manual*, a traffic signal may be warranted by the MUTCD (Warrant 4) based on pedestrian volumes. To provide a balance between pedestrian crossing needs and vehicular movement, some jurisdictions around the country have adopted the Pedestrian Hybrid Signal, otherwise known as the HAWK (**H**igh-intensity **A**ctivated Cross**W**al**K**) signal. The pedestrian hybrid beacon is a pedestrian-activated warning device located on the roadside or on mast arms over midblock pedestrian crossings.

This pedestrian activated signal is a combination of a flashing beacon and a traffic signal with pedestrian pushbuttons and pedestrian signal heads. The beacon head consists of two red lenses above a single yellow lens. The beacon head is "dark" until the pedestrian presses the pushbutton that activates the beacon. The signal controls traffic on the main road using a combination of red and yellow signal lenses, while the minor approach is controlled by pedestrian signals and a stop sign for vehicles.

The signal stops traffic when pedestrian activated, and is appropriate in locations where a full signal may cause unnecessary traffic delay by stopping traffic for the entire pedestrian phase. The HAWK signal is best suited for uncontrolled crossings of multi-lane, higher speed or volume roadways where there is a need to provide occasional pedestrian crossings without inordinate delay to motor vehicles. Installation of pedestrian hybrid signal in the City of Tuscan, Arizona, has shown increase in driver compliance from 30% under normal conditions to 93% over an eight-month study period. The typical cost for a pedestrian hybrid signal is approximately **$80,000**.

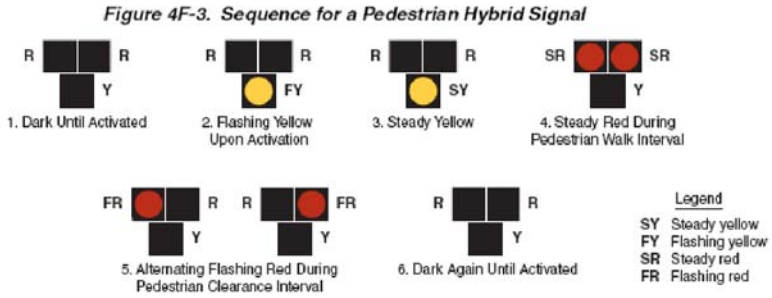
Operation

The HAWK signal remains dark for vehicles and a DON'T WALK signal is shown for pedestrians until it's activated. The signal proceeds in the following manner upon activation by a pedestrian:

- A flashing yellow light alerts the driver that conditions are changing and to use caution. (Pedestrians see a steady "DON'T WALK" signal)
- A steady yellow light alerts drivers that they should prepare to stop.
- A steady red light gives the clear signal to motorists to stop for pedestrians (pedestrians receive the "WALK" signal)

- After a set interval, a wigwag flashing red signal (i.e. top and bottom alternating red flash) is used to indicate to drivers to stop and only proceed after pedestrians have cleared the crosswalk (pedestrians receive the flashing "DON'T WALK" signal).

Pedestrian Hybrid Signal (HAWK)



Graphical depiction of operating sequence

Peak-Hour Restrictions

DDOT has implement peak-hour restrictions on several streets that restrict thru movement, left-turns and right-turns during the AM and PM peak periods. DDOT has also implemented parking restrictions on streets during both AM and PM peak periods. For e.g. reversible lane operations on Garfield Street, Connecticut Avenue and Nebraska Avenue between 7-8 AM during the AM peak period and 4-6 PM during the PM peak period.

Evaluation of Traffic Calming Measures

DDOT staff would perform comprehensive evaluation of speed data, traffic volumes, accidents, pedestrian volumes and other special considerations in determining the appropriate traffic calming measures, if any would be installed in the assessment. DDOT staff would also evaluate changes in traffic patterns on the adjacent street network as a result of installing the traffic calming measures in the assessment area before making the final recommendations.

Following the construction of project, DDOT staff would evaluate whether measures have been effective in calming traffic in the Assessment area. The DDOT staff would collect “after” data, normally within 6 months to one year after the project completion, using the same measurement parameters utilized in the evaluation procedure for identifying and analyzing the problems following the original request for traffic calming on the Assessment area. DDOT staff would monitor changes in traffic patterns and perform addition study deemed necessary to evaluate the effectiveness of the traffic calming measures.

The DDOT staff would analyze data and prepare an Evaluation Report for each project that compares the “before” and “after” data, determining if the traffic calming measures have accomplished the desired objectives. Proper corrective measures would be applied if analysis indicates deficiency in implementation of traffic calming measures. The Evaluation Report would be shared with the ANC and residents in the impact area. DDOT staff would coordinate with ANC and impacted residents to address any remaining issues, problems or concerns related to the traffic calming measures.

Note: The final approval of traffic calming measures is subjected to availability of sufficient funds for. Therefore DDOT does not make any specific guarantees of installing traffic calming measures regardless of the results of the comprehensive evaluation of the traffic calming assessment petition.

District Department of Transportation

Traffic Calming Assessment Petition
Applicant Questionnaire

Note: Please fill out if you are a resident of the affected neighborhood

Applicant Information (Required)

Name: _____

Address: _____

_____

_____

Telephone #: _____

Email Address: _____

Requestor Signature: _____

Traffic Issue	Very Significant	Significant	Not Significant
Speeding			
Traffic Volumes			
Cut-through Traffic			
Traffic Accidents			
Traffic Noise			
Pedestrian Safety			
Bike Safety			
Parking			
Other (please specify)			

Location of Requested Assessment - Please define geographic boundaries as clearly as possible (e.g. 400, 500, and 600 block of X Street, NE):

_____

_____

Conditions Necessitating Assessment – Please provide a detailed description of the problems observed in the Assessment Area:

_____

_____

Please identify the time of the day when the traffic problems appear to be the worst (such as AM peak, PM peak, afternoon, evening or night).

_____

_____

Please describe any of the following characteristics of your neighborhood: heavy use by pedestrians, bicyclists, or other more vulnerable users; substandard streets (lack of sidewalks, narrow streets, right curves, limited sight distance, etc) and pedestrian generating facilities (parks, elderly housing, shopping areas, etc).

_____

_____

Please describe if there are any schools, hospitals, places of worship, recreational centers, hotels, sports arenas or historical monuments in the vicinity of the location.

_____

_____

Please describe if the traffic problems mainly occur during holidays (such as Christmas, Thanksgiving, New Year, Jewish Holidays etc)

_____

_____

Please describe who you think is causing the traffic problems. For example is it local residents or the cut-through traffic? Is it cars or delivery trucks etc?

_____

_____

Please describe if the traffic problems create safety issues for pedestrians and bicyclists in your neighborhood. If yes, then please describe how the traffic problems affect safety of pedestrians and bicyclists in your neighborhood?

_____

_____

Are there any existing traffic calming measures within the Assessment area you have defined (e.g. speed bumps, rumble strips, median, curb extensions)?? If yes, then please describe if they effective in

_____

_____

If traffic calming is implemented, how would you feel about having traffic calming measures (median islands, speed humps, corner bulbouts, etc) being placed in front of your home?

_____

_____

Have you previously contacted District Department of Transportation for help in addressing your traffic problems? If yes, please indicate which departments have been contacted.

_____
_____

Is the area of concern an active construction zone? If so, do you know the project name or can you provide a description of the project?

_____
_____

Are there any traffic calming treatments that would not be acceptable to the petitioners?

_____
_____

Please provide us with any additional comments you feel would be helpful.

_____
_____

Does the area of concern include any Metro bus stops or affect other transit access?

_____
_____

District Department of Transportation

PETITION FOR TRAFFIC CALMING ASSESSMENT

4.1 Email Petition to **TRAFFIC.CALMING@DC.GOV** or mail to:

District Department Of Transportation
Attn: Customer Service Clearinghouse
55 M Street, SE (4th Floor)
Washington DC 20003
Telephone: 311

Block Representative: _____

Address: _____

Telephone: _____

Signature: _____

The undersigned residents in the _____hundred block(s) of _____ Street, petition the Department of Transportation to conduct a Traffic Calming Assessment in this street segment / area.

This petition must contain one (1) adult signature per household and be endorsed by ***75 percent or more*** of the households in each one hundred (100) block.

NAME	ADDRESS	SIGNATURE	PHONE

_____(attach additional sheets if necessary)