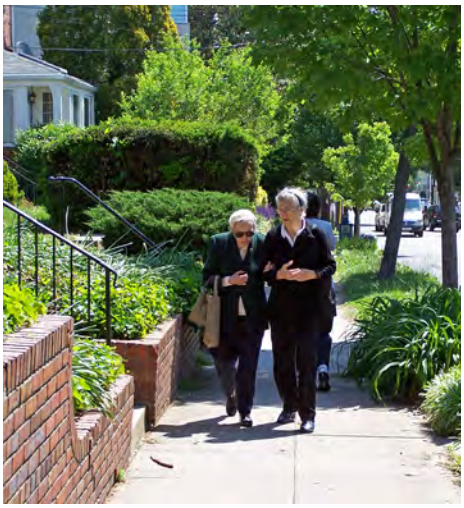
District of Columbia
Pedestrian Master Plan



District Department of Transportation

April 2009

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Acknowledgements

The District of Columbia Pedestrian Master Plan was prepared by the District of Columbia Department of Transportation (DDOT). Guidance and support for the development of this Plan was provided by a Technical Advisory Committee (TAC). The membership of the TAC is listed below.

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Chapter 1 ~ Introduction

Background

Walking has been a fundamental part of everyday travel in Washington, DC from the City's initial design by Pierre L'Enfant in 1791. L'Enfant's plan for the City was inherently walkable. He envisioned a series of grand avenues radiating from the core of the City, and a grid street netw6ork which would overlay these avenues and conform to the contours of the land.

Over 200 years later, L'Enfant's layout of the City remains largely intact, and provides both opportunities and challenges to modern pedestrian travel. Some parts of Washington, DC are known throughout the world for being great places to walk. The grid street network offers outstanding walking conditions along tree-lined neighborhood streets. Many of the commercial districts that lie along the grand avenues are vibrant and walkable. The District has invested a great deal of effort into improving walking conditions along many corridors and in various sectors of the City, particularly within the downtown core.

Pedestrians enjoying a stroll on a Saturday in Glover Park

Many of the grand avenues however, have become major arterial roadways that carry heavy volumes of motor vehicles in and out of the City, particularly during morning and evening rush hours. Crossing these grand avenues has become a particular challenge for pedestrians. An analysis of pedestrian crashes reveals a concentration of pedestrian injuries and deaths along these avenues. The grid street network connects to the radial avenues at angles, forming wide intersections with long pedestrian crossings and high-speed turning movements.

It is within this context that the District of Columbia has developed its first Pedestrian Master Plan. While countless efforts have been made to improve pedestrian conditions over the span of the District's history, this Plan represents the first comprehensive citywide effort to address pedestrian issues. Concerns about pedestrian safety have grown in recent years due to an increasing number of tragic pedestrian deaths and a rising number of hit-and-run pedestrian crashes. Citizens and elected officials have demonstrated strong support for better pedestrian conditions and programs that educate pedestrians and motorists regarding safer behavior. This Plan provides a foundation for future actions to address pedestrian needs throughout all parts of the City.

Vision and Goals

The vision of the Pedestrian Master Plan is stated below.

> *Washington, DC will be a city where any trip can be taken on foot safely and comfortably, and where roadways equally serve pedestrians, bicyclists, transit users and motorists.*

There are two primary goals for the Pedestrian Master Plan:

1) To reduce the number of pedestrians killed and injured in crashes with motor vehicles; and
2) To increase pedestrian activity by making walking a comfortable and accessible mode of travel throughout all parts of the District.

The recommendations included in the Pedestrian Master Plan are designed to achieve these two goals. Performance measures that are designed to measure progress towards these two goals can be found in Chapter 4 of this Plan.

Benefits of Walking

Walking is already a daily activity for many of the District's residents and visitors. For these and other people who can be encouraged to walk for transportation and recreation, getting around on two feet brings a host of benefits:

Increased Transportation Options

Many people in Washington, DC rely on alternative modes of travel. Because of age or economic circumstances, many of the District's residents - children, students, low-income households and older residents - do not have access to an automobile. Others choose to live without an automobile. Walking provides an affordable, often low-hassle transportation option for residents who cannot or choose not to drive. Providing adequate pedestrian facilities allows residents and visitors to walk safely and conveniently to nearby transit facilities and other destinations.

Transportation Facts for Washington, DC

- District population under age 16: 108,758 (19% of total population) *Source: Census 2000*
- District workers* (over 16) who do not own a motor vehicle: 68,121 (25% of all workers)
- 42% of District workers commute by motor vehicle
- 39% of District workers commute by public transportation
- 11.8% of District workers walk
- 2.0% of District workers bike to work
- 72% of District residents work in the District

Source: 2006 American Community Survey
**Employed District residents working inside and outside the District boundary*

Reduced Congestion

According to Texas Transportation Institute's *2007 Urban Mobility Report*, the Washington, DC area has the second worst traffic congestion in the nation[1]. While much of the traffic congestion is concentrated along major arterials into and out of the District, traffic also spills into neighborhoods as commuters seek alternative routes to avoid traffic tie-ups. Traffic has a direct effect on walking conditions, pedestrian safety and quality of life for local residents. Converting motor vehicle trips into walking trips (or walking/transit trips) can help alleviate congestion on the City's streets.

Fitness activities at Washington Harbor, Georgetown.
Photo Credit: Michael Ronkin

Improved Health

Walking for fitness or recreation has consistently been ranked as the number one outdoor recreational activity by U.S. adults for the past decade. Walking for 30 to 60 minutes at a moderate pace helps address problems that are created by sedentary lifestyles, including obesity and associated health problems such as heart disease, Type 2 diabetes, and high blood pressure. Walking an hour per day has also been shown to reduce the risk of breast cancer, colon cancer, and stroke – all of which pose serious health risks to District residents. Ensuring that adequate pedestrian facilities are provided in Washington, DC can help residents and visitors make walking part of their daily routine.

Quality of Life Benefits

People who live in neighborhoods where walking is comfortable and convenient are likely to be more familiar with their neighborhoods, and to have richer social connections to their community. Walkable neighborhoods and commercial

[1] The Washington, DC area is tied with the San Francisco-Oakland area for second place after Los Angeles, CA.

districts provide safe and efficient ways for residents to travel on foot, and have active street life. Walking can provide an enhanced quality of life for all District residents.

Reduced Pollution

Walking instead of driving helps improve air and water quality in the District. Emissions from motor vehicles are the greatest cause of pollution in the District of Columbia. Sixty percent of the pollution created by automobile emissions is emitted in the first few minutes of operation, before pollution control devices begin to work effectively. By walking instead of driving to a nearby store, park, or workplace, area residents can help reduce the amount of pollutants generated by automobiles. Decreased pollution also has obvious health benefits, as air pollution is an irritant that is known to trigger asthma attacks in children and adults.

Sidebar: National data show that 26.0% of all automobile trips are less than one mile in length.[2]

Development of the Plan

The planning process for this Master Plan focused not only an assessment of walking conditions, but also included a detailed analysis of policies and practices that affect walkability in the District. The planning process was overseen by an Advisory Committee and included opportunities for public involvement.

The recommendations in this Plan were based on an assessment of general walking conditions as well as detailed field work on high priority corridors throughout the District. A general assessment was conducted of the quality of the pedestrian network in the District by gathering data on roadway characteristics such as street width, number of lanes, destinations that attract pedestrian activity; presence of sidewalks and planting/buffer strips and police-reported pedestrian crash data. The findings of the *Existing Conditions Analysis* can be found in Chapter 2 of this plan.

Identification and Evaluation of Priority Pedestrian Corridors

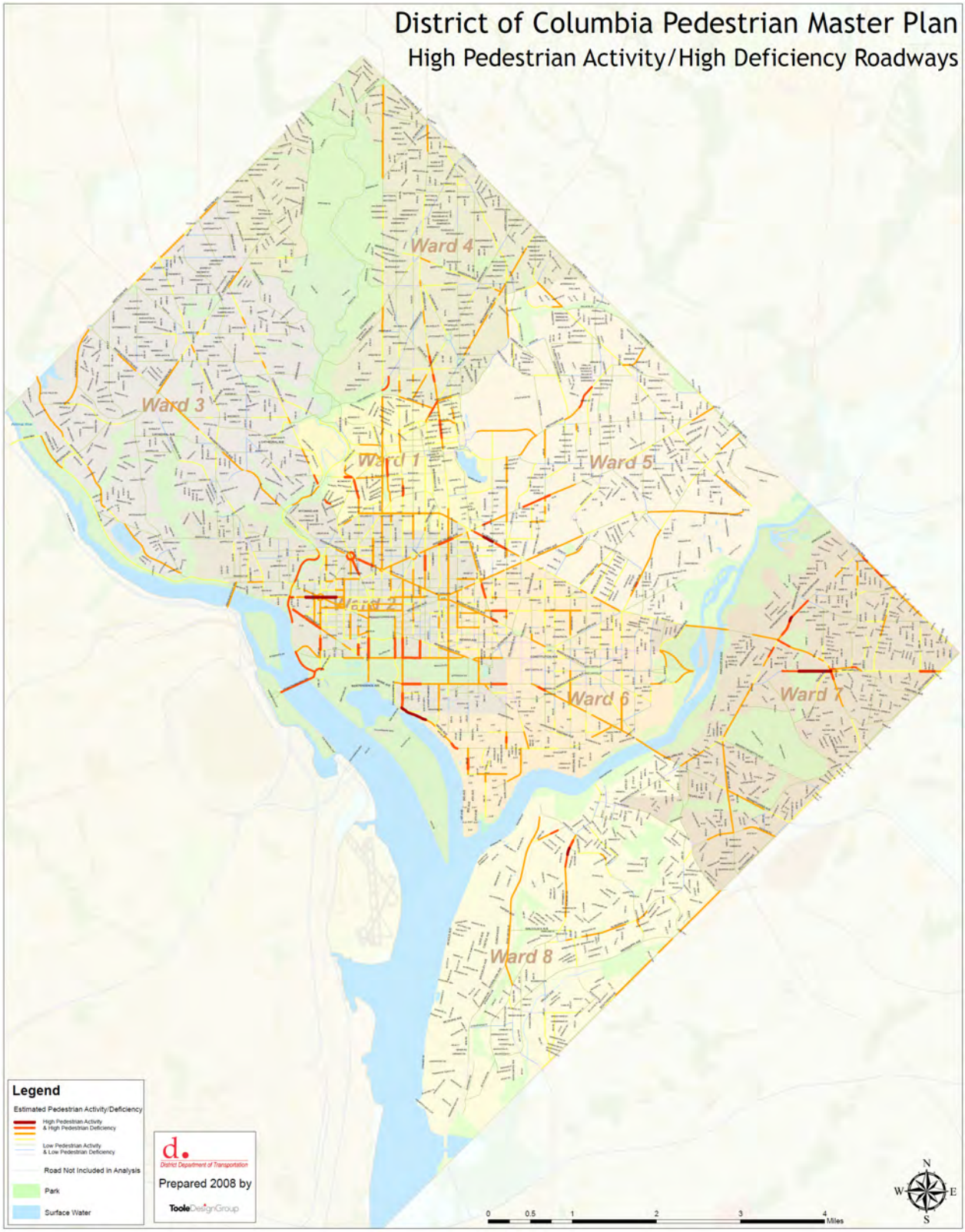
Every street in the District of Columbia should provide adequate facilities to allow for safe and comfortable pedestrian travel. Through the *Existing Conditions Analysis* the District's major arterials were generally found to have the poorest walking conditions (largely attributed to higher traffic volumes and speeds and wider streets) and higher numbers of pedestrian crashes. Because a principal goal of the Pedestrian Master Plan is to improve pedestrian safety, addressing conditions on the City's arterials is a priority.

Arterials with the greatest need for improvement were selected for more detailed evaluation, focusing on corridors with higher levels of pedestrian activity, yet poorer conditions for walking. A pedestrian demand model was used for this analysis based on a modified version of Portland, Oregon's Pedestrian Potential and Deficiency Indices (see Appendix A for a description of the methodology). The result of this analysis was a GIS map showing streets with high pedestrian activity and poor walking conditions (see page 7).

Comments from the public, and input from DDOT staff were then used to select one arterial in each of the District's 8 wards from the full list. The corridors selected (all classified as arterial roadways) are shown in the table on the following page (shaded in gray) and on the *Priority Pedestrian Corridors* map (on page 8). Corridors studied in other plans or programs that address pedestrian needs (shown in the table in the far right column), such as the Great Streets Initiative, were not selected for further evaluation to avoid duplicating efforts and resources.

Detailed recommendations have been developed to improve walking conditions on each of the eight priority corridors in the District of Columbia. A map book has been prepared for each corridor illustrating specific recommended improvements addressing facilities such as sidewalks, crossing distance, crosswalk markings, curb ramps and traffic signals (see the Priority Corridor Recommendations – separate report available soon on the DDOT website).

[2] Source: National Household Travel Survey, United States Department of Transportation, Bureau of Transportation Statistics, 2001. This data also shows that 87% of all pedestrian walking trips are less than 1-mile in length.


District of Columbia Pedestrian Master Plan
High Pedestrian Activity/High Deficiency Roadways
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Ward 4
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Ward 6
Ward 7
Ward 8
Legend
Estimated Pedestrian Activity/Deficiency
High Pedestrian Activity & High Pedestrian Deficiency
Low Pedestrian Activity & Low Pedestrian Deficiency
Road Not Included in Analysis
Park
Surface Water
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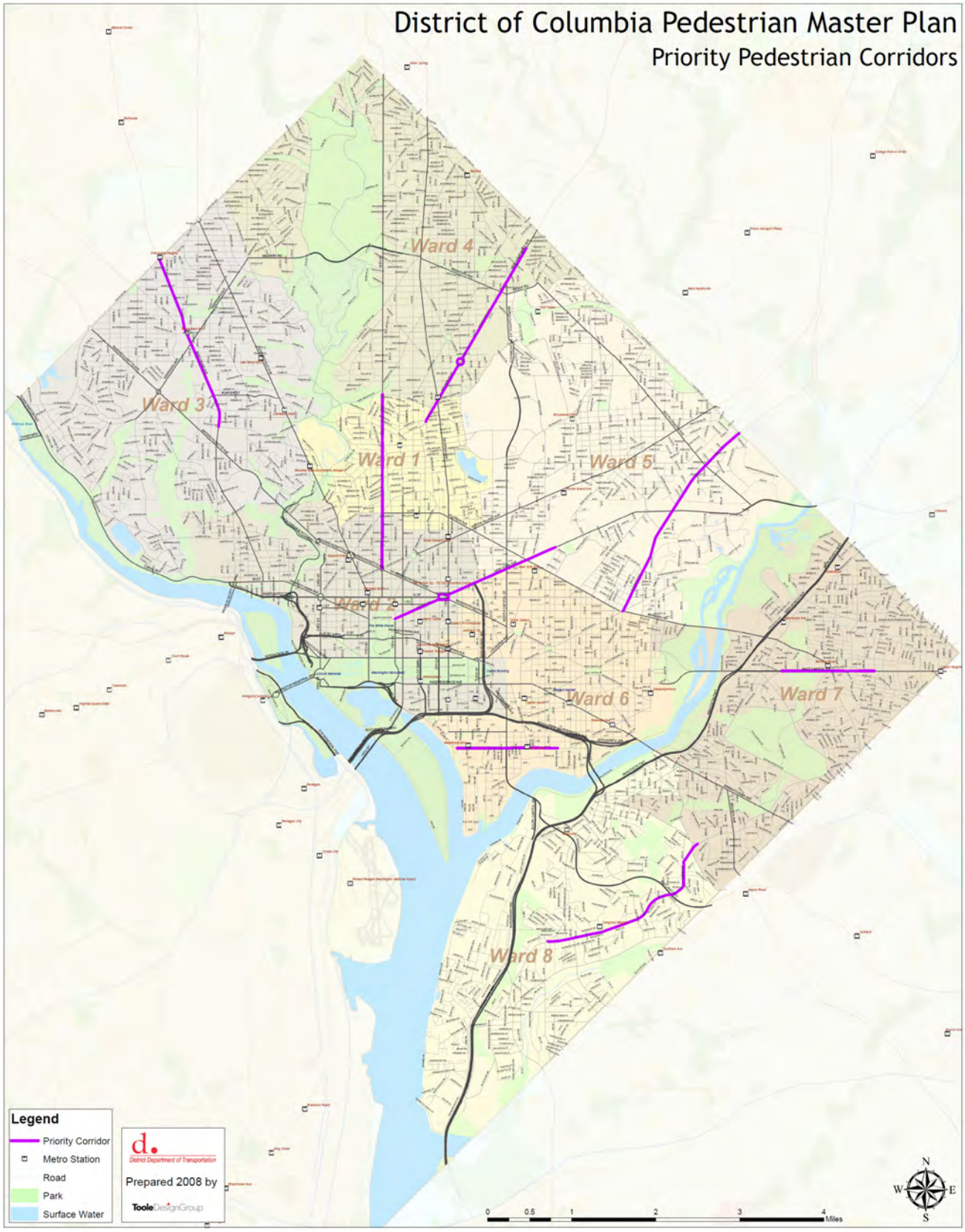
District of Columbia Pedestrian Master Plan
Priority Pedestrian Corridors
Ward 4
Ward 3
Ward 1
Ward 5
Ward 2
Ward 6
Ward 7
Ward 8
Legend
Priority Corridor
Metro Station
Road
Park
Surface Water
Prepared 2008 by
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0 0.5 1 2 3 4 Miles
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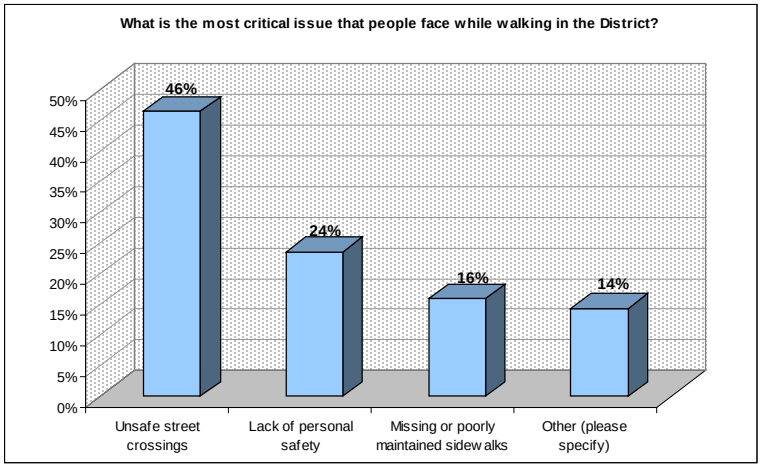
Priority corridors identified through the Pedestrian Master Plan process

Road Name	From	To	Plans/Studies
Ward 1			
16th St NW	**Spring Rd NW**	**Massachusetts Ave NW**	**District of Columbia Pedestrian Master Plan**
16th St NW	Spring Rd NW	W Street NW	Columbia Heights/Mount Pleasant Transp. Study
14th St NW	Buchanan St NW	Constitution NW	
14th St NW	Spring Rd NW	Florida Ave NW	Columbia Heights/Mount Pleasant Transp. Study
Georgia Ave NW	Eastern Ave NW	Pennsylvania Ave NW	Great Streets
U Street NW	18th St NW	6th NW	U Street/Shaw/Howard U. Transp/Parking Study
18th Street NW	Cathedral St/Harvard St NW	U Street NW	Adams Morgan/18th St Transp./Parking Study
Ward 2			
New York Ave NW to NE	**15th NW**	**Penn St. NE**	**District of Columbia Pedestrian Master Plan**
New York Ave NW	7th St NW	New Jersey Ave NW	Mount Vernon Triangle Transportation and Public Realm Design Project
Massachusetts Ave NW to NE	North Capitol NE	Dupont Circle NW	
14th St NW	Buchanan St NW	Constitution Ave NW	
16th St NW	Spring Rd NW	Massachusetts Ave NW	
Rhode Island Ave NW to NE	17th Street NE	16th St NW	
K Street NW	9th St NW	25th St NW	K Street Busway Study
Constitution Ave NW	23rd St NW	New Jersey Ave NW	
Independence Ave SW	15th St SW	South Capitol St SW	
Ward 3			
Wisconsin Ave NW	**Western Ave NW**	**Woodley Rd NW**	**District of Columbia Pedestrian Master Plan**
Wisconsin Ave NW	Fessenden St NW	Whitehaven Pkwy NW	Wisconsin Ave Corridor Transp Study
Western Ave NW	River Rd NW	Nevada NW	
Connecticut Ave NW	Western Ave NW	Calvert St NW	
Connecticut Ave NW	Albemarle St NW	Sedwick St NW	Connecticut Ave Transp Study
Macarthur Blvd NW	Western Ave NW	44th Street NW	
Ward 4			
New Hampshire Ave NW to NE	**Park Road NW**	**Peabody St NE**	**District of Columbia Pedestrian Master Plan**
Georgia Ave NW	Eastern Ave NE	Pennsylvania Ave NW	Great Streets
Kennedy St NW	Georgia Ave NW	North Capitol St NW	
North Capitol St NE	Blair Rd NE	Allison St NE	
Ward 5			
Bladensburg Rd NE	**Benning Rd NE**	**Eastern Ave NE**	**District of Columbia Pedestrian Master Plan**
South Dakota Ave NE	Riggs Rd NW	New York NE	South Dakota Transportation & Streetscape Study
Michigan Ave NE	North Capitol St NE	13th Place NE	Brookland Multi-Modal Transportation Study
Rhode Island Ave NE to NW	17th Street NE	16th St NW	
Ward 6			
M Street SW to SE	**6th St SW**	**Isaac Hull SE**	**District of Columbia Pedestrian Master Plan**
Pennsylvania Ave SE to NW	Independence Ave SE	K Street NW	
Pennsylvania Ave SE	2nd St SE	Southeast Fwy SE	Capitol Hill Transportation Study
H Street NE/Benning Road	North Capitol St NE	Southern Ave NE	Great Streets
Maine Ave SW	M Street SW	14th St SW	
Ward 7			
East Capitol St NE	**B St NE**	**Division Ave NE**	**District of Columbia Pedestrian Master Plan**
H Street NE/Benning Road	North Capitol St NE	Southern Ave NE	Great Streets
Minnesota Ave NE to SE	Nannie Helen Burroughs Ave NE	Good Hope Road SE	Great Streets; Kenilworth Ave
Ward 8			
Alabama Ave SE	**MLK Jr. Blvd SE**	**Naylor Road SE**	**District of Columbia Pedestrian Master Plan**
MLK Jr./S. Capitol Street SE	Good Hope Road SE	Alabama Ave SE	Great Streets
Minnesota Ave NE to SE	Nannie Helen Burroughs Ave NE	Good Hope Road SE	Great Streets; Kenilworth Ave
Southern Ave SE	Chesapeake Ave SE	Naylor Road SE	Southern Ave Streetscape and Safety Design (TSA)

Public Involvement and Stakeholder Input

Public involvement was an important part of the planning process for the District of Columbia Pedestrian Master Plan. Residents and visitors provided feedback on a wide variety of topics, ranging from driver behavior to locations needing crossing improvements. In all, over 5,000 individuals gave input into the development of the plan through the online survey, citywide public meeting, or face-to-face intercept surveys. Below is an overview of specific strategies used to gather input from a wide variety of people with an interest in pedestrian issues in the District. Detailed results of the public input process can be found in Appendix B.



Sample result from the Pedestrian Master Plan online survey

An online survey was developed in the fall of 2006 to gather a broad spectrum of views on walking in the District. Over 4,800 responses to the online survey were received. The following concerns were frequently cited by survey respondents:

- Unsafe street crossings or intersections
- Poor motorist behavior
- Personal safety while walking
- Construction zones that block sidewalks
- Poor sidewalk surface quality and maintenance
- Poor walking environment along major arterials

It is important to note that respondents to this survey were self-selected; therefore the results are not a statistical representation of all residents' views. An online survey was used to broaden the reach of public input that is typically heard in public meetings.

A citywide public meeting was held in the spring of 2007 at the Columbia Heights Recreational Center to introduce the DC Pedestrian Master Plan and solicit input from the public. Mayor Adrian Fenty and DDOT Director Emeka Moneme opened the meeting by emphasizing the District's commitment to improving pedestrian safety and access on city streets. Councilmember Graham also provided remarks in support of the Plan, and discussed the importance of enforcement to increase pedestrian safety.

The purpose and goals of the Pedestrian Master Plan were presented, as well as key tasks to be accomplished throughout the planning process. The methodology used to select priority corridors for detailed analysis was summarized. Maps illustrating reported pedestrian crashes and the existing sidewalk network were displayed for review. Participants were invited to provide feedback on general pedestrian issues in the District, as well as to identify specific locations needing improvement. Participant concerns were consistent with those that were identified via the online survey. A detailed listing of input received at the public meeting can be found in Appendix B.

One-on-one surveys with pedestrians were conducted on the eight selected priority pedestrian corridors to specifically reach out to people during their routine walking trips. This strategy created an opportunity for input from individuals who may not be compelled to answer an online survey or attend a public meeting.

Pedestrians were asked questions about the purpose of their walking trip, concerns they have about walking in the District, and specific locations that pose safety concerns. Over 600 interviews were conducted, approximately 75 in each ward. A summary of the most

Survey respondent on Alabama Avenue, SE

frequently cited responses regarding trip purpose and concerns about walking in the District are listed below. A summary of responses received specifically on each corridor can be found in Appendix B.

- The most commonly cited reasons for the respondent's walking trip include:
  - To access transit (metro station or bus stop)
  - To go to work
  - To go shopping/run errands

- The most common reasons cited for feeling unsafe or uncomfortably crossing specific roadways include:
  - Driver behavior (failing to yield to pedestrians, speeding)
  - Need for traffic lights to stop cars so pedestrians can cross
  - Not enough time to cross the street
  - No crosswalks
  - Crossing distance is too long
  - Concerns about personal safety
  - Missing or poorly maintained sidewalks
  - Traffic volume and congestion
  - Construction zones blocking sidewalk
  - Jaywalking

Technical Advisory Committee

A Technical Advisory Committee (TAC) was formed to guide the development of the Pedestrian Master Plan. The TAC consisted of representatives of various District departments and agencies, and regional stakeholders. In addition, several interest groups and pedestrian safety advocates were part of the committee such as the U.S. Access Board, Coalition for Smarter Growth, and Washington Area Bicyclist Association. The TAC met three times during the development of the Pedestrian Master Plan. Please see the acknowledgements at the beginning of this report for a list of the TAC participants.

Chapter 2 ~ Existing Walking Conditions

This chapter provides an overview of existing pedestrian facilities and safety concerns in the District.

Foundation for a Walkable City

The District of Columbia's street network, population and employment density, mix of land uses and extensive transit system provide a foundation for a walkable city. Twelve percent of District residents walk to work – which is nearly twice the national average. There is a relatively comprehensive network of sidewalks; crosswalks and curb ramps are provided at most intersections; and pedestrian signal heads are installed at the majority of signalized intersections. Many corridors have wide planted buffers with street trees which improve the pedestrian experience.

While the District has many essential elements that improve walkability, there are also numerous barriers to walking. Wide multi-lane arterials and skewed intersections make it difficult to cross streets. Some streets have missing or narrow sidewalks, or obstructions that limit accessibility. Motorist behaviors observed in the District, specifically failing to yield to pedestrians at legal crossings and exceeding posted speed limits, present signficant safety hazards to those on foot. The number of pedestrian collisions and fatalities in Washington, DC has generally increased over the past few years.

Adequate sidewalk space is critical for safe and efficient pedestrian accommodation.

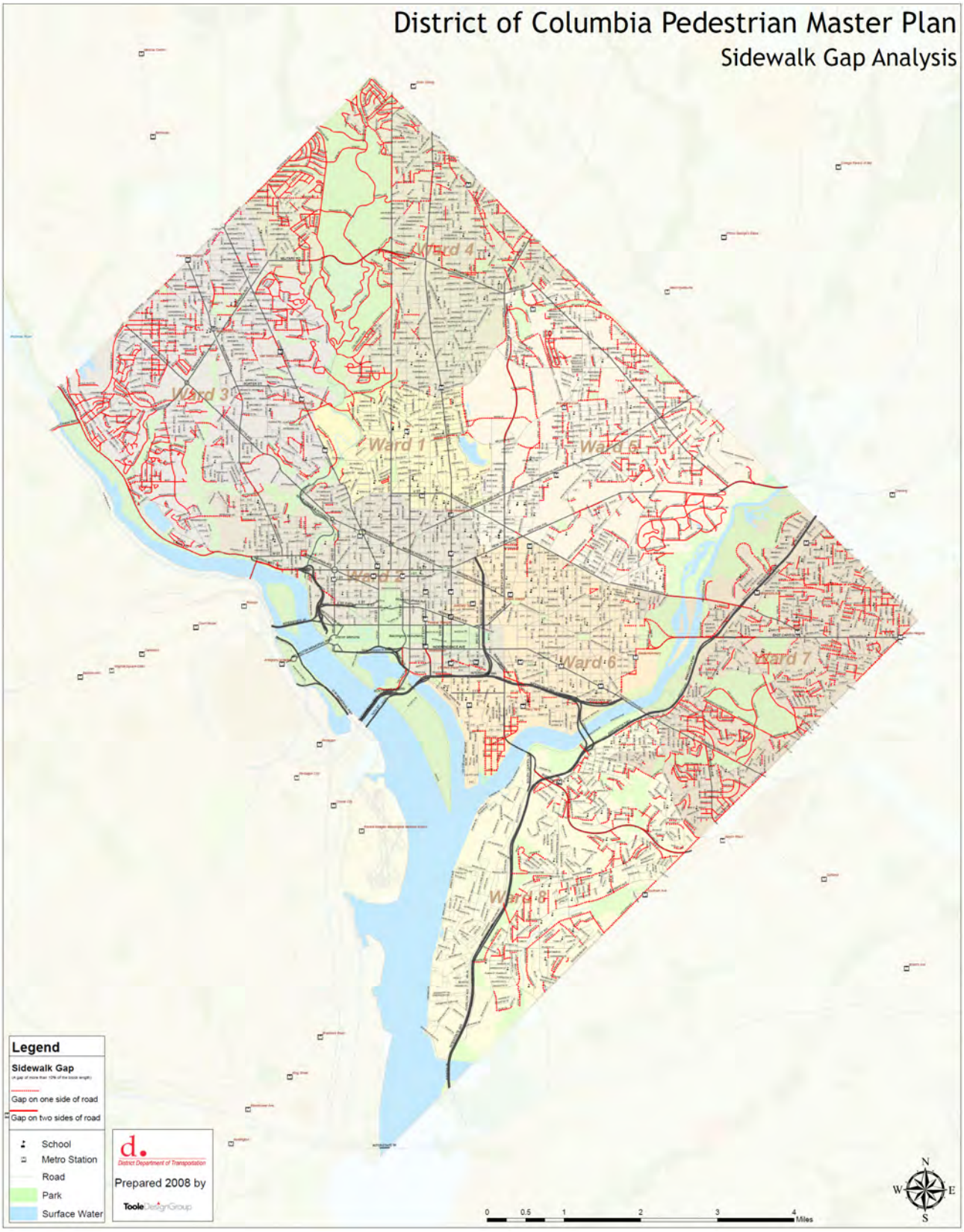
Sidewalk Network

Locations with sidewalk gaps (defined as a missing sidewalk that is more than 10% of the length of the block) are shown on the *Sidewalk Gap Analysis* map (see page 13). Approximately eighteen percent of the blocks in the District have a gap on one or both sides of the street.

Public input revealed a number of specific concerns regarding sidewalk maintenance and management in the District:

- Lack of adequate snow removal, including failure to clear snow from sidewalks, or piling snow into curb ramps limiting access to crosswalks and creating barriers for those using assistive devices.
- Cracks, uneven surfaces, and raised sections of sidewalk that pose major impediments and safety hazards to individuals with mobility and visual impairments.
- Newspaper boxes, statues and decorative fixtures can obstruct sidewalks or limit the clear path of travel resulting in congestion on sidewalks, and in some cases making sidewalks inaccessible for those using assistive devices such as wheelchairs.
- Sidewalks are often closed adjacent to properties under construction forcing pedestrians to walk long distances out of their way or to walk in the roadway.

Recommendations for improving the sidewalk network are found in Chapter 3 ~ Recommendations.


District of Columbia Pedestrian Master Plan
Sidewalk Gap Analysis
Ward 1
Ward 2
Ward 3
Ward 4
Ward 5
Ward 6
Ward 7
Ward 8
Legend
Sidewalk Gap
Gap on one side of road
Gap on two sides of road
School
Metro Station
Road
Park
Surface Water
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Street Crossings

Street crossings present one of the greatest safety hazards for pedestrian travel. Through the public participation process and field observations, a number of concerns were raised related to street crossings in the District:

High visibility crosswalk markings on 16th Street, NW.

- Angled streets create skewed intersections increasing crossing distance for pedestrians and allowing motorists to make higher speed turns
- Multi-lane arterials carry substantial traffic and create wide intersections and long crossings for pedestrians. Many residents perceive signals to prioritize motor vehicle movement and don't allow enough time for pedestrians to cross.
- Most crossing treatments at uncontrolled crossings on the District's arterials are limited to high visibility crosswalks. Motorists often fail to yield the right-of-way to pedestrians at these crossings.
- Motorist behaviors, including failing to stop for pedestrians in crosswalks, running red lights and exceeding posted speed limits significantly increase safety hazards for pedestrians. Turning motorists are often in conflict with pedestrians crossing major arterials.
- Pedestrians often fail to use legal crossings, cross against the light, or step into the roadway without checking for oncoming traffic. These behaviors put pedestrians at risk.
- Crossing treatments such as high visibility crosswalks, median refuge islands, and curb ramps that meet ADA requirements are lacking in many locations.
- Additional safety measures are needed around schools (such as crossing guards, signs and traffic calming).

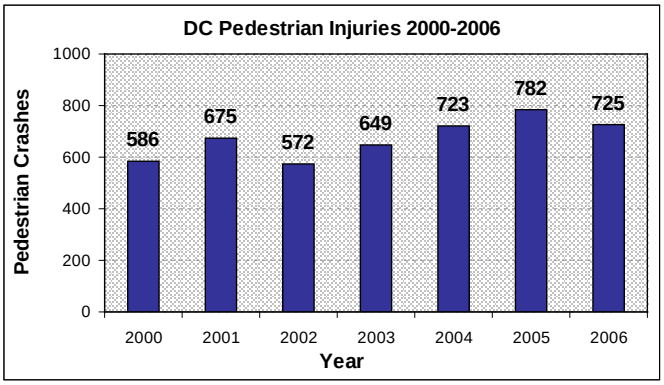
Accessibility for People with Disabilities

Accessibility is also a critical issue in the District. The City is committed to providing universal access within the public right-of-way for people with disabilities. This is a challenge in the District where many sidewalks and crossings were built well before the Americans with Disabilities Act Accessibility Guidelines (ADAAG) were introduced. While there are mechanisms in place to ensure new construction meets the latest accessibility guidelines for the public right-of-way, there are many locations throughout the City that are not accessible due to narrow sidewalk widths (i.e. pinch points at obstructions), lack of curb ramps, and inaccessible pedestrian signals, among other deficiencies.

DDOT is in the process of developing an ADA transition plan which will guide improvements throughout the city to ensure accessibility within the public right-of-way.

Pedestrian Injury Data

The District of Columbia has seen an increasing trend in pedestrian-related crashes in recent years. On average, more than 670 pedestrian injuries occurred annually between 2000 and 2006 in the District of Columbia (see chart).



Pedestrian fatality rates in the District of Columbia have also increased; in 2002 pedestrians accounted for 8% of fatalities; by 2004 pedestrian fatalities accounted for 22% of all traffic fatalities in the City.[3]

The District of Columbia has a higher rate of pedestrian traffic fatalities (adjusted by population) than many cities nationwide including Chicago, IL, New York, NY and Los Angeles, CA (see chart).

Pedestrian Safety Comparison Cities 2003 - 2005[4]

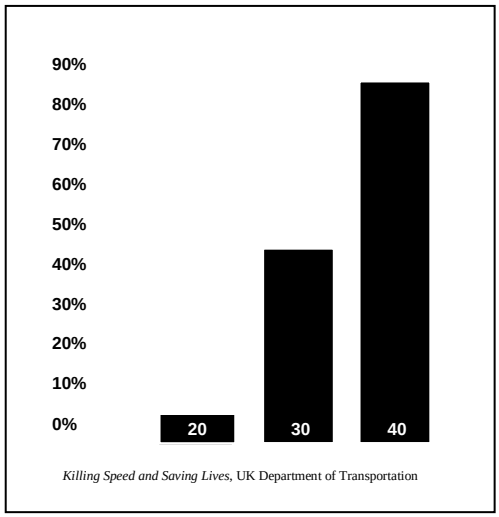
City	Pedestrian Fatalities	Pedestrian Fatality Rate per 100,000 persons
Boston, MA	9	1.7
Seattle, WA	10	1.8
New York, NY	155	1.9
Portland, OR	11	2.0
Chicago, IL	63	2.2
Los Angeles, CA	93	2.4
Washington, DC	**15**	**2.7**

Pedestrian injury rates were also reviewed to identify the geographic distribution of pedestrian crashes throughout the District. Police-reported pedestrian crashes resulting in injury from the District of Columbia Traffic Accident Reporting and Analysis System (TARAS) were mapped for the years 2000 to 2005. Pedestrian fatalities occurring between 2000 and 2006 were also included. The *Pedestrian Injury Data* map (see page 16) shows the location and frequency of crashes and reveals the frequency of crashes on the District's major arterials.

Many recommendations in the Pedestrian Master Plan address the need to reduce pedestrian injuries in the District. New policies and design guidelines recommended in this Plan will improve the design of the street system to emphasize walkability and pedestrian safety. Education and enforcement recommendations in Chapter 3 focus on increasing motorist and pedestrian compliance to the rules of the road.

Motor Vehicle Speeds

Higher motor vehicle speeds create a less comfortable environment for pedestrians, increase required stopping distance, and increase the frequency and severity of pedestrian crashes. A pedestrian hit by a motorist traveling 40 mph has a slim chance of survival compared to a pedestrian who is hit by a car that is traveling only 20 mph (see chart).



A pedestrian's chance of death if hit by a motor vehicles traveling at different speeds

The District Department of Transportation conducted a speed study in 2005 and 2006 on arterials and collectors throughout the City. The 85th percentile speeds[5] on many of the City's principal and minor arterials were found to be well over the posted speed limit. Findings of the speed study for the priority corridors identified through this plan can be seen in the table below.

[3] Data from DC Metropolitan Police Department. http://mpdc.dc.gov/mpdc/cwp/view,a,1240,q,557665,mpdcNav_GID,1552,mpdcNav,%7C.asp

[4] NHTSA, National Center for Statistics and Analysis. Traffic Safety Facts Annual Report. http://www-nrd.nhtsa.dot.gov/departments/nrd-30/ncsa/AvailInf.html

[5] 85th-Percentile Speed—The speed at or below which 85 percent of the motor vehicles travel. 2003 MUTCD Definition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Pedestrian Injury Data 2000 - 2006
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Ward 5
Ward 2
Ward 6
Ward 7
Ward 8
Legend
Pedestrian Injury Count
1
2 - 4
5 - 8
9 - 13
14 - 20
Pedestrian Fatality
Road
Park
Surface Water
District Department of Transportation
Prepared 2008 by
Toole Design Group
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LOCATION	BEGIN	END	POSTED SPEED	85TH PERCENTILE	CLASSIFICATION	MPH > POSTED SPEED
ALABAMA AVE	9TH ST	WHEELER RD	25 MPH	32 MPH	Minor Arterial	7 MPH
ALABAMA AVE	30TH ST	31ST ST	25 MPH	35 MPH	Minor Arteril	10 MPH
BLADENSBURG RD	CENTRAL AVE	EARL ST	30 MPH	36 MPH	Minor Arterial	6 MPH
BLADENSBURG RD	EASTERN AVE	35TH ST	30 MPH	32 MPH	Minor Arterial	2 MPH
BLADENSBURG RD	CENTRAL AVE	YOST PL	30 MPH	39 MPH	Minor Arterial	9 MPH
BLADENSBURG RD	V ST	24TH ST	30 MPH	35 MPH	Minor Arterial	5 MPH
BLADENSBURG RD	R ST	17TH ST	25 MPH	42 MPH	Minor Arterial	17 MPH
BLADENSBURG RD	L ST	K ST	25 MPH	36 MPH	Minor Arterial	11 MPH
EAST CAPITOL ST	CENTRAL AVE	DIVISION LINE	35 MPH	42 MPH	Principal Arterial	7 MPH
EAST CAPITOL ST	41ST ST	BENNING RD	35 MPH	51 MPH	Principal Arterial	16 MPH
EAST CAPITOL ST	RAMP	KENILWORTH AVE	40 MPH	52 MPH	Principal Arterial	12 MPH
M ST	11TH ST	10TH ST	25 MPH	32 MPH	Minor Arterial	7 MPH
NEW HAMPSHIRE AVE	ILLINOIS AVE	TAYLOR ST	30 MPH	33 MPH	Principal Arterial	3 MPH
NEW HAMPSHIRE AVE	EMERSON ST	DECATUR ST	30 MPH	35 MPH	Minor Arterial	5 MPH
NEW HAMPSHIRE AVE	BLAIR RD	MADISON ST	25 MPH	32 MPH	Principal Arterial	7 MPH
NEW HAMPSHIRE AVE	PEABODY ST	ONEIDA ST	25 MPH	39 MPH	Principal Arterial	14 MPH
NEW HAMPSHIRE AVE	PADBODY ST	QUACKENBOS ST	30 MPH	35 MPH	Principal Arterial	5 MPH
NEW YORK AVE	9TH ST	10TH ST	25 MPH	27 MPH	Minor Arterial	2 MPH
NEW YORK AVE	FLORIDA AVE	1ST ST	30 MPH	32 MPH	Principal Arterial	2 MPH
NEW YORK AVE	FAIRVIEW RD	KENDALL ST	35 MPH	46 MPH	Principal Arterial	11 MPH
WISCONSIN AVE	GARRISON ST	FESSENDEN ST	30 MPH	33 MPH	Principal Arterial	3 MPH
WISCONSIN AVE	EDMUNDS ST	DAVIS ST	25 MPH	34 MPH	Principal Arterial	9 MPH
16TH ST	MERIDIAN ST	OAK ST	25 MPH	42 MPH	Principal Arterial	17 MPH
16TH ST	HARVARD ST	FULLER ST	25 MPH	38 MPH	Principal Arterial	13 MPH
16TH ST	P ST	O ST	25 MPH	35 MPH	Principal Arterial	10 MPH

DDOT 2005 - 2006 Speed Study

Specific facility recommendations for the priority corridors in the Priority Corridor Recommendations (separate report available on the DDOT website) include treatments to reduce motorist speeds with engineering treatments such as raised crossings, reduced turning radii, realigned intersections, and improved median islands. Enforcement programs such as expanding the District's photo enforcement program and increasing penalties for speeding infractions are described in Chapter 3.

Pedestrian Safety Innovations

The District Department of Transportation is committed to improving walking conditions and pedestrian safety. The following list provides a number of recent facility improvements and innovations for the benefit of pedestrian travel in the District.

- Updated over 95% of the District's 1550 intersections with countdown pedestrian signals (the most new pedestrian signals of any major city in the US).
- Made signal changes in June 2007 to intersections with high pedestrian crash rates, such as the intersection of 7th and Pennsylvania Avenue, NW.
- Adjusted pedestrian signals along Pennsylvania Avenue, NW (5th St. to 13th St. NW) in July of 2007 to provide sufficient time to allow pedestrians to cross the roadway in one walk signal.
- Completed the District of Columbia's *Strategic Highway Safety Plan* in February of 2007 which includes pedestrian safety as a significant emphasis area.

Rapid Flash Crosswalk Beacon on Brentwood Road, NE

- Completed construction in 2008 of DC's first in-street lighted crosswalk on Howard Road in Anacostia.

While the District has many of the elements needed for a walkable city, there are opportunities to improve conditions for pedestrians. Recommendations in the following chapter to amend the District's policies will create standards for facilities that will improve pedestrian safety and comfort. With these benefits in mind, the Pedestrian Master Plan sets forth a series of actions which will improve the walking conditions in the District of Columbia. Implementation of this plan will result in an improved walking environment which will encourage an increase in walking by residents and visitors, improve their safety, and enable additional residents to choose walking as their primary transportation choice.

Chapter 3 ~ Recommendations

This chapter presents the recommendations that will achieve the two primary goals set forward by this Plan:

1. To reduce the number of pedestrians killed and injured in crashes with motor vehicles;
2. To increase pedestrian activity by making walking a comfortable and accessible mode of travel throughout all parts of the District.

The recommendations in this Chapter are supported by a number of appendices that provide more detailed actions that are needed to strengthen District policies and codes, make high priority corridors safer for people on foot, and generally ensure that all streets are designed to accommodate pedestrians.

The recommendations in this chapter are structured in the following way:

Objectives are broad, but identify specific strategies for accomplishing the dual goals of this Plan. The responsibility for carrying out the objectives will fall upon many different agencies and organizations. The objectives are summarized below:

Objective 1: Provide accessible, safe and well-maintained pedestrian facilities along and across all streets.
Objective 2: Institute policies and practices to ensure that every street in the District meets the needs of pedestrians of all abilities.
Objective 3: Establish education, enforcement and encouragement programs that support pedestrian travel.

Recommendations are provided for each of the objectives listed above. Recommendations are specific activities that will be undertaken in order to achieve the objectives. Actions typically have a specific timeframe and are usually assigned to a specific agency or organization.

Objective 1: Provide accessible, safe and well-maintained pedestrian facilities along and across all streets.

The safety and quality of the walking environment were consistently raised as critical issues by local citizens who participated in public meetings and surveys conducted for this Plan. Many deficiencies were identified during the existing conditions analysis as well. This objective therefore addresses the need to ensure that pedestrians walking along streets throughout the City are provided with adequate facilities that accommodate all types of users.

Recommendation 1.1: Ensure all transportation and real estate development projects include safe and convenient pedestrian facilities.
DDOT, private developers, and others reconstruct hundreds of blocks of public space each year. The most cost effective strategy for improving the pedestrian environment is to include state-of-the-practice pedestrian designs into all new construction projects in the District.

Sidewalks adjacent to high speed travel lanes do not provide a comfortable walking

Recommendation 1.2: Implement improvements to the high-priority corridors identified by this Plan.
This Plan identifies eight high priority corridors (listed below), one in each ward of the District. Each of these high priority corridors carry high volumes of pedestrians, and experience frequent pedestrian crashes. Recommendations for pedestrian improvements for these corridors include sidewalk repair and construction, relocation of bus stops, signalization changes, reduced crossing distances at intersections, and a wide variety of other pedestrian safety improvements. The recommendations are provided in detail in Appendix D: Priority Corridor Recommendations.

The high priority corridors include the following:

Ward 1: 16th Street NW from Massachusetts Ave NW to Spring Road NW
Ward 2: New York Ave NW to NE from 15th St NW to Penn St. NE
Ward 3: Wisconsin Ave NW from Western Ave NW to Woodley Rd NW
Ward 4: New Hampshire Ave NW to NE from Park Road NW to Peabody St NE
Ward 5: Bladensburg Rd NE from Benning Rd NE to Eastern Ave NE
Ward 6: M Street SW/SE from 6th St SW to Isaac Hull SE
Ward 7: East Capitol St NE from B St NE to Division Ave NE
Ward 8: Alabama Ave SE from MLK Jr. SE to Naylor Rd SE

Recommendation 1.3: Construct new sidewalks where missing on streets in the District.
Approximately eighteen percent of the blocks in the District have missing sidewalks on one or both sides of the street. The presence of sidewalks is critical to the safety of pedestrians because they provide an accessible travel path that is separated from traffic. While it will require many years to achieve sidewalks on both sides of every street in the District, this is a critical need that should be incorporated in the City's budget in the years to come. The City will use the pedestrian demand/deficiency analysis described in Appendix A to prioritize sidewalk gap construction. The process should include a mechanism for citizen/neighborhood input and requests. All sidewalks will be constructed in conformance with the Americans with Disabilities Act Accessibility Guidelines.

Recommendation 1.4: Improve the system for prioritizing sidewalk maintenance and repair.
The City will refine the system for inspecting sidewalks, and identifying and cataloging needed repairs. This system will apply only to sidewalks that fall within the maintenance responsibility of the District. The system should include a method for residents and visitors to make requests for specific locations in need of repair. Sidewalk repairs and reconstruction should be prioritized based on high pedestrian demand and poor walking conditions, requests, and meeting ADA guidelines.

Recommendation 1.5: Improve pedestrian access and safety at controlled crossings and intersections.
Safety improvements are needed at signalized intersections throughout the District with significant pedestrian activity (such as in the Downtown Business District, adjacent to metro stations and schools), with conflicts between turning motorists and pedestrians, and with higher frequencies of pedestrian crashes.

The District Department of Transportation has been systematically updating pedestrian signals and installing pedestrian countdown signals at signalized intersections throughout the City. The District should continue their efforts to provide countdown signals at all appropriate signalized intersections and to implement other safety improvements.

Countdown pedestrian signals are planned for all signalized intersections in the District by 2009.

Leading pedestrian intervals and right-turn-on-red restrictions should be installed at intersections where appropriate to increase motorist yielding compliance and reduce conflicts between pedestrians and turning motorists. Signal timing at these locations should be evaluated to ensure pedestrians are provided with sufficient crossing time. These types of improvements will require a traffic analysis to develop a balanced approach that addresses the safety and efficiency of all modes of travel.

Pedestrian push buttons to trigger a walk signal or extend a walking phase are utilized throughout the District. In some instances, pedestrians may not have enough time to cross the street unless they push the button. Many pedestrians are unaware that they must push the button to get adequate crossing time. In locations with high pedestrian activity (pedestrians present at least 50% of the time for each cycle), particularly around transit stations, a pedestrian phase should be provided during every cycle of the signal rather than requiring pedestrians to push the button. In these cases, the push button should be removed and signal timing modified to provide a walk phase during

each cycle. Push buttons and pushbutton locations were found to not meet current ADA requirements at a number of locations along the priority corridors. Push buttons should be relocated to meet ADA requirements where it is determined to be necessary to have pedestrian actuation for a walk signal.

Recommendation 1.6: Improve pedestrian access and safety at uncontrolled crossings and intersections.
Improving the safety of pedestrians crossing at uncontrolled locations (crossings without a stop sign or traffic signal) is a major focus of this plan. The decision regarding where to mark crosswalks and what types of engineering treatments to use is complex. The most recent research on pedestrian safety[1] indicates that on multi-lane arterials with higher traffic volumes (over 12,000 ADT) such as Wisconsin Avenue and 16th Street, uncontrolled crossings with marked crosswalks *alone* were associated with higher rates of pedestrian crashes. It was found that in addition to marked crosswalks, these types of uncontrolled crossing locations require other engineering treatments, such as median refuge islands and pedestrian signals in order to improve the safety of pedestrians crossing the roadway.

Developing a crosswalk marking policy is explained in more detail with a detailed policy analysis in Appendix C. It addresses the need for the District to adopt a standard approach and treatment for uncontrolled crossings throughout the City to improve pedestrian safety at these locations which is based on current research and best practice.

The Department of Transportation should develop a program to systematically review uncontrolled crossings in the City, and make improvements following the Crosswalk Marking Policy presented in this plan. Additional engineering treatments are recommended at the majority of the existing marked uncontrolled crossings on the priority corridors to improve pedestrian safety. When several marked uncontrolled crosswalks are located in close proximity on a corridor, recommendations are made to consolidate the markings and provide additional engineering measures that improve pedestrian safety. Pedestrian travel patterns, pedestrian generators and safety issues were taken into consideration to select the optimum locations for marked crossings. In locations where additional engineering treatments were needed but were not feasible to improve the safety of an existing marked uncontrolled crossing, it is recommended that the crosswalk markings be removed.

Recommendation 1.7: Improve pedestrian access and safety at bus stops while maximizing transit efficiency.
Bus stops throughout the District are primarily located on the near-side of intersections. When bus stops are on the near-side of an intersection, pedestrians often cross in front of the bus which blocks the sight line to adjacent traffic. Where possible, bus stops should be located on the far-side of intersections and at controlled crossings when located on higher volume multi-lane arterials.

Far-side bus stops encourage pedestrians to cross behind the bus which improves visibility to other motorists. Bus stops located on the far side of signalized intersections also improve transit efficiency and minimize parking loss to neighborhoods.

In conjunction with Recommendations 1.5 and 1.6, intersections with bus stops should be a first priority for further safety studies, and should be redesigned according to the design principles described above and in Appendix C of this Plan.

Bus stop in Glover Park

[1]Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations. Federal Highway Administration, 2001

Objective 2: Institute policies and practices to ensure that every street in the District meets the needs of pedestrians of all abilities.

A comprehensive policy and code analysis was conducted as a central component of this Plan. Many policy changes and adjustments were identified that will have a profound impact on the walkability of City streets. These policy changes will be essential in order for the District to provide complete streets that meet the needs of pedestrians of all abilities. Below are the specific recommendations that should be taken to institute policies that support walking.

Recommendation 2.1: revise the DDOT Design and Engineering Manual to better address pedestrian safety and accessibility, specifically incorporating the revisions identified in Appendix C (Pedestrian Policy Analysis/Recommendations) and create a standalone Pedestrian Design Guidelines document.
DDOT already has established many policies and standards with respect to pedestrian facility design. For example, the DDOT Design and Engineering Manual already has chapters that address the Americans with Disabilities Act, sidewalks, and traffic calming, and pedestrian issues are incorporated into many of the existing chapters that address various aspects of roadway design.

However, based on an analysis of the Manual, there are a number of additions and adjustments that are needed in order to better address the safety and comfort of pedestrians. For example, there is a critical need to address the design of uncontrolled pedestrian crossings (those that occur at midblock locations and at intersections where motor vehicle traffic is not controlled with a stop sign or traffic signal). Uncontrolled intersections exist throughout the District and represent a significant safety issue for pedestrians.

Updates to the Design and Engineering Manual will enable DDOT to incorporate new provisions in the MUTCD (Manual on Uniform Traffic Control Devices) and ADAAG (Americans with Disabilities Act Accessibility Guidelines) into the Manual, as well as a number of pedestrian policies that the District developed in the Anacostia Waterfront Transportation Architecture Design Standards and the proposed Public Realm Design Handbook**.**

Detailed recommendations in Appendix C (Pedestrian Policy Analysis/Recommendations) address the following topics:

Pedestrian Facilities Along Streets
- Access Management and Driveway Width
- Sidewalks
- Tree Box and Furnishing Area

Intersection Geometric Design
- Turning Radius and Intersection Size
- Curb Ramps

Signalized Intersection Treatments
- Turning Traffic Yield to Pedestrians Signs
- Leading Pedestrian Interval
- Right Turn on Red Restrictions
- Dedicated Pedestrian Signal Phases/Pedestrian Scramble Patterns
- Accessible Pedestrian Signals
- Pedestrian Actuated Signals/Button Locations

Uncontrolled Intersection Treatments
- Signs for Uncontrolled Crossings
- Advance Stop Lines at Uncontrolled Marked Crosswalks
- Medians for Pedestrian Refuge
- Flashing Warning Beacons
- Pedestrian Hybrid Signals

Crosswalks
- Crosswalk Marking Design
- Crosswalk Marking Policy

Other Pedestrian Design Elements
- School Zones
- Bus Stop Siting

To supplement the Design and Engineering Manual and Standard Drawings, DDOT will develop Pedestrian Design Guidelines to highlight pedestrian engineering topics from the Design and Engineering Manual and depict detailed engineering guidance.

Recommendation 2.2: Issue new and/or revised independent policy statements as needed to support pedestrian safety and accommodation on District streets.
DDOT should issue interim independent policy statements that address key pedestrian safety accessibility issues. This recommendation speaks to the need to move forward with guidance for pedestrian safety issues that are not incorporated into revisions to the Design and Engineering Manual. Most immediately, guidance is needed on the design of uncontrolled crossings, as described in Recommendation 2.1.

Recommendation 2.3: Provide training as necessary to roadway planners and designers responsible for improvements to the public right-of-way in the District to ensure they are fully aware of new policies and practices.
Education will be needed to ensure that project consultants, DDOT planners, inspectors, engineers and staff that oversee transportation studies and construction projects that impact the public right-of-way are aware of new pedestrian design policies, and have the necessary information to carry them out. A one-day pedestrian design seminar was conducted as part of this Plan, in combination with a bicycle facility design seminar (also one day) – additional educational opportunities will be needed on a yearly basis to ensure that roadway designers are kept up to speed on the District's pedestrian design practices. A two day FHWA "Designing for Pedestrian Safety" training workshop was held in October, 2008.

Recommendation 2.4: Evaluate progress on implementing the pedestrian design policies recommended in this Plan after 5 years.
It will be important to evaluate progress in implementing policy changes over time, as well as to reassess next steps and priorities as new issues arise. It is recommended that DDOT undertake an assessment of progress on policy changes after five years have elapsed since the completion of this Plan, and to develop a plan for implementing any remaining policy changes that are needed.

Objective 3: Establish education, enforcement and encouragement programs that support pedestrian travel.

When asked which factors make it more difficult or unpleasant to walk in the District, one-third of respondents to the online survey (approximately 1,500 people) selected "Drivers not stopping for pedestrians in crosswalks" as the number one factor. Feedback from face-to-face interviews conducted in each of the District's wards in addition to observations, suggest that motorist behavior such as exceeding posted speed limits, running red lights, and failing to yield to pedestrians at appropriate locations, and pedestrian behavior including crossing multi-lane streets at unmarked mid-block locations, often put pedestrians at risk. In addition to motorist education, residents and visitors to the District need to be taught basic pedestrian safety skills as well as laws that pertain to pedestrians in the public right-of-way.

To meet the District's goal of improving pedestrian safety, physical improvements must be complemented by education, enforcement, and encouragement programs. Efforts must be made to develop a culture of respect between pedestrians and motorists that acknowledges the shared responsibility for the safety of all roadway users. The following specific actions are recommended to fulfill this objective:

Recommendation 3.1: ***Increase penalties for motorists for infractions that impact pedestrian safety***
The current fine in the District of Columbia for failing to yield the right-of-way to pedestrians is $50.00. The District should increase the fine to be similar to fines charged by other localities. In addition to increased fines, repeat offenders of infractions hindering pedestrian safety should receive points on their license.

Arlington, VA has increased fines up to $500 when a motorist fails to yield to a pedestrian in crosswalk locations with high pedestrian activity. Fairfax County successfully changed state law to allow the placement of signs at designated intersections indicating an increased fine for failing to yield to pedestrians. The signs reading, *Yield to Pedestrians in Crosswalks $100 - $500 Violation Fine,* are currently installed at approximately 100 intersections in Fairfax County and can be requested by citizens. While it is recommended that fines be increased, if citations appear excessive officers may be discouraged from issuing tickets and the courts may fail to uphold the citations, therefore this recommendation should be explored further to determine the most effective strategy that will yield results in the District

Progressive Ticketing Approach:

1. **Educating** — Establish community awareness of the problem. The public needs to understand that drivers are speeding and the consequences of this speeding on pedestrian safety. Raising awareness about the problem will change some behaviors and create public support for the enforcement efforts to follow.
2. **Warning** — Announce what action will be taken and why. Give the public time to change behaviors before ticketing starts. Fliers, signs, newspaper stories and official warnings from officers can all serve as reminders.
3. **Ticketing**—Finally, after the warning time expires, hold a press conference announcing when and where the police operations will occur. If offenders continue their unsafe behaviors, officers issue tickets.

Source: Pedestrian and Bicycle Information Center. www.walkinginfo.org

Following the institution of increased penalties, progressive ticketing is recommended to raise awareness and compliance with pedestrian laws.

Step 1 includes a higher frequency of stops than for ticketing which ensures that many motorists make direct contact with law enforcement, and that many others witness the stops and may be prompted to obey the rules. Ticketing is necessary for motorists who continue to violate the laws. Issuing tickets ultimately gives the program credibility.

Recommendation 3.2: ***Develop an Educational Campaign Program for New Pedestrian Facilities***
An educational campaign should be developed to alert residents, employees, and visitors to the District of new pedestrian facilities within the District. The City of Seattle has developed door hangers which are distributed within the vicinity of new projects which provide information on:

- Project purpose
- Project timeline
- Project impact on the neighborhood
- Explanation of how to use device (i.e. hawk signal)
- Contact information for questions

Recommendation 3.3 ***Expand the District's Photo Radar Speeding Reduction Program***
Decreased motor vehicle speeds are *essential* to improving pedestrian safety in the District of Columbia. Motorists exceeding posted speed limits present hazards for pedestrians by increasing the frequency and severity of crashes and reducing the comfort of pedestrians walking along the street.

The District of Columbia Metropolitan Police Department has been successfully operating a Photo Radar Speeding Reduction Program since 2001. The program has helped to reduce the percentage of vehicles exceeding the speeding threshold from 17 percent (December 2001) to less than 2 percent (July 2007) of all traffic passing through the camera enforcement zone.[2] Both mobile photo radar units and fixed-location cameras are used and enforcement zones are selected by MPD based on speeding history, speed-related incidents and proximity to locations with vulnerable populations such as children. Many of the fixed cameras are located along major commuter routes, such as New York Avenue, NE, Florida Avenue, NE, Benning Road, NE, MacArthur Boulevard, NW and 16th Street, NW.

DDOT should work with MPD to expand the photo radar speeding program and identify locations with high pedestrian activity for the installation of additional fixed cameras. Montgomery County's *Safe Speed* campaign installed fixed speed cameras at seven locations in 2007 targeting residential streets, school locations and streets with speed limits of 35mph or less. The District should also ensure that revenues generated from the cameras can be used to fund additional speed zones.

Recommendation 3.4: ***Expand the DDOT Pedestrian Program Website***
DDOT's pedestrian program website provides information about:

- Pedestrian laws and regulations
- Pedestrian safety
- Current pedestrian projects and initiatives
- Pedestrian collision study
- Links

The DDOT pedestrian program website should be more comprehensive, user-friendly, and promoted with a simple URL. The site should be an educational tool on the topic of pedestrian safety, including appropriate pedestrian and motorist behaviors, and should provide printable safety materials that can be circulated (as described below). The site should promote walking by describing the benefits of walking, providing local maps, a calendar of events such as walking tours, and linking to health and wellness resources and transit options. An example of an in-depth and user-friendly pedestrian program site is the Cambridge, Massachusetts Pedestrian Program site (http://www.ci.cambridge.ma.us/~CDD/et/ped/index.html). DDOT should also consider a standalone site similar to the site developed for Arlington's *Walk Arlington* initiative (www.walkarlington.com). The site describes the initiative, provides information on guided walking tours, walking for health, features of a walkable community, opportunities to get involved and join other walkers, and links to commuter pages and Arlington's *Car Free Diet* campaign.

Graphic from the *Walk Arlington* website

Recommendation 3.5: ***Integrate walking information into the District of Columbia's official tourism site***
The "Getting Around" section on the District's official tourism site (www.washington.org) includes information on traveling around the City by car, transit, taxi and tour bus. The site should include detailed information on getting around as a pedestrian, with walking tour maps, safety tips, and links to other resources.

The District should develop walking route maps targeted to visitors as well as residents, which direct pedestrians to existing and newly constructed trails, great neighborhood walks, and destinations such as parks and tourism sites. These maps should be promoted through existing channels (such as the Pedestrian Program website) as well as the various educational campaigns recommended in this section.

[2] http://mpdc.dc.gov/mpdc/cwp/view,a,1240,q,548110,mpdcNav_GID,1552,mpdcNav,%7C31886%7C.asp

Recommendation 3.6: ***Develop a tag line that conveys the walkability of the District of Columbia and promotes walking***

Washington, DC is a walkable city; many key destinations are within close proximity of one another, there is a comprehensive sidewalk network, crossing facilities, and an efficient transit system. Many residents rely on walking for transportation, evidenced by the District having the second highest walk-to-work rate of any city in the country. However, pedestrian injury and fatality rates in the District work against the image of the District as a safe and comfortable place to walk.

A consistent message (a tag line) should be developed to help promote walking as a healthy activity, to raise awareness of pedestrian issues, and begin to change attitudes and behaviors that impact pedestrian safety. The tag line should be promoted at the completion of the Pedestrian Master Plan to coincide with an expanded pedestrian program website and other education, enforcement and encouragement initiatives.

For example, Louisville, KY has branded, "Step Up, Louisville!" to coincide with the launching of a Community Pedestrian Summit and Master Plan project. The tag line will be used for community outreach activities, to galvanize action around pedestrian issues, to promote a walking listserv, and as the URL for a pedestrian program and project website.

Recommendation 3.7: ***Expand Pedestrian Safety Campaign Efforts***

Respondents to the online survey and the face-to-face interviews conducted for this plan cited aggressive driving as the number one safety hazard facing pedestrians in the District. While the District participates in the successful *Street Smart* campaign along with other agencies in the region, the campaign is limited to a short timeframe each year. Safety message, particularly for motorists, need to be heard year round.

The District should expand the current safety education program. Safety messages specifically regarding pedestrians should be broadcast year round through various media outlets including radio, tv, online and printed material only in targeted locations (such as the DC Department of Motor Vehicles, schools, the DDOT website). Particular attention should be paid to revising driver education and testing standards. Content of the materials should inform pedestrians as well as motorists and may include:

- Laws
- Rules of the road
- Street crossing safety
- Pedestrian visibility to drivers at night
- Stopping for pedestrians in crosswalks
- Yielding to pedestrians while turning at signalized intersections
- The relationship between vehicle speeds and the severity of pedestrian injury

To combat motorist behavior, many jurisdictions across the United States and Europe are turning to more graphic messages to convey the vulnerability of pedestrians and to increase safety, such as Street Smart's "Steel vs. Flesh" campaign. This type of attention-grabbing media campaign should be expanded to run throughout the year and to address specific motorist behavior in the District including speeding and failing to yield to pedestrians in crosswalks, and pedestrian behavior of failing to use legal crossings. Messages should be direct and can follow examples used elsewhere, such as London's bloody "Kill Your Speed, Not a Child" campaign which has succeeded in attaching a stigma to speeding (www.thinkroadsafety.gov.uk/campaigns/slowdown/slowdown.htm).

The Chicago area has developed a campaign "to stigmatize and stop reckless driving" through the use of marketing and enforcement as well as street design (www.healthystreets.org/pages/drive_care.htm). The "Drive with Care" campaign, part of their Healthy Streets initiative, relies on local and regional support to improve safety through the following principles: "Public space should discourage reckless driving by design. There should be a high probability of fines for illegal behavior. And negative behavior should generate a guaranteed negative stigma."

Recommendation 3.8: ***Conduct an Educational Campaign on the Benefits of Walking***

Most people are aware of the environmental benefits of walking instead of driving an automobile, yet do not fully realize the health benefits that walking provides. DDOT should work with other District agencies (such as the Department of Parks and Recreation), advocacy groups, and health/wellness organizations to coordinate and promote programs that

encourage walking. An important key to developing successful encouragement programs throughout the District is having a coordinated approach, a consistent message, and focused activities.

This strategy supports the development of walkways and multi-use trails to promote routine as well as recreational physical activity and wellness programs for people of all ages in the District. The initiative should emphasize the links between walking and weight loss, disease prevention, lower health care costs, and longer lives for all members of the community. Targeted audiences for this outreach effort may include:

- Faith-based organizations
- Community-based health improvement partnerships
- Elder care facilities
- Hospitals
- Schools

Specific projects can be targeted based on local needs and ideas, however a key component of each project should be community outreach that highlights the health benefits of walking and gives practical advice about where to walk in the community and safe walking tips.

An example of a recent educational and encouragement campaign is Arlington, Virginia's *Car-Free Diet*. Arlington's County Commuter Services (ACCS) launched the carfreediet.com website at the end of 2007 to educate residents and encourage them to leave their car at home: "Each time you leave your car at home — choosing instead to ride ART or Metro, bike, walk or telework — you can save money, improve your health and clean our environment." Brochures were created announcing the start of the campaigning and including a map and information on transit options and resources on walking, biking, carpooling, carsharing, and teleworking. The brochures were distributed in an issue of *The Citizen* which is mailed to every household in Arlington County.

The website provides information on transportation options and includes an interactive calculator that computes how much money and carbon dioxide you can save by not driving, and how many calories you can burn by walking, bicycling or taking transit.

Recommendation 3.9: ***Expand the Implementation of the Safe Routes to School Program***

The District's Safe Routes to School program is managed by DDOT. In 2005, DDOT received Federal funding to increase the safety of District students who walk to school. Efforts to date have included participation in International Walk to School Day, pedestrian and bicycle safety education and training programs for kids, overtime enforcement funding for the Metropolitan Police Department and hiring a full-time SRTS coordinator in January of 2008.

Through a combination of engineering, education, encouragement and enforcement strategies, SRTS programs have the ability to impact traffic safety, traffic congestion, pollution and air quality issues. They also present a unique opportunity to address personal safety concerns and significant child health problems while enhancing livability within the District.

It is important to note that the Safe Routes to School program does NOT encourage students to walk or bike alone in unsafe locations – it provides a method for improving conditions, and encourages parents to walk with students to school.

DDOT should increase coordination with the District of Columbia Public Schools to identify pilot schools to initiate SRTS programs that address all five "E's" (education, enforcement, encouragement, engineering and evaluation). Involvement from other key community partners (health organizations, neighborhood groups, PTA's, advocacy groups, and others) should be sought

in order to create sustainable programs that do not rely on continuous Federal funding in order to continue. The goal should be to ultimately offer a SRTS program to every District school interested in participating and to address pedestrian safety at all schools where appropriate. This should include both public and private schools, and schools at all levels (elementary through high school). DDOT should also develop partnerships in order to ensure that comprehensive pedestrian and bicycle safety education is provided to every District student from Kindergarten through 8th Grade.

Recommendation 3.10: ***Develop a Snow Removal Educational Campaign Program***
An educational campaign should be developed to alert property owners of their responsibilities and the associated penalties if in violation of the law. A plan for enforcing snow removal regulations should then be developed and implemented. The Snow Plan section of the District Department of Transportation's website should clearly describe the District's enforcement practices and penalties.

Chapter 4 ~ Implementation

Projects that support pedestrian travel occur on a continuous basis in the District, and involve a vast array of public agencies and private entities, including developers and property owners who initiate projects that impact the public right-of-way. The policies and design standards that are established and/or recommended in this Plan will ensure that activities of these different partners will positively impact walkability in the District.

This Master Plan provides a method for coordinating among the different entities that implement pedestrian projects and programs. . DDOT will primarily be responsible for this continued coordination, and for implementing the recommendations identified in Chapter 3. Therefore, this chapter describes a timeline for implementation and performance measures that will be used by DDOT moving forward.

As described in Chapter 1, this Master Plan sets forward two primary goals:

1. To reduce the number of pedestrians killed and injured in crashes with motor vehicles;
2. To increase pedestrian activity by making walking a comfortable and accessible mode of travel throughout all parts of the District.

The objectives and recommendations in Chapter 3 are designed to achieve these goals. In order to measure progress over time, this chapter sets forward two performance measures that will help DDOT staff, elected officials and citizens to determine if implementation activities are having the desired effect. The two performance measures are provided below:

	Data item	**Baseline Measurement**	**Performance Target**	**Data Collection Frequency**
Performance Measure #1	Number of reported pedestrian deaths and injuries City-wide	2004-2006 average for fatalities and injuries	Reduce pedestrian deaths and injuries by 5% every 3 years, adjusting for exposure	Annually, with a rolling three year average
Performance Measure #2	Number of pedestrians walking and using transit to work	American Community Survey, Census Data	Measurable increases annually through 2018	Every year

Performance monitoring will be led by the DDOT Policy and Planning Administration, with support from the DDOT Pedestrian and Bicycle Program The implementation table on the following pages provides a general timeframe for achieving the recommendations (per Chapter 3).

Objective 1: Physical Improvements

Recommendations	2008	2009	2010	2011	2012	2013	2018
1.1: Ensure all transportation and real estate development projects include safe and convenient pedestrian facilities.	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$100,000
1.2: Implement improvements to the high-priority corridors identified by this Plan.		Begin corridor improvements	Continue corridor improvements	Continue corridor improvements	Continue corridor improvements	Continue corridor improvements	8 corridors will be complete
Cost		$1,875,000	$1,875,000	$1,875,000	$1,875,000	$1,875,000	$5,625,000
1.3: Install new sidewalks where missing on streets in the District.	Complete 5 miles of new sidewalks	10 miles of new sidewalks will be complete	15 miles of new sidewalks will be complete	20 miles of new sidewalks will be complete	25 miles of new sidewalks will be complete	30 miles of new sidewalks will be complete	55 miles of new sidewalks will be complete
Cost	$575,000	$575,000	$575,000	$575,000	$575,000	$575,000	$2,875,000
1.4: Develop a system for prioritizing sidewalk maintenance and repair.	Develop system, implement repairs	Ongoing sidewalk maintenance and repair	Ongoing sidewalk maintenance and repair	Ongoing sidewalk maintenance and repair	Ongoing sidewalk maintenance and repair	Ongoing sidewalk maintenance and repair	Ongoing sidewalk maintenance and repair
Cost	(Costs incorporated into existing maintenance budgets)						
1.5: Improve pedestrian access and safety at controlled crossings and intersections.	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing
Cost	$75,000	$100,000	$100,000	$100,000	$100,000	$100,000	$500,000
1.6: Improve pedestrian access and safety at uncontrolled crossings and intersections.	Conduct 5 pilot projects, analyze uncontrolled crossings throughout City	Conduct 5 pilot projects, analyze uncontrolled crossings throughout City	Improvements at 20 uncontrolled intersections are complete	Improvements at 30 uncontrolled intersections are complete	Improvements at 40 uncontrolled intersections are complete	Improvements at 50 uncontrolled intersections are complete	Improvements at 100 uncontrolled intersections are complete
Cost	$200,000	$700,000	$500,000	$500,000	$500,000	$500,000	$2,500,000
1.6: Improve pedestrian access and safety at bus stops while maximizing transit efficiency.							
Cost	(Implementation and costs incorporated into 1.4 and 1.5)						

Total Cost for Objective 1 Recommendations	$870,000	$3,270,000	$3,070,000	$3,070,000	$3,070,000	$3,070,000	$11,600,000

Objective 2: Policies

Recommendations	2008	2009	2010	2011	2012	2013	2018
2.1: Revise the DDOT Design and Engineering Manual to better address pedestrian needs, specifically incorporating the revisions identified in Appendix C and complete Pedestrian Design Guidelines.	Initiate project	Complete new manual	Finalize Pedestrian Design Guidelins			Revise manual	Revise manual
Cost	$70,000	$80,000				$50,000	$50,000
2.2: Issue new and/or revised independent policy statements as needed to support pedestrian safety and accommodation on District streets.	Develop and issue new policies	Develop and issue new policies	Develop and issue new policies	Develop and issue new policies	Develop and issue new policies	Develop and issue new policies	Develop and issue new policies
Cost	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$50,000
2.3: Provide education as necessary to roadway planners and designers responsible for improvements to the public right-of-way in the District to ensure they are fully aware of new policies and practices.		Conduct training	Conduct training	Conduct training	Conduct training	Conduct training	Conduct training
Cost		$4,000	$4,000	$4,000	$4,000	$4,000	$20,000
2.4: Evaluate progress on implementing the pedestrian design policies recommended in this Plan after 5 years.		Collect data		Collect data		Collect data/perform evaluation	Collect data/perform evaluation
Cost		$60,000		$60,000		$80,000	$140,000
Total Cost for Objective 2 Recommendations	$80,000	$154,000	$14,000	$74,000	$14,000	$144,000	$260,000

Objective 3: Pedestrian Programs

Recommendations	2008	2009	2010	2011	2012	2013	2018
3.1: ***Increase penalties for motorists for infractions that impact pedestrian safety***	Study appropriate penalty levels	Initiate changes to law					
Cost	(No Cost)	(No Cost)					

3.2: ***Develop an Educational Campaign Program for New Pedestrian Facilities***		Develop templates, materials	Implement campaign	Implement campaign	Implement campaign	Implement campaign	Implement campaign
Cost		$30,000	$10,000	$10,000	$10,000	$10,000	$50,000
3.3: ***Expand the District's Photo Radar Speeding Reduction Program***		Expand program to school zones and other high pedestrian areas	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing
Cost		(Self-funding through fines collected)					
3.4: ***Expand the DDOT Pedestrian Program Website***	Develop web content and design	Website updates	Website updates	Website updates	Website updates	Website updates	Website updates
Cost	$25,000	$12,000	$12,000	$12,000	$12,000	$12,000	$60,000
3.5: ***Integrate walking information into the District of Columbia's official tourism site***	Develop content, design walking tour maps		Update content		Update content		Update content
Cost	$80,000		$4,000		$4,000		$12,000
3.6: ***Develop a tag line that conveys the walkability of the District of Columbia and promotes walking***	Logo design					Update logo, tag line	Update logo, tag line
Cost	$5,000					$8,000	$8,000
3.7: ***Expand Pedestrian Safety Campaign Efforts***	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing	Ongoing
Cost	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$500,000
3.8: ***Conduct an Educational Campaign on the Benefits of Walking***		Develop Campaign materials	Implement campaign	Implement campaign	Update materials, implement	Implement campaign	Implement campaign
Cost		$60,000	$120,000	$120,000	$180,000	$120,000	$600,000
3.9: ***Expand the Implementation of the Safe Routes to School Program***	Initiate planning in 8 schools	Program is in place in 8 schools	Ongoing support of pilot schools	Program is in place in 20 schools	Program is in place in 30 schools	Program is in place in 40 schools	Program is in place in 90 schools
Cost	$80,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$5,000,000

3.10: ***Develop a Snow Removal Educational Campaign Program***		Develop campaign approach, materials	Implement campaign	Implement campaign	Implement campaign	Implement campaign	Implement campaign
Cost		$50,000	$20,000	$20,000	$20,000	$20,000	$100,000
Total Cost for Objective 3 Recommendations	$290,000	$1,252,000	$1,266,000	$1,262,000	$1,326,000	$1,270,000	$6,330,000
Total Costs	$1,240,000	$4,676,000	$4,350,000	$4,406,000	$4,410,000	$4,484,000	$18,190,000

Appendix A ~ Pedestrian Demand Methodology

This document describes the methodology used to identify and select priority corridors in the District for detailed study as part of the Pedestrian Master Plan. Eight arterial road segments were selected for this high level of analysis, focusing on corridors with higher levels of pedestrian activity, yet poorer conditions for walking. The pedestrian demand model that was used for this analysis was based on a modified version of Portland, Oregon's Pedestrian Potential and Deficiency Indices.

The selected corridors were analyzed in the field, and detailed recommendations were developed to improve pedestrian conditions (see Priority Corridor Recommendations – a separate document available on the DDOT website). The Pedestrian Plan also incorporates general recommendations to make all streets in the District more walkable, including a neighborhood sidewalk gap analysis to identify needed sidewalk improvements. This pedestrian demand analysis can also be used in the future to prioritize capital projects in other parts of the District.

Road segments in the District have been rated on two factors; pedestrian potential (how much pedestrian activity is expected in particular locations) and pedestrian deficiency (how challenging it is for pedestrians to travel along or cross particular roads). Road segments with high potential for pedestrian activity and high deficiency are considered to be priorities for further evaluation. The criteria used to rate pedestrian potential and deficiency are described below. Because this is a sketch plan method, it is not intended to produce precise estimates of the number of pedestrians along a particular roadway or the relative risk of pedestrian crashes in specific locations. Instead, it is used to select general corridors for additional detailed analysis.

PEDESTRIAN POTENTIAL

The potential for pedestrian activity on a given roadway segment was determined by the pedestrian attractors/generators and the anticipated growth in population and employment density near that location. Corridors that were scheduled for significant transportation and pedestrian improvements were also considered as having potential for greater future pedestrian activity. Pedestrian potential was determined using the following two criteria:

1. Proximity - Roadway segments received more points for being located close to pedestrian attractors and generators*. Buffer zones of one-eighth, one-fourth, and one-half mile (straight line distance, not network distance) were drawn around each attractor and generator. Road segments received points for falling within each of these buffer areas as follows:

Attractor/Generator	1/8 mile	1/4 mile	1/2 mile
Metro Station	15	10	5
Bus stop	5	3	
School (public, charter, and colleges/ universities)	5	3	
Major Park Access Point	3	1	
Shopping	3	1	
Senior Center/Nursing Home	3	1	
The National Mall (proximity to any part of the National Mall)	20	5	
Stadiums/Convention Center (proximity to any part of the building)	20	5	

**point allocations are based on average pedestrian activity.*

For example, the National Mall is a location of significant pedestrian activity for both tourists and residents. Most pedestrian activity is concentrated on the National Mall or within several blocks of it, so roadways that are in or adjacent to the Mall received a large number of points (30), but those locations further away were not assigned any points. In contrast, people are generally willing to walk longer distances to transit (studies have shown that a typical walk to transit is ¼ to ½ mile, and many people walk even further[1]). Therefore, points were given to roadways as far away as ½ mile from each Metro station. In addition, more pedestrians walk to most Metro stations than walk to schools, bus stops, or parks, so the roads near the stations received higher scores.

2. Population and Employment Density - This category incorporates population and employment forecasts for 2025 from the Metropolitan Washington Council of Governments (MWCOG). Roadway segments contained in MWCOG Traffic Analysis Zones (TAZs) with greater future population and employment density were assigned more points. As more pedestrian trips are typically generated from a residential location than an employment location, population forecasts were assigned greater values than employment forecasts. Population and employment projections were divided into quintiles, and points assigned for each class as follows:

Quintile	**2025 Population Forecast** (per sq. mile)	**Points**	**2025 Employment Forecast** (per sq. mile)	**Points**
1	0 - 2,527	0	0 – 1,040	0
2	2,528 – 7,929	5	1041 – 2,888	3
3	7,930 – 13,071	10	2,889 – 8,007	6
4	13,072 – 22,626	15	8,008 – 41,258	9
5	22,627 – 134,959	20	41,259 – 464,493	12

PEDESTRIAN DEFICIENCY

Barriers to walking on the city's network of approximately 400 miles of arterial and collector roadways were analyzed to identify roads that are most deficient for pedestrian travel. The pedestrian deficiency factor was determined using the following criteria:

1. Walking Along the Roadway

The deficiency rating for walking along the roadway was developed using sidewalk inventory data. Roadway segments with sidewalk gaps, with narrow sidewalks and without buffers or street trees were given more points to indicate they are highly deficient for pedestrian travel. Points were also given to roadway segments with higher traffic volumes and speed limit to indicate a more deficient environment for walking. Each roadway segment was assigned a deficiency rating for walking along the roadway based on the following factors:

Factor/criteria		**Points allocated**
Sidewalk Gap: more than 10% of a block length without sidewalk*		
	1 side of street with a sidewalk gap	10
	2 sides of street with a sidewalk gap	20
Sidewalk Width		

[1] Weinstein, A., V. Bekkouche, K. Irvin, and M. Schlossberg. "How Far, by Which Route, and Why? A Spatial Analysis of Pedestrian Preference," Presented at 2007 Transportation Research Board Annual Meeting.

	Under 5' wide	2
	Under 4' wide	3
Presence of Planting Strip		
	No planting strip	3
Presence of Street Trees		
	No street trees	1
Traffic Volume (ADT)		
	5,000 – 10,000	1
	10,001 – 15,000	2
	15,001 – 20,000	3
	20,001 – 25,000	4
	25,001 or more	5
Posted Speed Limit		
	30mph	1
	35mph	2
	40mph	3
	45mph or more	5

**Data from a 2003 inventory of arterial roadways in the District were used to assign points for the walking along the roadway analysis. Where data was missing for a specific road segment, data from the adjacent segment was applied.*

2. Crossing the Roadway

Roads with higher traffic volumes, more travel lanes, higher speed limits and no medians generally present more hazards for pedestrians trying to cross the road. Therefore, the deficiency rating for crossing the roadway at uncontrolled locations was based on roadway characteristics including traffic volume, number of travel lanes, speed limit and the presence of a raised median or median island. The deficiency rating was not based on an actual evaluation of crosswalks in the District, but was derived based on these roadway characteristics. Using categories developed by FHWA[2] (see below), roadway segments are classified into the non-compliant (represented by a "N" in the chart on the next page), possibly compliant ("P"), and compliant ("C") categories based on the following characteristics:

- Traffic Volume (ADT)
  - Less than 9,000
  - 9,000 – 12,000
  - 12,001 – 15,000
  - More than 15,000
- Number of Vehicle Travel Lanes
  - 2 lanes
  - 3 lanes
  - 4 or more lanes with raised median
  - 4 or more lanes without raised median
- Speed Limit
  - Less than or equal to 30mph
  - 35mph
  - 40mph

[2] Zegeer, C., J. Stewart, H. Huang, and P. Lagerwey. "Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations- Executive Summary and Recommended Guidelines." Report No. FHWA-RD-01-075, Federal Highway Administration, Washington, D.C., February 2002

Table 1. Recommendations for installing marked crosswalks and other needed pedestrian improvements at uncontrolled locations.*

Roadway Type (Number of Travel Lanes and Median Type)	Vehicle ADT ≤ 9,000			Vehicle ADT >9000 to 12,000			Vehicle ADT >12,000 - 15,000			Vehicle ADT > 15,000		
	Speed Limit**											
	≤ 30 mi/h	35 mi/h	40 mi/h	≤ 30 mi/h	35 mi/h	40 mi/h	≤ 30 mi/h	35 mi/h	40 mi/h	≤ 30 mi/h	35 mi/h	40 mi/h
2 Lanes	C	C	P	C	C	P	C	C	N	C	P	N
3 Lanes	C	C	P	C	P	P	P	P	N	P	N	N
Multi-Lane (4 or More Lanes) With Raised Median***	C	C	P	C	P	N	P	P	N	N	N	N
Multi-Lane (4 or More Lanes) Without Raised Median	C	P	N	P	P	N	N	N	N	N	N	N

Distance between signalized intersections was also incorporated into the roadway crossing analysis. Greater distances between signalized intersections may potentially increase in the frequency of mid-block crossings. Because mid-block crossings are associated with a higher pedestrian crash risk in non-compliant or possibly compliant corridors, it is particularly important to focus pedestrian crossing facility improvements on the corridor segments with long distances between signals.

SELECTING PRIORITY CORRIDORS

Once the pedestrian potential and deficiency analyses were completed, maps were produced showing the following:

- Road segments in the District with the greatest potential for pedestrian activity.
- Road segments highly deficient for pedestrians walking along the roadway.
- Road segments highly deficient for crossing the roadway.
- Road segments with long distances between signalized intersections. This map highlights areas with the greatest potential for mid-block crossings.

The data shown on these maps was combined to highlight corridors with high potential and high deficiency for walking along the roadway and/or crossing the roadway, and greater distances between signalized intersections.

Two additional factors were then used as overlays to these maps in order to identify the priority corridors:

Pedestrian Crashes

Police-reported pedestrian crashes occurring in the District between 2000 and 2005 were mapped to help determine the corridors and road segments with higher crash risk. Locations with a greater frequency of crashes may need focused pedestrian facility improvements. Once corridors were identified as having high pedestrian potential and deficiency, the crash map was reviewed to help prioritize corridors and identify the limits of a prioritized corridor.

Policy

Corridors that have been officially designated as important for pedestrians, such as roadways designated as Great Streets, or roadways recommended for pedestrian improvements in corridor planning projects

or the transportation improvement program were also considered in the corridor selection process. These corridors are addressed in two ways:

- Roads expecting a significant increase in pedestrian activity due to a special designation may be given a higher priority for further analysis in this Pedestrian Master Plan.
- Roads that have specific pedestrian recommendations from another existing or future study will not be prioritized for additional analysis in this Pedestrian Master Plan because improvements will be made to pedestrian facilities as part of the other study.

Appendix B ~ Summary of Public Input

Public involvement was an important part of the planning process for the District of Columbia Pedestrian Master Plan. Residents and visitors provided feedback on a wide variety of topics, ranging from driver behavior to locations needing crossing improvements. In all, over 5,000 individuals gave input into the development of the plan through the online survey, citywide public meeting, and through face-to-face intercept surveys. Below is an overview of specific strategies used to gather input from a wide variety of people with an interest in pedestrian issues in the District.

Online Survey

An online survey was developed in the fall of 2006 with input from the Pedestrian Plan's Technical Advisory Committee (TAC). The survey was available online for two months from December 11th, 2006 through February 12th, 2007. It was provided in English and Spanish, and made accessible for the visually impaired. The survey was publicized on the District Department of Transportation home page, the project website, through neighborhood listservs, on flyers distributed to public libraries with computer terminals, and through local media coverage.

Over 4,800 responses to the Pedestrian Master Plan online survey were received. The most frequently cited concerns expressed by survey respondents regarding walking in the District include:

- Unsafe street crossings or intersections
- Motorist behavior; aggressive driving, failing to yield to pedestrians, exceeding posted speed limits, running red lights.
- Personal safety while walking
- Construction closing/blocking sidewalks
- Poor sidewalk surface quality and maintenance; uneven brick surfaces, inadequate snow removal, obstructions on sidewalks.
- Major corridors need the most improvements for pedestrians

It is important to note that this survey was self-selected, therefore the results are not statistically significant. The main purpose of the survey was to broaden the reach of public input that is typically heard in public meetings. Other strategies were employed to insure that the concerns of communities underrepresented in the survey were taken into account.

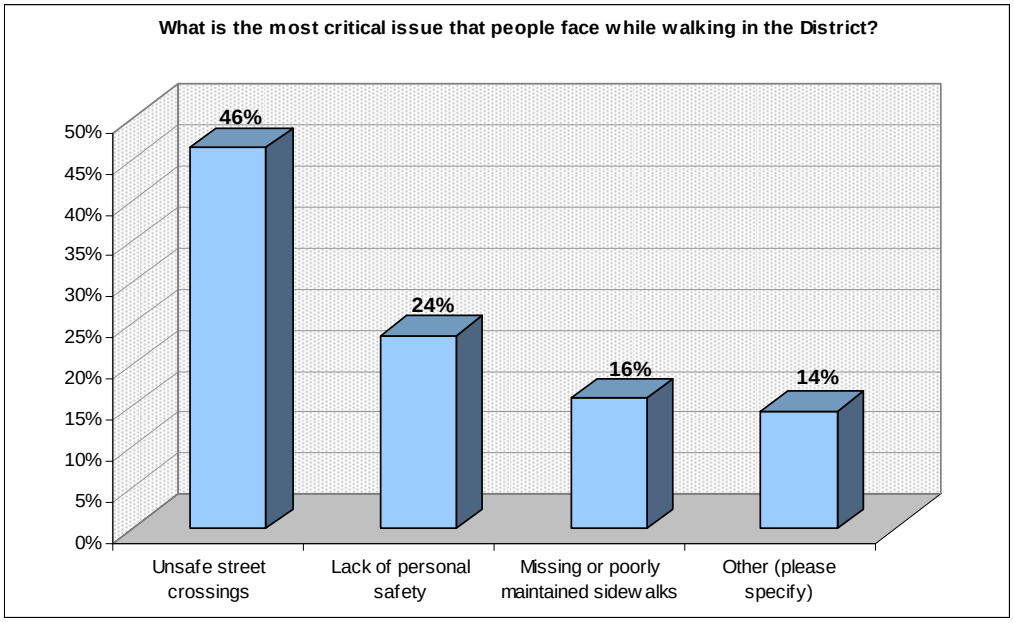
Below are summary tables and charts illustrating the results of the survey questions. For more information on the Pedestrian Master Plan, please visit the project website at www.tooledesign.com/projects/dc.

Walking Behavior

If you walk in the District please tell us why and how often.			
	Frequently (3 or more days per week)	Occasionally (several times per month)	Rarely or never (less than 1 - 2 times per month)
I walk to reach destinations for running errands shopping or entertainment	**71%**	23%	7%
I walk to the bus stop or metro station	**71%**	20%	9%
I walk for exercise or personal fitness	50%	32%	19%
I walk for leisure	49%	39%	12%
I walk to my car	46%	16%	38%
I walk all the way to work	28%	13%	59%
I walk the dog	21%	4%	75%
I walk all the way to school	8%	3%	89%

- Approximately 3 out of 4 respondents walk frequently (3 or more days per week) to run errands, shop or for entertainment
- Approximately 3 out of 4 respondents walk frequently (3 or more days per week) to a bus stop or metro station.
- 3 out of 5 respondents rarely or never walk all the way to work.

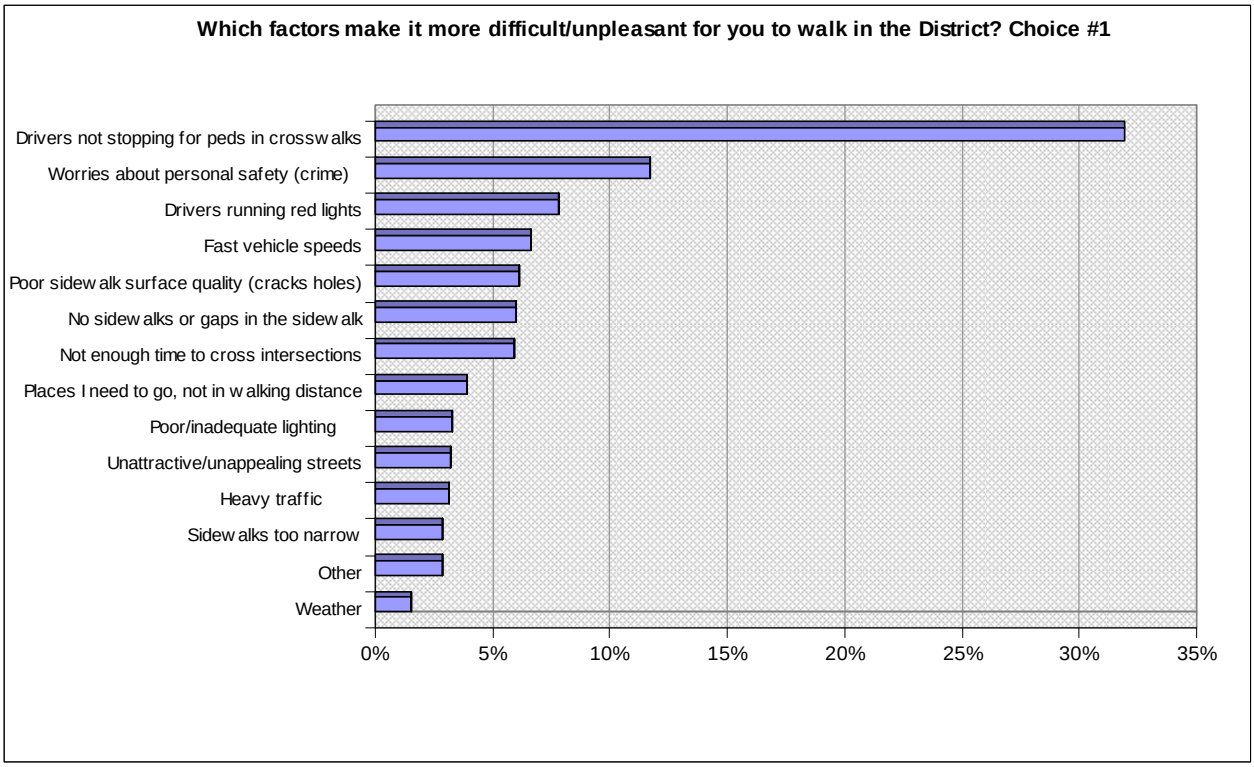
Critical Issue



- Almost half of survey respondents replied that unsafe street crossings are the most critical issue that people face while walking in the District.

- One-fourth of respondents replied that lack of personal safety is the most critical issue facing pedestrians in the City.
- Of the 14% of respondents who selected "Other", close to half wrote in that motorist behavior (aggressive/careless driving, failing to yield to pedestrians, excessive vehicle speeds) is the most critical issue that people face while walking in the District.

Factors Making it More Difficult or Unpleasant to Walk in the District



- When asked which factors make it more difficult or unpleasant to walk in the District, one-third of respondents selected "Drivers not stopping for pedestrians in crosswalks" as the number one factor.
- More than 10% of respondents replied that concern for personal safety (from crime) was the number one factor that makes it more difficult or unpleasant to walk in the District.
- Of those respondents who selected "Other", the most frequently cited factor that makes it more difficult/unpleasant to walk in the District is construction blocking sidewalks, followed by motorist behavior (talking on cell phones, not yielding, running stop signs), issues with intersections (long waits to cross, pedestrian-motorist conflicts), and sidewalk maintenance (uneven bricks, obstructions, snow removal).

Areas in Need of Improvement

Which areas of the District need the most improvements (such as new sidewalks or safer crossings) to improve your walking experience? Please rate each area according to need.

	No improvements needed		Some improvements needed		Substantial improvements needed		N/A or Don't Know
On major street corridors (i.e. Georgia Ave, Connecticut Ave)	324	6%	1,858	10%	1,536	**16%**	264
On neighborhood streets	289	5%	2,348	13%	1,215	**13%**	179
Near highway interchanges (i.e. BW Pkwy, Route 395)	173	3%	569	3%	1,115	**12%**	1,983
Near bus stops	433	8%	1,881	11%	893	9%	647
Near retail/shopping centers	564	10%	1,859	10%	827	9%	587
Near metro stations	830	15%	2,043	11%	743	8%	283
Near parks and other recreation destinations	497	9%	1,906	11%	726	8%	708
On bridges or overpasses	331	6%	1,230	7%	724	8%	1,531
Near schools	371	6%	1,333	7%	647	7%	1,465
Near tourist destinations	1,361	**24%**	1,448	8%	470	5%	553
Near service providers (i.e. hospitals, clinics)	488	9%	1,370	8%	445	5%	1,449
Other	61	1%	58	0%	251	3%	814

- Respondents to the online survey stated that substantial pedestrian improvements are most needed on major street corridors, followed by neighborhood streets, and highway interchanges.
- One-fourth of respondents replied that no improvements are needed near tourist destinations.
- Of the approximately 250 respondents who replied that substantial improvements are needed in "Other" areas, constructions sites were the most frequently cited area.

Destinations Needing Improvements

Please list any SPECIFIC DESTINATIONS in the District (such as the name of a school park shopping center or metro station) that need improvements to make walking safer and more comfortable.

The most frequently cited destinations in the District in need of improvements include:

- Columbia Heights Metro Station
- Dupont Circle
- Union Station
- Rock Creek Park
- Georgetown
- Friendship Heights Metro Station
- Adams Morgan
- Eastern Market
- Gallery Place/Verizon Center

Roads/Intersections Needing Improvements

Please list any specific ROADWAYS or INTERSECTIONS in the District that need improvements for pedestrians. For roadways please provide the street name from ___ and to___. For intersections please provide two roadway names.

The most frequently cited corridors needing improvements for pedestrians include:

- Connecticut Ave.

- Wisconsin Ave
- 14th Street
- Massachusetts Ave
- New York Ave
- Florida Ave

Demographics

Where do you live?	% of total
Ward 1	19%
Ward 2	19%
Ward 3	18%
Ward 4	7%
Ward 5	5%
Ward 6	17%
Ward 7	1%
Ward 8	1%
Maryland	5%
Out of the DC Metro Area	1%
Virginia	7%

Age (optional)	
0-20	1%
21-45	71%
46-65	25%
Over 65	4%

Gender (optional)	
Male	44%
Female	56%

Do you have a mobility limitation? (optional)	
Yes	3%
No	97%

- Wards 1, 2, 3, and 6 were evenly represented in the online survey responses (approximately 20% of respondents for each Ward). 5% of respondents reside in Ward 4, and 7% of respondents reside in Ward 5. Lower participation was received by residents of Wards 7 and 8.
- Almost three-fourths of respondents are between the ages of 21 and 45.
- A majority of respondents are female.
- Less than 5% of respondents reported a mobility limitation.

Citywide Public Meeting

Below are written comments that were gathered at the Citywide Public Meeting that was held on May 3rd, 2007.

What is the most critical issue that people face while walking in the District of Columbia?

- Cut-through traffic on residential streets which are caused by gridlock on arteries such as Wisconsin Avenue
- Vehicles entering the crosswalk and faulty crosswalk signals
- Constant battle with motorists in areas with and without traffic measures
- Right turns on red and crossing pedestrian walkways
- Crossing the streets
- Narrow sidewalks in some neighborhoods
- Pollution, noise and insufficient tree coverage
- Crossing dangerous intersections like 16th and 4th and the John P. Sousa Bridge

- Traffic signals that violate pedestrians' expectations or encourage drivers to violate pedestrians' expectations
- Unsafe drivers (speeding and using cell phones)
- Respect for laws/signs
- No enforcement of traffic laws
- Unsafe intersections
- Lack of sidewalks and gaps
- Great urban design providing eyes on the street and things for pedestrians and motorists to look at. Great trees that help slow traffic and provide shade for pedestrians. High performance infrastructure that provides multiple functions; stormwater, habitat, aesthetic.
- Commuters routed through residential streets.

2. Looking at the *Neighborhood Sidewalk Deficiency Map* (Board #2), do you know of any other sidewalk gaps that are not shown?

- Too many
- Q St. between 8th and 9th (NW), south side of street
- Do we really want to put concrete or cement on sidewalks? Shouldn't we find/use materials that are friendlier to the environment?
- 39th between Macomb and Newark, east side
- Map shows Kenyon Street and 14th street NW, but Park Street, west side of 14th has very poor and narrow sidewalks
- Do neighborhoods where people do not walk need sidewalks?
- Sidewalks are good on the Hill but the crosswalks are not safe, traffic does not stop for pedestrians (even children).

3. Looking at the *Proposed Priority Pedestrian Study Area* map (Board #5), do the highlighted corridors reflect the areas of the city with the most pedestrians and the worst conditions for walking?

- Pennsylvania Avenue corridor should be extended across the river because it is really bad for pedestrians on the SE side
- Some of them
- Macomb and Connecticut identified as a high crash area and priority pedestrian plan area, but there is no information on when the crashes occurred (rush hour?). Information should be more specific
- Eastern Avenue – there are bus stops on both sides between Bladensburg and Varnum Street
- No, the Hill (ward 6) is littered with dangerous intersections (Constitution Avenue is a speedway).
- Maryland Avenue, Constitution Avenue, Independence Avenue, C St. NE
- 8th/Massachusets/Constitution NE, Maryland/7th/D St. NW

Are there corridors highlighted that should NOT be prioritized for pedestrian improvements?

- Near bridges – connections to bridges (bike path)

Are there any other corridors with substantial pedestrian activity and poor or unsafe conditions for walking that you would like to see added to the map?

- 24th and Good Hope Road SE
- Anacostia Drive (between river and park land) cannot walk safely
- The 3100 block of Alabama Avenue SE is very difficult for pedestrians to cross
- Around the 9:30 club (Florida and 8th NW)
- 11th Street, Columbia Heights at intersections with high numbers of car crashes

Are there any other intersections with substantial pedestrian activity and unsafe conditions for crossing that you would like to see added to the map?

- 24th and Alabama Avenue next to Garfield Elementary
- Sousa Bridge on Pennsylvania Avenue
- 14th Street NW at G Street NW – traffic signal violates expectations of pedestrians crossing 14th Street on the south side of the intersection due to the exclusive left turn phase for southbound traffic on 14th Street. Pedestrians on the south side of G Street who are waiting to cross 14th Street see the red signal (for northbound traffic on 14th) and enter the intersection while southbound traffic still has a green light (which these pedestrians cannot see), so they routinely violate the signal and walk out into traffic. Perhaps better signage would help. Note that an incapacitating pedestrian injury occurred at this intersection in early 2007 (but that does not appear on the 2000-2006 map).
- 18th Street, Q, New Hampshire Avenue NW
- Near and around schools
- Improve paths/streets

4. Where do you live? (please check one)

X2 Ward 1	X2 Ward 4	X1 Ward 7	None - Virginia
X2 Ward 2	X2 Ward 5	X1 Ward 8	None - Other (please
X3 Ward 3	X3 Ward 6	None -Maryland	specify)_____

5. Please provide any additional comments below related to walking in the District of Columbia.

- Overdevelopment in the Friendship Heights area.
- DC exacerbates gridlock and causes frustrated motorists to cut through residential streets to avoid gridlock and causes vehicle and pedestrian accidents.
- Has it ever been a consideration to include a pedestrian only movement into an intersection's normal cycle?
- Mid-block crossings along some of DC's "super blocks" would improve the pedestrian environment.
- Ned to pay particular attention to intersections involving Washington's diagonal streets (Avenues). Many of these intersections form pedestrian environments that are difficult to negotiate.
- Looking at improvements to the pedestrian environment and quality of the public realm along the connections between the National Mall and downtown through the federal triangle would be good.
- Major improvements to the Pennsylvania Avenue and Constitution Avenue intersections are needed.
- The block of Bryant Street NW needs speed bumps now that it is one way (east bound). Channing has them; the two streets now operate as a one-way pair. Many commuters use Channing to get to the Washington Hospital Center, Howard University, etc. and they use Bryant to get home (to N. Capital Street). PM commuter traffic flies down this street.
- No schools (especially elementary) should be without traffic lights on a main through fair.
- Give the highest priority to safety of children and also provide/install benches for people to sit on.
- I'm depressed that you are dealing with streets and sidewalks without dealing with high performance infrastructure.
- There are a lot of locations that are arguably hazardous and easy to fix that do not show up on your risk maps because of low pedestrian volumes. One example is 13th Street NW at Rittenhouse Street NW. Traffic routinely drives 35-45 mph on 13th Street NW at this location, and visibility for pedestrians crossing 13th Street on Rittenhouse is poor because of the hill and curve on 13th Street.

There is a crosswalk across 13th Street at this location. The crosswalk should be eliminated immediately because it encourages unwary pedestrians to cross at a location where it is definitely not safe to cross. Pedestrians should walk 1 block south to Fort Stevens Drive to cross with the signal or 1 block north to Sheridan Street to cross where there is an acceptable sight distance.

- Eliminate right turn on red and put more lead pedestrian interval add to all new signals.
- New beige/grey stone/brick crosswalks without white painted lines (grids even better) don't get drivers' attention to what out for pedestrians.
- DC needs an enforceable system for intersections without traffic lights like the lighted crosswalks in London.
- 14th Street at the intersection between Park and Kenyon is very busy with lights (green is on at overlapping times for both directions).
- Park Street sidewalks are extremely narrow, especially when the new shopping stores open.
- Commuters directed to residential streets (off 295 to C street, Constitution Avenue, East Capitol)

Intercept Surveys – Summary of Responses

Below is a summary of responses that were gathered during pedestrian intercept surveys that were conducted along high priority corridors during the summer of 2007.

WARD 1 – 16th Street
Date: June 12, 2007; Time: 9:00 AM
Weather: Sunny (about 80 degrees)
Surveys Completed: 98; Response rate: 56% (completed surveys/total surveys offered)

1. What is the primary purpose of your walk today? *(check one)*

(44) To access transit (metro station or bus stop)
(15) To go to work
(16) To go shopping, run errands
(05) To go to a restaurant/movies/other entertainment
(05) To visit friends, go to the gym, etc.
(05) For exercise only
(01) To go to school
(07) Other: Sell papers, On vacation, Walk dog, Move car

2. Where is the most difficult place to cross the road along 16th Street?

- Irving (31)
- Harvard (22)
- New Hampshire (19)
- U Street (14)
- Columbia (11)
- Florida (2)
- Kalorama
- Girard
- Spring Cave
- George
- K Street
- Beekmon Place

3. Why is it difficult to cross at that location? *(check all that apply)*

(36) Drivers' behavior (failing to yield to pedestrians, speeding, running red lights and stop signs)
(15) Traffic signal is not long enough for me to cross
(13) No crosswalks
(04) No traffic light to stop cars
(03) Lack of personal safety (from crime)
(08) Crossing distance is too long
(01) No median island (or refuge)
(00) Missing or poorly maintained curb ramps
(30) Other: Accidents (3)
Light is to long (8)
Very congested (3)
Lights favor cars
Rush hour
Hard to get on and off of bus
Confusing (5)
Lights do not coincide with each other (2)
Angle on New Hampshire is odd and catches people off guard
North corner of New Hampshire needs a stop sign/no turn on red sign

4. What ward do you live in? *(check one)*

(41) Ward 1
(15) Ward 2
(05) Ward 3
(05) Ward 4
(02) Ward 5
(00) Ward 6
(02) Ward 7
(02) Ward 8
(12) Other: (Illinois, Maryland, Virginia, Langley Park, Graham, College Park, Hyattsville, Alexandria)

5. Do you have any additional comments about walking in the District of Columbia?

- To many accidents
- Construction
- Aggressive cars
- 18th and Florida

WARD 2 – New York Avenue
Date: June 19, 2007; Time: 9:00 AM
Weather: Sunny and hot (about 80 degrees)
Surveys Completed: 83; Response rate: 63% (completed surveys/total surveys offered)

1. What is the primary purpose of your walk today? *(check one)*

(32) To access transit (metro station or bus stop)
(26) To go to work
(13) To go shopping, run errands
(04) For exercise only
(03) To go to a restaurant/movies/other entertainment
(03) To visit friends, go to the gym, etc.
(01) To go to school

(01) Other: Going home

2. Where is the most difficult place to cross the road along New York Avenue?

- North Capitol (37)
- Florida Avenue (23)
- 1st Street (13)
- New Jersey (2)
- 4th Street (2)
- Eckington
- Q Street
- O Street
- Columbia

3. Why is it difficult to cross at that location? *(check all that apply)*

(50) Drivers' behavior (failing to yield to pedestrians, speeding, running red lights and stop signs)
(39) Traffic signal is not long enough for me to cross
(12) Crossing distance is too long
(05) No crosswalks
(04) Lack of personal safety (from crime)
(01) No median island (or refuge)
(01) No traffic light to stop cars
(01) Missing or poorly maintained curb ramps
(32) Other: Construction (2)
Volume (8)
Traffic (4)
No sidewalks
Crossing guard needed (at schools) (4)
Too many cars turning (right) (4)
No turn on red sign needed going east on New York Avenue
More beat cops in the area
Too many in and out streets
Drivers don't yield in the loop
Island where cars don't yield
Crosswalk in blocked by cars
Confusing
Cars coming off the bridge don't see pedestrians

4. What ward do you live in? *(check one) If they don't know, ask for their street and closest cross-street.*

(03) Ward 1
(20) Ward 2
(03) Ward 3
(02) Ward 4
(15) Ward 5
(06) Ward 6
(03) Ward 7
(04) Ward 8
(25) Other: (California, Maryland, Minnesota, Boston, Anne Arundel County, Silver Spring, Fairfax, Arlington)

5. Do you have any additional comments about walking in the District of Columbia?

(places you wish it were easier to walk to, ideas for making it safer to walk in your community)

- Sidewalks need repair
- Overpass
- Fix sidewalks and roads
- Yield to pedestrians
- Wheelchair
- More police on foot
- Clean drainage gutters so there is no standing water

WARD 3 – Wisconsin Avenue
Date: June 7, 2007; Time of day: 2:00 PM
Weather: Sunny (about 80 degrees)
Surveys Completed: 92; Response rate: 44% (completed surveys/total surveys offered)

1. What is the primary purpose of your walk today? *(check one)*

(37) To go shopping, run errands
(23) To go to work
(12) To access transit (metro station or bus stop)
(09) To go to a restaurant/movies/other entertainment
(04) To go to school
(03) To visit friends, go to the gym, etc.
(02) For exercise only
(02) Other: Pick up kids; Fresh air

2. Where are the three most difficult places to walk or cross the road on Wisconsin Avenue?

- Wisconsin and Jenifer (11)
- Wisconsin and Western (7)
- Wisconsin and Harrison (9)
- Wisconsin and Albemarle (7)
- Wisconsin and River (no lights) (7)
- Wisconsin and Warren (2)
- Tenley Circle (2)
- Wisconsin before Tenley Hill (pedestrians almost get hit)
- Wisconsin and Garrison
- Wisconsin and Military
- Wisconsin @ Fire Station (Tenley Town)
- Wisconsin and Massachusetts
- Fessenden Street (always blocked; hard to cross)
- Wisconsin and Brandywine
- Wisconsin and Van Ness
- Wisconsin and Mazza Galleria
- Wisconsin and Yuma
- Davenport Street
- Wisconsin and Willard

3. What is the most critical issue that people face while walking on Wisconsin Avenue?

(54) Driver behavior (failing to yield to pedestrians, speeding, running red lights and stop signs)
(23) Unsafe street crossings or intersections
(10) Missing or poorly maintained sidewalks
(03) Lack of personal safety (from crime)
(00) Not enough places nearby to walk/bike to
(24) Other: Irresponsible pedestrians
Construction
Traffic (2)
Jaywalking (4)
Not paying attention
No problems (4)
Crowdedness (2)
Cultural differences
Buses drive crazy
Panhandlers
Drivers use countdown signals to beat the lights
Pedestrians stopping in medians
Lights turn green to fast (2)
Not enough time to cross

4. What ward do you live in? *(check one)*

(03) Ward 1
(00) Ward 2
(34) Ward 3
(04) Ward 4
(09) Ward 5
(03) Ward 6
(02) Ward 7
(04) Ward 8
(30) Other: (Chevy Chase, Northern Virginia, Silver Spring, Connecticut Avenue, 19th and Florida, Arlington, Bethesda, Rockville, Glen Echo, Woodbridge, Cleveland Park, Takoma Park, Georgetown, Maryland, Montgomery County)

5. Do you have any additional comments about walking in the District of Columbia?

- Crime
- Illiterate people who are unable to read signs
- Dangerous school zones during morning rush hour
- Kids wait until the end of the traffic cycle then run across
- Cars are not patient
- 7-11 and Van Ness is unsafe at night (homeless)
- Too many people on cell phones (causes bad driving)
- M Street and Key Bridge (Driving east blocks the intersection at rush hour and holds up traffic)
- No stopping in residential areas
- Motorist versus pedestrians
- Wide streets – left/right hand turners

WARD 4 – New Hampshire Avenue
Date: June 8, 2007; Time: 9:00 AM
Weather: Sunny
Surveys Completed: 76; Response rate: 42% (completed surveys/total surveys offered)

1. What is the primary purpose of your walk today? *(check one)*

(23) To access transit (metro station or bus stop)
(21) To go shopping, run errands
(17) To go to work
(03) To go to school
(03) To visit friends, go to the gym, etc.
(02) To go to a restaurant/movies/other entertainment
(01) For exercise only
(06) Other: Going home

2. Where are the three most difficult places to walk or cross the road on New Hampshire Ave?

- New Hampshire and Georgia (44)
- New Hampshire and Quincy Street (13)
- New Hampshire and Farragut (5)
- New Hampshire and Missouri (3)
- Randolph (3)
- Grant Circle (2)
- Taylor (2)
- Rock creek Church and Georgia (2)
- New Hampshire and Emerson (dangerous for schools) (2)
- Crittenden Street
- New Hampshire and Sherman Circle
- Hamilton (needs traffic light)
- Shepard (short light)
- New Hampshire and 2nd

3. What is the most critical issue that people face while walking on New Hampshire Ave?

(47) Driver behavior (failing to yield to pedestrians, speeding, running red lights and stop signs)
(25) Unsafe street crossings or intersections
(02) Missing or poorly maintained sidewalks
(02) Lack of personal safety (from crime)
(01) Not enough places nearby to walk/bike to
(20) Other: No big issues (4)
Construction
Not enough time for pedestrians to cross (2)
Gang violence
The light is to short across New Hampshire but to long across Georgia
Jaywalking (2)
Have to wait for cars to stop at the lights
Pedestrians not paying attention (ipods/radios)
Not enough streetlights at night
Too many trees block the sight lines
Cars are eager to turn on red
Confusing lights
More beat police
Need stop signs or zebra crossings

4. What ward do you live in? *(check one)*

(08) Ward 1
(00) Ward 2
(03) Ward 3
(45) Ward 4
(02) Ward 5
(01) Ward 6
(06) Ward 7
(04) Ward 8
(05) Other: (Silver Spring, Columbia, Maryland) _____

5. Do you have any additional comments about walking in the District of Columbia?

- Streetlights are not replaced fast enough
- Would like bike lanes
- New roads are needed
- Keep the subways open longer
- Enforce existing traffic and pedestrian laws
- Need crossing lights at Georgia and Kennedy
- Need more police
- "I love walking in DC"
- Beautifying
- Improve traffic flow on 13th Street so people can cross
- Would like to see some trees in the medians
- Don't feel safe walking at night
- Rock Creek Church – don't cross at light
- Quincy Street – 3-4 intersections with high speeds
- Enforce Jaywalking laws

WARD 5 – Bladensburg Road
Date: June 19, 2007; Time: 11:30 AM
Weather: Sunny and very hot (about 90 degrees)
Surveys Completed: 73; Response rate: 70% (completed surveys/total surveys offered)

1. What is the primary purpose of your walk today? *(check one)*

(24) To go shopping, run errands
(20) To access transit (metro station or bus stop)
(12) To go to work
(03) To visit friends, go to the gym, etc.
(03) For exercise only
(01) To go to school
(00) To go to a restaurant/movies/other entertainment
(07) Other: Going home (3)
Save gas
Across town

2. Where is the most difficult place to cross the road along Bladensburg Road?

- Benning/H Street (14)
- Neal Street (9)
- South Dakota (9)
- New York Avenue (4)
- K Street (3)
- L Street (1)

- 15th Street (2)
- M Street (2)
- Earl Place – in front of/near apartments (5)
- Levis Street (4)
- Eastern (4)
- Lang Place
- 17th Street
- Banneker Drive

3. Why is it difficult to cross at that location? *(check all that apply)*

(33) Drivers' behavior (failing to yield to pedestrians, speeding, running red lights and stop signs)
(25) No traffic light to stop cars
(16) Traffic signal is not long enough for me to cross
(13) No crosswalks – *only on one side
(02) Crossing distance is too long
(00) No median island (or refuge)
(00) Lack of personal safety (from crime)
(00) Missing or poorly maintained curb ramps
(34) Other: Traffic/volume (13)
Jaywalking (2)
4-way intersections (4)
Too many streets come together (2)
Elderly need more time to cross (2)
Need a 4-way stop sign
Add stop signs
Drivers do not look/pay attention
Several streets merge/intersect
Need stop signs or speed bumps

4. What ward do you live in? *(check one)*

(01) Ward 1	(02) Ward 4	(06) Ward 7
(00) Ward 2	(39) Ward 5	(03) Ward 8
(01) Ward 3	(06) Ward 6	(15) Other: (Maryland, Baltimore, Suitland, Capitol Heights, Hyattsville, Potomac Avenue, College Park)

5. Do you have any additional comments about walking in the District of Columbia?

- More assistance for the handicapped
- Fix the street lights/traffic lights/walk lights
- Add more walk lights
- Build an overpass at this intersection
- Bus schedule are not correct
- Fix streets
- Ride free on bus on hot days
- Sidewalk repair for the handicapped
- There is no left turn signal on Eastern Avenue

- There is no right turn on red sign on the MD side of Eastern Avenue
- Apartments near Earl Place need wheelchair ramp
- Sidewalks need repair
- Streets need to be repaired
- Fix the streets
- Help the senior citizens
- Fix sidewalks

WARD 6 – M Street
Date: June 12, 2007; Time: 1:00 PM
Weather: Sunny (about 85 degrees)
Surveys Completed: 81; Response rate: 64% (completed surveys/total surveys offered)

1. What is the primary purpose of your walk today? *(check one)*

(28) To go to work
(20) To access transit (metro station or bus stop)
(19) To go shopping, run errands
(04) For exercise only
(02) To go to a restaurant/movies/other entertainment
(01) To go to school
(01) To visit friends, go to the gym, etc.
(06) Other: Pick up car
Go home

2. Where is the most difficult place to cross the road along M Street?

- M and South Capitol (19)
- M and 4th Street (17)
- M and 1st Street (10)
- M and 2nd Street (8)
- New Jersey Avenue (5)
- M and Half Street (4)
- M and 3rd Street (3)
- M and 6th Street (3)
- Navy Yard (2)
- Mid-block crossing east of New Jersey (2)
- Cushing Place
- Canal Street
- South Carolina Avenue
- New York Avenue
- M and 7th Street

3. Why is it difficult to cross at that location? *(check all that apply)*

(30) Drivers' behavior (failing to yield to pedestrians, speeding, running red lights and stop signs)
(15) Traffic signal is not long enough for me to cross
(14) No crosswalks
(04) Crossing distance is too long

(03) No traffic light to stop cars
(03) Lack of personal safety (from crime)
(02) No median island (or refuge)
(02) Missing or poorly maintained curb ramps
(38) Other: Jaywalking
Long lights
Bad parking habits
Construction (13)
Poor turning directions
People need to pay better attention (2)
No problems (2)
Traffic (5)
No sidewalks (8)
No crossing lights (5)
Unclear/confusing traffic lights (2)

4. What ward do you live in? *(check one) If they don't know, ask for their street and closest cross-street.*

(01) Ward 1	(02) Ward 4	(07) Ward 7
(02) Ward 2	(03) Ward 5	(03) Ward 8
(05) Ward 3	(24) Ward 6	(32) Other: (Maryland, Virginia, Rosslyn, Falls Church, Suitland, Capital Heights, Lakeridge, Alexandria, Bowie, Arlington, Greenbelt, La Plata, Crystal City, Delaware, Fairfax, St. Mary's, Great Falls)

5. Do you have any additional comments about walking in the District of Columbia?

- Need audio on pedestrian signals
- Jaywalking is common
- Pay government workers more
- Homeless
- Security is always an issue
- It is okay walking on M Street
- Some sections of the city are terrible
- Drivers run left turn, red lights

WARD 7 – East Capitol Street
Date: June 14, 2007; Time: 9 AM
Weather: Overcast/windy (about 70 degrees)
Surveys Completed: 77; Response rate: 56% (completed surveys/total surveys offered)

1. What is the primary purpose of your walk today? *(check one)*
(35) To access transit (metro station or bus stop)
(12) To go to work
(11) To go shopping, run errands
(06) For exercise only
(02) To go to a restaurant/movies/other entertainment
(02) To visit friends, go to the gym, etc.
(00) To go to school

(05) Other: Library (3)
Church
Going home

2. Where is the most difficult place to cross the road along East Capitol Street?

- Benning (52)
- East Capitol and 49th Street (8)
- Sycamore (3)
- East Capitol and 46th Street
- East Capitol and 47th Street
- Central Avenue
- East Capitol and 58th Street
- East Capitol and 60th Street

3. Why is it difficult to cross at that location? *(check all that apply)*

(45) Drivers' behavior (failing to yield to pedestrians, speeding, running red lights and stop signs)
(24) Traffic signal is not long enough for me to cross
(04) Lack of personal safety (from crime)
(05) No traffic light to stop cars
(06) No crosswalks
(01) No median island (or refuge)
(00) Crossing distance is too long
(00) Missing or poorly maintained curb ramps
(34) Other: Traffic (13)
Jaywalking (4)
Confusing pedestrian lights
Speeding
No problems (3)
Not paying attention/bad attitudes
No signs
Distance
Congestion
Signals not timed right
Not courteous drivers
Drivers do not use turn signals
Ambulances and police cars block traffic
Drivers do not slow down to turn on red

4. What ward do you live in? *(check one) If they don't know, ask for their street and closest cross-street.*

(01) Ward 1
(00) Ward 2
(00) Ward 3
(00) Ward 4
(00) Ward 5
(03) Ward 6
(62) Ward 7
(02) Ward 8
(09) Other: (Maryland, Virginia, Capitol Heights, Chesapeake)

5. Do you have any additional comments about walking in the District of Columbia?

- Son was hit by a car when not crossing carefully
- Fix the streets

- Bushes need to be cut/trimmed down
- Stop signs needed

WARD 8 – Alabama Avenue
Date: June 14, 2007; Time: 12:30 PM
Weather: Cloudy (about 70 degrees)
Surveys Completed: 79; Response rate: 81% (completed surveys/total surveys offered)

1. What is the primary purpose of your walk today? *(check one)*

(23) To access transit (metro station or bus stop)
(16) To go to work
(15) To go shopping, run errands
(06) For exercise only
(05) To visit friends, go to the gym, etc.
(03) To go to school
(02) To go to a restaurant/movies/other entertainment
(09) Other: Library
Going home (3)
Walking dog
Security

2. Where is the most difficult place to cross the road along Alabama?

- Stanton Road (15)
- 18th PL (14)
- 15th PL (11)
- Metro (6)
- Naylor Road (7)
- Congress (6)
- Everywhere along Alabama (3)
- 13th Street (2)
- 14th Street (2)
- Good Hope Road (2)
- 4th Street (near fire station) (2)
- Gainesville Street
- Wheeler Road
- Savannah Place
- Jasper Street
- Martin Luther King Jr. Blvd.
- Miller Road

3. Why is it difficult to cross at that location? *(check all that apply)*

(42) Drivers' behavior (failing to yield to pedestrians, speeding, running red lights and stop signs)
(25) No traffic light to stop cars
(18) No crosswalks
(14) Traffic signal is not long enough for me to cross
(02) Crossing distance is too long
(01) Lack of personal safety (from crime)

(01) Missing or poorly maintained curb ramps
(00) No median island (or refuge)
(35) Other: Traffic (5)
Jaywalking (4)
No problems (3)
Congestion (2)
Construction (2)
No signs
School kids
No crossing guard (7)
Accidents
Traffic lights don't change at the same time
Too many lights
More police protection
Speed bumps needed around schools
Hard to push strollers

4. What ward do you live in? *(check one) If they don't know, ask for their street and closest cross-street.*

(00) Ward 1
(00) Ward 2
(00) Ward 3
(01) Ward 4
(00) Ward 5
(00) Ward 6
(06) Ward 7
(63) Ward 8
(05) Other: (Maryland, Temple Hill)

5. Do you have any additional comments about walking in the District of Columbia?

- Motorcycles speeding
- Horse feces in the street
- Sidewalks need work
- Need a stop sign outside of shopping center at Alabama and Stanton
- Need speed bumps, speed cameras
- Roadside grates to stop cars from going on the sidewalks
- Need crossing guard, speed bumps, crossing lights, and cameras 50 yards east of 18th
- Put Metro bus stops in front on Turner Elementary School
- Dedicated left turns on Stanton and Alabama – east bound and west bound
- Crossing light and crossing guards are needed
- Speed bumps are needed
- Kids need crossing guards
- Yield signs are needed in school areas
- There are no yield signs

Appendix C ~ Pedestrian Policy Analysis/Recommendations

Existing policies and design standards regulate the infrastructure that both public and private entities construct in the District of Columbia, and ultimately determine the quality of the pedestrian environment. The District's *Department of Transportation Design and Engineering Manual* is the principal document that includes design standards for facilities that impact pedestrian travel such as roads, intersections, signals, sidewalks, pedestrian crossings, ADA requirements, traffic calming, pavement markings and signage. There are several other documents that provide standards for facilities that affect pedestrian travel including:

- Design Guidelines for Traffic Calming Measures for Residential Streets in the District of Columbia (July 2005)
- District of Columbia Temporary Traffic Control Manual Guidelines and Standards (2006)
- DDOT Pedestrian Safety and Work Zone Standards: Covered and Open Walkways (2007)
- District of Columbia Municipal Regulations
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, 2004
- Manual on Uniform Traffic Control Devices (MUTCD), 2003 – Current Edition
- AASHTO Green Book , 2004
- DDOT Public Realm Design Handbook – Final Draft (2007)
- Anacostia Waterfront Transportation Architecture Design Standards
- Highway Capacity Manual (2000)

A review of existing standards was conducted to ensure that pedestrians are appropriately accommodated in District policies. Recommendations to update or improve policies and standards follow the most current research on pedestrian safety and the best practices of other jurisdictions across the country.

A number of revisions are being proposed to the current MUTCD standards (2003 edition) which will be incorporated into a 2009 edition[1]. Many of the proposed changes provide additional clarity to existing pedestrian standards (i.e. criteria for marking crosswalks) or describe new tools or techniques to accommodate pedestrians (i.e. new crosswalk warning signs and the Pedestrian Hybrid Signal). Standards proposed for the 2009 edition of the MUTCD that were determined to be relevant and useful for improving DDOT pedestrian policies are recommended for eventual adoption by the District. These recommendations are included in the relevant policy discussion and are referred to as 2009 MUTCD changes.

The following pages include a review of and recommendations for amending the District's current pedestrian-related policies. Each policy review includes: a reference to the District's existing policy or standard on the topic; national best practice examples from other jurisdictions; and recommendations for updating or amending the District's policies or standards.

[1] These proposed changes were published in the Federal Register on January 02, 2008 by FHWA, and are open to comment until July 31st, 2008.

The policy review addresses the following topics:

Many of the policy recommendations are supported by recommended updates to the District's existing design standards. The Pedestrian Master Plan includes a review of existing DDOT design guidelines as well as draft proposals for new guidelines for pedestrian facilities in the District.

Access Management and Driveway Width

Current Policy

Design and Engineering Manual
31.4.3.1 Traffic Safety Division Requirements
All driveways must be flush with the grade of the sidewalk when crossing the entire sidewalk area;

Residential driveways should have a minimum 12 ft. width within the public space area. Driveway entrances should be flared (Type D) or have a maximum radius of 6 ft.

If any driveway is wider than 25 ft., then a 6 ft. wide pedestrian island must be provided between driveways.

A driveway shall be a minimum of 12 ft. in width and a maximum width of 25 ft.
All driveways shall not be less than 12 ft. in width for one-way traffic and 24 ft. for two-way traffic.

When changing the existing original use of any property, the property owner must submit a design for new driveways for this property.
All existing driveways must be restored with new curb and gutter, tree space and sidewalk

32.3.15 Driveways
*Existing Street – **AASHTO, Chapter VI.** No new driveway entrances to be constructed closer than 60 ft. from the intersection.*
*Proposed Street – **AASHTO, Chapter VI**. No new driveway entrances to be constructed closer than 60 ft. from the intersection.*

State of the Practice

Driveway Width

Seattle Municipal Code; Title 23 Land Use Code; Subtitle III Land Use Regulations

1. Residential Uses.
   a. Driveways shall be at least ten (10) feet wide. Driveways with a turning radius of more than thirty-five (35) degrees shall conform to the minimum turning path radius shown in Exhibit 23.54.030 B
2. Nonresidential Uses.
   a. Driveway Widths.
   (1) The minimum width of driveways for one (1) way traffic shall be twelve (12) feet and the maximum width shall be fifteen (15) feet.
   (2) The minimum width of driveways for two (2) way traffic shall be twenty-two (22) feet and the maximum width shall be twenty-five (25) feet.

Sacramento City Code
18.08.050 Maximum/minimum width and length.

A. For residential driveways serving one or two family dwellings with a maximum two-car parking area, the minimum driveway width shall be ten (10) feet; the maximum driveway width to serve a single-car parking space shall be fourteen (14) feet; and the maximum for a two-car parking space shall be twenty-two (22) feet. Except as provided below, driveways shall have minimum twenty (20) foot length behind the property line.

Access Management

Maryland State Highway Access Manual (January 2004)

2.4. Access Management should be thought of as an attempt to balance the need to provide good mobility for through traffic with the requirement for reasonable access to adjacent land uses. The use of access management techniques results in safer, more efficient travel along our State highways and preserves the benefits of investment, both public and private, in the transportation infrastructure. By reducing traffic congestion in urbanized areas, safety is improved, travel times are reduced, and site accessibility is enhanced.

2.4.1 Access Management Techniques. The following access management techniques, endorsed by FHWA, help to maintain highway safety, capacity and function:

- **Limit the Number of Conflict Points at Driveway Locations.** Points of potential conflict between different vehicular movements are good indicators of the potential for accidents at an intersection. The potential for vehicular crashes increases as the number of conflict points increases. Therefore, limiting the number of conflict points, most often accomplished by restricting certain turning movements at an access point, can be an effective safety measure. When left turns and cross movements are restricted at an intersection, the number of conflict points is significantly reduced.
- **Separate Conflict Points.** Intersections created by public streets and driveways represent basic conflicts areas. Adequate spacing between theses conflict areas is promoted through entrance and street spacing standards. Separating conflict areas reduces the complexity of interactions between vehicles and allows more room for drivers to negotiate speed changes and turning movements.

City of Chicago – Street and Site Plan Design Standards

- **Driveways** (page 19): Typically, driveway access is provided onto a public street rather than an alley. However, streets that have been designated as Pedestrian Streets or "P" Streets under the City's Zoning Code, may provide access to parking and loading only through alleys, and not via driveways onto streets. Pedestrian Streets are streets that are widely recognized as Chicago's best examples of pedestrian-oriented shopping districts, and are designated in outlying commercial districts (Section 17-3-0500) and Downtown Districts (Section 17-4-0500) in the Zoning Code.
- **Offsets** (page 20): In designing driveway access along streets in the downtown area, driveways should be located away from intersections to the extent possible to minimize traffic queuing problems. For example, entrance driveways on one-way streets should be located as far away as possible from upstream intersections to avoid queuing back through the intersections by entering vehicles waiting for pedestrians to clear, while exit driveways on one-way streets should be located away from downstream intersections to minimize the possibility of queued street traffic blocking the exit driveway and to avoid difficult weaving maneuvers by driveway traffic attempting to weave across the entire roadway close to the intersection. For parking facilities over 100 spaces in capacity, minimum corner clearances of 100 feet are recommended for entrance driveways located on the far side of intersections, or for exit driveways located on the near side approach of intersections. To further minimize queuing on-street at parking entrance driveways, the ticket gates inside the facility should be located the maximum distance feasible from the property line, based on an analysis of arrivals and queuing at the parking garage or lot, but never less than one vehicle length (20 feet) inside the property line.

Recommendations

The current DDOT policy controlling access management and driveway width generally reflects best practices; however these policies could be strengthened to improve the pedestrian environment along a roadway.

Expand driveway policy to address access management and limit conflict points. When properties are redeveloped, sold, or change use, consideration should be given to eliminating or consolidating existing driveways. Additionally, when roadways are being constructed, reconstructed or resurfaced, existing driveways should be reviewed for opportunities to consolidate or reduce their width to conform to the access management policy.

Example of a short driveway that cannot accommodate a typical vehicle without blocking the sidewalk

Consider a policy to restrict driveways in locations identified as high pedestrian activity zones, similar to Chicago's policy. This would support the goal of the District's *Great Streets* program to create more pedestrian and transit friendly corridors.

Develop design criteria for sidewalk offsets to tickets gates and garage doors to reduce the likelihood that a vehicle parked/idling in a driveway will block a sidewalk. This can be accomplished by requiring driveways be designed in 20-foot increments from the back edge of sidewalk to the garage door or end of driveway.

Reduce the minimum driveway width for residential uses from 12-feet to 10-feet, and establish a 14-foot maximum width following the Sacramento example. For commercial uses, the minimum width for two-way traffic should be reduced from 24-foot to 22-foot to reflect best practices.

Sidewalks

Current Policy

Design and Engineering Manual
CHAPTER 29 - PEDESTRIAN AND AMERICAN DISABILITIES ACT (ADA) FACILITIES
29.3 ADA Requirements
All pedestrian facilities shall be designed in accordance with ***ADA*** *regulations and the requirements of these Standards, whichever is safer for pedestrians, and also meet Traffic Safety Division's (DDOT) requirements.*

29.4.1.3 Slope
Cross Slope – Maintain 2 percent (maximum) or ¼ in. per ft. sidewalk cross slope towards the roadway. Maximum cross slope for sidewalks shall be 3 percent only as directed, since 3 percent does ***NOT*** *meet ADA requirements.*

Longitudinal Slope - Longitudinal slope shall be consistent with the street slopes but should not exceed 8 percent. Maximum longitudinal slopes are limited to 8 percent in all new development construction.

ADA Requirements for Steeper Longitudinal Slopes – Sidewalks detached from the curb, with greater than 5 percent longitudinal slope, shall be constructed to meet ADA requirements.

29.12 Pedestrian Minimum Clear Path
The minimum clear path around utility structures, street furniture and other encroachments shall be greater or equal to the sidewalk width. The minimum width is 36 inches.

29.4.1.1 Sidewalk Widths
Minimum Sidewalk Widths at Bus Stops – Minimum sidewalk with at bus stops shall be 6 ft., a traffic safety requirement.
Minimum Sidewalk Width - Minimum sidewalk width shall be 6 ft.

Additional Sidewalk Width - The District Project Manager may require additional width for activity areas and routes leading to these areas. The final sidewalk width shall be determined through additional study of higher pedestrian traffic areas. Most persons will avoid the area less than 30 in. away from the edge of the roadway and 18 – 30 in. from a building façade. Additionally, the presence of street furniture and other features will also reduce the effective width of a pathway for pedestrians. The minimum pathway must be no less than 36 in. However, if the existing sidewalk width is less than 36 inches, "passing pads" measuring 60" x 60" must be constructed every 200 ft. to allow disabled persons to pass one another. Crossing driveways and alleys are considered "passing pads".

29.4.1.2 Sidewalk Both Sides of Street
All new street designs shall include sidewalks on both sides of the street. All projects should consider the need for a sidewalk. Sidewalks should be included in projects if the pedestrian volume warrants a sidewalk or if the street is on a typical walkway to schools. For existing streets, the community should be consulted when the project consists of installing a new permanent sidewalk or replacing a temporary sidewalk with a permanent sidewalk.

CHAPTER 31 - SIDEWALKS, CURB AND GUTTER, MEDIANS, DRIVEWAYS AND ALLEYS
31.4.1 Sidewalks
All sidewalks shall have a minimum width of 6 ft. when separated from the roadway by a buffer strip. The width of the buffer strip should be a minimum of 4 ft. preferably 6 ft. for tree space. All sidewalks for arterials shall have a minimum width of 8 ft. with a 6 ft. buffer. "Standards for sidewalk treatment in downtown areas shall meet the current requirements of the ***Downtown Streetscape Regulations.*** *All downtown streets shall have a minimum sidewalk width of 16 ft. with 6 ft. buffer strip. Where no buffer strip is provided, the width of the sidewalk should be 16 ft., especially where there is no shoulder (aids in preventing truck overhangs or side view mirrors from hitting pedestrians). Where utility poles, sign supports, fire hydrants, tree boxes etc., are provided in the sidewalk, the minimum usable width of sidewalk shall be 3 ft. to allow for wheelchair passage. Where the adjacent roadway has a low level of service (D, E, or F), a wider sidewalk (8 ft.) should be considered.*

The maximum sidewalk cross slope is 2 percent. The maximum grade is 12:1 (8.3 percent). If the 12:1 grade is not feasible due to topography and other physical constraints, the least practical grade greater than 8.3 percent should be used.

CHAPTER 32 - GEOMETRIC DESIGN FOR COLLECTOR AND LOCAL STREETS

32.3.14 Sidewalks

Existing Street - Sidewalks to be reconstructed, if required, with a minimum cross-slope of 1 percent and a maximum cross-slope slope of 2 percent and meet requirements of ***Americans with Disabilities Act Accessibility Guidelines (ADAAG).*** *Proposed Street –* ***AASHTO, Chapter VI, ADAAG*** *requirements.*

DDOT Public Realm Design Handbook

This Public Realm Design Handbook has been developed by the District Department of Transportation as a resource for property owners, developers, architects, planners, landscape architects, and engineers involved with the design, permitting, and construction of improvements located within the public realm. The public realm in this handbook refers to all the key elements in the city's public Right-of-Way, including roadways, sidewalks, planting areas, intersections, alleys, plazas, and other open spaces throughout Washington, DC.

With any new construction, development or substantial renovation of a property that affects public space, it is required that the property owner upgrade all streetscape elements along the frontage of that property to current DC standards.

State of the Practice

Montgomery County, MD

Montgomery County Code, Chapter 49, Streets and Roads. See the Design Standards Table on the following page for an example of a ROW improvements table. ***Note: The table should be used as a model for organization/formatting, not for content.***

City of Chicago – Street and Site Plan Design Standards

The City of Chicago requires a 6 foot minimum width sidewalk on all streets and a 4 foot minimum width landscaped buffer.

TABLE 1 - LOCAL/RESIDENTIAL STREET CROSS-SECITON WIDTH STANDARDS

	Parkway				Roadway			Parkway					
Street Operation Type	Offset to Property Line	Sidewalk	Parkway Landscape Area	Curb	Parking Lane	Travel Lanes	Parking Lane	Curb	Parkway Landscape Area	Sidewalk	Offset to Property Line	Total Right-of-Way	Total Face-to-Face Width
Two-Way Parking Both Sides	1'	6'	4'	0.5'	7'	10'-10'	7'	0.5'	4'	6'	1'	57' min.	34'
	1'	6'	8.5'	0.5'	7'	10'-10'	7'	0.5'	8.5'	6'	1'	66'	34'
Two-Way Parking One Side	1'	6'	4'	0.5'	7'	10'-11'	---	0.5'	4'	6'	1'	51' min.	28'
	1'	6'	11.5'	0.5'	7'	10-11'	---	0.5'	11.5'	6'	1'	66'	28'
Two-Way No Parking	1'	6'	4'	0.5'	---	11'-11'	---	0.5'	4'	6'	1'	45' min.	22'
	1'	6'	14.5'	0.5'	---	11'-11'	---	0.5'	14.5'	6'	1'	66'	22'
One-Way Parking Both Sides	1'	6'	4'	0.5'	7'	14'	7'	0.5'	4'	6'	1'	51' min.	28'
	1'	6'	11.5'	0.5'	7'	14'	7'	0.5'	11.5'	6'	1'	66'	28'
One-Way Parking One Side	1'	6'	4'	0.5'	7'	15'	---	0.5'	4'	6'	1'	45' min.	22'
	1'	6'	14.5'	0.5'	7'	15'	---	0.5'	14.5'	6'	1'	66'	22'
One-Way No Parking	1'	6'	4'	0.5'	---	16'*	---	0.5'	4'	6'	1'	39' min.	16'*
	1'	6'	17.5'	0.5'	---	16'*	---	0.5'	17.5'	6'	1'	66'	16'*

Sidewalk width of 5' allowable in RS and Manufacturing Zoning Districts - See Table 1B

* 16-foot width only to be used as special exception, approved by CDOT and Fire Department

Montgomery County, MD

49-32[2]. Minimum requirements for types of roads.

(a) The design standards in the table below govern the construction or reconstruction of any County road except Rustic Roads and Exceptional Rustic Roads.

Classification	*Road/Lane Width ('urban')*	*Road/Lane Width ('other')*	*Planned Bike Lanes*	*Sidewalk ('urban')*[6]	*Sidewalk ('other')*[6]
Freeway	12' lanes	12' lanes	none	none	none
Major Highway[1,3]	11' lanes	12' lanes	5' wide[2]	5+' wide	5' wide
Parkway[1]	11' lanes	11' lanes	none	none	none
Arterial[1,4]	10.5' lanes	12' lanes	5' wide[2]	5+' wide	5' wide
Minor Arterial[1,4]	10.5' lanes	11' lanes	4' wide[2]	5+' wide	4' wide
Business District Street[1]	10.5' lanes	11' lanes	none	5+' wide	5' wide
Industrial Street[1]	10.5' lanes	11' lanes	none	5+' wide	5' wide
Primary Residential Street (with curbs, no parking)[53]	22' road	22' road	3' wide[2]	5+' wide	4' wide
Primary Residential Street (with curbs, 1-side parking)[53]	28' road	28' road	3' wide[2]	5+' wide	4' wide
Primary Residential Street (with curbs, 2-side parking)[53]	34' road	34' road	3' wide[2]	5+' wide	4' wide
Principal Secondary Residential Street (with curbs, no parking)	22' road	22' road	none	5+' wide	4' wide
Principal Secondary Residential Street (with curbs, 1-side parking)	28' road	28' road	none	5+' wide	4' wide
Principal Secondary Residential Street (with curbs, 2-side parking)	34' road	34' road	none	5+' wide	4' wide
Secondary Residential Street (with curbs, no parking)	20' road	20' road	none	5+' wide	4'3.5' wide
Secondary Residential Street (with curbs, 1-side parking)	20'18' road	20'18' road	none	5+' wide	4'3.5' wide
Secondary Residential Street (with curbs, 2-side parking)	24' road	24' road	none	5+' wide	4'3.5' wide

(1) Add 1 foot of width to each lane abutting an outside curb. Add another 1 foot of width to each lane abutting an outside curb if a shared-use roadway is consistent with the Countywide Bikeways Functional Master Plan or the applicable area master or sector plan.

(2) Bike lanes must be included when a road is constructed or reconstructed only if bike lanes are consistent with the Countywide Bikeways Functional Master Plan or the applicable area master or sector plan. This bike lane width replaces the added width under paragraph (1).

(3) For an open-section Major Highway add 4 feet of width on each road edge for a paved shoulder. If a bike lane is provided on a road edge, the bike lane replaces this additional width.

(4) For an open-section Arterial, Country Arterial, or Minor Arterial add 2 feet of width beyond the edge of the outside lane for a paved shoulder. If a bike lane is provided on a road edge, the bike lane replaces this additional width.

(5) For a Primary Residential Street, the total curb-to-curb width must be the sum of the road width and any master-planned bike lane widths.

(6) Sidewalks are required on both sides of roads and streets except for Secondary and Tertiary Residential Streets, where the Planning Board may require a sidewalk on either one or both sides of a street, depending on the housing density and potential use of sidewalks. Alleys must not have sidewalks.

[2] Montgomery County Code, Chapter 49, Streets and Roads

Recommendation

Sidewalk Network

The language in Section *29.4.1.2 Sidewalk Both Sides of Street* should be strengthened. Sidewalks should be required on both sides of the street for all projects (when reconstructing or rehabilitating existing streets and new construction and redevelopment of adjacent land) except when infeasible, when severe negative impacts to street trees are encountered, or when one side of the street is undeveloped. Factors requiring a sidewalk on one side only should be at the discretion of the Chief Engineer and the ADA Coordinator.

A comprehensive pedestrian network includes sidewalks along the road as well as sidewalks or paths providing pedestrians with a connection to building entrances. Include requirements for sidewalk or pathways from the right-of-way to building entrances. Minimum widths and ADA standards for these facilities should be established.

Curb Walks

On new construction, require a 12 to 32 inch curb walk between parked vehicles and planters strips when the available right-of-way will meet the minimum planter and sidewalk width required. This will improve access to vehicles and minimize disturbance to the vegetation in the planter strip.

Example of a curb walk, wide sidewalk, and planting strip on New Jersey Avenue, SE – Photo by Heather Whitlow (photo courtesy of Casey Trees)

Sidewalk and Planting Strip Width

The District's sidewalk and planting strip minimum width standards are on par with best practice examples across the country. Many jurisdictions are updating minimum sidewalk widths from 4 or 5 feet to 6 feet which matches the District's standard.

To ensure that sidewalk and planting strip widths are clearly established for each road type, develop a table that clearly outlines basic design criteria for right-of-way (ROW) improvements similar to the tables shown for Chicago and Montgomery County. Clearly communicated design standards will help ensure that appropriate pedestrian facilities are included with all road construction or retrofit and redevelopment projects. Standards for special district (such as Downtown, Great Streets, or a Historic District) or any area plans would supersede the requirements presented in this type of table. A ROW table may include the following design criteria:

- Road type/classification
- Required placement of sidewalks (both sides of street)
- Minimum sidewalk width
- Minimum planting strip width
- Curb and gutter requirements
- Pedestrian demand/capacity
- Curb walks

Cross Slope and Clear Path

Update requirements for cross slope and minimum clear path to reflect current ADA guidelines.

Section 29.4.1.3:

- Remove the statement "Maximum cross slope for sidewalks shall be 3 percent only as directed, since 3 percent does **NOT** meet ADA requirements". ***Section 31.4.1 Sidewalks*** already states that 2 percent is the maximum cross slope which is what ADA requires.
- ADAAG does not limit longitudinal slope for sidewalk along a curb. The following statement: "Longitudinal slope shall be consistent with the street slopes but should not exceed 8 percent" should be amended to "Longitudinal slope shall be consistent with the street slopes. It is preferred that longitudinal slopes do not exceed 8 percent."

Tree Box and Furnishing Area

Current Policy

Design and Engineering Manual
CHAPTER 47 – LANDSCAPE DESIGN CRITERIA
47.3.1 Local Streets
For all residential local streets, the adjacent homeowner shall be responsible for planting and maintaining the ROW behind the sidewalk.

47.3.2 Local Street Commercial
For all commercial local streets, the adjacent property owner shall be responsible for designing, planting and maintaining the ROW behind the curb.

47.3.6 Tree Box
Tree boxes shall consist of rod iron loops and borders on three sides. No landscape fabric or stone mulch is permitted in the tree boxes. When replacing trees in an existing row, select new trees of similar ultimate characteristics to those being replaced, including form, scale, texture, size and color. Tree boxes in the Downtown Streetscape Impact Area shall be in accordance with the DDOT Downtown Streetscape Regulations, August 2000 or latest edition. The following items are requirements to be followed in the design of trees and their location in order to reduced utility conflicts:

- *Trees shall not be planted closer than 40 ft. from the curb face at intersections and street corners within the site distance triangle.*
- *Trees shall not be planted within 40 ft. of a controlled intersection, or other traffic control device (this does not include "No Parking" signs).*
- *Within the Sight Distance Triangle, non-plant materials over 32 in., or plant materials over 6 in. high, are not permitted.*
- *Maintain the minimum sight distance triangle and corner triangle distances for safe view of oncoming traffic and pedestrians.*
  - *Trees to be planted a minimum of 10 ft. from a driveway or alley.*
  - *Trees to be planted a minimum of 15 ft. from a light pole, preferably 20 ft.*
  - *Trees to be planted a minimum of 10 ft. from a fire hydrant.*
  - *Trees should be located in the middle of the tree lawn space.*
  - *Trees shall be designed to ensure the driver's visibility of all regulatory signs.*
  - *Additionally, trees shall not be planted:*
    - *directly in front of a sidewalk or the steps to a dwelling,*
    - *where existing public or private tree cover will interfere with a tree's growth,*
    - *in front of forested or open areas where there are no existing dwellings.*

47.4.1 Street Trees
Design for street trees should respond to the uses on the street. The following factors are guidelines for determining how and when trees should be used within the landscaping areas. They are:

- *Where tree lawns do not exist, tree grates or pavers are recommended to protect tree roots and pedestrians.*
- *Use tree grates where pedestrian traffic is high. Minimum openings on the tree grates are 24 in. diameter. Pavers shall be inserted into the holes in the grates.*

State of the Practice

Anacostia Waterfront Transportation Architecture Design Standards
These standards are considered a draft and do not apply to the entire city, therefore they are not discussed under the current policy section. However, they offer guidance on the selection of vegetation materials and scales, including supporting structures such as grates, bed siding, and growing medium:

Section 4: Median
Roadway medians can control pedestrian circulation, enhance safety and protect plants and trees from harmful pollutants from the roadway surface. The width of the median shall determine the type of planting or softscape. Understory plants may be used near crosswalks and major intersections for color interest and textural enhancement.

Median Widths	Planting Type
Less than 4'-0"	Hardscape or understory planting
4'-0" – 6'-0"	Lawns, understory planting, columnar tree
6'-0" – 10'-0"	Lawns, understory planting, columnar shade or ornamental tree
10'-0" – 16'-0"	Lawns, understory planting, ornamental or shade tree
18'-0" and wider	Lawns, understory planting, ornamental or all shade trees

Section 11: Planting Zone- Surface Treatment
Unit Pavers set over the contiguous root zone in the furnishing/planting zone provide a walking surface and also maximize planting soil areas for root growth. Permeable pavers shall be solid interlocking paving units complying with ASTM C 936 made from normal–weight aggregates with openings specifically designed to allow water infiltration. Granite (or other approved material) pavers shall be placed in a pattern with ½ inch joints to allow water infiltration.

Tree grates protect immediate surface of the tree planting area from soil compaction. Tree grates also provide an accessible clear path of travel on narrow urban sidewalks. Design standards include:

- Material: Cast iron or aluminum.
- Dimensions: 48" x 96" rectangular, (2) 2' sections extend the tree grate to be 144" long –optional.
- Gap Openings: 3/8" maximum slot openings for ADA compliance and pedestrian safety.
- Orientation: Longer side parallel to curb.
- Lightwells: Tree grates shall have lightwells. Lightwell covers shall be bolted to tree grates, as per manufacturer's recommendation. Finish shall match tree grates.

In addition to protecting the immediate surface of the tree planting area from soil compaction and providing accessible clear path of travel on narrow urban streets, custom designed tree grates provide an opportunity to integrate artwork into the streetscape to celebrate the unique character and history of an area or neighborhood. The design of the openings may vary and must conform to typical standards and ensure that the design meets ADA accessibility regulations.

> Use a raised planter edge to hold soil and mulch in place. Raised planter edges can also direct pedestrian travel paths, prevent soil compaction, and help define a space. Planter edging is effective if roots are above grade. Metal tree guards help direct pedestrian travel paths, prevent soil compaction, and define a space.

Portland, Oregon Pedestrian Design Guide, 1998
The Furnishings Zone buffers pedestrians from the adjacent roadway, and is also the area where elements such as street trees, signal poles, utility poles, street lights, controller boxes, hydrants, signs, parking meters, driveway aprons, grates, hatch covers, and street furniture are properly located. Wherever it is wide enough, the Furnishings Zone should include street trees.

In commercial areas, this zone may be paved; with tree wells and planting pockets for trees, flowers and shrubs. In other areas, this zone generally is not paved except for access walkways, but is landscaped with some combination of street trees, shrubs, ground cover, lawn, or other landscaping treatments.

All grates within the sidewalk shall be flush with the level of the surrounding sidewalk surface, and shall be located outside the Through Pedestrian Zone. Ventilation grates and tree well grates shall have openings no greater than 13 mm (0'-1/2") in width. Designers should consider using tree well grates or treatments such as unit pavers in other areas of intense pedestrian use, such as Pedestrian Districts.

Cambridge Pedestrian Plan
The Cambridge, Massachusetts Pedestrian Plan, published in 2000, provides the following information on the placement of street trees:

> Trees should only be planted on streets that have adequate sidewalk widths to maintain a minimum 3 foot path of travel. On sidewalks that are too narrow to accommodate trees without infringing on the pedestrian travel zone or utilities, residents may request that the City plant a tree in their yard near the sidewalk. Trees can be planted in curb extensions provided they do not interfere with the visibility of pedestrians waiting to cross the

street or motorists turning corners. Trees should not be planted where they would be in the way of people getting on or off buses or interfere with the operation of utilities.

The selection of trees should be coordinated with the City arborist. Trees with root systems that won't become a trip hazard should be selected. Continued review will be conducted on types of trees and planting techniques to maintain accessible sidewalks. Trees should be pruned to ensure that their branches do not interfere with pedestrian and vehicular visibility and movement.

City of Chicago - Street and Site Plan Design Standards – Newspaper Boxes, Mailboxes, Benches and Trash Cans.

Permits for miscellaneous street furniture are regulated by the Department of Business Affairs and Licensing with a Use of the Public Way Permit (a grant of privilege) in the public way. Structures should be located a minimum of 2 feet from the face of curb to the edge of the kiosk, and should provide for 6 feet of clear sidewalk width for passage of pedestrians, except downtown, where 9 feet of clear sidewalk should be provided. They should not be located so as to obstruct the sight triangle (12 feet on each side) of an adjacent driveway or mid-block crosswalk, and should be a minimum of 30 feet from an intersection on the near side approach, and 20 feet from the intersection on the far side. Grants of Privilege for permanent advertising sign kiosks bolted to the public way cannot be accepted within the Greater Downtown Area. Private kiosks/ground structure signs are not recommended by CDOT and require special permission and ordinance.

Recommendation

Adopt the standard terminology proposed in the District's *Public Realm Design Handbook* to describe the pedestrian realm and edit all policies, standards, and guidelines to reflect the adopted terminology. Incorporate definitions for curb zone, furnishing zone, and pedestrian through zone similar to the definitions Portland, OR has established.

Expand the current policies on vegetation to include issues discussed in the *Anacostia Waterfront Transportation Architecture Design Standards, Cambridge Pedestrian Plan*, and *Portland, Oregon Pedestrian Design Guide*. Provide guidance on how ground treatments in vegetation zones are selected, including design standards for implementation. This includes information on medians, tree grates, pavers, and planter edging. Design standards for tree grates, pavers, and other supporting materials will increase the visual connectivity of areas and neighborhoods for pedestrian travelers.

Modify policies on where trees cannot be planted as listed in 47.3.6. Because street trees provide shade, slow traffic, and create a friendlier pedestrian environment, there is no reason to say that "trees shall not be planted…in front of forested or open areas where there are no existing dwellings." Also modify guidance to not plant trees "directly in front of a sidewalk or the steps to a dwelling" since in some cases site distance, utilities and spacing requirements may make this the only space available for a street tree.

Currently, responsibility for maintenance of tree grates on street trees falls to the adjacent property owner. As trees grow the grates are almost never enlarged to accommodate the growth, causing many street trees to die before reaching maturity. Discourage tree grates except where sidewalks are very narrow.

Add guidelines for insuring ADA compliance and pedestrian accessibility. Focus on maintaining clear paths of travel for pedestrians and maintaining a flush surface between tree grates and the adjacent pedestrian through zone (to reduce tripping hazard). The impact on pedestrian travel paths should be considered when raised planters and tree guards are used, in order to insure an easily navigable path for pedestrians. Tree space design techniques that minimize conflicts between tree roots and sidewalks should be encouraged both to prevent sidewalk heaving and to create a better growing environment for trees.

Formally adopt guidelines for the protection of street trees during construction, as outlined by the *Anacostia Waterfront Transportation Architecture Design Standards* and by guidance from DDOT's Urban Forestry Administration. Street trees create shade, reduce pollution, provide separation for vehicular and pedestrian traffic, and add visual interest to the pedestrian streetscape. As such, add a stipulation similar to that found in the *Cambridge Pedestrian Plan* to allow residents to apply for the installation of street trees on private property in areas where sidewalk width and utility restraints prevent plantings in the public ROW.

Develop a policy similar to the City of Chicago's regulating the placement of street furniture along the roadway and at intersections.

Crosswalk Marking Design

Current Policy

District of Columbia DOT Pavement Marking Guidelines (April 8, 2002)

Crosswalks

Crosswalks should be marked at all intersections, unless otherwise noted. All crosswalks must have a minimum 15-foot width. Crosswalk edge lines are six inches (6") wide and the lines must be parallel to each other. Install handicap ramps for each direction of crosswalk travel. The entire handicap ramp, including the side flared, must be located within the crosswalk at all time.

- *The side flare of a handicap ramp must align as close as possible to the back edge line of the crosswalk. Each crosswalk must have two handicap ramps, one on each side of the street. There is a maximum 20-foot width for any type of crosswalk. At the top of each ramp, there must be a minimum five-foot clearance between ramp and an obstruction. On the plans, dimension all crosswalks wider than 15 feet.*
- *The ramp of the handicap ramp must have a 12:1 slope, scored with non-slip surface, and built to D.C Standards.*
- *Striped crosswalk (longitudinal) lines are two-foot wide, with two-foot spacing and striped must be parallel to the curb of the street. Include six-inch edge lines, with the stripes. Stripes crosswalks are located at predetermined intersections, such as high hazard pedestrian-crossings -, leading to a block with a school in it; within a designated school zone area, such as a school route; and at children's playground areas and when using center of the radius ramps. Do not use diagonal lines within a crosswalk.*
- *All "center of the radius handicap ramps" locations at corners will require pre-approval for their location, from the Traffic Safety Division before installation. Crosswalks leading to these ramps require special longitudinal striping. No longer allowed, ADA meeting (Feb. 2004) must have handicap ramp for each crosswalk direction.*
- *Minimum twenty-foot wide crosswalks have the following boundaries and include the boundary streets. Bounded on the north by Massachusetts Avenue, NW; on the east by North Capitol Street and the south by Constitution Avenue, NW and on the west by 23rd Street, NW. If a building site street is located adjacent to the Downtown Streetscape area, then all streets and intersections will be part of this requirement, even if located outside of the above boundary streets.*

Design and Engineering Manual

CHAPTER 29 - PEDESTRIAN AND AMERICAN DISABILITIES ACT (ADA) FACILITIES

In the light of the above requirements, crosswalk width shall be a 15 ft. minimum and it may be increased up to 20 ft., to allow for the ramp accommodation. Before the crosswalk width is increased to 20 ft. where a traffic signal is involved, the Traffic Services Administration's, Signal Branch must be contacted to insure there is no conflict with the signalization.

CHAPTER 31 - SIDEWALKS, CURB AND GUTTER, MEDIANS, DRIVEWAYS AND ALLEYS

31.2.4 Crosswalks

Crosswalks at intersections shall be designed on a case-by-case basis, as directed by the Department. Brick patterns, 4 in. by 8 in., stamped or scored joints on concrete pavement, with 8 in. wide granite shorelines, may be considered when approved by the Department.

CHAPTER 43 - GUIDELINES FOR PAVEMENT MARKINGS AND SIGNAGE

43.3.1 Legend of Pavement Markings (If shown:)

- *Crosswalks shall be 15 ft. wide, unless otherwise noted.*
- *Crosswalk lines shall be white and 6 in. wide.*
- *Parallel line crosswalks are 2 ft. wide (white stripes) with 2 ft. spacing.*
- *Make stripes parallel to the curb line of the street. Edge lines are 6 in. wide.*
- *All handicap ramps must be located within a crosswalk, including side flares of the ramps. At least one side flare must align as close as possible to the back edge line of the crosswalk.*
- *Stop lines are white and 12 in. wide (unless otherwise noted) and are located 6 ft. before crosswalk line. Stop lines are parallel to crosswalk lines.*

43.3.2 Special Pavement Marking Areas

- *All crosswalks shall have a minimum 20 ft. width whenever possible within the Downtown Central Business District (CBD), including the Downtown Streetscapes Area. This area is currently bounded on the east by 3rd Street, N.W., on the south by Independence Avenue, S.W., on the west by 23rd Street, N.W. and on the north by Massachusetts Avenue, N.W. and includes the full width of the boundary streets. The contractor should always contact the DDOT*

Transportation Policy and Planning Administration (TPPA) for CBD limits, since the CBD limits are occasionally modified and TPPA determines the limits. Except in all residential areas (no commercial buildings present) the crosswalks may have a minimum width of 15 ft.

- *All crosswalks throughout the rest of the city shall be 15 ft. wide, unless otherwise noted.*

43.4 Stop Lines

- *Stop lines are white and 12 in. wide.*
- *Stop lines are to be parallel to the crosswalk.*
- *There shall be a 6 ft. clear space between the back edge line of the crosswalk line and the stop line.*
- *Stop lines are required at all signalized intersections, unless otherwise indicated.*
- *Must have a valid reason for not including at that location.*
- *When a Stop Sign is present a Stop Line is required. Stop lines should align with the Stop Signs if possible.*
- *Stop lines can be installed at other locations as specified by the Traffic Services Administration.*

43.7.1 Definitions of Crosswalk Lines

Crosswalk lines are 6" wide white lines and a minimum of 10 ft. wide located at the intersection or in mid block to designate the areas in which pedestrians walk to cross a street. Refer to AASHTO or the MUTCD for any additional requirements.

43.8 Minimum Parking Distance From A Crosswalk (Location of Parking An Intersection)

NOTE: NO PARKING IS ALLOWED WITHIN AN INTERSECTION

43.8.1 General Restrictions

- *If there are restrictions limiting where parking is allowed, these are the following signs which will limit the distance to and from each intersection as to where parking will be allowed: NO STANDING OR PARKING ANYTIME, NO PARKING ANYTIME, NO STANDING OR PARKING METRO BUS ZONE, NO PARKING OR STANDING with (RUSH HOUR/TIME LIMIT RESTRICTIONS).*
- *If no parking restrictions are present, then parking spaces shall be installed as follows:*
  - *If a stop line is present or if a stop line is not present, parking is restricted to within 40 ft. of the intersection (P.I.)*

State of the Practice

Portland, Oregon Pedestrian Design Guide. 1998

Crosswalk Marking Guidelines:

- Use parallel pavement markings for signalized or stop-controlled crosswalks. A parallel pavement marking consists of two 300 mm (1'-0") wide stripes placed 3 m (10'-0") apart (inside dimension) to delineate the outside edges of the crosswalk, parallel to pedestrian travel. Where there is a compelling reason to narrow the crosswalk, the inside dimension between stripes may be reduced to as narrow as 1.9 m (6'-0").
- Use ladder pavement markings for crosswalks at school crossings, across arterial streets for pedestrian-only signals, at midblock crosswalks, and where the crosswalk crosses a street not controlled by signals or stop signs. A ladder pavement marking consists of 600 mm (2'-0") wide, 3 m (10'-0") long bars on 1.5 m (5'-0") centers, with the bars placed perpendicular to pedestrian travel.
- Where the Sidewalk Corridor is wider than 3.7 m (12 ft) the crosswalks may be wider than the standard width to match the Sidewalk Corridor.
- At midblock locations, marked crosswalks are always accompanied by signing to warn drivers of the unexpected crosswalk.
- The crosswalk should be located to align as closely as possible with the Through Pedestrian Zone of the Sidewalk Corridor.
- Where traffic travel lanes are adjacent to the curb, crosswalks should be set back a minimum of 600 mm (2'-0") from the edge of the travel lane.

Intersection parking restrictions:

- In front of or within five (5) feet of the intersection of the side lines of a public or private driveway with the nearest roadway edge of pavement;
- Within an intersection or within twenty-five (25) feet of an intersection;
- Within ten (10) feet of a fire hydrant, except to the extent authorized as a taxicab stand by the city traffic schedule and appropriate signage;

- On a crosswalk or within twenty (20) feet of the center of any crosswalk;

Oregon Pedestrian and Bicycle Plan, July 2007

Crosswalks should be 10 ft wide, or the width of the approaching sidewalk if it is greater.

The standard in many jurisdictions has been two parallel lines. The staggered continental crosswalk marking is more visible and effective, with the advantage of reduced long-term maintenance costs due to less wear and tear: stripes are placed outside of the wheel tracks, reducing the need to repaint often. Staggered continental crosswalks are recommended at midblock crossings and at intersections not controlled by a stop sign or traffic signal. Signalized intersections may be marked with two parallel lines.

The Manual on Uniform Traffic Control Devices

The *Manual on Uniform Traffic Control Devices* (*MUTCD*) indicates that no parking should be located 20 feet in advanced of a crosswalk. This helps prevent screening of both pedestrians and motorists from each other. If used, stop lines should be placed a minimum of 4 feet in advance of the closest marked crosswalk line and should be no more than 30 feet from the crosswalk.

Pedestrian Facilities Users Guide, FHWA

The *Pedestrian Facilities Users Guide*, published by the Federal Highway Administration (FHWA) in 2002, offers the following guidance on textured crosswalks:

> Textured crosswalks can provide visual and audible indications to motorists that they are in a pedestrian environment, as well as provide enhancement to the streetscape. However, textured sidewalks are often uncomfortable and difficult for pedestrians and bicyclists to cross, creating uneven or slippery surfaces that can cause accident or injury. In addition, decorative crosswalks are often constructed of dark or muted materials that can blend in with the roadway. Though decorative materials are often chosen based upon historical conditions or for aesthetic purposes, it is important to maximize crosswalk visibility. Textured or decorative crosswalks should be marked with high visibility lines since these types of crosswalks are less visible, particularly at night or during inclement weather.

Designing Sidewalks and Trails for Access, Part II of II

The flared portion of the curb ramp does not necessarily need to be contained within the crosswalk. The majority of the examples of "Good Curb Ramp Design" included in this manual show the flared portion of the curb ramp extending beyond the marked crosswalk.

The City of Seattle

Near side parking restrictions:

- signalized intersection – parking is allowed up to the stop line
- stop controlled intersections - parking is restricted 30 feet in advance of stop lines
- uncontrolled intersections - parking is restricted 20 feet in advance of the crosswalk or back edge of sidewalk of perpendicular street

Far side parking restrictions:

- parking is allowed immediately after the crosswalk or back edge of sidewalk of perpendicular street

The City of Chicago

Near side parking restrictions:

- signalized intersection – parking is allowed up to the stop line
- stop controlled intersections - parking is restricted 30 feet in advance of stop lines
- uncontrolled intersections - parking is restricted 20 feet in advance of the crosswalk or back edge of sidewalk of perpendicular street
- alleys and driveways – parking restricted 5 feet from edge

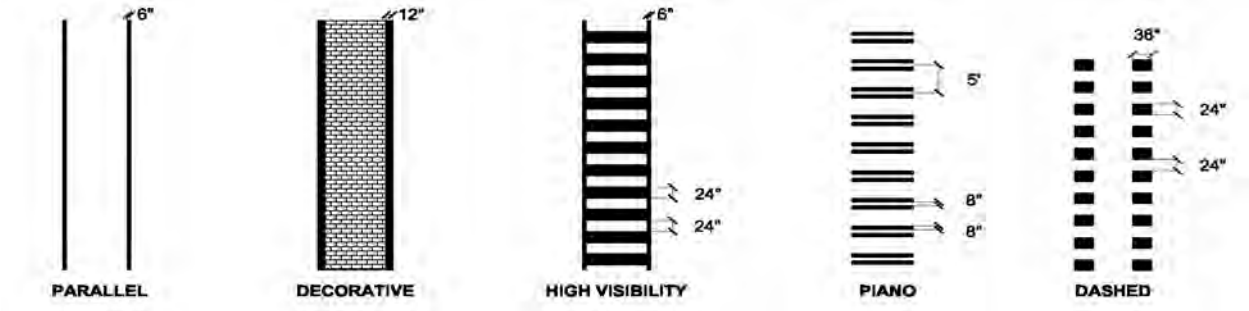
Far side parking restrictions:

- parking is allowed immediately after the crosswalk or back edge of sidewalk of perpendicular street
- alleys and driveways – parking restricted 10 feet from edge

Recommendation

Update crosswalk marking design policies to better align with current research and best practices.

Standard Terminology



DDOT's current language for describing crosswalks is inconsistent with national best practices and with current DDOT guidelines. Adopt standard crosswalk design terminology as shown in the figure of crosswalk marking types.

Parallel Markings

Parallel crosswalk markings should be the standard striping treatment for low-volume signalized intersections and low-volume pedestrian uncontrolled crossing locations. The lines should be white and a minimum of 6-inches wide.

High Visibility Markings

The existing DDOT high visibility marking style consist of white longitudinal stripes 24 inches wide and spaced 24 inches apart bounded by 6 inch parallel white lines. This style is very visible but subject to wear by motor vehicles. Every effort should be made to place longitudinal stripes outside the wheel tracking path.

High visibility markings should be 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 (see *Crosswalk Marking Policy* in this chapter for more information on where to mark crosswalks).

Decorative Crosswalk Markings

High visibility crosswalk markings are strongly preferred over decorative markings because they are easier for motorists to see. Require crosswalks constructed of decorative materials to include 12 inch wide reflective white lines along the boundary of the crosswalk to maximize visibility. Also require that the decorative surface be firm, stable and slip resistant and vertical displacement not exceed ¼ inch, and horizontal gaps not exceed ½ inch per ADA requirements.

Crosswalk Width

Currently, 15-feet is the minimum width for crosswalks in the District of Columbia. It is recommended that the requirement be changed to be consistent with Oregon's, "Crosswalks should be 10' wide or the width of the approaching sidewalk if it is greater." Unnecessarily wide crosswalks may result in the stop bar being located too far from the intersection, preventing motorists from seeing traffic on the intersecting street. This may result in motorists pulling into and waiting in the crosswalk.

Maintain the requirement for minimum 20-foot wide crosswalks in the Downtown Streetscape Area, as described in DDOT's *Pavement Marking Guidelines* and *Design and Engineering Manual.*

Parking Restrictions

Existing DDOT practice of restricting parking 40 feet on the near side of the intersection and 25 feet on the far side is similar to other jurisdictions. However, the current policy does not differentiate controlled intersections from uncontrolled intersections, nor does it account for one-way streets or locations with curb extensions. For locations in the District with high demand for parking, additional flexibility could be added to this provision without detriment to pedestrian safety.

As stated in the MUTCD Section 3B.16, parking should be prohibited in the area between the advance stop line and the crosswalk. Modify current regulations to restrict parking a minimum of 20 feet upstream of an uncontrolled crosswalk. The restriction zone should be accompanied with a NO PARKING ZONE sign or pavement marking to ensure adherence.

Consider reducing the parking restrictions at signalized intersections, locations with curb extensions, and one way streets.

Curb Ramps in Relation to Marked Crosswalks

Remove the following requirement from the Design and Engineering Manual: "All handicap ramps must be located within a crosswalk, including side flares of the ramps." A national review of pedestrian facility guidance did not reveal any jurisdictions that require the flares of the curb ramps to be fully included within crosswalk markings. National best practices, including those summarized in *Designing Sidewalks and Trails for Access, Part II of II* do require that the curb ramp itself be fully located within the crosswalk, but the flares or portions thereof may extend beyond the crosswalk markings. (Please note: see curb ramp policy discussion for further information on curb ramp design.)

Crosswalk Marking Policy
(at controlled and uncontrolled locations)

Current Policy

Design and Engineering Manual
CHAPTER 29 – PEDESTRIAN AND AMERICAN DISABILITIES ACT (ADA) FACILITIES
29.7 Pedestrian Crossings
Crosswalks will be required at all signalized intersections, school areas, and high pedestrian areas. Crosswalks may be required at mid-block crossings in neighborhoods, activity centers, trail or path crossings and school crossings when approved by the Traffic Services Administration. Local streets longer than 600 ft. may require additional accesses, which should be spaced approximately 300 ft. apart. If mid-block ramps are used, pavement markings and signing in accordance with the Traffic Control chapter of this manual shall be provided.

CHAPTER 43 - GUIDELINES FOR PAVEMENT MARKINGS AND SIGNAGE
43.7 Crosswalks
Crosswalks are to be marked at the following locations:*

- *Intersections of arterial streets with other arterial streets.*
- *Intersections of arterial streets with collector streets.*
- *Intersections of collector streets with other collector streets.*
- *Intersections or mid-block locations controlled by vehicular and/or pedestrian traffic signals or ALL-WAY STOP signs.*
- *Diagonal line or parallel line crosswalks are required when intersections are adjacent to school blocks, and along selected home school routes, within four blocks of a school.*
- *From all bus stops to the nearest crosswalk at an intersection.*
- *Handicap ramps must be included within a crosswalk at all times. Handicap ramps must be installed in pairs of two, one for each pedestrian travel direction.*
- *Any corner and/or mid-block crosswalk having handicap ramps.*

State of the Practice

A research study on the safety of marked and unmarked crosswalks at uncontrolled locations was published by the Federal Highway Administration (FHWA) in 2001[3]. The study was the most comprehensive study of crosswalk safety to date, examining the safety of 2,000 uncontrolled crosswalks (1,000 marked, and 1,000 unmarked) in cities throughout the United States. Based on safety statistics at the study crosswalks, the FHWA report includes recommendations for when it is appropriate to install a marked crosswalk at an uncontrolled intersection. The report makes recommendations for when additional engineering are recommended in addition to the marked crosswalk, but does not provide specific guidance on the type of treatment (other than a traffic signal) at uncontrolled locations.

Following the publishing of the FHWA crosswalk report, the City of Seattle, Washington and Boulder, Colorado as well as the Virginia and Maryland Departments of Transportation developed more detailed crosswalk marking policies to provide additional treatment selection guidance to practitioners when determining which engineering measure or measures to employ to safely mark a pedestrian crossing.

The Seattle, Washington "Marked Pedestrian Crosswalks" Policy/Director's Rule #01-02

The City of Seattle adopted a formal policy for the marking of crosswalks in 2001(Director's Rule # 04-01), largely based on the FHWA report. While the FHWA recommendations focus on crosswalks at uncontrolled locations, the Seattle policy provides guidelines for marking crosswalks at signalized and non-signalized locations. Based on conclusions from the FHWA study, Seattle's policy begins with the premise that,

[3] Zegeer, Charles V., J.Richard Stewart, Herman H. Huang, and Peter A. Lagerwey, "Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations: Executive Summary and Recommended Guidelines." FHWA-RD-01-075. March 2001.

> Marked crosswalks are only one of many possible engineering measures. Thus, when considering how to provide safer crossings for pedestrians, the question should NOT simply be: 'should I provide a marked crosswalk or not?' Instead the question should be: 'What are the most effective measures that can be used to help pedestrians to safely cross the street?' Deciding where to mark or not mark crosswalks is only one consideration in meeting the objective to create safe pedestrian crossings.

The Seattle policy lists a number of treatments other than marked crosswalks that may be considered prior to installing marked crosswalks, such as raised medians and reducing the effective street crossing distance for pedestrians. The list of treatments is also based on the recommendations from the FHWA study.

At signalized intersections, Seattle marks crosswalks only at locations where it is determined that stopped vehicles will encroach upon the pedestrian crossing area. Stop lines are typically not utilized at these locations.

At uncontrolled locations, Seattle's policy adopts the FHWA recommendations for installing marked crosswalks and other needed pedestrian improvements. The guidelines, as shown in the table below, are based on number of travel lanes (including turn lanes), presence of a raised median, traffic volume (Average Daily Traffic or ADT), and roadway speed limit.

Guidelines for installing marked crosswalks at non-signalized locations.
Source: Seattle Director's Rule # 04-01. www.seattle.gov/transportation/docs/DirectorsRulecrosswalks.pdf

	≤ 9K ADT			> 9K to ≤ 12K ADT			> 12K to ≤ 15ADT			> 15K ADT		
	≤ 30 mph	35 mph	40 mph	≤ 30 mph	35 mph	40 mph	≤ 30 mph	35 mph	40 mph	≤ 30 mph	35 mph	40 mph
2 LANES												
3 LANES												
≤ 4 LANES RAISED MEDIAN												
≥ 4 LANES NO MEDIAN												

Where speed limit exceeds 40 mph, marked crosswalks alone should never be used.

K = 1000
ADT = Average Daily Traffic
Mph = Miles per hour

	Candidate for a marked crosswalk. Marked crosswalks, if installed, must be installed carefully and selectively. Complete engineering evaluation prior to installing marked crosswalk.
	May or may not be a good candidate for a marked crosswalk. Complete engineering evaluation prior to installing marked crosswalk.
	Usually not a good candidate for a marked crosswalk (unless used in combination with other treatments). Complete engineering evaluation prior to installing marked crosswalk.

Seattle's Policy also includes some additional detail. The policy specifies that:

> Typically there should be at least 200 feet between the proposed marked crosswalk location and the nearest existing signal on the same arterial, except on one-way streets and in unique situations where there is high pedestrian demand. The new marked crosswalk shall not, in the [Seattle Department of Transportation's] judgment, unduly restrict platooned traffic, and shall be coordinated with adjacent signals and marked crosswalk at unsignalized locations.

Finally, the Seattle policy makes clear that an engineering analysis, considering other factors such as pedestrian volume, gaps in traffic, sight distances, etc, be completed before installing a marked crosswalk. The Seattle policy concludes that, "in all cases, good engineering judgment must be applied." The policy does not provide specific treatment guidance.

Pedestrian Crossing Treatment Installation Guidelines, Boulder Colorado, January 2006

The City of Boulder developed guidelines to provide additional guidance on how to apply the FWHA crosswalk study recommendations to specific treatments to improve pedestrian safety at uncontrolled crossings.The guidelines "provide a set of criteria, procedures, and policies to guide the installation of crossing treatments" at all pedestrian crossing locations. These guidelines were the result of an extensive before/after testing program designed to evaluate the effectiveness of various crossing treatments on driver yielding behavior at uncontrolled crossings.

These findings were utilized to develop warrants to standardize the application of the following crossing treatments at uncontrolled crossing locations:

A - Marked crosswalk with warning signs
B – Marked crosswalk, warning sign, and in-street bollard
C – Marked crosswalk, warning sign, in-street bollard, and geometric improvements (i.e. median)
D – Marked crosswalk and signal or grade separated crossing

The following chart is modified from the FHWA guidelines to provide additional detail for each treatment.

City of Boulder Pedestrian Crossing Treatment Installation Guidelines
Criteria for Crossing Treatments at Uncontrolled Locations

Roadway Configuration	Roadway ADT and Posted Speed															
	1,500- 9,000 vpd				9,000-12,000 vpd				12,000-15,000				> 15,000 vpd			
	≤ 30 mph	35 mph	40 mph	≥ 45 mph	≤ 30 mph	35 mph	40 mph	≥ 45 mph	≤ 30 mph	35 mph	40 mph	≥ 45 mph	≤ 30 mph	35 mph	40 mph	≥ 45 mph
2 Lanes	A	B	B	D	A	B	C	D	B	B	C	D	B	C	C	D
3 Lanes w/Raised Median	A	B	B	D	A	B	C	D	B	C	C	D	C	C	C	D
3 Lanes w//Striped Median	A	B	B	D	A	B	C	D	B	C	C	D	C	C	C	D
4 Lanes	A	B	C	D	B	C	C	D	B	C	C	D	C	C	C	D
5 Lanes w/Raised Median	A	B	C	D	B	C	C	D	B	C	C	D	C	C	C	D
5 Lanes w/Striped Median	A	B	C	D	B	C	C	D	B	C	C	D	C	C	C	D
6 Lanes	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

A ***Install marked crosswalk with enhanced road-side signs***

Specific Guidance : Install marked crosswalk with "State Law - Yield to Pedestrian" signs mounted on the side of the roadway with standard (W11-2) advance pedestrian warning signs; use S1-1 signs for School Crossing locations.

B ***Install marked crosswalk with enhanced road-side and in-roadway (bollard mounted) signs***

Specific Guidance : Install marked crosswalk with "State Law - Yield to Pedestrian" signs mounted on the side of the roadway and on in-roadway bollards; use standard (W11-2) advance pedestrian warning signs; use S1-1 signs for School Crossing locations.

C ***Install marked crosswalk with enhanced signs and geometric improvements to increase pedestrian visibility and reduce exposure***

Specific Guidance : Install marked crosswalk with "State Law - Yield to Pedestrian" signs (for 2 or 3-lane roadways) mounted on the side of the roadway and on in-roadway bollards or median mounted signs; use standard (W11-2) advance pedestrian warning signs; use S1-1 signs for School Crossing locations. For 4 or 5 lane roadways, flashing signs and/or other adopted City of Boulder treatment for multi-lane crossings should be used. Add neckdowns (for 2-lane roadways) or median refuge islands (for 3+ lane roadways) to shorten the pedestrian crossing distance and increase pedestrian visibility to motorists.

D ***Do not install marked crosswalk. Consider pedestrian traffic signal or grade-separated crossing.***

Specific Guidance : Consider traffic signal or grade-separated crossing, application of these treatments will consider corridor signal progression, existing grades, physical contraints, and other engineering factors

Guidelines for the Installation of Marked Crosswalks, Virginia Department of Transportation, January 2002
The guidelines were the result of a task force assigned to provide additional guidance on how to apply the FWHA crosswalk study recommendations to specific treatments to improve pedestrian safety at uncontrolled crossings. The guidelines provide more detailed considerations for applying the following treatments:

Level 1 - Parallel line crosswalks, raised mid-block crossings, rumble strips
Level 2 – High visibility crosswalks
Level 3 – refuge island, split pedestrian crossover island, curb extensions
Level 4 – overhead signs, flashing beacons, in-roadway lights
Level 5 – signals, grade separated crossings

The treatments applied were based upon the engineering judgment of the team preparing the guidelines.
The following language is proposed for the 2009 MUTCD to clarify when an uncontrolled crossing should or should not be marked based on the FHWA study:

> *Marked crosswalks alone, without other substantial measures designed to reduce traffic speeds, shorten crossing distances, enhance driver awareness of the crossing, and/or provide active warning of pedestrian presence, should not be installed across uncontrolled roadways where:*
>
> *A. The speed limit exceeds 60 km/h (40 mph);*
> *B. The roadway has four or more lanes of travel without a raised median or pedestrian refuge island and an ADT of 12,000 vehicles per day or greater; or*
> *C. The roadway has four or more lanes of travel with a raised median or pedestrian refuge island and an ADT of 15,000 vehicles per day or greater.*

Recommendation

Update crosswalk marking policy to better align with current research and best practices. DDOT needs a crosswalk marking policy that is comprehensive in its approach for applying pedestrian crossing treatments and that reflects the most up-to-date research and practices. The proposed Crosswalk Decision Matrix, below, is based on the City of Seattle's Policy for Marked Pedestrian Crosswalks and the City of Boulder's Pedestrian Crossing Treatment Guidelines and the FHWA study "Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations," by Charles Zegeer et al. The policy includes a table (Table 1, below) showing recommended treatments for marking uncontrolled crosswalks in relation to ADT, speed limit, and number of travel lanes (including turn lanes). This table is based on the City of Boulder's policy which provides additional treatment details using current research.

Include a list of treatments that can be used with or without marked crosswalks to improve the safety of pedestrians crossing the street. The following treatments should be included in the policy:

- Raised medians or intersection crossing islands on multi-lane roads
- Traffic signals or HAWK signal/beacons (with pedestrian signals) where warranted
- Reducing the effective street crossing distance for pedestrians by:
  - Providing curb extensions
  - Providing raised pedestrian refuge islands
  - Completing road diets or lane diets
- Installing traffic calming measures on neighborhood streets to slow vehicle speeds or reduce cut-through traffic
- Providing adequate nighttime lighting for pedestrians
- Designing safer intersections for pedestrians (e.g., crossing islands, tighter turn radii)
- Providing narrower widths and/or access management
- Constructing grade-separated crossings
- Developing pedestrian-only streets (opportunities for this treatment are limited)
- Using various pedestrian warning signs, flashers, and other traffic control devices to supplement marked crosswalks
- Establish design criteria for building narrower street widths and/or woonerfs in new communities to achieve pedestrian friendly roadways that encourage desired vehicle speeds
- Use advance stop lines and STOP HERE FOR CROSSWALK signs approximately 20-50 feet in advance of uncontrolled crosswalks on multi-lane roads(i.e., two or more lanes in one direction)

- Eliminate parking on the approach to uncontrolled crosswalks

At uncontrolled intersections on major arterials, marked crosswalks may not necessarily be provided on each leg of the intersection. Multiple marked crosswalks or crossing treatments in close proximity may desensitize the motorist and decrease the effectiveness of the treatment. It may be more appropriate to mark only a single side of the intersection in cases where:

- pedestrian demand is low or can easily be directed to one location
- where the crossing treatment (marked crosswalk or marked crosswalk plus additional treatment) is not effective in achieving motorist compliance
- the crossing treatments are less effective because they are applied close together

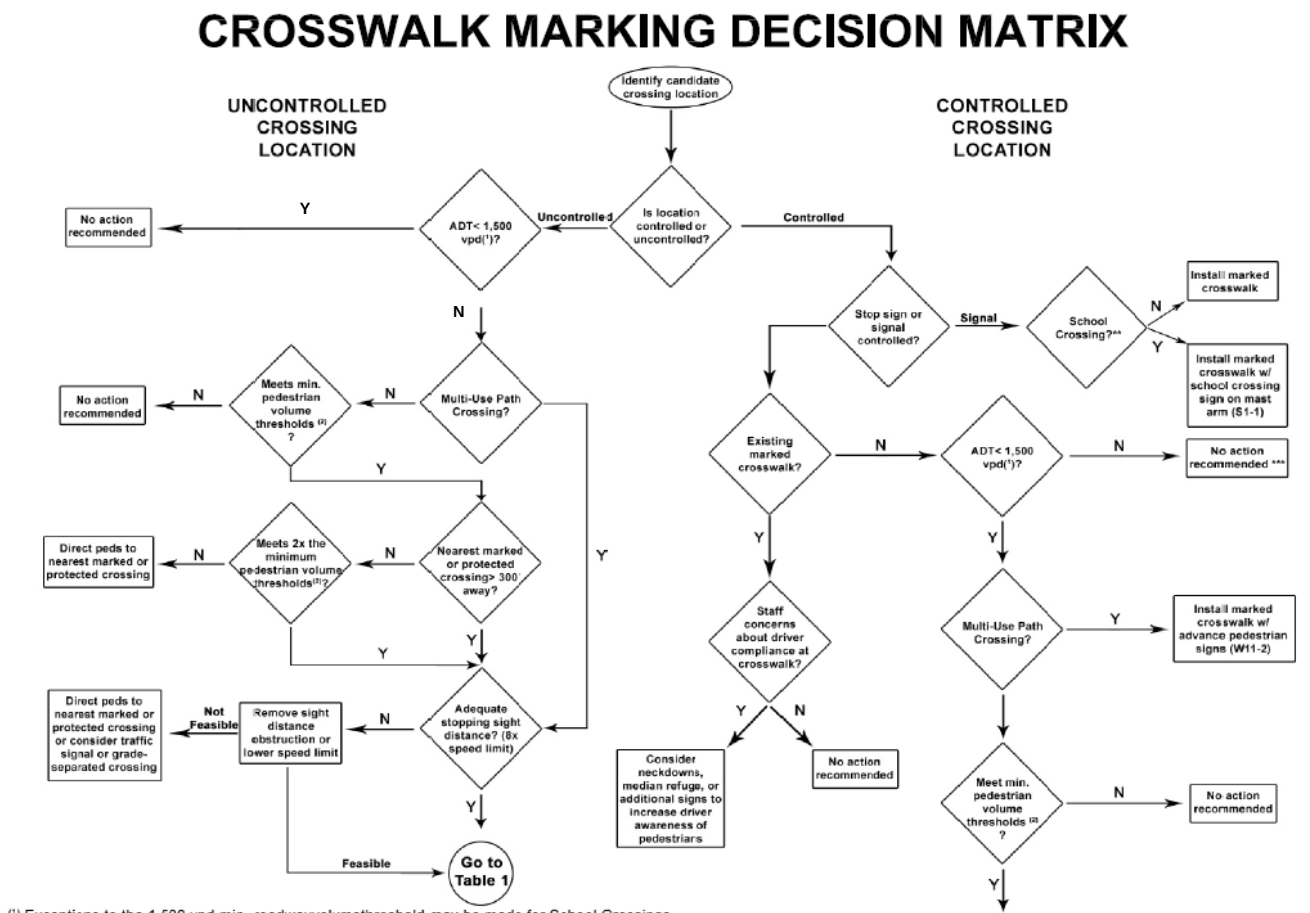
In many cases it may be necessary to add additional engineering treatments to one or all crosswalks to increase effectiveness.

In selecting the most appropriate side of an intersection for the marked crosswalk, the following should be considered:

- pedestrian demand (such as location of bus stops or metro stations)
- vehicle turning movements, multi-leg intersections (3 or more roadways) require a careful consideration of vehicular turning movements balanced against the pedestrian crossing
- sight distance
- proximity to other marked crosswalks or crossing locations

Maintain current policy of marking crosswalks at all signalized intersections and maintain the existing requirement that crosswalks align with the curb ramps (see Crosswalk Marking Design for further discussion).

Recommended Crosswalk Marking Policy:



(1) Exceptions to the 1,500 vpd min. roadwayvolumethreshold may be made for School Crossings where the peak hour traffic exceeds 10% of the daily traffic

(2) **Minimum Pedestrian Volume Thresholds:**
- 20 peds per hour* in any one hour, or
- 18 peds per hour* in any two hours, or
- 15 peds per hour* in any three hours

* Young, elderly, and disabled pedestrians count 2x towards volume thresholds
** School Crossing defined as a crossing location that meet minimum pedestrian volume thresholds and has a high concentration of student pedestrians
*** Marked crosswalks may be appropriate along some arterials (particularly in commercial areas) regardless of the ADT on the minor street approach.

Recommended Crosswalk Marking Policy Table:

TABLE 1 - UNCONTROLLED CROSSWALK ENGINEERING TREATMENTS

Table 1 - 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.

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.

Turning Radius and Intersection Size

Current Policy

Design and Engineering Manual
CHAPTER 31 - SIDEWALKS, CURB AND GUTTER, MEDIANS, DRIVEWAYS, ALLEYS
31.5.1 Minimum Required Curb Return Radii

Table 31-A

TYPE OF INTERSECTION	CURB RADIUS (FT)
Curb return radius for street intersection (90 degree angle)	15 ft.
Standard curb return radius for Alleys	10 ft.
Standard curb return radius for driveway	6 ft.

Curb return radius may be increased beyond the above minimum requirements, depending on the geometry of the road and the dimensions of different types of running vehicles. Curb return geometry is required to be enhanced and its radius to be increased to allow easy turns for all running vehicles at certain locations (i.e., trailers, busses, long vehicles, EMS vehicles, etc.).

CHAPTER 35 - INTERSECTIONS
35.2.8 Turning Radius
The minimum allowable intersection turning radii are as follows in accordance with the current ***AASHTO - A Policy on Geometric Design of Highways and Streets,*** *later version:*

SU-30 Vehicles - All SU-30 vehicles must be able to turn easily from one street to the next and remain in the correct lane for each roadway.

This shall be required for all roadways and alleys.
B-40 Vehicles - All B-40 vehicles may use more than one traffic lane to complete the turn when turning from the correct lane without crossing into opposing traffic lanes and without tracking onto the curb at corners. This shall apply to all streets.

WB-50 Vehicles - All WB-50 vehicles may use more than one traffic lane to complete the turn without tracking onto the curb at corners. In addition, the vehicle must make the turn in one forward maneuver.This requirement shall apply to all Arterial/Arterial, Arterial/Collector, Arterial/Connector, Commercial Local/Arterial, Arterial/Local Industrial, Arterial/Local Industrial, Collector/Collector, and Collector intersections at Connectors, Local Commercial, and Industrial streets.

For all other intersections, the vehicles may use the entire paved surface of the street to negotiate the turn; the vehicle may have to back up to complete the turn.

35.2.14 Roadway Narrowing
Minor Collector or Local streets may be narrowed at intersections to provide more visibility for pedestrians when approved by the TSA. This shortens the distance necessary for pedestrians to cross the street. The narrowing shall not encroach into bike lanes or travel lanes. Narrowing may not be used on Major Collectors without any parking lanes, on any Arterials, or where the standard width is necessary.

State of the Practice

The American Association of State Highway and Transportation Officials, Policy on the Geometric Design of Highways and Streets (AASHTO Green Book, 2004) provides the basis for roadway geometric design throughout the country. The Green Book states that "Where it is appropriate to provide for turning vehicles within minimum space, as at unchannelized intersections, the corner radii should be based on the minimum turning path of the selected design vehicles." The Green Book also states that "the appropriate design may depend on other factors such as the type,

character and location of the intersecting roads, the vehicular and pedestrian traffic volumes, the number and frequency of the larger vehicles involved in turning movements, and the effect of these larger vehicles on other traffic. For example, if turning traffic is nearly all passenger vehicles, it may not be cost-effective or pedestrian friendly to design for large trucks. However, the design should allow for the occasional large truck to turn by swinging wide and encroaching on other traffic lanes without disrupting traffic significantly."

The following general principles and recommended practices for intersection size and turning radius design are provided in *the ITE Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities*:

- Intersections should be designed as compact as practical in urban contexts. Intersections should minimize crossing distance, crossing time, exposure to traffic, encourage pedestrian travel and increase safety.
- Use a design speed appropriate for the context. Motorists traveling at slower speeds have more time to perceive and react to conflicts at intersections.
- Curb return radii should be designed to accommodate the largest vehicle type that will frequently turn the corner (sometimes referred to as the control vehicle). This principle assumes that the occasional large vehicle can encroach into the opposing travel lane. If encroachment is not acceptable, then a larger design vehicle should be used.
- Curb return radii should be designed to reflect the "effective" turning radius of the corner. The effective turning radius takes into account the wheel tracking of the design vehicle utilizing the width of parking and bicycle lanes. Use of the effective turning radii allows a smaller curb return radius while retaining the ability to accommodate larger design vehicles.
- In urban centers and urban cores where pedestrian activity is intensive, curb return radii should be as small as possible.
- On multi-lane thoroughfares, large vehicles may encroach entirely into the adjacent travel lanes (in the same direction of travel).
- To help select a design vehicle, identify bus routes to determine whether buses are required to turn at the intersection. Also check transit service plans for anticipated future transit routes. Map existing and potential future land uses along both streets to evaluate potential truck trips turning at the intersection.
- Apply curb return radii that are compatible with the design vehicle. Occasional turns by vehicles that are larger than the design vehicle could be accomplished by turning more slowly and possibly encroaching into oncoming travel lanes to complete the turn.
- Curb return radii of different lengths can be used on different corners of the same intersection to match the design vehicle turning at that corner. Compound, spiral, or asymmetrical curb returns can be used to better match the wheel tracking of the design vehicle (see AASHTO's Green Book for the design of spiral and compound curves).
- If large vehicles need to encroach into an opposing travel lane, consider placing the stop line for opposing traffic further from the intersection.
- In urban centers and urban cores at intersections with no vehicle turns, the minimum curb return radii should be 5 ft.
- A typical minimum curb return radius of 10 to 15 ft. should be used where:
  - High pedestrian volumes are present or reasonably anticipated;
  - Volumes of turning vehicles are low;
  - The width of the receiving intersection approach can accommodate a turning passenger vehicle without encroachment into the opposing lane;
  - Passenger vehicles constitute the majority of turning vehicles;
  - Bicycle and parking lanes create additional space to accommodate the "effective" turning radius of vehicles;
  - Low turning speeds are required or desired; and
  - Occasional encroachment of turning school bus, moving van, fire truck, or oversized delivery truck into an opposing lane is acceptable.
- Curb radii will need to be larger where:
  - Occasional encroachment of a turning bus, school bus, moving van, fire truck, or oversized delivery truck into the opposing lane is not acceptable;
  - Curb extensions are proposed or might be added in the future; and
  - Receiving thoroughfare does not have parking or bicycle lanes and the receiving lane is less than 12 ft. in width.

Recommendation

Update turning radii policy to better align with best practices. DDOT's current minimum radius policy (Chapter 31, section 31.5) requires a 15 ft radius for all streets regardless of need. The discussion on turning radius relative to vehicular needs is discussed in Chapter 35 (section 35.2.8). Consolidate the curb radius discussion into Chapter 35 to enable the designer to review the considerations for heavy vehicles. The discussion of minimum curb radius should be reorganized around the minimum effective curb radius.

The curb radius design policy should be expanded to allow more flexibility in intersection design based on site conditions and traffic characteristics. The designer should be permitted to select the smallest curb radius that serves the required design vehicles, considering the available effective curb radius, the presence of turning bus traffic, vehicular volumes, the percentage of heavy vehicles (i.e. potential design vehicle), pedestrian safety, land use, and convenience (relative to the heavy vehicle driver). The *ITE Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities* detailed previously should be used as a guide in expanding the policy.

Develop a policy describing when curb extensions should be installed as part of retrofit projects, rehabilitation projects, resurfacing projects, and new construction. It is generally recommended that curb extensions be utilized to shorten crossing distances and to enhance the public space or to provide space for a bus shelter wherever possible on arterial roadways and at multi-legged intersections.

Curb Ramps

Current Policy

Design and Engineering Manual
CHAPTER 29 - PEDESTRIAN AND AMERICAN DISABILITIES ACT (ADA) FACILITIES
29.5.1 Ramp Requirements

The curb ramps will be designed with stamped concrete in historic and business districts when directed by the Project Manager. Curb ramps shall be installed at all intersections and at certain mid-block locations for all new construction or reconstruction of curb and sidewalk, as follows:

- *If a public walkway or bikeway intersects the street, a ramp shall be provided to connect the walkway to the street. A landing is required at the top of a ramp that shall connect to a travel route that is at least 36in. wide. At the top of the ramp there shall be a preferred 5 ft. of clearance or a 4 ft. minimum clearance. The transition from the ramp to the gutter shall be flush. All ramps shall be concrete or stamped concrete, which resembles brick, with 24 inch wide Truncated Domes at the bottom of the 4 ft. wide ramp surface.*
- *All pedestrian facilities on and along sidewalks shall be accessible including signal actuators, telephones, drinking facilities, kiosks, sidewalk cafes, etc.*
- *Plans shall indicate where the existing sidewalks, grass areas, and tree spaces are required to be replaced, to be repaired, or to be maintained.*

The following are the DDOT requirements for curb ramps that include the ***ADA Regulations*** *for curb ramps:*

- *It is not recommended to provide curb ramps at the center of corners at roadway intersections. All the ramps to be located at the corner center must be pre-approved by the Traffic Safety Division.*
- *Install two curb ramps, on each corner, one for each direction of travel.*
- *The entire curb ramp, (4 ft. width) must be located within the crosswalk.*
- *The ramp width is 4 ft. The length of the ramp depends on curb height, considering a maximum slope of 1/12. The side flare width is 2 ft. while the flare slope is 1/10. Provide landing at the top of the ramp 4 ft. minimum, to allow the wheelchair to turn. See section below on Detectable Warnings and also on installation of truncated domes.*
- *In the light of the above requirements, crosswalk width shall be a 15 ft. minimum and it may be increased up to 20 ft., to allow for the ramp accommodation. Before the crosswalk width is increased to 20 ft. where a traffic signal is involved, the Traffic Services Administration's, Signal Branch must be contacted to insure there is no conflict with the signalization.*
- *Move and adjust the curb ramp to a location, which allows for the accommodation of the ramps properly, using the required ramp geometry, dimensions, and slopes as per the Standards.*
- *Curb ramps shall be indicated to scale and proportionate with drawings. Do not use different shapes of curb ramps.*
- *The curb ramp has top priority at a corner intersection above all other features. When new construction is taking place, the streetlights, traffic signals, control cabinets, and catch basins are relocated out-of-the-way of these ramp locations.*
- *Sidewalks shall be flush with driveways and alleys. Curb ramps shall not be located on both sides of the alley or driveway entrances. See section below on Detectable Warnings.*

29.9 Tactile Warning Strips (Detectable Warnings): A Traffic Safety Division Requirement

Differences in paving materials can provide tactile cues to aid negotiation and identify hazards. Truncated domes are a detectable warning device used on walkway surfaces and curb ramps to warn visually impaired persons of abrupt grade changes and hazardous vehicular areas. Detectable warning strips are used at potentially dangerous exits such as corners and mid-block crossings, water fountains, and other obstructions to warn visually impaired persons of abrupt grade changes.

At sidewalk grade changes leading to retail businesses detectable warning strips are needed at both the top and the bottom of stairways. Truncated domes are also used in hazardous locations when a walking surface and vehicular driveways and/or alleys cross or adjoin and are not separated by curbs or other elements, and on all ramp locations.

State of the Practice

Extensive guidance on curb ramps and other ADA facilities is available from a number of sources and therefore is not repeated in this plan. The *Americans with Disabilities Act Accessibility Guidelines (ADAAG)* is the current law governing the

design of curb ramps (www.access-board.gov/adaag/html/adaag.htm). *Guidelines for Accessible Public Rights-of-Way* are currently in draft form and may be adopted by the US Access Board in the future (current draft is available at: www.access-board.gov/prowac/). Further guidance on curb ramps is provided in *Part 2, Designing Sidewalks and Trails for Access: Best Practices Design Guide*. This document was published by the Federal Highway Administration (FHWA) in 2001 and devotes an entire chapter to the design of curb ramps (www.fhwa.dot.gov/environment/sidewalk2/).

Recommendation

Update curb ramp policies to better align with current research and best practices. Incorporated specific recommendations from the draft of the *Guidelines for Accessible Public Rights-of-Way* into the DDOT curb ramp details and Design and Engineering Manual:

> **4.7.5 Sides of Curb Ramps.** If a curb ramp is located where pedestrians must walk across the ramp, or where it is not protected by handrails or guardrails, it shall have flared sides; the maximum slope of the flare shall be 1:10 (see Fig. 12(a)). Curb ramps with returned curbs may be used where pedestrians would not normally walk across the ramp (see Fig. 12(b)).
>
> **4.7.7 Detectable Warnings.** A curb ramp shall have a detectable warning complying with 4.29.2. The detectable warning shall extend the full width and depth of the curb ramp.
>
> **4.7.9 Location at Marked Crossings.** Curb ramps at marked crossings shall be wholly contained within the markings, excluding any flared sides (see Fig. 15).
>
> **4.29.2 Detectable Warnings on Walking Surfaces**. Detectable warnings shall consist of raised truncated domes with a diameter of nominal 0.9 in (23 mm), a height of nominal 0.2 in (5 mm) and a center-to-center spacing of nominal 2.35 in (60 mm) and shall contrast visually with adjoining surfaces, either light-on-dark, or dark-on-light. The material used to provide contrast should contrast by at least 70%. Contrast in percent is determined by:
>
> **Contrast = [(B1 - B2)/B1] x 100**
>
> where B1 = light reflectance value (LRV) of the lighter area and B2 = light reflectance value (LRV) of the darker area. Note that in any application both white and black are never absolute; thus, B1 never equals 100 and B2 is always greater than 0.
>
> **4.29.5 Detectable Warnings at Hazardous Vehicular Areas.** If a walk crosses or adjoins a vehicular way, and the walking surfaces are not separated by curbs, railings, or other elements between the pedestrian areas and vehicular areas, the boundary between the areas shall be defined by a continuous detectable warning which is 36 in (915 mm) wide, complying with 4.29.2.
>
> **4.29.6 Detectable Warnings at Reflecting Pools**. The edges of reflecting pools shall be protected by railings, walls, curbs, or detectable warnings complying with 4.29.2.

Develop the following curb ramp details and include them in DDOT's standard drawings:

1. returned curb situations where it is not necessary to construct flares
2. parallel curb ramp for constrained situations where it is difficult to establish a level landing area
3. curb ramps placement on curb extensions

The revised guidelines should discuss the desirability of locating drainage catch basins upstream of curb ramps to avoid drainage issues on the ramps during rain events.

Turning Traffic Yield to Pedestrians Sign (at Controlled Intersections)

Current Policy or Practice

DDOT does not appear to have an established policy on the use of *state law* signs at signalized intersections. DC Law requires that vehicular traffic yield to pedestrians in crosswalks at signalized intersections while turning. DDOT's current practice is to utilize a YIELD TO PEDESTRIANS WHILE IN CROSSWALK sign at selected intersections in the District. This sign is also found at a number of uncontrolled crosswalks throughout the District; most likely a remnant of the District's prior uncontrolled crosswalk law requiring motorists to yield to pedestrians in crosswalks.

DDOT sign currently in

DC Law - 50-2201.28. Right-of-way at crosswalks.
(b) A pedestrian who has begun crossing on the "WALK" signal shall be given the right-of-way by the driver of any vehicle to continue to the opposite sidewalk or safety island, whichever is nearest.

State of the Practice

Pedestrian Crossing Signs: At Crossing (Signalized)
The MUTCD allows use of the TURNING TRAFFIC MUST YIELD TO PEDESTRIANS sign (R10-15) as an additional reminder to drivers to yield to pedestrians while turning. Proposed changes to the 2009 edition of the MUTCD include an update of the design of the sign to improve its readability (see signs at right).

Current MUTCD R10-15

Proposed MUTCD R10-15

Recommendation

Develop a DC specific version of the proposed MUTCD R10-15 that reads "**TURNING VEHICLES *STOP* FOR PEDESTRIANS"** and replace existing YIELD TO PEDESTRIANS IN CROSSWALK signs through a program of routine maintenance at controlled intersections.

Remove all YIELD TO PEDESTRIANS WHILE IN CROSSWALK signs at uncontrolled crossings to reflect the current DC law that specifies STOPPING for pedestrians. See the policy for uncontrolled crosswalk signs for guidance on appropriate signs for uncontrolled crossings.

Leading Pedestrian Interval

Current Policy or Practice

DDOT has used Leading Pedestrian Intervals (LPI) at selected locations in the District (for example, 15th and U Streets, NW) but does not have a policy on its use.

State of the Practice

The most common type of pedestrian signal phasing provides a WALK signal when vehicular traffic on the adjacent street has a green light, which can create a conflict between pedestrians crossing and turning vehicles. A large proportion of vehicle/pedestrian collisions at signalized intersections involve left- and right-turning vehicles. One phasing strategy to improve pedestrian safety in locations with heavy volumes of turning traffic and frequent pedestrian crossings is to provide an LPI. During the leading interval, all motor vehicle flows are stopped for 2-4 seconds while pedestrians are given the WALK signal. This enables pedestrians to begin crossing in advance of vehicular turning movements. In many cases, an LPI is a simple, inexpensive treatment because the signal controller can be retimed relatively easily. LPIs can be complemented by geometric design changes that shorten crossing distances.

LPIs have been used successfully for decades in the United States. They are in use in New York City, St. Petersburg, Florida, and San Francisco, California among other places. Numerous studies have confirmed that LPIs reduce conflicts for pedestrians. LPI's are most effective when combined with NO TURN ON RED restrictions.

Recommendation

Develop a policy providing guidelines for the use of Leading Pedestrian Intervals.

LPIs are recommended in locations where there are frequent conflicts between pedestrians and turning vehicles at signalized intersections. LPIs are an effective treatment as they are typically low in cost yet offer much of the benefit of dedicated pedestrian signal phasing/pedestrian scramble patterns while minimizing delay to pedestrians and motorists. According to ITE's *Alternative Treatments for At-Grade Pedestrian Crossings*, suitable locations for LPIs would include locations where pedestrian right-of-way violations by turning vehicles ranged from 3 to 20 percent (2001). Where an LPI is in use, Accessible Pedestrian Signals (APS) should be provided to alert pedestrians with vision impairments that the pedestrian crossing phase has begun.

Right-Turn-on-Red Restrictions

Current Policy or Practice

Right Turn On Red (RTOR) is permitted in the District unless otherwise posted. Right-turn-on-red restrictions are in place throughout the District. Restrictions vary from all day, to peak hours which are typically 7am to 7pm.

State of the Practice

The Pedestrian and Bicycle Information Center (www.walkinginfo.org)

A permissible Right-Turn-on-Red (RTOR) was introduced in the 1970s as a fuel-saving measure and has sometimes had detrimental effects on pedestrians. While the law requires motorists to come to a full stop and yield to cross-street traffic and pedestrians prior to turning right on red, many motorists do not fully comply with the regulations, especially at intersections with wide turning radii. Motorists may be so intent on looking for traffic approaching on their left that they may not be alert to pedestrians approaching on their right. In addition, motorists usually pull up into the crosswalk to wait for a gap in traffic, blocking pedestrian crossing movements. In some instances, motorists simply do not come to a full stop.

One concern that comes up when RTOR is prohibited is that this may lead to higher right-turn-on-green conflicts when there are concurrent signals. The use of the leading pedestrian interval (LPI) can usually best address this issue. Where pedestrian volumes are very high, exclusive pedestrian signals should be considered.

Prohibiting RTOR should be considered where and/or when there are high pedestrian volumes, or where there is a proven problem with motorists conflicting with pedestrians. This can be done with a simple sign posting, although there are some options that are more effective than a standard sign. For example, one option is a larger 762-mm by 914-mm (30-in by 36-in) NO TURN ON RED sign, which is more conspicuous. For areas where a right-turn-on-red restriction is needed during certain times, time-of-day restrictions may be appropriate. A variable-message NO TURN ON RED sign is also an option.

ITE's Alternative Treatments for At-Grade Pedestrian Crossings (2001)

The ITE report references a study conducted by Zegeer and Cynekci[4] on safety considerations associated with RTOR intersections. Based on the results of their study, the authors recommended that RTOR should be prohibited when one or more of the following conditions are found through an engineering study:

- There is an exclusive pedestrian phase during which pedestrians can use all crosswalks.
- The number of total RTOR collisions is two or more for an approach in a 3-year period.
- The intersection is within 18m (60 feet) of a railroad crossing, and the signal controller is pre-empted during train crossings (the prohibition should apply only on the approach from which right turns are made into the lane crossing the railroad.

RTOR may be prohibited where:

- The intersection has five or more approaches and substantial traffic exists on all approaches. Depending on geometric characteristics and traffic and pedestrian flows, RTOR may be prohibited on all approaches, only on critical legs, or only for critical movements.
- The sight distance of vehicles approaching from the left is less than the minimum value shown in the *Minimum Sight Distance for Right Turn on Red* table on the following page for the cross street's speed limit.
- For all approaches with double right turns, RTOR may be prohibited for both lanes or only for the left lane (i.e., no turn on red except for the curb lane)
- A total of six or more RTOR conflicts with pedestrians have occurred during the peak hour for an approach.

[4] Zegeer, C.V. and M.J. Cynecki. "Increased Safety at Right-Turn-on-Red Intersections." *1997 Annual Meeting Compendium of Papers*, 190-194. Washington, DC: ITE, 1997

- For intersections in school zones, field studies indicate that motorists often fail to yield to pedestrians before making RTOR.
- At approaches with 250 or more RTOR maneuvers per hour.
- The area has an unusually high number of elderly or mobility and visually impaired people.

Minimum Sight Distance for Right Turn on Red	
Cross Street Speed Limit	Minimum Sight Distance
32 km per hour, 20 mph	36m, 118 ft
40 km per hour, 25 mph	45m, 148 ft
48 km per hour, 30 mph	57m, 187 ft
56 km per hour, 35 mph	66m, 217 ft
64 km per hour, 40 mph	81m, 266 ft
72 km per hour, 45 mph	96m, 315 ft
80 km per hour, 50 mph	108m, 354 ft
88 km per hour, 55 mph	123m, 404 ft

ITE's Alternative Treatments for At-Grade Pedestrian Crossings (2001):

The ITE report references a study by the Insurance Institute for Highway Safety[5] which evaluated two methods of restricting RTOR to promote pedestrian safety at 15 intersections in Arlington, VA. Results indicated that signs prohibiting RTOR during specified hours were moderately effective in increasing the percentage of drivers stopping at the limit line. Signs prohibiting RTOR when pedestrians were present were not effective. Signs prohibiting RTOR at all times were most effective.

Recommendation

Adopt the recommendations provided in the study by Zegeer and Cynecki for the use of RTOR restrictions (as described above and in ITE's *Alternative Treatments for At-Grade Pedestrian Crossings*). Where RTOR prohibitions are used, it is recommended that one of three sign types be used to indicate the prohibition: 1) 30-in by 36-in NO TURN ON RED sign; 2) NO TURN ON RED variable message sign; and 3) NO TURN ON RED sign indicating prohibitions during certain times.

[5] Retting, R.A., M. Nitzburg, C.M. Farmer, and R. Knoblauch. *Field Evaluation of Two Methods for Restricting Right-Turns-on-Red to Promote Pedestrian Safety*. Washington, DC: Insurance Institute for Highway Safety, April 2001

Protected Pedestrian/Scramble Phasing

Current Policy or Practice

DDOT has not established a policy on protected pedestrian/scramble phasing.

State of the Practice

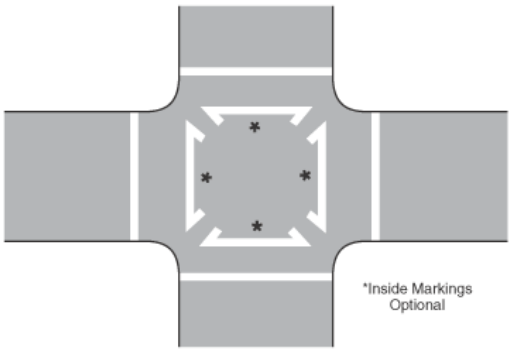
A protected pedestrian signal phase, also known as a pedestrian scramble pattern, provides an all-red phase for all directions of traffic at an intersection. Pedestrians are permitted to cross in any direction, including diagonally, at an intersection with this all-red phase. Typically, each corner of an intersection with a pedestrian scramble pattern has pedestrian signal heads pointing in three directions, one for each of the standard crosswalks and one for the diagonal crosswalk.

According to ITE's *Alternative Treatments for At-Grade Pedestrian Crossings*, the advantage of a scramble pattern is that they "allow pedestrians to cross intersections diagonally instead of crossing two legs of the intersection, making signalized intersections more pedestrian friendly. Reduces vehicle turning conflicts, which represent 60 percent of pedestrian-related collisions at intersections (2001)." The disadvantage of a pedestrian scramble pattern is that it reduces the capacity of the intersection for vehicular traffic, and all users, including pedestrians, have to wait longer to cross the intersection.

Pedestrian scramble patterns are used in cities throughout the United States, such as Seattle, Washington; New Orleans, Louisiana; Pasadena, California; and Denver, Colorado.

Recommendation

Consider using pedestrian scramble patterns only in locations with high pedestrian activity, and where key destinations create demand for pedestrians to cross diagonally. Scramble signals are particularly useful in locations where there is significant turning traffic creating the potential for conflict with pedestrians, and where vehicular speeds are high.



MUTCD Figure 3B-17: Example of Crosswalk Markings for Exclusive Pedestrian Phase that Permits Diagonal Crossing

Because this type of signal phasing results in delays to pedestrians as well as vehicles, it is recommended for intersections where the motor vehicle signal is relatively short (less than 30 seconds per phase). Pedestrian scramble patterns should be used in conjunction with right-turn-on-red prohibitions to reduce conflicts between pedestrians and turning vehicles. Accessible Pedestrian Signals (APS) should be used at all locations with pedestrian scramble patterns to provide a cue to pedestrians with vision impairments to start crossing the street. The pedestrian clearance interval for the intersection should be long enough to accommodate pedestrians crossing the intersection diagonally. Chapter 3 of the MUTCD includes a special crosswalk marking pattern for intersections with pedestrian scramble patterns.

Accessible Pedestrian Signals

Current Policy or Practice

Design and Engineering Manual
CHAPTER 40 – TRAFFIC SIGNAL DESIGN
40.11.8 Audible Pedestrian Signals
General.
Audible Pedestrian signals may be installed at signalized intersection crosswalks. These devices supplement visual "WALK PERSON" indications and are designed to aid visually impaired pedestrians. The installation of Audible Pedestrian Signals may be considered when an engineering study and evaluation have been conducted and the following minimum conditions have been met:

- *The proposed intersection crosswalk must be signalized.*
- *The audible devices should be retrofittable to the existing traffic signal hardware.*
- *The signalized intersection should be equipped with pedestrian push buttons.*
- *The selected crosswalk must be suitable for the installation for audible signals, in terms of surrounding land use and traffic patterns.*
- *There must be a demonstrated need for the audible signals in the form of a request from an individual or group that would use the audible signal.*
- *The individual or group requesting the device should agree to train the visually impaired users of the audible signals.*

It is recommended that the audible devices selected emit a "Cuckoo" walk sound for a crosswalk in the North-South direction and a "Peep-Peep" walk sound for a crosswalk in the East-West direction.

State of the Practice

What are Accessible Pedestrian Signals?

Accessible Pedestrian Signals (APS) include a variety of different features that make traffic signals more accessible, particularly to pedestrians with vision impairments. The most common feature of these signals is the use of audible tones and/or vibration to indicate the WALK interval. The signals may include a number of additional features, including but not limited to, tactile arrows, tactile maps, and Braille and raised print information.

Extensive information on APS is available through the Pedestrian and Bicycle Information Center (PBIC). Portions of that guidance are provided here. For more information, visit: www.walkinginfo.org/aps/home.cfm.

Where are Accessible Pedestrian Signals Required?

As part of compliance with the Americans with Disabilities Act, the PBIC advises that

"Municipalities should establish a plan to prioritize and make decisions about installations of APS at 'unaltered' intersections:

- Where a request for APS is received, and
- Where insufficient information from street crossing using non-visual clues exists."

According to the PBIC, "APS should be installed wherever pedestrian signals are installed in new construction or reconstruction projects, in accord with the Draft Public Rights-of-Way Accessibility Guidelines." Currently, the most recent draft of these guidelines is from November 23, 2005 and is called "Revised Draft Guidelines for Accessible Public Rights-of-Way" (available at www.access-board.gov/prowac/). Section R306 contains extensive guidelines for APS.

Where are Accessible Pedestrian Signals Needed?

The Manual of Uniform Traffic Control Devices provides guidance on the location of APS. Section 4E.06 of the *MUTCD* recommends:

The installation of accessible pedestrian signals at signalized intersections should be based on an engineering study, which should consider the following factors:

A. Potential demand for accessible pedestrian signals.
B. A request for accessible pedestrian signals.

C. Traffic volumes during times when pedestrians might be present; including periods of low traffic volumes or high turn-on-red volumes.
D. The complexity of traffic signal phasing.
E. The complexity of intersection geometry.

According to the PBIC, the following are additional considerations:

Too little traffic is as great a problem for pedestrians who are blind as is too much traffic. In the absence of APS, blind pedestrians must be able to hear a surge of traffic parallel to their direction of travel in order to know when the walk interval begins.

Locations that may need APS include those with:

- Intersections with vehicular and/or pedestrian actuation
- Very wide crossings (in existing 2003 MUTCD)
- Major streets at intersections with minor streets having very little traffic (APS may be needed for crossing the major street) (in existing 2003 MUTCD)
- T- shaped intersections
- Non-rectangular or skewed crossings(in existing 2003 MUTCD)
- High volumes of turning vehicles
- Split phase signal timing (proposed for 2009 MUTCD)
- Exclusive pedestrian phasing, especially where right-turn-on-red is permitted (proposed for 2009 MUTCD)
- A leading pedestrian interval (proposed for 2009 MUTCD)

Where these conditions occur, it may be impossible for pedestrians who are visually impaired or blind to determine the onset of the WALK interval by listening for the onset of parallel traffic, or to obtain usable orientation and directional information about the crossing from the cues that are available.

How to Prioritize the Installation of Accessible Pedestrian Signals

The following is excerpted from the PBIC:

Existing intersections

As discussed previously, this prioritization information is to be used in prioritizing existing intersections for retrofit with APS either in response to requests, or in updating an ADA transition plan.

Establishing priorities

Prioritization schemes should place only limited emphasis on factors related to frequency or likelihood of use by blind pedestrians. The information provided by APS may be necessary at any time, along any route, to residents, occasional travelers, and visitors. Intersections having high pedestrian volumes are likely to have pedestrians whose vision is sufficiently impaired that they have difficulty using conventional pedestrian signals.

Of greater importance are factors related to determining whether sufficient acoustic information exists - at all times - to permit safe crossing at a particular intersection.

Rating scales

Several rating scales have been developed, some of which have been utilized for over 20 years. These rating scales are used in different ways in different cities, for example to aid in prioritization.

Generally, points are assigned to specific intersection features, as well as proximity to services for all pedestrians, such as transit, government offices, or shopping. San Diego, Los Angeles, Portland, Oregon, and Maryland Department of Transportation use point rating scales as part of their process.

After a request for an APS is made by an individual who is blind or by an organization representing or serving individuals who are blind or visually impaired, the intersection is evaluated using a rating scale.

Individual crossings
Systems developed most recently rate each crossing at an intersection rather than the whole intersection.

- The developers of these schemes have recognized that certain crossings of an intersection may not be problematic, while other crossings of the same intersection may not have sufficient auditory information
- This change reflects recent developments in types of APS available as well, which may allow installation on particular crosswalks of an intersection without providing confusing cues to individuals at other crosswalks.

How to Design Accessible Pedestrian Signals

Section R306 of the "Revised Draft Guidelines for Accessible Public Rights-of-Way" includes guidance on proper design of APS. This document includes guidance on issues such as location of Accessible Pedestrian Signals (in relation to pedestrians using the crosswalk), and the audible walk indication, including frequencies and durations of tones and volume.

Recommendation

Adopt the language proposed for the 2009 MUTCD to provide additional clarity on accessible signal design and policy.

Require all new construction and retrofit construction to comply with the current "Revised Draft Guidelines for Accessible Public Rights-of-Way" (Published by the US Access Board). Section R306 of the Revised Draft describes best practices for APS. The guidelines offer extensive discussion on how to retrofit intersections with curb ramps, where to place signals, and install push buttons. Constructing facilities to comply with these guidelines, even if the APS equipment is not installed, will enable DDOT to add APS devices if requested at a later date at minimal expense.

Pedestrian Actuated Signals and Push Button Locations

Current Policy or Practice

Design and Engineering Manual
CHAPTER 40 - TRAFFIC SIGNAL DESIGN
40.10.24 Pedestrian Detectors

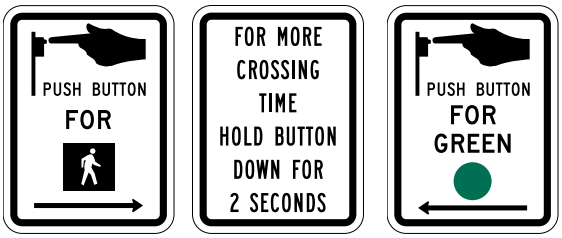
Where required, pedestrian push buttons should be located convenient to the corresponding crosswalk so as to encourage their use by both pedestrians and people in wheelchairs. Push buttons should be located not more than 5 feet from the crosswalk and should be placed on signal poles if they are adjacent to the crosswalk area. Separate pedestrian push-button posts (or a pedestal) should be used when the signal poles are more than 5 feet from the crosswalk.

State of the Practice

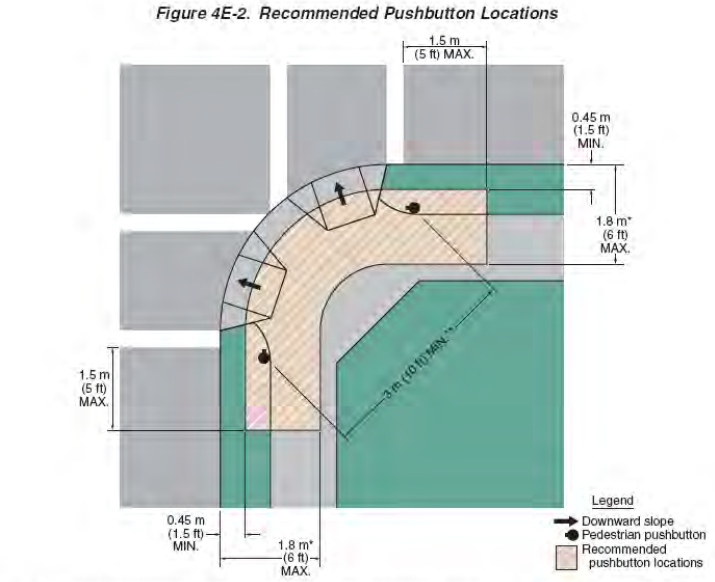
Pedestrian and Bicycle Information Center (PBIC)
For optimal pedestrian service, fixed-time signal operation usually works best. Pedestrian pushbuttons may be installed at locations where pedestrians are expected intermittently. Quick response to the pushbutton or feedback to the pedestrian (e.g.- indicator light comes on) should be programmed into the system. When used, pushbuttons should be well-signed and within reach and operable from a flat surface for pedestrians in wheelchairs and with visual disabilities. They should be conveniently placed in the area where pedestrians wait to cross. Section 4E.09 within the MUTCD provides detailed guidance for the placement of pushbuttons to ensure accessibility (www.walkinginfo.org).

2009 MUTCD
Proposed language for the 2009 MUTCD provides enhanced guidance on the placement of push buttons (see figure at right which has been developed for addition to the 2009 MUTCD).

The new MUTCD edition also contains a provision to provide additional crossing time for pedestrians who hold the button for 2 seconds or more, and has added a number of additional pedestrian pushbutton signs (below) based on signs successfully used in Canada.



Proposed pushbutton signs for the 2009 MUTCD



Proposed graphic for the 2009 MUTCD: Recommended Pushbutton

Recommendation

Replace pedestrian detector policy language contained in current DDOT Design and Engineering Manual with language proposed for 2009 MUTCD.

Push buttons should be designed according to the standards and guidelines in Sections 4E.08 and 4E.09 of the *Manual of Uniform Traffic Control Devices (MUTCD)*. They shall be a minimum of 2" across in at least one direction. The force required to activate the buttons should not be greater than 5 pounds. It is desirable for pushbuttons to offer confirmation that the button has been pressed (see photo). In locations where new pedestrian signals are being installed, Accessible Pedestrian Signals should be provided, see the "Accessible Pedestrian Signals" policy for details.

Adopt the proposed 2009 MUTCD language to provide more guidance on locating push buttons in typical and constrained situations. The provision allowing a person to call a longer walk cycle may also be useful for locations in the District where a walking speed below 3.5 ft/sec is desirable on an intermittent basis to minimize unnecessary delays to traffic.

In general, if pedestrians are present during a majority of the signal phases during the peak hour for a particular leg of an intersection, the pedestrian signal phase should be automatic and pedestrian push buttons should not be used. However, in areas with intermittent pedestrians, push buttons may be used to reduce delays to vehicular traffic. Push button installations throughout the District should be evaluated for compliance with ADA and to determine actual need for push button.

It is a common misconception that pedestrian push buttons are required for a signal to be accessible. Push buttons are not required at locations where the walk signal is provided with each signal cycle. Where a signal requires pedestrian actuation, it is recommended that it be installed to meet the accessibility guidelines.

Signs for Uncontrolled Crossings

Current Policy or Practice

DDOT does not appear to have a policy specifically for signing uncontrolled pedestrian crossings. DDOT's policy regarding the use of pedestrian warning signs is included below..

> ***Design and Engineering Manual***
> ***CHAPTER 43 – GUIDELINES FOR PAVEMENT MARKINGS AND SIGNAGE***
> *43.13 Traffic Signing*
> *43.13.1 General*
> *Sign Reflectivity - All traffic control signs must be fabricated with reflective materials. All regulation signs, such as stop signs, one-way signs, etc. must use Diamond Grade Sheeting. For all other signs High Intensity Grade sheeting shall be used. Engineer Grade sheeting may only be used if authorized by TSA for signs of less importance. Sheeting for all School Zone (S1-1) crossing signs and sheeting for all mid-block Pedestrian and Advanced Pedestrian crossing (W11-2) signs shall be Fluorescent High Performance Lime Green – Diamond Grade.*
>
> ***DC Law - 50-2201.28. Right-of-way at crosswalks.***
> *When official traffic-control signals are not in place or not in operation, the driver of a vehicle shall stop and give the right-of-way to a pedestrian crossing the roadway within any marked crosswalk or unmarked crosswalk at an intersection.*

W11-2 shown with W16-7P (downward diagonal arrow) and W16-9P (AHEAD)

In practice, the District uses variations of MUTCD pedestrian warning signs at controlled and uncontrolled crossing locations. The W11-2 pedestrian warning sign (and plaque) is a standard sign in the MUTCD. It is in widespread use across the country and in the District

The *In-Street Pedestrian Crossing Sign* (R1-6a) is often used in the roadway in the District, and has also been post-mounted as a supplement to pedestrian warning signs (W11-2). The text height used on post-mounted signs in the District is approximately one-inch which does not meet the standard highway sign minimum height of two inches for legibility.

R1-6a sign post - mounted in the District

State of the Practice

Pedestrian Warning Signs

Section 2C.01 of the 2003 MUTCD states that "warning signs call attention to unexpected conditions on or adjacent to a highway or street and to situations that might not be readily apparent to road users." ITE's *Traffic Control Devices Handbook (TCDH)* further explains that it is not possible to identify every potential hazard a driver may encounter, and thus the decision to provide a warning should be based on the definition of the function of a warning sign (2001). The TCDH points out "warning signs are particularly useful to unfamiliar drivers. The role of warning signs is especially important in view of the fact that the driver may not be able to get information from other sources." While drivers should possess a basic knowledge of the types of potential hazards that may be encountered, the driver is not expected to anticipate extraordinary dangers, impediments, or obstructions. This is particularly true for drivers who are unfamiliar with a given road. However, signs should be installed judiciously, as overuse may cause noncompliance and create visual clutter, reducing the readability of each sign.

The MUTCD provides guidelines for the design and placement of warning signs, referring to the Standard Highway Signs book for further detail on the sizes, shaped, colors, and legends. Warning signs associated with pedestrian, bicyclist, and school zone conditions are allowed to utilize a fluorescent yellow-green background to increase visibility. The MUTCD recommends placing warning signs so that there is adequate time for roadway users to perceive, identify, decide, and execute a choice, while insuring the sign is not too far in advance, lest motorists forget the warning due to driving distractions. Warning signs that identify locations of unexpected entries into the roadway in advance (through the use of supplemental plaques with the legend AHEAD, XX FEET, or NEXT XX MILES) should be accompanied by a similar warning at the point of entry, supplemented with a diagonal downward pointing arrow plaque identifying the location of the crossing. The 2003 MUTCD recommends fluorescent-yellow green warning signs not be mixed with yellow signs within the same area.

Standard MUTCD R1-6a

Proposed language for the 2009 MUTCD recommends that all pedestrian, bicyclist, and school zone related signing use the fluorescent-green color instead of yellow. It will require that all school zone related signs be fluorescent-green in color.

In-Street Pedestrian Crossing Signs

MUTCD

The R1-6a in-street pedestrian sign is standard in the MUTCD (see right) and is in widespread use across the country and in the District to remind motorists of their responsibilities at crosswalks. The 2003 MUTCD does not provide guidance for when to use the sign except to restrict its use at signalized intersections.

Proposed revisions for the 2009 MUTCD clarify conditions under which it is appropriate to provide the sign. The following criteria are proposed additions:

- prohibits the post mounting of this sign on the left or right side of the roadway
- pedestrian volume is 25 or more during any 1 hour of the day
- the sign shall be mounted on the center line, lane line, or median island

Maryland SHA MD-MUTCD Side-of-Street Pedestrian Crossing Sign R1-6a (1)

Side-of-Street Pedestrian Uncontrolled Crosswalk Signs

To compensate for the poor legibility of the in-street crossing sign (R1-6a), some agencies have developed a side-of-street sign. This is not found in the MUTCD, but is a modified version of the R1-6a for use on the side of the road.

Maryland State Highway

MD SHA utilizes a Side-of-Street Pedestrian Crossing sign (see right) which may be used at uncontrolled crosswalk locations that do not meet the specifications MD SHA prescribed for the use of the in-street pedestrian crossing sign (where the roadway's clear width is less than 24 feet, where the speed limit is over 35 mph, or where there are 4 or more lanes of vehicular traffic).

Boulder, CO Side-of-Street Pedestrian Crossing Sign

Boulder, Colorado

Boulder uses a similar sign (see right) which was tested as a replacement for the warning sign assembly (W11-2). The City of Boulder found that motorists yielding rates increased in locations with this sign, compared to locations with the W11-2 only. A summary of their yielding rates is shown in the table on the following page. Boulder also developed warrant criteria for this sign which requires a minimum of 20 pedestrians crossing per hour and a minimum vehicular volume of 1,500 per day.

Compliance Results – "State Law – Yield to Pedestrians" Signing

Location	Vehicle Volume (daily) *	Pedestrian Volume (3 peak hours)	Yield Compliance (Before)	Yield Compliance (After)	Percent Increase
9th Street & Walnut	10,000	190	54%	93%	+72%
9th Street & Hawthorne	-----	-----	-----	-----	-----
19th Street & Sumac	3,000	50	96%	* *	n/a
University & 15th Street	10,000	180	47%	69%	+47%
University & 17th Street	10,000	170	68%	89%	+31%
Iris & 15th Street	20,000	10	5%	50%	+900%
Arapahoe & 13th Street	14,000	140	34%	65%	+91%
Arapahoe & 11th Street	12,000	130	38%	70%	+84%
Alpine west of Broadway	5,000	550	91%	90%	0%
Mapleton & 8th Street	-----	70	82%	87%	+6%
19th Street & Norwood	3,000	40	24%	33%	+38%
Greenbriar & Chambers	-----	-----	-----	-----	-----
Walnut & 16th Street	3,000	140	25%	* *	n/a
19th Street & Upland	-----	-----	-----	-----	-----
Pearl & 19th Street	12,000	80	21%	66%	+214%
Linden & 4th Street	3,000	100	45%	81%	+80%
Folsom south of Arapahoe	14,000	50	28%	* *	n/a

Table 1 – Boulder, Colorado motorist yielding behavior results of evaluation of side street crossing sign

Recommendation

Update DDOT uncontrolled crosswalk signing policy and sign standards to better align with current research and best practices.

Develop a Side-of-Street Uncontrolled Crosswalk Sign similar to that used in Boulder and MD SHA in lieu of the current practice of providing a W11-2 supplemented with the R1-6a.

Adopt the proposed language for the 2009 MUTCD describing the use of the R1-6a sign.

Develop warrant criteria (similar to the City of Boulder) to determine when to provide pedestrian signs. Criteria may also include vehicle volume, roadway cross section, motorist operating speed, and sight distance. Develop draft criteria and study the effectiveness of the sign in increasing motorist compliance. Results of an evaluation of the sign should be used to further refine the warrant criteria for installation. Once criteria are developed for uncontrolled crossing signs, develop a plan to upgrade signs at all uncontrolled crossings to bring them into compliance.

Develop guidelines restricting the use of the W11-2 pedestrian warning sign at uncontrolled crosswalks and develop guidance for utilizing the W11-2 to provide advanced warning of unexpected pedestrian crossings..

Develop a plan for upgrading all uncontrolled crossings to comply with policies developed for marking and signing uncontrolled crossings.

Advance Stop Lines at Uncontrolled Marked Crosswalks

Current Policy or Practice

DDOT does not have a policy on the use of advance stop lines at uncontrolled marked crosswalks.

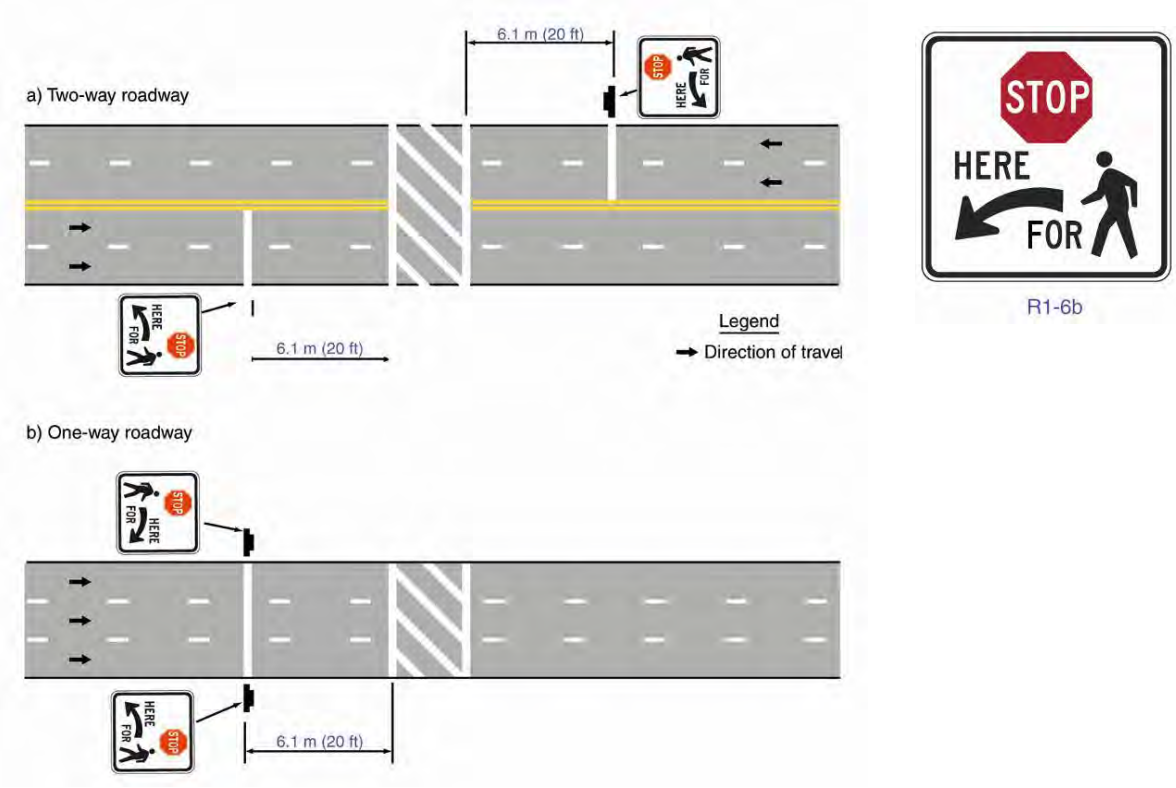
State of the Practice

Numerous studies have shown that the use of advance stop or yield lines at uncontrolled marked crosswalks in conjunction with "Stop Here for Pedestrians" signs can reduce the incidence of multiple threat crashes. Multiple threat crashes are common on multi-lane roads when a driver in one lane yields to a pedestrian, and a driver in the adjacent lane fails to stop.

The MUTCD allows for the use of advance yield lines at unsignalized midblock crosswalks. The law in many jurisdictions across the country (and in the District of Columbia) states that a vehicle must "Stop" for pedestrians rather than "Yield" to pedestrians. A number of states have adopted the use of advance stop lines at uncontrolled marked crosswalks.

Maryland State Highway Administration

The Maryland State Highway Administration has approved the use of advance stop bars at midblock uncontrolled marked crosswalks.



MDSHA Figure 3B-15 (*modified*): Examples of Stop Lines at unsignalized midblock crosswalks and the accompanying sign.

The Oregon Bicycle & Pedestrian Plan Update

The July 2007 draft of Oregon's Bicycle & Pedestrian Plan Update includes the use of advance stop bars at uncontrolled marked crosswalks. In this case, the advance stop bars are not limited to midblock locations, but are also allowed at uncontrolled intersections on multi-lane roads. The draft text is as follows:

> One of the main crash types at marked crosswalks on multi-lane roads is the multiple threat crash. This occurs when a driver in the curb lane stops to let a pedestrian cross, but too close to the crosswalk, masking visibility of the adjacent travel lane. A motorist proceeding in the adjacent lane doesn't notice the first car has stopped to let a pedestrian cross. The pedestrian doesn't see the other car coming and continues to cross, which can result in a high speed, fatal or severe injury crash.
>
> The likelihood of a multiple-threat crash is greatly reduced with an advance stop line placed about 30' ahead of the crosswalk. This encourages drivers to stop back far enough so a pedestrian can see if a second motor vehicle is not stopping, and take evasive action. Advance stop bars are recommended at midblock crosswalks and at uncontrolled intersections on multi- lane roads.
>
> The advance stop line should be supplemented with signs to alert drivers where to stop to let a pedestrian cross. At least one sign should be placed on the right; another may be placed on a median island.

Recommendation

Develop guidelines and standard details for utilizing advanced stop lines at all multi-lane uncontrolled crossings. As in the Oregon plan, advance stop bars should be allowed mid-block and at uncontrolled intersections on multi-lane roads. The adopted standard should follow the proposed language provided in the 2009 MUTCD.

> **Section 3B.16 Stop and Yield Lines (proposed language with yield references deleted)**
>
> *Guidance:* Stop lines should be used to indicate the point behind which vehicles are required to stop in compliance with a traffic control signal.
> *Option:* Stop lines may be used to indicate the point behind which vehicles are required to stop in compliance with a STOP (R1-1) sign, a Stop Here For Pedestrians (R1-5b or R1-5c) sign, or some other traffic control device that requires vehicles to stop, except YIELD signs.
> *Standard:* Yield lines shall not be used at locations where drivers are required to stop in compliance with a STOP (R1-1) sign, a Stop Here For Pedestrians (R1-5b or R1-5c) sign, a traffic control signal, or some other traffic control device.
>
> Stop lines shall consist of solid white lines extending across approach lanes to indicate the point at which the stop is intended or required to be made.
>
> *Guidance:* Stop lines should be 12 to 24 in wide.
>
> If used, stop lines should be placed a minimum of 4 ft in advance of the nearest crosswalk line at controlled intersections, except for yield lines at roundabouts as provided for in Section 3C.04 and at midblock crosswalks. In the absence of a marked crosswalk, the stop line should be placed at the desired stopping point, but should not be placed more than 30 ft or less than 4 ft from the nearest edge of the intersecting traveled way.
>
> Stop lines at midblock signalized locations should be placed at least 40 ft in advance of the nearest signal indication (see Section 4D.14).
>
> If stop lines are used at a crosswalk that crosses an uncontrolled multi-lane approach, the stop lines should be placed 20 to 50 ft in advance of the nearest crosswalk line, and parking should be prohibited in the area between the stop line and the crosswalk (see Figure 3B-16).
>
> *Standard:* If stop lines are used at a crosswalk that crosses an uncontrolled multi-lane approach, Stop Here For Pedestrians (R1-5 series) signs (see Section 2B.11) shall be used.
>
> *Guidance:* Stop lines and Stop Here For Pedestrians signs should not be used in advance of crosswalks that cross an approach to or departure from a roundabout.

Support:

When drivers yield too close to crosswalks that cross uncontrolled multi-lane approaches, they place pedestrians at risk by blocking other drivers' views of pedestrians and by blocking pedestrians' views of vehicles approaching in the other lanes.

Option: Stop lines may be staggered longitudinally on a lane-by-lane basis.

Support: Staggered stop lines can improve the driver's view of pedestrians, provide better sight distance for turning vehicles, and increase the turning radius for left-turning vehicles.

Section 8B.21 contains information regarding the use of stop lines and yield lines at highway-rail grade crossings.

The following additional criteria should be considered in the District to complement the proposed language above:

- The application of this treatment should only be used where a crosswalk meets the warrants of the District's crosswalk marking policy
- On streets with parking, it is recommended that parking be restricted near the crosswalk, and curb extensions be provided to improve sight distances between motorists and pedestrians.
- Provide additional flexibility to the MUTCD language to reduce parking restrictions where curb extensions are not feasible. Specify a minimum parking should be restricted between the advance stop line and the crosswalk (i.e. at least 20 feet on the upstream side).
- Solid lane line striping should be provided on the upstream side of the stop bar for a distance equivalent to the required stopping sight distance (i.e. 155 feet at 25 mph, 200 feet at 30 mph, 2004 AASHTO Exhibit 3-1 on level ground)
- Consideration should be given to providing an overhead pedestrian crosswalk sign on multi-lane roadways with uncontrolled crosswalks

Medians for Pedestrian Refuge

Current Policy or Practice

Design and Engineering Manual
CHAPTER 31 - SIDEWALKS, CURB AND GUTTER, MEDIANS, DRIVEWAYS AND ALLEYS
31.6.1 General Requirements
Minimum width of raised medians shall be no less than 4 ft. wide as measured from the inside edge of the travel lane. Medians may be designed for Collector and Local streets if approved by the District Program Manager. The minimum opening in the medians or islands shall be 3 ft.

Medians may be flush, depressed, or raised. Advantages of depressed medians include improved drainage and snow removal. Depressed medians should slope downward on a 6:1 slope to a central valley and adequate median drainage provided.

Medians 5 ft. or less in width should be paved except where the special nature of an area might warrant the higher cost and risk involved in maintaining grass.

CHAPTER 32 - GEOMETRIC DESIGN FOR COLLECTOR AND LOCAL STREETS
32.3.11 Medians
Existing Street - Medians shall be constructed when there are more than 4 lanes of traffic.
Proposed Street – AASHTO, Chapter VI.

CHAPTER 35 - INTERSECTIONS
35.2.10 Median Islands Separating Opposing Traffic
These islands shall be designed to provide pedestrian refuge. The medians must not obstruct the minimum left turn radius for the design vehicle. Any landscaped medians shall include drainage facilities to handle sprinkler with trickle irrigation, outfall curb and gutter should be used. The medians must be placed such that the required visibility in the intersection is not obstructed. Medians must be placed so they do not diminish the intersection use.

State of the Practice

A number of research studies have shown that pedestrians receive a safety benefit from raised medians. For example, in *Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations: Executive Summary and Recommended Guidelines,* the presence of a raised median was found to improve the safety of crosswalks. This study found that there was no safety benefit from medians that were not raised.

ITE's Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities provides some guidance on the use of medians for pedestrian refuge (2006):

- Avoid providing overly wide medians at the expense of unreasonably narrowing the roadside. In urban contexts, roadsides of appropriate widths should take higher priority than wide medians. However, the design needs to balance the safety, operational, and pedestrian needs of the street.
- In contrast to medians in rural areas, in urban areas the width of medians at intersections should only be as wide as necessary to provide the desired function (such as pedestrian refuge), otherwise the intersection loses operation efficiency and vehicles crossing the median may use the width inappropriately (side-by-side queuing, angled stopping, etc.).
- On multi-lane thoroughfares, medians are important to aid pedestrians in their crossings. Even a narrow median of 6 to 8 ft. can be more desirable to a crossing pedestrian than the same width added to another element of the thoroughfare.
- If the median will not be landscaped, consider using pavers, colored stamped concrete, stone, or other contrasting material to create visual interest and an aesthetic appearance.
- At intersection crossings, extend the median nose beyond the crosswalk to provide an enclosed pedestrian refuge.

The guidelines further recommend 6 feet as the minimum width for a median that serves as a pedestrian refuge, with a recommended width of 8 feet.

Designing Sidewalks and Trails for Access Best Practices Design Guide suggests it may be beneficial to provide shorter curb ramps with a lowered landing area (3" height) to provide the maximum level landing area within the median. An alternative is to provide a cut-through median with a relatively flat (2% slope) to prevent water from pooling within the waiting area.

Recommendation

Update DDOT median design standards and policies to better align with current research and best practices. Language should be added to clarify that when a median is provided with the goal of improving pedestrian safety, it should be raised rather than flush or depressed. Medians intended for pedestrian refuge should be a minimum of 6 feet wide (8 feet when feasible).

At intersections, medians provide the best refuge for pedestrians when the median nose extends beyond the crosswalk. An accessible route through the median is required for pedestrians, either through the use of curb ramps, or a cut-through.

The standard median and pedestrian refuge detail (601.3) should be changed to add the following:

- Clearly show that the slope of the opening is directed towards the roadway travel lane to prevent ponding within the refuge area.
- Recommend the 48-inch opening be widened in locations where there are high volumes of pedestrians
- Recommend the 48-inch opening be widened to match the width of the shared use path when utilized at a shared use path crossing

Flashing Warning Beacons

Current Policy or Practice

DDOT follows guidance in the MUTCD for the use of flashing beacons. DDOT has one pilot location of the Rapid Flashing Beacon.

State of the Practice

Flashing Beacons

A flashing beacon is a traffic control signal that operates in a flashing mode (flash rate is typically one flash per second). It is typically a single light, but can be installed in other combinations. A common application is to add a flashing amber signal to the top of a standard pedestrian sign to provide warning of a pedestrian crossing. The flashing signal has also been used on overhead signs at crosswalks. School zones are sometimes identified with flashing beacons that operate during specific periods of the day.

Flashing Beacon

In some cases, pedestrian detection is used to activate the beacons. Detection can be either passive or active. For flashing beacons with active detection a pedestrian must press a pushbutton. For flashing beacons with passive detection, there are a number of options including bollards with motion sensors. The MUTCD provides guidance for the use of flashing beacons in Chapter 4K.

Studies have found inconsistent rates of motorist compliance with laws to stop or yield for pedestrians at uncontrolled crosswalks when only flashing beacons were provided. This is in large part due to variations in roadway conditions at each of the study sites.

Rapid Flash Beacon, RFB

The Rapid Flash Beacon is a device using LED technology (instead of the traditional incandescent bulbs) in combination with crosswalk warning signs. The RFB design differs from the flashing beacon by utilizing:

- A rapid flashing frequency (60 times per second vs. 1 per second)
- Brighter light intensity
- Ability to aim the LED lighting

RFB at Brentwood Rd. NE, Washington, DC

Additionally, pauses can be incorporated at chosen intervals to create patterns and increase motorist recognition of accompanying information.

The RFB 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.

Boulder uses a pedestrian activated RFB, with the Side-of-Street Uncontrolled Crosswalk sign with imbedded LED lights. In St. Petersburg, the RFB is also pedestrian activated but is used with a standard W11-2 sign with a separate LED device. In St Petersburg, the RFB includes an audible message to give the pedestrian crossing safety information, and a light directed on the pedestrian to improve visibility for approaching motorists. Both cities have evaluated motorists yielding rates at locations with the RFB. Results are summarized in the following tables.

St. Petersburg, Florida Motorist Compliance Rates

Lanes	24 Hour Volume	Posted Speed	Median	Baseline Yield Rate	7 Day Yield Rate	90 Day Yield Rate	180 Day Yield Rate	Location
3	12,245	35	No	n/a	75%	82%	n/a	1st N/61st St
4	18,367	35	Yes	n/a	96%	92%	91%	22nd Ave N/7th St
4	17,657	35	Yes	n/a	60%	62%	68%[6]	4th St/18th Ave S
5	19,192	35	Yes	0.26%	84%	82%	n/a	58th/3rd Ave N
5	16,352	40	No[7]	n/a	93%	71%	n/a	Central Ave/61st St
4	19,422	35	Yes	0.49%	84%	82%	n/a	MLK St/15th ave S
4	12,723	35	No[8]	n/a	78%	93%	76%	9th Ave N/26th St

City of Boulder Compliance Results – Pedestrian actuated flashing signs

Location	Year Installed	Vehicle Volume (daily) *	Pedestrian Volume (3 peak hours)	Yield Compliance (Before)	Yield Compliance (After)	Percent Increase
Pearl (2900 Block)	10/00	24,000	70	26%	54%	**+110%**
Canyon & 11th Street	01/01	19,000	460	38%	80%	**+110%**
Broadway & Pleasant	07/01 removed 10/04	39,000	530	16%	71%	**+340%**
Broadway & 18th Street	07/01	43,000	440	23%	78%	**+240%**
Pearl west of 48th Street	01/02 removed 07/03	18,000	10	0%	9%	**Infinite**
Folsom & Walnut	06/02	23,000	100	11%	54%	**+390%**
Broadway & Norwood	09/02	17,000	20	6%	60%	**+900%**
Valmont & Center Green	07/03	24,000	10	6%	83%	**+1280%**
Canyon & 19th Street	02/04	24,000	80	10%	55%	**+450%**
Broadway & 17th Street	10/04	43,000	180	42%	67%	**+60%**
Canyon & 10th Street **	02/05	19,000	No Data	No Data	No Data	**n/a**

* - Many of the daily traffic volumes have been estimated from peak-hour turning movement counts and should be considered approximations.

** - Data collection has not yet occurred.

Recommendation

Develop a flashing beacon policy and sign standard for use at uncontrolled crossings to better align with current research and best practices. DDOT should develop warrant criteria (similar to the City of Boulder) to determine when to use the RFB. Factors to consider may include vehicle volume, roadway cross-section, motorist operating speed, and sight distance. The warrant criteria should be adjusted based on the RFB's effectiveness in increasing motorist compliance to stop for pedestrians under various conditions.

Although the RFB device was not in use at the time of the FHWA crosswalk study (so it is not included as a recommended engineering treatment; see Crosswalk Marking Policy in this chapter), it received Interim Approval from FHWA in July of 2008. Results of testing in DC, St. Petersburg and Boulder indicate that this device has the ability to

[6] This is actually a 270 day count, there was no data for 180 days at this location
[7] Parking is restricted on this roadway so sight distance to the crosswalk and the sign is ideal because the roadway is flat and straight. There are opposing left turn pockets (the 5th lane) at this location.
[8] Parking is restricted on this roadway so sight distance to the crosswalk and the sign is ideal because the roadway is flat and straight

dramatically improve motorists' stopping rate for pedestrians at uncontrolled crosswalks. The RFB may be an appropriate treatment for crossing conditions identified in the FHWA study as requiring a pedestrian signal.

The proposed Side-of-Street Uncontrolled Crosswalk Sign should be utilized as the sign base for the RFB standard in place of the W11-2 as shown in the example photo. Boulder has adopted the side-of-street sign as the base sign for the RFB. This will be consistent with the sign proposed for uncontrolled crossings in the District.

Pedestrian Hybrid Signals (HAWK) and Pedestrian Volume Signal Warrant

Current Policy or Practice

For pedestrian signals, DDOT utilizes the existing MUTCD pedestrian volume signal warrant (No. 4) shown below.

MUTCD
Section 4C.05 Warrant 4, Pedestrian Volume
Standard: The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that both of the following criteria are met:

A. The pedestrian volume crossing the major street at an intersection or midblock location during an average day is 100 or more for each of any 4 hours or 190 or more during any 1 hour; and
B. There are fewer than 60 gaps per hour in the traffic stream of adequate length to allow pedestrians to cross during the same period when the pedestrian volume criterion is satisfied. Where there is a divided street having a median of sufficient width for pedestrians to wait, the requirement applies separately to each direction of vehicular traffic.

The Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 90 m (300 ft), unless the proposed traffic control signal will not restrict the progressive movement of traffic.

State of the Practice

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 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.

This pedestrian activated signal is a combination of a flashing beacon and a traffic signal with pedestrian pushbuttons and pedestrian signal heads. It 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. This signal has been approved for inclusion into the MUTCD by the National Committee and is included in the proposed language for the 2009 MUTCD. This signal may also be used at mid-block locations.

In the City of Tucson, Arizona, the HAWK signal, combined with a media campaign, has generated a high motorist yield rate, increasing compliance from 30 percent under normal conditions to 93 percent over an eight-month study period. This treatment is profiled in ITE's *Traffic Control Devices Handbook*. The signal has proven to be a successful tool to assist pedestrian crossings of multi-lane arterials with high vehicular volumes while minimizing vehicular delay to the arterial and discouraging minor roadway cut-through traffic.

Placement

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 (i.e. school crossings, low volume neighborhood street crossings of high volume, multi-lane arterials). See proposed MUTCD warrant graphic included below.

Design of Vehicular Signal
Traffic signal head with the following 3-lens configuration:

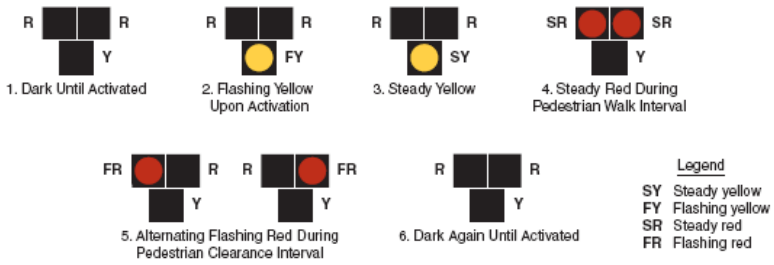
Red – Red
Yellow

Design of Pedestrian Signal
Standard pedestrian countdown signal head

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).

Figure 4F-3. Sequence for a Pedestrian Hybrid Signal



Graphical depiction of operating sequence – graphic proposed for 2009 MUTCD

Proposed language for the 2009 MUTCD defines the HAWK signal operation, provides warrants for its use, and provides installation guidance. The following pages contain the proposed language.

CHAPTER 4F. PEDESTRIAN HYBRID SIGNALS
Section 4F.01 Application of Pedestrian Hybrid Signals
Support: A pedestrian hybrid signal is a special type of hybrid signal used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk.
Option: A pedestrian hybrid signal may be considered for installation at a location that does not meet other traffic signal warrants to facilitate pedestrian crossings.
Standard: If used, pedestrian hybrid signals shall be used in conjunction with signs and pavement markings to warn and control traffic at locations where pedestrians enter or cross a street or highway. A pedestrian hybrid signal shall only be installed at a marked crosswalk.
Guidance: If a location meets the traffic control signal warrants under Sections 4C.05 and/or 4C.06 and a decision is made not to install a traffic control signal, a pedestrian hybrid signal should be considered. If one of the signal warrants of Chapter 4C is met and a traffic control signal is justified by an engineering study, and if a decision is made to install a traffic control signal, it should be installed based upon the provisions of Chapters 4D and 4E.

If a traffic control signal is not justified under the signal warrants of Chapter 4C and if gaps in traffic are not adequate to permit pedestrians to cross, or if the speed for vehicles approaching on the major street is too high to permit pedestrians to cross, or if pedestrian delay is excessive, the need for a pedestrian hybrid signal should be

considered on the basis of an engineering study that considers major-street volumes, speeds, widths, and gaps in conjunction with pedestrian volumes, walking speeds, and delay.

For a major street where the posted or statutory speed limit or the 85th-percentile speed is 60 km/h or less or is 35 mph or less, the need for a pedestrian hybrid signal should be considered if the engineering study finds that the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding total of all pedestrians crossing the major street for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4F-1 for the length of the crosswalk.

For a major street where the posted or statutory speed limit or the 85th-percentile speed exceeds 60 km/h or exceeds 35 mph, the need for a pedestrian hybrid signal should be considered if the engineering study finds that the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding total of all pedestrians crossing the major street for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4F-2 for the length of the crosswalk.

For crosswalks that have lengths other than the four that are specifically shown in Figures 4F-1 and 4F-2, the values should be interpolated between the curves.

Section 4F.02 Design of Pedestrian Hybrid Signals

Standard: Except as otherwise specified in this Section, a pedestrian hybrid signal shall meet the provisions of Chapters 4D and 4E.

A pedestrian hybrid signal face shall consist of three signal sections, with a CIRCULAR YELLOW signal indication centered below two horizontally aligned CIRCULAR RED signal indications (see Figure 4F-3).

When an engineering study finds that installation of a pedestrian hybrid signal is justified, then:

A. At least two pedestrian hybrid signal faces shall be installed for each approach of the major street,
B. A stop line shall be installed for each approach of the major street,
C. A pedestrian signal head conforming to the provisions set forth in Chapter 4E shall be installed at each end of the marked crosswalk, and
D. The pedestrian hybrid signal shall be pedestrian actuated.

Guidance: When an engineering study finds that installation of a pedestrian hybrid signal is justified, then:

A. Parking and other sight obstructions should be prohibited for at least 30 m (100 ft) in advance of and at least 6.1 m (20 ft) beyond the marked crosswalk,
B. The installation should include suitable standard signs and pavement markings, and
C. If installed within a signal system, the pedestrian hybrid signal should be coordinated.

On approaches having posted speed limits or 85th-percentile speeds in excess of 60 km/h (35 mph) and on approaches having traffic or operating conditions that would tend to obscure visibility of roadside hybrid signal face locations, both of the minimum of two pedestrian hybrid signal faces should be installed over the roadway.

On multi-lane approaches having posted speed limits or 85th-percentile speeds of 60 km/h (35 mph) or less, either a pedestrian hybrid signal face should be installed on each side of the approach (if a median of sufficient width exists) or at least one of the pedestrian hybrid signal faces should be installed over the roadway.

Support: Section 4D.11 contains additional provisions regarding lateral and longitudinal positioning of signal faces for approaches having a posted or 85th-percentile speed exceeding 60 km/h or exceeding 40 mph.

Standard: A CROSSWALK STOP ON RED (symbolic circular red) (R10-23) sign (see Section 2B.59) shall be mounted adjacent to a pedestrian hybrid signal face on each major street approach. If an overhead pedestrian hybrid signal face is provided, the sign shall be mounted adjacent to the overhead signal face.

Option:

A Pedestrian (W11-2) sign (see Section 2C.52) with an AHEAD (W16-9P) supplemental plaque may be placed in advance of a pedestrian hybrid signal. A warning beacon may be installed to supplement the W11-2 sign.

Guidance: If a warning beacon supplements a W11-2 sign in advance of a pedestrian hybrid signal, it should be programmed to flash only during the yellow and red signal indications of the pedestrian hybrid signal.

Standard: If a warning beacon is installed to supplement the W11-2 sign, the design and location of the beacon shall comply with the provisions of Sections 4L.01 and 4L.03.

If a pedestrian hybrid signal is installed at or immediately adjacent to an intersection with a side road or driveway, vehicular traffic on the side road or driveway shall be controlled by STOP signs.

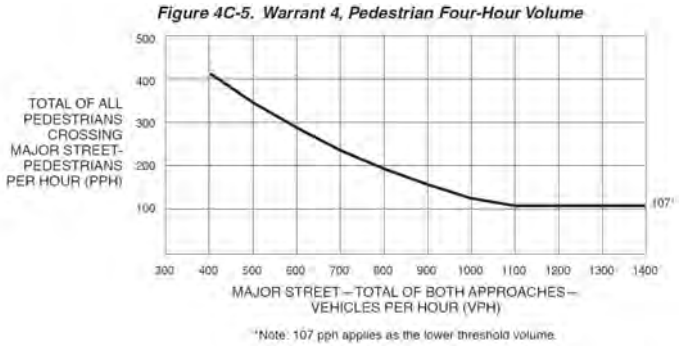
Section 4F.03 Operation of Pedestrian Hybrid Signals
Standard: Pedestrian hybrid signal indications shall be dark (not illuminated) during periods between actuations.

Upon actuation by a pedestrian, a pedestrian hybrid signal face shall display a flashing CIRCULAR YELLOW signal indication, followed by a steady CIRCULAR YELLOW signal indication, followed by both steady CIRCULAR RED signal indications during the pedestrian walk interval, followed by alternating flashing CIRCULAR RED signal indications during the pedestrian clearance interval (see Figure 4F-3). Upon termination of the pedestrian clearance interval, the pedestrian hybrid signal faces shall revert to a dark (not illuminated) condition.

Except as noted in the Option below, the pedestrian signal heads shall continue to display a steady UPRAISED HAND (symbolizing DONT WALK) signal indication when the pedestrian hybrid signal faces are either dark or displaying flashing or steady CIRCULAR YELLOW signal indications. The pedestrian signal heads shall display a WALKING PERSON (symbolizing WALK) signal indication when the pedestrian hybrid signal faces are displaying steady CIRCULAR RED signal indications. The pedestrian signal heads shall display a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication when the pedestrian hybrid signal faces are displaying alternating flashing CIRCULAR RED signal indications. Upon termination of the pedestrian clearance interval, the pedestrian signal heads shall revert to a steady UPRAISED HAND (symbolizing DONT WALK) signal indication.

Option: Where the pedestrian hybrid signal is installed adjacent to a roundabout to facilitate crossings by pedestrians with visual disabilities and an engineering study determines that pedestrians without visual disabilities can be allowed to cross the roadway without actuating the pedestrian hybrid signal, the pedestrian signal heads may be dark (not illuminated) when the pedestrian hybrid signal faces are dark.
Guidance: The duration of the flashing yellow interval should be determined by engineering judgment. The steady yellow interval should not have a duration of less than 3 seconds or more than 6 seconds (see Section 4D.26). The longer intervals should be reserved for use on approaches with higher speeds.

Pedestrian Volume Signal Warrant (No. 4)
Proposed language and figures have been developed for the next edition of the MUTCD to simplify the pedestrian volume signal warrant (warrant 4). The proposed warrant eliminates the gap analysis required by the existing warrant, and is based on a combination of pedestrian volume and vehicle volume (a surrogate for gaps). The proposed graphic depicting the pedestrian signal warrant is shown below. If a crossing meets this warrant, the designer has the option to choose either a full signal or the hybrid pedestrian signal.



Revised warrant criteria for Warrant 4 – graphic proposed for 2009 MUTCD

Recommendation

Adopt the proposed language for the 2009 MUTCD for both the pedestrian volume signal warrant and the Pedestrian Hybrid Signal. DDOT may want to consider adjusting the parking restriction (100 feet – 4F.02 A) in the proposed language as this standard was developed based on suburban-area installation criteria where the vehicular and roadway characteristics may not be directly comparable to the District.

This signal will be a useful tool for roadways with an uncontrolled crossing where a marked crosswalk alone is not recommended (per the Crosswalk Marking Policy in this chapter) and where the installation of a full signal will cause excessive vehicular delay or induce traffic to shift to lower volume neighborhood streets. This signal will also be an important option for improving the safety of crosswalks on the cities multi-lane arterials that do not have median islands. Although this device was not in widespread use at the time of the FHWA crosswalk study, it may be an appropriate treatment for uncontrolled crossings that require a signal as per the study.

Recommendations for pedestrian pushbuttons, accessible pedestrian signals, and crosswalk warrants are located on separate policy sheets.

School Zones

Current Policy or Practice

In practice, DC stripes school zone crosswalks with high visibility crosswalk striping. DDOT also provides traffic signal warrants for School Crossings, flashing beacons for school crosswalks, and some guidance on types of crosswalk markings near schools.

Design and Engineering Manual
CHAPTER 40 - TRAFFIC SIGNAL DESIGN
40.2.5 Warrant 5 – School Crossing (Note: This Text is taken from Section 4C.06 of The MUTCD Warrant 5, School Crossing.)
The School Crossing signal warrant is intended for application where the fact that school children cross the major street is the principal reason to consider installing a traffic control signal.

The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of school children at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the children are using the crossing is less than the number of minutes in the same period and there are a minimum of 20 students during the highest crossing hour.

Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade separated crossing.

The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

If this warrant is met and a traffic control signal is justified by an engineering study, then:
If at an intersection, the traffic control signal should be traffic-actuated and should include pedestrian detectors. If at a non-intersection crossing, the traffic control signal should be pedestrian-actuated, parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the crosswalk, and the installation should include suitable standard signs and pavement markings.

40.12.5 Flashing Beacons at School Crosswalks
Flashing beacons at school crosswalks may be installed on city's streets.

State of the Practice

The Part 7 of the MUTCD, "Traffic Controls for School Areas" provides detailed standards and guidance on school areas (not shown here). Standards and guidance are provided on a number of topics, including school zone signage, reduced speed zones, crosswalk markings, crossing guards, and many other topics. For example, the MUTCD standard clearly states that if used, the School Crosswalk Warning assembly shall not be used at marked crosswalks other than those adjacent to schools and those on established pedestrian routes." Further guidance is given, stating that "the School Crosswalk Warning assembly should be installed at marked crosswalk(s), including those at signalized locations, used by students going to and from school."

Recommendation

Adopt the standards and guidance found in the "Traffic Controls for School Areas" portion of the MUTCD. This includes the guidance for creating school route plans for each school, and standards and guidance for school signs, crosswalk markings, crossing guards, and pavement word and symbol markings.

The following is intended to provide additional guidance beyond what is provided in the MUTCD:

Sign Color

Fluorescent yellow-green background should be used for all school-related signs to provide maximum visibility. The MUTCD recommends that "when the fluorescent yellow-green background color is used, a systematic approach featuring one background color within a zone or area should be used. The mixing of standard yellow and fluorescent yellow-green backgrounds within a zone or area should be avoided."

Crosswalk Markings

DDOT should continue its existing practice of providing high visibility crosswalk markings at intersections adjacent to school blocks, and along selected home school routes within four blocks of a school. DDOT should establish this practice as a standard policy.

Pavement Word and Symbol Markings

Per the MUTCD, "word and symbol markings on the pavement are used for the purpose of guiding, warning, or regulating traffic." The SCHOOL pavement marking may be used to draw motorists' attention to the school zone. In the FHWA *Course on Bicycle and Pedestrian Transportation*, it is stated that these pavement markings "may be helpful on high-volume or high speed streets with unusual geometrics (such as vertical or horizontal curves) in advance of a pedestrian crossing area…Their use should be kept to a minimum to retain effectiveness."

Warrant 5—School Crossing

DDOT should maintain its School Crossing warrant for traffic signals, as described in Chapter 40 of the *Design and Engineering Manual*.

Bus Stop Siting

Current Policy or Practice

Bus stop siting policy is handled by multiple agencies, including WMATA and DDOT. Field observations in the District of Columbia indicate that it is common practice to locate bus stops on the near side of intersections. The following text is relevant to DDOT's procedures for signing bus stops and coordination with other agencies:

> ***Design and Engineering Manual***
> ***CHAPTER 5 - GUIDELINES FOR TRAFFIC***
> ***5.9 Mass Transit Accommodations***
> *The Program Manager/Project Manager must confer with the Mass Transit Division, in the Transportation Policy and Planning Administration (TPPA), concerning public transit issues. On Federal Aid projects involving public transit,*
> *FHWA, DDOT, and FTA shall coordinate to facilitate project selection, approval, and completion. The decision to implement transit accommodations is usually a joint effort between the FHWA, FTA, WMATA, and DDOT. Appropriate design standards and plans, and project decision type documentation should be sent to the FHWA and to transportation agencies for review and advisement when appropriate. Transit projects should be considered in both the planning and the design process. The planning process should consider major capital investments and issues, such as light rail or commuter rail lines, high-occupancy vehicle lanes, or major expansions to bus systems.*
>
> *The design process should not only consider major project decisions, but should also include consider smaller elements that would accommodate and facilitate transit service delivery, such as park-n-ride lots, and bus stops/pads/shelters. In scoping stage, the Project Manager should consider future mass-transit needs and incorporate appropriate elements into the project scope. It is important to ensure that project design does not preclude future transit options. The Project Manager should coordinate with WMATA on long-range planning necessary to incorporate transit elements into the plans. The Project Manager is responsible for the coordination of any highway construction plans that involve high-occupancy vehicle lanes, parking facilities, bus pullouts, etc.*
>
> ***CHAPTER 43 - GUIDELINES FOR PAVEMENT MARKINGS AND SIGNAGE***
> ***43.13.4 Bus Stop Signage***
> *The Metro Bus stop sign should be located at the beginning of the bus stop after the 50 ft. taper. These signs will be installed by the Washington Metropolitan Area Transit Authority (WMATA).*
> *"No Standing or Parking – Metro Bus Zone" signs should be posted at both ends of the bus stop. These signs will be installed by DDOT.*

State of the Practice

Several publications provide excellent guidance on the placement of bus stops and associated amenities. In most recently published bus stop siting guidelines, decisions regarding the location of bus stops are discussed in the context of the intersection, pedestrian safety and access, and the bus route.

The *Arlington County Bus Stop Design Standards* presents recommendations for the use of near side, far side, and mid block bus stops in addition to the advantages and disadvantages of the location choices (see Table 1).

Table 1: ADVANTAGES AND DISADVANTAGES OF STOP PLACEMENT RELATIVE TO THE NEAREST INTERSECTION

Bus Stop Location	Advantages	Disadvantages	Recommended When the Following Conditions Exist
Near-side (located immediately before an intersection)	-Less potential conflict with traffic turning onto the bus route street from a side street. -Passengers usually deboard closer to a crosswalk	-Potential conflicts with right-turning traffic as cars may cut in front of the bus while it is stopped. -The stopped bus obscures the sight distance of drivers entering from the right as well as crossing pedestrians. -At intersections controlled by a stop sign, the stopped bus may block visibility of the sign. -At signalized intersections, may result in schedule delays.	-When traffic is heavier on the far-side than on the approaching side of the intersection. -When pedestrian access and existing landing area conditions on the near-side are better than on the far-side. -When street crossings and other pedestrian movements are safer when the bus stops on the near-side than the far-side. -When the bus route continues straight through the intersection.
Far-Side (located immediately after an intersection)	-Does not conflict with vehicles turning right off of the direction of the bus route. -Appropriate after the route has made a left-hand or right-hand turn. -The stopped bus does not obscure sight distance to the left for vehicles entering or crossing from the side street. -At signalized intersections, buses can more easily re-enter traffic. -The stopped bus does not obscure traffic control devices or pedestrian movements at the intersection.	-The stopped bus obscures the sight distance to the right of drivers entering from the cross street to the right of the bus. -If the bus stopping area is of inadequate length, the rear of the stopped bus will block the cross street (especially an issue for stops where more than one bus may be stopped at a time). -If the bus stops in the travel lane, it may result in queued traffic behind it blocking the intersection.	-When traffic is heavier on the near-side than on the far-side of the intersection. -At intersections where heavy left or right turns occur. -When pedestrian access and existing landing area conditions on the far-side are better than on the near-side. -At intersections where traffic conditions and signal patterns may cause delays. -At intersections with transit signal priority treatments.
Mid-Block (located 300 feet or more beyond or before an intersection)	-The stopped bus does not obstruct sight distances at an intersection. -May be closer to major activity centers than the nearest intersection.	-Requires most curb clearance of the three options (unless a mid-block sidewalk extension is built). -Encourages mid-block jaywalking. -May increase customer walking distances if the trip generator is close to an intersection.	-When traffic or street/sidewalk conditions at the intersection are not conducive to a near-side or far-side stop. -When the passenger traffic generator is located in the middle of the block. -When the interval between adjacent stops exceeds stop spacing standards for the area. -When a mid-block stop is compatible with a corridor or district plan.

Other factors to be considered in selecting a bus stop location discussed in the Arlington County Guideline:

- Sidewalk Conditions - Stops should be located and constructed to make use of existing sidewalk facilities, or new sidewalk facilities should be constructed to provide pedestrian access to the bus stop. Bus shelters, benches, and sign poles should be installed off of (but connected to) the main sidewalk path. At stops with heavy ridership, additional passenger waiting/standing areas should be constructed off of the main sidewalk so that waiting passengers do not block passage of other pedestrians.
- Crosswalks - Bus stops should ideally be located close to existing crosswalks to encourage safe pedestrian crossings, but also located so that a stopped bus will neither block a crosswalk nor obstruct pedestrian visibility of oncoming traffic and vice-versa. In general, it is safer to locate the bus stop on the far side of a crosswalk, so that passengers will cross behind, rather than in front of, the bus.
- Driveways - Driveways should only be blocked at stops with very brief dwell times. It is preferable to fully, rather than partially, block a driveway in these cases, to prevent other vehicles from attempting to squeeze by the bus in a situation with reduced sight distances.
- Potential Landscaping Issues - The presence of trees and bushes at a bus stop may necessitate periodic landscaping at the stop to prevent buses from hitting tree branches and bushes from encroaching on sidewalks. Tall bushes are also a potential security problem, and additional lighting should be considered at stops with this issue.
- Lighting - Adequate lighting is important for passenger comfort and security as well as for visibility of waiting passengers to the bus and other oncoming traffic. Bus stops which are served after dark should be located where they will be illuminated at night, preferably from an overhead street light. If this is not possible, lighting should be installed at the stop.
- Limited Visibility Over Hills and Around Curves - Bus stops should not be located over the crest of a hill, immediately after a right-hand curve in the road, or at other locations that limit the visibility of the stopped bus to oncoming traffic. If the bus stops in the travel lane at such locations, it is in danger of being struck from the rear. Even if the bus pulls off the road at such stops, pulling back into the travel lane presents crash potential. If a bus stop must be located at such a stop, approaching cars should be warned of the need to be prepared to stop.
- On-Street Parking - Locating a bus stop in an area with existing curbside parking requires either removal of enough parking to permit the bus to pull off, service the stop, and re-enter the travel lane, or installation of a sidewalk extension or curb bulb to provide passenger access to the bus.
- Proximity to Major Trip Generators - When feasible, a bus stop should be located to minimize walking distances to the activity center that is expected to generate the most ridership.
- Right-of-Way Considerations - If a bus stop may be a future candidate for transit shelter or bench installation, a site should be selected that includes adequate right-of-way for constructing improvements.
- Transfer Locations - Bus stops where transfer activity between routes is heavy, stops should be located to minimize street crossings of passengers transferring to other routes.
- Compatibility with Adjacent Properties - Care should be taken to avoid locating a bus stop immediately adjacent to land uses which are highly sensitive to the effects of bus fumes and noise.
- Drainage - Areas which tend to accumulate standing water should be avoided or improved. However, bus stops should not be located so that passengers are required to step over catch basins when deboarding the bus, as this creates a potential tripping hazard.
- Bicycle Facilities - To the extent feasible, bus stops should be located so they do not block bicycle travel lanes. Bus stops should also be located so that bicycle racks do not block pedestrian access to the bus boarding and deboarding area.

Safety and Security: Traffic safety issues are discussed in the context of bus stop placement considerations. Curbside safety and security issues include:

- location of storm drains and catch basins which put passengers at risk of catching a foot under one when boarding or deboarding the bus
- uneven surfaces which could result in a fall
- slope of the terrain surrounding the landing area which can put passengers in danger of falling in an adjacent ravine or into the travel lane
- presence of hazardous objects, such as broken street furniture and jagged edges
- surface traction (for example, stone aggregate can be exceedingly slippery when wet for

- wheelchair users)
- water accumulation areas which can also result in icy surfaces in winter months
- overgrown bushes which could potentially present a security hazard as well as encroach on the sidewalk and landing area
- other obstacles in the sidewalk that, in addition to making it inaccessible, force pedestrians to walk in the street, and area lighting.

Recommendation

Adopt the *Arlington County Bus Stop Design Standards*. This is a comprehensive guide that addresses the numerous considerations required for bus stop siting in the District, and it has already been approved by the Washington Metropolitan Transit Authority (WMATA). It is recommended that the bus stop siting policy generally favor far side bus stops.

Modifications to the guide will be necessary to account for unique elements of the District roadway environment, DDOT bus stop shelter designs, and bus routing.

Systematically review all bus stops located at uncontrolled crosswalks in the District and develop a plan to bring them into compliance with the bus stop siting policy.

When roadways are being constructed, reconstructed or resurfaced DDOT should review and relocate as necessary all existing bus stops to meet the bus stop policy.

Work Zones

Current Policy or Practice

Summary of the 12/14/07 Departmental Order [9]

The District Department of Transportation is responsible for regulating the temporary occupancy of public space during construction on both private property and public space. As part of this responsibility, DDOT reviews and approves traffic control plans governing the safe routing of pedestrians and vehicles around the work zone in public space.

To ensure that work zones adjacent to sidewalks minimize disruption to the normal pedestrian pathways while providing adequate protection for pedestrians, DDOT shall review all traffic control plans that include a covered walkway on the sidewalk or the roadway or that include an open walkway on the sidewalk or in the roadway and are submitted with applications for public space permits to ensure that the plan is consistent with the standards in the District Guideline and Standards for Traffic Control: Work Zone Safety Pocket Guide and the District Temporary Traffic Control Manual: Work Zone Manual 2006 Edition.

It is the general policy of DDOT that, in accordance with the Manual on Uniform Traffic Control Devices, 2003 Edition, traffic control plans should replicate the existing pedestrian pathway as nearly as practical and the pedestrian pathway should not be severed or moved for non-construction activities such as parking for vehicles or the storage of materials or equipment. All traffic control plans submitted with applications for public space permits shall include a schedule of work. The proposed traffic control plan shall provide a pedestrian pathway consistent with the phase of work as outlined in the District Guideline and Standards for Traffic Control: Work Zone Safety Pocket Guide and the District Temporary Traffic Control Manual: Work Zone Manual 2006 Edition and the attached document titled Pedestrian Protections and Phases of Construction.

Modification from this policy is allowed based on site-specific conditions. Modification must be requested in writing when submitting the traffic control plan and public space permit application. The request must explain the nature of the modification requested and the site-specific conditions that require the modification.

State of the Practice

Recommendation

Implement the work zone policy and adopt it into District Code to apply to all new projects.

Review all existing construction projects with closed sidewalk access and assess the ability to retrofit the project site to comply with the new work zone policy.

[9] http://ddot.dc.gov/ddot/cwp/view,a,1250,q,642974,ddotNav_GID,1758,ddotNav,%7C34358%7C.asp