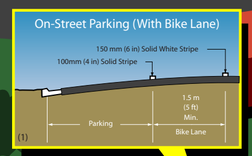
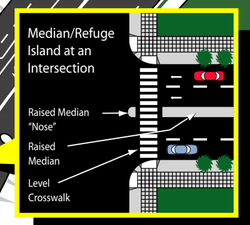
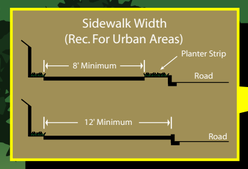
A Walkable Community

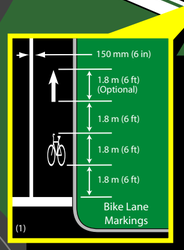
is much more than just sidewalks...

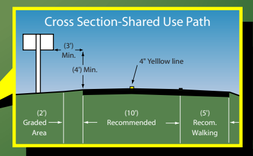
Your Town, USA

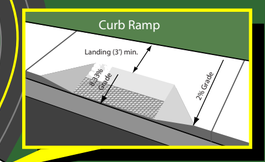


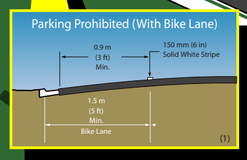


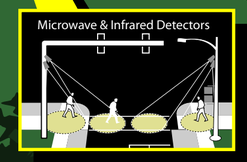


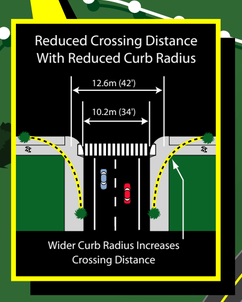


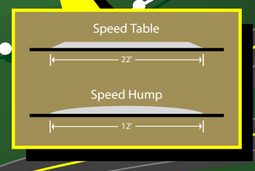


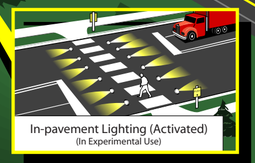












Trail

Trail

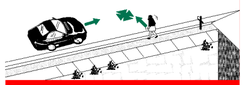
Trail

Rest Area

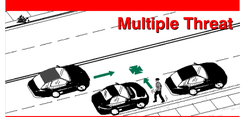
(1) AASHTO

Midblock Related:

Description: At a midblock location, the motorist's view of the pedestrian was blocked until an instant before impact.



Description: At a midblock location, the pedestrian was struck while running and the motorist's view of the pedestrian was not obstructed.



Description: The pedestrian entered the traffic lane at midblock in front of standing or stopped traffic and was struck by another vehicle moving in the same direction as the stopped traffic.

Bus Related:

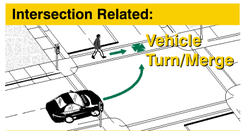
Description: The pedestrian was struck going to or from a school bus or school bus stop.

Description: The pedestrian was struck by another vehicle while crossing in front of a commercial bus stopped at a marked bus stop.

Failure to Yield at Un-signalized Location:

Description: The motorist failed to yield to the pedestrian and/or the pedestrian stepped directly into the path of the oncoming vehicle.

Intersection Related:



Description: The pedestrian and vehicle collided while the vehicle was preparing to turn, in the process of turning, or had just completed a turn (or merge).

Description: The pedestrian was struck by a vehicle proceeding straight ahead and the report indicated that the driver committed a violation such as careless driving, failed to yield, signal/sign violation, speeding, or DWI, etc.

Description: The pedestrian was struck while crossing at a signalized intersection when the light changed and traffic started moving.

General Engineering Countermeasure

Crash Group / Problem

Countermeasures with the extension (eg B3) are referenced on the other side

The Walking Environment:	Road Design:	Intersection Treatments:	Traffic Calming:	Traffic Management:	Signs and Signals:	Other Measures:
1) Sidewalks / Walkways A4, E3 2) Street Furniture (design, location, etc) E3 3) Curb Ramps J5 4) Marked Crosswalks & Enhancements E6, C2, F7 5) Transit Stop Treatments G3 6) Roadway lighting 7) Pedestrian Overpass or Underpass 8) Shared Use Paths E4	9) Curb Radius Reduction C7 10) Bicycle lanes D1, A6, J4 11) Roadway Narrowing 12) Reduction in lanes 13) Street conversions one/two-way 14) Driveway improvements A4 15) Well designed Right-turn Slip lanes 16) Raised medians J2, E6 17) Pedestrian Barriers	18) Roundabouts F5 19) Modified T-Intersection 20) Intersection Median Barriers 21) Improved Visibility A1, B3 22) Tactile Strip J5	23) Curb extensions A1, B3 24) Choker 25) Crossing Island J2, E6 26) Chicanes A8 27) Traffic mini-circles 28) Speed Hump/Table E7 29) Raised Intersection 30) Raised Pedestrian Crossing 31) Gateways 32) Landscaping 33) Specific Paving Treatments A1, B3 34) Serpentine Design 35) Woonerf	36) Diverters 37) Full Street Closure 38) Partial Street closure 39) Pedestrian Streets/Mall	40) Traffic Signals F2,I2 41) Upgrade/Modify Pedestrian Signal Timing 42) Traffic Signal Enhancements 43) Pedestrian Signals H4, G1, I2, J7 44) RTOR Restrictions 45) Recessed STOP lines F2, I6 46) Add/Modify Signing G6, J4 47) Prohibit Left Turns 48) ITS Technologies G1, G8, J7, I2 49) Pedestrian Detector/push button in Median H4, J7 50) Shared Use Paths E4	51) School Zone improvements 52) Identify Neighborhood 53) Speed Monitoring Eq. 54) ADA Design J5, A4 55) On-street Parking 56) Remove/Restrict Parking A5 57) School Crossing Guard 58) Adopt Ordinance 59) Education Program 60) Relocate Mailbox 61) Enforcement 62) School Bus Stop Treatment 63) Retro-reflective Materials (for peds) 64) GIS Tools

Crash Group / Problem	The Walking Environment:	Road Design:	Intersection Treatments:	Traffic Calming:	Traffic Management:	Signs and Signals:	Other Measures:
Midblock Related:							
Dart/Dash:							
Child runs into collector street.	6	10,11,12		23,26,28,31,35	36,37,38,39	46	56,57,59
High Speed and/or high-volume arterial street.	4,5,6,7	16		23,24,25		40,42,43,46,48	53,56,58,61,
Multiple Threat:							
Sight distance problem.	5,6,	17		23,30		40,43,45,46,48	
High vehicle speeds/High volume arterial st.		11,12,16		25,26,28		46	61
Other:							
Struck while going to/from:							
a) ice-cream truck		11,12		25,28			58,59
b) mailbox	6			26,28		46	59,60
Struck while getting into/from parked vehicle or by a speeding vehicle.				26,28		46	53,56,59,61
Bus Related:							
Limited Sight distance at intersection.	2,5,6			23,25			
Midblock location with high speeds or volumes.	1,5,6	10,17		23		45	59,61
School bus stop.	1,6					46	59,61,62
Failure to Yield at Unsignalized Location:							
On 2-lane, low speed road.				23,24,25,26,28,29,30		42,43,46	
Crossing multi-lane road.	5,6	10,11,12,16		23,25		40,42,43	61
High speeds on high volumes.		10,11,12,16,17		25,31		40,42,43,46	61
Intersection Related:							
Turning Vehicle/s:							
Large number of pedestrian or left turn vehicles.	6	13	18	23,24,25		40,41,42,43,46,47	59
RTOR conflicts.	6	9,15	21	23,24		41,44,46	
School Children crossing and large left-turn vehicle movement.	6			23,24,25		41,46,47	57,59,61
Inadequate Sight Distance and/or intersection geometrics.	6	9,15,17	21	23,24,25,27,32		42,43,46,47	56
Through Vehicle:							
Pedestrians cannot see traffic signals.	5		21			43	
Excessive delay to pedestrians prior to getting the walk interval.	7			25	39	41,48,49	
Lack of pedestrian compliance with WALK phase due to other causes.						41	57,59
Motorist does not see pedestrian in time to stop.	5,6	16	21	23,25,29,30		45	53,56
Children crossing in school areas.	7					40,43,46	52,57,59,61,64
Other:							
Slow walking pedestrian.	3,7	9,16	21	23,24,25		41,48,49	59
Walking Along Roadway:							
Inadequate walking area.	1	11,12				46	
High vehicle speeds and /or volumes.	1,6	11,12				46	61
Route to school.	1			28		46	52,53,57,59,61,63,64
Inaccessible sidewalk.	1,2,3	14	22				54
Working/Playing in Road:							
Worker struck in the roadway.	6	17				46	59,61,63
Pedestrian playing on foot or on play vehicle.	1,6	11,12		28,31,35	37,38,39	46	59
Excessive speeds on local streets		11,12		26,27,28,31,34		46	53,61
Disabled Vehicle Related:							
a) walking to/from	1,6						59,63
b) working on or standing by	6						59,63
Not in Road:							
Pedestrian was struck at or near curb.	1,6	9,15,17		23			59,61
Pedestrian was struck in driveway, etc.	1,2,6	14	21				59
Vehicle enters or exits a driveway or alley and strikes a pedestrian.	1,2,	14	21				
Backing Vehicle:							
Pedestrian struck by backing vehicle.	2	14	21				59
Crossing on Expressway:							
Disabled Vehicle.	6						59,61,63
Pedestrians routinely cross section of road.	6,7	17				46	59

Walking Along Roadway:

Description: The pedestrian was struck while walking (or running) along a road without sidewalks. The pedestrian may have been: hitchhicking, walkingwithtraffic, walking against traffic, walking along a road.

Working/Playing in Road:

Description: The pedestrian (e.g., police/emergency personnel, flagman, road maintenance crew, etc) was struck while working on, in, over, or under the roadway.

Description: The pedestrian was struck while riding a play vehicle (e.g. wagon, sled, skateboard, skates, "big wheel" type tricycle, or tricycle.

Description: The pedestrian was struck while walking to or from or while near or next to a disabled vehicle (no emergency vehicle present), or while near an active police or emergency vehicle.

Not in Road:

Description: The pedestrian was struck while standing at or near the curb or roadway edge waiting to cross.

Description: The pedestrian was struck when not in the roadway. Areas included parking lots, driveways, private roads, sidewalks, service stations, yards, etc.

Backing Vehicle:

Description: The pedestrian was struck by a vehicle that was backing.

Crossing on Expressway:

Description: The pedestrian was struck while attempting to cross a limited access expressway.

One important factor in pedestrian crashes is *SPEED...*

The probability of a pedestrian being severly injured and/or killed when struck by a vehicle increases as the motorist speed increases. Figure 1 shows the correlation of vehicle impact speed and pedestrian death rates. As vehicle speeds increase the ability of the driver to stop in time for crossing pedestrians also significantly decreases.

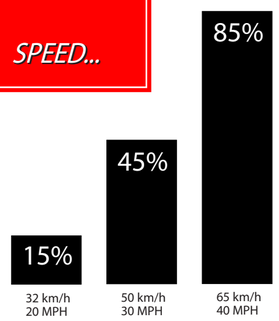


Figure 1: Pedestrian's chances of death if hit by a motor vehicle (Ref. UKDOT)

Reducing traffic speeds not only reduces the severity of pedestrian crashes, but may reduce their occurrence. Faster vehicle speeds result in increase breaking distance, and also an increase in the distance a vehicle will travel during the 2.5 second perception/reaction time as shown in Figure 2.

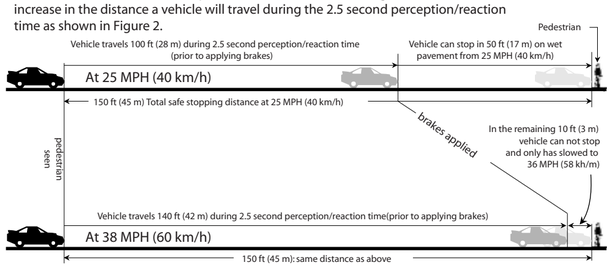


Figure 2: Relationship between safe stopping distance and travel speed

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What is the Focus of this brochure?

This brochure "A Walkable Community" focuses on the design of safe and successful pedestrian facilities. A Crash Group/General Engineering Countermeasure Matrix identifies potential solutions for use by safety practitioners. This matrix is particularly helpful as a categorical resource of potential countermeasures, which may be implemented at a location to address a particular pedestrian crash type. Some of the engineering countermeasures are illustrated on the map (other side) as referenced.

Moreover, this Matrix should be used in conjunction with local site data, including the number of pedestrian crashes and types, traffic and pedestrian volumes, vehicle speeds, and road width to develop the most suitable countermeasure. Conscientious planning, effective education programs, and consistent safety and law enforcement also contribute to improving our communities for pedestrians. A "walkable" community is much more than just sidewalks...

When designing pedestrian facilities it is important to understand the needs and characteristics of the pedestrian and those which affect their travel. Some of the these needs and characteristics are highlighted in this section.

Table 1: Crossing Distances, Speeds and Time (1)

Crossing Distance	Average Pedestrian Crossing Time (4 ft/sec.)	Older Adult Pedestrian Crossing Time (2.5 ft/sec.)
24 ft. (2 lanes)	6 secs	9.6 secs.
58 ft. (4 lanes with bike lane)	14.4 secs..	23.3 secs.

Table 1 shows that as crossing distance increases, crossing time may vary by pedestrian user by as much as 1.6 times that of the average pedestrian . This does not include start-up times. Transportation practitioners need to be aware of their design audience and cater to all users, e.g. allocation of pedestrian signal timings.

Table 2: Effects of curb radius on pedestrian crossing times and distances (1) (C7)

Sidewalk width	5 ft	5 ft	5 ft
Curb return radius	10'	15'	25'
Crossing distance to be added	6.8'	13.4'	13.4'
Pedestrian crossing time to be added to street crossing time	1.9 secs.	3.8 secs	8.1 secs.

Table 2 shows that the larger the curb radius at intersections, the pedestrian crossing distance is increased and also the time to cross. Transportation practitioners need to balance the need for a larger curb radius against existing traffic characteristics, speed, and overall intersection safety.

At times, pedestrian facility improvements and expansions are not supported because use levels are low . Many reasons exist for low levels of pedestrian travel and include:

- Poorly designed facilities, excessive access points
- Failure to provide a contiguous system of pedestrian facilities
- Concerns for personal safety
- Poor lighting
- Lack of separated facilities
- Failure to provide facilities to and from popular origins/ destinations
- No protection from inclement weather
- Lack of pedestrian furniture (e.g. benches)

Table 3: Common Pedestrian Characteristics (1)

Age	Characteristics
0 - 4	learning to walk, requiring constant supervision, developing peripheral vision and depth perception
5 - 12	Increasing independence but still requiring supervision, poor depth perception, susceptible to "Dart Out"/Intersection Dash
13 - 18	Sense of invulnerable, intersection dash
19 - 40	Active, fully aware of the environment
40 - 65	Slowing of reflexes
65 +	Street crossing difficulty, poor vision, difficulty hearing, high fatality rate

Different pedestrian age groups have different needs. Understanding the user needs help in the design and use of pedestrian facilities.

Reducing Turning Conflicts: Turning crashes kill or injure many pedestrians, some low-cost engineering countermeasures include:

- Design compact intersections with small turning radii that force slower speeds C7
- Prohibit Right-Turn-On-Red
- When right-turn slip lanes are used, place crosswalks as far upstream as possible and provide highly visible markings,
- During certain hours when there are higher concentrations of pedestrians crossing use a separate left-turn phase in conjunction with the WALK/DON'T WALK signal, or restrict left turns
- Shorten crossing distance and exposure time with curb extensions or bulb-outs A1
- Provide medians and refuge islands J2
- Provide well-illuminated crossings
- Improve markings and visibility of crosswalks C2
- Place signs to remind motorists of their duty to "Yield" to pedestrians while turning left or right.

(1) WSDOT

Older pedestrians and pedestrians with disabilities , including those using special walking aids or wheelchairs, need carefully designed facilities that eliminate barriers. Pedestrian facility features that are helpful include:

- Curb cuts and ramps J5
- Tactile strips
- Easy-to-reach activation buttons H4
- Audible warnings and message systems
- Raised and Braille letters for communications
- Pedestrian signal timing at slower than average walking speed
- Maximum grade of 1:20 and cross slope of 1:50 (ramps can be up to 1:12)
- Roadway crossing refuge J2, E6
- Traffic calming devices
- Smooth surfaces and unobstructed travel ways

As more and more construction/work zones appear in our urban areas the need to protect pedestrians and provide a safe travel way becomes more critical. Some consideration for pedestrians in work zones include:

- Separate pedestrians from conflicts with construction equipment
- Separate pedestrians from conflicts with re-routed traffic
- Provide a safe, convenient, and accessible route that maintains the direction and character of the original route
- Minimize the amount of construction access points
- Communicate construction activity and pedestrian impact through the local media and pedestrian interest groups
- Avoid using delineating materials that are difficult to recognize by persons with impaired sight

Common Characteristics of Pedestrian Collisions:

- Driver inattention
- Struck by a vehicle while crossing at an intersection
- Struck by a vehicle while crossing at an midblock
- Struck from behind while walking in the roadway in the same direction as traffic
- Motorist exceeding safe speed
- Darting out into the street at midblock (most common for children)
- Vehicles backing up (difficult to see children or other walking behind)
- Collisions in urban areas (~ 70 percent)

A Walkable Community

is much more than just sidewalks...

Your Town, USA

U.S. Department of Transportation
Federal Highway Administration

Common Characteristics of Pedestrian Friendly Communities:

- Continuous Systems/Connectivity
- Separation from Traffic
- Pedestrian Supportive Land-use Patterns
- Well-Functioning Facilities
- Designated Space
- Security and Visibility
- Linkages to a Variety of Land-uses
- Coordination between Jurisdictions
- Automobile is not the only Consideration
- Appropriately Located Transit
- Pedestrian Furnishings
- Accessibility by all Users