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Guidance Memorandum on Consideration and Implementation of Proven Safety Countermeasures

Subject: ACTION: Consideration and Implementation of Proven Safety Countermeasures

Date: July 10, 2008

From: Jeffrey A. Lindley, Associate Administrator for Safety

In Reply Refer To: HSSI

To: Division Administrators
Federal Lands Highway Division Engineers

Improving safety is a top priority of the US Department of Transportation, and FHWA remains strongly committed to reducing highway fatalities and serious injuries on our Nation's highways. We know that a comprehensive mix of strategies is required–including stronger policies to support system-wide and sustainable improvements. We believe our area of greatest potential influence is how Federal funds are used and targeted to implement improvements that will have a positive impact on safety.

In our stewardship and oversight role for federally funded highway programs, we have the opportunity to strongly encourage Federal, State, local agencies, and tribal governments to include safety in their investment decision-making process. While there is still much work to do on determining the precise effectiveness of some safety countermeasures, we are highly confident that certain processes, infrastructure design techniques, and highway features are effective and should be encouraged whenever Federal funds are used. Safety should be considered at every stage of the project development process. Every investment decision should consider the impact on safety and every federally funded project should include appropriate safety enhancement features.

This guidance memorandum highlights when and where we believe certain processes, design techniques, or safety countermeasures should be used. This document also includes countermeasure descriptions and background on the proven effectiveness and benefits; a statement on when the countermeasure or process should be applied; links to reference documents; and current FHWA technical contacts for each topic. This guidance was developed based on effectiveness data for various crash types compiled from a variety of sources. It reflects the types of circumstances and situations that we are confident will yield high pay-offs and be cost beneficial for all projects.

We need your leadership to encourage our partners to apply this guidance as they make investment decisions and develop projects. I am requesting that all Federal-aid and Federal Lands Division Offices review this guidance and meet with officials in their State and with tribal governments, as well as Federal partners, to determine how and when they can consider these measures to improve safety when federally funded investments are pursued. In discussing this guidance with your safety partners, it will be particularly important to address the need for comprehensive high quality safety data as a foundational element for facilitating project and program decisions. Data systems should be continually improved to help foster better decision-making.

The Office of Safety believes that widespread implementation of these

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Highlights

Safety Benefits of Raised Medians and Pedestrian Refuge Areas: **Brochure**, **Booklet**

Safety Benefits of Walkways, Sidewalks, and Paved Shoulders: **Brochure**, **Booklet**

FHWA Nine Proven Crash Countermeasures - *Addressing Critical Safety Concerns*

Crash Countermeasures FAQs

"Top Nine" Life-Saving Strategies Flyer

Safety Newsletter - Issue Dedicated to the Nine Crash Countermeasures

safety countermeasures can serve to accelerate the achievement of local, State and national safety goals. We are currently considering whether to advance one or more elements of this guidance through a formal rulemaking process. As your office works with your State, tribal governments, and Federal partners in implementing your State's Strategic Highway Safety Plan and providing stewardship and oversight of federally funded investments, we would appreciate feedback on your experiences in using this guidance. We also invite your input on other potential safety guidance needs.

List of guidance documents included herein:

1. Road Safety Audits
2. Rumble Strips and Rumble Stripes
3. Median Barriers
4. Safety Edge
5. Roundabouts
6. Left and Right Turn Lanes at Stop-Controlled Intersections
7. Yellow Change Intervals
8. Medians and Pedestrian Refuge Areas in Urban and Suburban Areas
9. Walkways

Attachment

cc: Associate Administrators
Directors of Field Services
Resource Center Manager

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1. Road Safety Audits (Rev. 6/05/08)

Description:
A Road Safety Audit is a very effective tool to reduce injuries and fatalities on our Nation's roadways. A road safety audit (RSA) is a formal safety performance examination of an existing or future road or intersection by an independent and multi-disciplinary team. It estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users.

Background:
Section 625.2 of 23 CFR states that plans and specifications for proposed NHS projects shall adequately serve the existing and planned future traffic of the highway in a manner that is conducive to safety, durability, and economy of maintenance. While numerous requirements and analytical methods have been developed to support Federal-aid project decision-making, few requirements or analytical tools have been applied that relate to safety. The use of Road Safety Audits for this purpose would result in significant reductions in the numbers of fatalities and injuries.

The use of RSAs is increasing across the United States, in part due to crash reductions of up to 60 percent in locations where they have been applied. The relative low-cost nature of RSAs and implementation is another factor. RSAs may be conducted at every stage in the lifecycle of a transportation facility including pre-construction, construction, and post-construction as discussed in the FHWA Road Safety Audit Guidelines, FHWA-SA-06-06. Highway agencies should consider conducting a Road Safety Audit at the earliest stage possible (planning or preliminary design) when all roadway design options and alternatives are being explored.

Guidance Statement/Application:
Each State Department of Transportation (DOT) should develop an RSA policy which will establish criteria for conducting RSAs on highway projects. The policy should cover Federal-aid highway projects, as a minimum, and preferably all highway projects under jurisdiction of the State DOT. The policy should identify which projects will have RSAs conducted and when (at what project stage). Consideration for types of projects, project cost thresholds and the likelihood of producing significant, beneficial safety recommendations for implementation should be included. The policy should cover who will conduct the RSA and how it will be funded. The policy may list the project types or categories

considered to have the highest potential benefit from application of an RSA. The policy may contain a list of project types or categories which may be exempt from the RSA process.

The State's RSA policy should contain procedures for prompt reviews of RSA recommendations, and procedures for implementing accepted RSA recommendations. The State's RSA policy should be coordinated with the FHWA Division Office and may be incorporated or referenced in the Stewardship and Oversight agreement.
Federal and local agencies and tribal governments administering highway projects using Federal funds should also be encouraged to adopt a RSA policy for these projects.

Reference Documents and Guidelines:
FHWA Road Safety Audit Guidelines, February 2005, http://safety.fhwa.dot.gov/rsa/guidelines/
FHWA Road Safety Audit Webpage: http://safety.fhwa.dot.gov/rsa
FHWA Priority Technologies and Innovations 2008 List: http://www.fhwa.dot.gov/crt/lifecycle/ptisafety.cfm
FHWA SA-07-007, Pedestrian Road Safety Audit Guidelines and Prompt Lists, FHWA SA-07-007, 2007.
http://drusilla.hsrc.unc.edu/cms/downloads/PedRSA.reduced.pdf

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2. Rumble Strips and Rumble Stripes (Rev. 6/05/08)

Description:
Rumble strips are raised or grooved patterns on the roadway that provide both an audible warning (rumbling sound) and a physical vibration to alert drivers that they are leaving the driving lane. They may be installed on the roadway shoulder or on the centerline of undivided highways. If the placement of rumble strips coincides with centerline or edgeline striping, the devices are referred to as rumble stripes.

Background:
Centerline Rumble Strips and Rumble Stripes: The 2005 NCHRP Synthesis 339 (data from the Insurance Institute for Highway Safety study on centerline rumble strips in September 2003) found that head-on and opposite direction sideswipe injury crashes were reduced by an estimated 25% at sites treated with centerline rumble strips or stripes. Centerline rumble strips/stripes have been shown to provide a crash reduction factor of 14% of all crashes and 15% of injury crashes on rural two-lane roads.

Shoulder Rumble Strips and Rumble Stripes: Continuous shoulder rumble strips (CSRS) can be applied on many miles of rural roads in a cost-effective manner. Studies have documented the following crash reduction benefits:

- Overall crash reduction of 13% and injury reduction of 18% on rural two-lane highways.
- Overall crash reduction of 16% and injury reduction of 17% on rural multi-lane divided highways.
- Reduction in run-off-road crashes of 38% on freeways.

Shoulder rumble stripes have not been studied to the same extent; however, they show great potential for reducing run-off-the-road crashes in addition to improving night-time visibility.

Guidance Statement/Application:
Rumble Strips or Rumble Stripes should be provided on all new rural freeways and on all new rural two-lane highways with travel speeds of 50 mph or greater. In addition, State 3R and 4R policies should consider:

- Installation of centerline rumble strips (or stripes) on rural 2-lane

road projects where the lane plus shoulder width beyond the rumble strip will be at least 13' wide; particularly roadways with higher traffic volumes, poor geometrics, or a history of head-on and opposite-direction sideswipe crashes.
- Installation of continuous shoulder rumble strips on all rural freeways and on all rural two-lane highways with travel speeds of 50 mph or above (or as agreed to by the Division and the State) and/or a history of roadway departure crashes, where the remaining shoulder width beyond the rumble strip will be 4 feet or greater, paved or unpaved.

Federal and local agencies and tribal governments administering highway projects using Federal funds should also be encouraged to adopt similar policies for providing rumble strips or rumble strips.

Reference Documents and Guidelines:
NCHRP Project 17-32, *Guidance for the Design and Application of Shoulder and Centerline Rumble Strips (projected release date of August 2008)*
http://www.trb.org/trbnet/projectdisplay.asp?projectid=458
Technical Advisory 5040.35, *Roadway Shoulder Rumble Strips*
http://safety.fhwa.dot.gov/roadway_dept/policy_guide/t504035.cfm
NCHRP Synthesis 339, Centerline Rumble Strips
http://onlinepubs.trb.org/Onlinepubs/nchrp/nchrp_syn_339.pdf

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3. Median Barriers (Rev. 6/05/08)

Description:
Median barriers are longitudinal barriers used to separate opposing traffic on a divided highway. They are designed to redirect vehicles striking either side of the barrier. Median barriers can significantly reduce the occurrence of cross-median crashes and the overall severity of median-related crashes.

Background:
Crashes resulting from errant vehicles crossing the median and colliding with traffic on the opposing roadway often result in severe injuries and fatalities. The fact that these crashes involve innocent motorists is another compelling reason for highway agencies to take action.

In the past, median barriers were not typically used with medians that were more than 30 feet wide. In the 1980's and 1990's, however, a number of States experienced a large number of cross median fatal crashes. This led them to review their design policies and begin installing barriers in medians wider than the 30 feet originally called for in the AASHTO Roadside Design Guide (RDG). The 2006 RDG revision encourages consideration of barriers in medians up to 50 feet wide.

A recent review of cross median fatality data shows many States experiencing crashes involving vehicles traversing medians well in excess of 30 feet. Although W-beam guardrail has typically been used to prevent medians crossovers, more recently many States have demonstrated that cable median barriers are a very cost-effective means of reducing the severity of median encroachments. Although a small number of high-profile crashes involving vehicles going over or under cable barrier systems has caught the public's attention, the failure rate of cable systems is comparable to, or may even be lower than, that for W-beam median barriers. Cable systems are a highly cost-effective way to impact cross-median crashes by reducing the number and severity of such crashes, and the FHWA has been actively urging each State to install cable median barrier, where feasible, on highway segments.

Guidance Statement/Application:

- Each State should update its median barrier policy to be consistent with the 2006 Roadside Design Guide Chapter 6 revision.
- Where median barriers are determined to be needed, States should give strong consideration to cable median barrier, based on its performance history.

Reference Documents and Guidelines:

- AASHTO Roadside Design Guide, 3rd Edition, 2006 https://bookstore.transportation.org/item_details.aspx?ID=148
- NCHRP Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features." http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/
- FAQ on Median Barriers on Divided Highways with Less than Full Access Control: http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/qa_bttabr.cfm#brrs1, *Reference added Jan. 14, 2011*

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4. Safety Edge (Rev. 6/05/08)

Description:
The Safety Edge is a specific asphalt paving technique where the interface between the roadway and graded shoulder is paved at an optimal angle to minimize vertical drop-off and provide a safer roadway edge. A Safety Edge shape can be readily attained by fitting resurfacing equipment with a device that extrudes and compacts the shape of the pavement edge as the paver passes. This mitigates shoulder pavement edge drop-offs immediately during the construction process and over the life of the pavement. This technique is not an extra procedure but merely a slight change in the paving equipment that has a minimal impact on the project cost. In addition, the Safety Edge improves the compaction of the pavement near the edge. Shoulders should still be pulled up flush with the pavement.

Background:
New and resurfaced pavements improve ride quality but can be a detriment to safety if the edges are left near vertical. Drivers trying to regain control after inadvertently dropping a tire over the edge frequently have difficulty with a steep vertical edge and may lose control of the vehicle, possibly resulting in severe crashes. Making the adjacent non-paved surface flush with the paved surface alleviates this problem, but a vertical edge may appear due to erosion or wheel encroachment, especially along curves. Installing the Safety Edge during a paving project provides a surface that can be more safely traversed.

Recent studies have shown that crashes involving pavement edge drop-offs greater than 2.5 inches are more severe and twice as likely to be fatal than other roadway departure crashes. An effective countermeasure is to implement a pavement wedge as referenced in the AASHTO Roadside Design Guide, Chapter 9. Research in the early 1980's found a 45 degree pavement wedge effective in mitigating the severity of crashes involving pavement edge drop-offs. During the Georgia DOT Demonstration project, evaluation of wedge paving techniques found it beneficial to flatten the wedge to a 30 to 35 degree angle that resulted in a pavement edge referred to as the Safety Edge. Subsequent research has shown this design to be 50% more effective than the original 45 degree wedge.

Guidance Statement/Application:

Each State should implement policies and procedures to incorporate the Safety Edge where pavement and non-pavement surfaces interface on all Federal-aid new paving and resurfacing projects with surface differentials of 2.5 inches or more. The differentials should be measured from the pavement surface to the adjacent non-pavement surface, accounting for grading along the pavement edge during construction and including existing drop-offs.

In addition, Divisions should work with Federal, State and local agencies and tribal governments to determine how the Safety Edge can be installed on all routes with pavement edge drop-offs (i.e., surface differentials of 2.5 inches or greater) during resurfacing over time, based on highest priority by traffic volume, lack of paved shoulders, and historical presence of edge rutting or pavement edge drop-offs.

Reference Documents and Guidelines:
AAA Foundation for Traffic Safety, Safety Impacts of Pavement Edge Drop-offs
http://www.aaafoundation.org/pdf/pedo_report.pdf
The Safety Edge: Pavement Edge Treatment, FHWA-SA-07-023:
http://safety.fhwa.dot.gov/roadway_dept/pavement/safedge/fhwasa07023/

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5. Roundabouts (Rev. 7/01/09)

Description:
The modern roundabout is a type of circular intersection defined by the basic operational principle of entering traffic yielding to vehicles on the circulatory roadway and certain key design principles to achieve deflection of entering traffic by channelization at the entrance and deflection around a center island. Modern roundabouts have geometric features providing a reduced speed environment that offers substantial safety advantages and excellent operational performance.

Background:
Roundabouts have demonstrated substantial safety and operational benefits compared to other forms of intersection control, with reductions in fatal and injury crashes of from 60–87 percent. The benefits apply to roundabouts in urban and rural areas and freeway interchange ramp terminals under a wide range of traffic conditions. Although the safety of all-way stop control is comparable to roundabouts, roundabouts provide much greater capacity and operational benefits. Roundabouts can be an effective tool for managing speed and transitioning traffic from a high speed to a low speed environment. Proper site selection and channelization for motorists, bicyclists, and pedestrians are essential to making roundabouts accessible to all users. In particular, it is important to ensure safe accommodation of bicyclists at higher speed roundabouts and for pedestrians with visual or cognitive impairments.

Guidance Statement/Application:
Roundabouts are the preferred safety alternative for a wide range of intersections. Although they may not be appropriate in all circumstances, they should be considered as an alternative for all proposed new intersections on Federally-funded highway projects, particularly those with major road volumes less than 90 percent of the total entering volume. Roundabouts should also be considered for all existing intersections that have been identified as needing major safety or operational improvements. This would include freeway interchange ramp terminals and rural intersections.

Reference Documents and Guidelines:

1. *Roundabouts: An Informational Guide* (Report No. FHWA-RD-00-067)
   http://www.fhwa.dot.gov/publications/research/safety/00068/

2. *Public Rights-of-Way Access Advisory* http://www.fhwa.dot.gov/environment/bikeped/prwaa.htm
3. Pedestrian Access to Modern Roundabouts: Design and Operational Issues for Pedestrians who are Blind http://www.access-board.gov/research/roundabouts/bulletin.htm#CROSSING%20AT%20ROUNDABOUTS
4. *NCHRP Project 03-78A, Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities* http://www.trb.org/TRBNet/ProjectDisplay.asp?ProjectID=834
5. *Desktop Reference for Crash Reduction Factors, FHWA-SA-07-015, 2007* http://www.transportation.org/sites/safetymanagement/docs/Desktop%20Reference%20Complete.pdf
6. *NCHRP Report 572: Roundabouts in the United States* onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_572.pdf
7. *Guide for the Planning, Design, and Operation of Pedestrian Facilities, American Association of State Highway and Transportation Officials, 2004.*

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6. Left and Right-Turn Lanes at Stop-Controlled Intersections (Rev. 7/01/09)

Description:
Left-turn lanes are auxiliary lanes for storage or speed change of left-turning vehicles. Installation of left-turn lanes reduces crash potential and motorist inconvenience, and improves operational efficiency. Right-turn lanes provide a separation between right-turning traffic and adjacent through traffic at intersection approaches, reducing conflicts and improving intersection safety.

Background: The AASHTO Green Book recommends that left-turning traffic be removed from the through lanes whenever practical, and that left-turn lanes should be provided at street intersections along major arterials and collector roads wherever left turns are permitted. Consideration of left turn lanes has traditionally been based on such factors as the number of through lanes, speeds, left turn volumes, opposing through volumes, and/or left-turning crashes. Providing left-turn lanes on the major road approaches has proven safety benefits at rural and urban 3 and 4-leg, two-way stop-controlled intersections. Studies have shown total crash reductions ranging from 28-44% and fatal/injury crash reductions of 35-55% for providing a left-turn lane on one major road approach, and 48% for providing left-turn lanes on both major road approaches, at rural intersections with traffic volumes ranging from 1,600-32,400 vehicles per day (vpd) on the major road and 50-11,800 on the minor road.

For urban intersections, total crash reductions of 27-33% and fatal/injury crash reduction of 29% have been experienced after providing a left-turn lane on one major road approach, and 47% for providing left-turn lanes on two major road approaches, intersections with traffic volumes from 1,520-40,600 vpd on the major road and 200-8,000 vpd on the minor road.

Providing right-turn lanes on major road approaches has been shown to reduce total crashes at two-way stop-controlled intersections by 14% and fatal/injury crashes by 23% when providing a right-turn lane on one major road approach, and a total crash reduction of 26% for right-turn lanes on both approaches, at 3 and 4-leg urban and rural intersections with traffic volumes ranging from 1,520-40,600 vpd on the major road and from 25-26,000 vpd on the minor road.

Guidance Statement/Application:
Installing left-turn lanes and right-turn lanes should be considered for the major road approaches for improving safety at 3 and 4-leg intersections with two-way stop control on the minor road, where significant turning volumes exist or where there is a history of turn-related crashes. Safe

accommodation of pedestrians and bicyclists at these intersections should be considered as well.

Reference Documents and Guidelines:
Desktop Reference for Crash Reduction Factors, FHWA, SA-07-015, 2007
http://www.transportation.org/sites/safetymanagement/docs/Desktop%20Reference%20Complete.pdf
NCHRP Project 17-27, Highway Safety Manual, Parts I and I1
NCHRP Report 500, Volume 5, A Guide for Addressing Unsignalized Intersection Collisions
http://onlinepubs.trb.org/Onlinepubs/nchrp/nchrp_rpt_500v5.pdf
Safety Effectiveness of Intersection Left- and Right Turn Lanes (FHWA-RD-02-089)
http://www.fhwa.dot.gov/publications/research/safety/02089/index.cfm
NCHRP Project 03-91, Left-Turn Accommodations at Unsignalized Intersections (underway) Guide for the Planning, Design, and Operation of Pedestrian Facilities. American Association of State Highway and Transportation Officials. 2004. [Available for purchase from AASHTO.]

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7. Yellow Change Intervals (Rev. 7/01/09)

Description:
The yellow change interval is the interval following a green signal indication during which the yellow signal indication is displayed to warn drivers of the impending change in right of way assignment. Yellow change intervals that are not consistent with normal operating speeds create a dilemma zone in which drivers can neither stop safely nor reach the intersection before the signal turns red.

Background:
Red-light running is one of the most common causes of intersection crashes. Research shows that yellow interval duration is a significant factor affecting the frequency of red-light running and that increasing yellow time to meet the needs of traffic can dramatically reduce red light running. Bonneson and Son (2003) and Zador et al.(1985) found that longer yellow interval durations consistent with the ITE Proposed Recommended Practice(1985) using 85th percentile approach speeds are associated with fewer red-light violations, all other factors being equal. Bonneson and Zimmerman (2004) found that increasing yellow time in accordance with the ITE guideline or longer reduced red light violations more than 50%. Van Der Host found that red light violations were reduced by 50% one year after yellow intervals were increased by 1 second. Retting et al (2007) found increasing yellow time in accordance with the guideline reduced red-light violations on average 36%. Retting, Chapline & Williams (2002) found that adjusting the yellow change interval in accordance with the ITE guidelines reduced total crashes by 8%, reduced right angle crashes by 4%, and pedestrian and bicycle crashes by 37%. Both Kentucky and Missouri report a 15% reduction in all crashes and a 30% reduction in right-angle crashes after increasing the yellow interval.

Guidance Statement/Application:
The length of the yellow change interval should be increased at any intersection where the existing yellow change interval time is less than the time needed for a motorist traveling at the prevailing speed of traffic to reach the intersection and stop comfortably before the signal turns red. The minimum length of yellow should be determined using the kinematics formula in the 1985 ITE proposed practice assuming an average deceleration of 10 ft/sec^2 or less, a reaction time of 1 sec or more, and an 85th percentile approach speed. If approach speed is not

known, the posted speed limit may be used. An additional 0.5 sec of yellow time should be considered for locations with significant truck traffic, significant population of older drivers, or more than 3 percent of the traffic is entering on red.

Reference Documents and Guidelines:
Desktop Reference for Crash Reduction Factors, FHWA-SA-07-015, 2007
http://www.transportation.org/sites/safetymanagement/docs/Desktop%20Reference%20Complete.pdf

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8. Medians and Pedestrian Refuge Areas in Urban and Suburban Areas (Rev. 6/05/08)

Description:
The *Median* is the area between opposing lanes of traffic, excluding turn lanes. Medians can either be open (pavement markings only) or they can be channelized (raised medians or islands) to separate various road users.

Pedestrian Refuge Areas (or crossing islands)—also known as center islands, refuge islands, pedestrian islands, or median slow points—are raised islands placed in the street at intersection or midblock locations to separate crossing pedestrians from motor vehicles.

Background:
Providing raised medians or pedestrian refuge areas at pedestrian crossings at marked crosswalks has demonstrated a 46% reduction in pedestrian crashes. Installing such raised channelization on approaches to multi-lane intersections has been shown to be particularly effective. At unmarked crosswalk locations, medians have demonstrated a 39% reduction in pedestrian crashes. Medians are especially important in areas where pedestrians access a transit stop or other clear origin/destinations across from each other. Midblock locations account for over 70% of pedestrian fatalities. Also it is where vehicle travel speed are higher which contributes to the injury and fatality rate at this location. Over 80% of pedestrians die when hit by vehicles traveling at 40 mph or faster while less than 20% die when hit at 20 mph.

Guidance Statement/Application:
Raised medians (or refuge areas) should be considered in curbed sections of multi-lane roadways in urban and suburban areas, particularly in areas where there are mixtures of a significant number of pedestrians, high volumes of traffic (more than 12,000 ADT) and intermediate or high travel speeds. Medians/refuge islands should be at least 4 feet wide (preferably 8 feet wide for accommodation of pedestrian comfort and safety) and of adequate length to allow the anticipated number of pedestrians to stand and wait for gaps in traffic before crossing the second half of the street.

Reference Documents and Guidelines:

1. *A Review of Pedestrian Safety Research in the United States and Abroad*, pp 85-86
   http://www.walkinginfo.org/library/details.cfm?id=13
2. *Pedestrian Facility User's Guide: Providing Safety and Mobility*, p. 56
   http://drusilla.hsrc.unc.edu/cms/downloads/PedFacility_UserGuide2002.pdf
3. *Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations*, p. 55
   http://www.walkinginfo.org/library/details.cfm?id=54

4. *Guide for the Planning, Design, and Operation of Pedestrian Facilities, American Association of State Highway and Transportation officials, 2004* [Available for purchase from AASHTO.]
5. PEDESTRIAN ROAD SAFETY AUDITS AND PROMPT LISTS - http://www.walkinginfo.org/library/details.cfm?id=3955
6. FHWA Office of Safety Bicycle and Pedestrian Safety - http://safety.fhwa.dot.gov/ped_bike/

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9. Walkways (Rev. 6/05/08)

Description:
Several types of pedestrian* walkways have been defined:

- Pedestrian Walkway (Walkway): A continuous way designated for pedestrians and separated from motor vehicle traffic by a space or barrier.

- Shared Use Path: A bikeway or pedestrian walkway physically separated from motorized vehicular traffic by an open space or barrier—either within a highway right-of-way or within an independent right-of-way. Shared use paths may also be used by pedestrians, skaters, wheelchair users, joggers, and other nonmotorized users. Shared use paths also may be referred to as “trails” or “multiple-use trails.
- Sidewalks: Walkways that are paved and separated from the street, generally by curb and gutter.
- Roadway Shoulder: In rural or suburban areas where sidewalks and pathways are not feasible, gravel or paved highway shoulders provide an area for pedestrians to walk next to the roadway.

*Pedestrian: Any person traveling by foot, and any mobility impaired person using a wheelchair.

Background:
USDOT policy calls for bicycling and walking facilities to be incorporated into all transportation projects unless exceptional circumstances exist (http://www.fhwa.dot.gov/environment/bikeped/design.htm#d4)

The presence of a sidewalk or pathway on both sides of the street corresponds to approximately an 88 % reduction in “walking along road” pedestrian crashes.Providing paved, widened shoulders (minimum of 4 feet) on roadways that do not have sidewalkscorresponds to approximately a 71% reduction in “walking along the road” pedestrian crashes. “Walking along road” pedestrian crashes typically are around 7.5% of all pedestrian crashes (with about 37% of the 7.5% being fatal and serious injury crashes).

A number of studies have also shown that widening shoulders reduces all types and all severity of crashes in rural areas. Reductions of 29% for paved and 25% for unpaved shoulders have been found on 2-lane rural roads where the shoulder was widened by 4 feet. In addition, shoulder widening and paving provides space for rumble strips.

Guidance Statement/Application:
Accessible sidewalks or pathways should be provided and maintained along both sides of streets and highways in urban areas, particularly near school zones and transit locations, and where there is frequent pedestrian activity. Walkable shoulders (minimum of 4 feet stabilized or paved surface) should be provided along both sides of rural highways routinely used by pedestrians.

Reference Documents and Guidelines:

1. *A Review of Pedestrian Safety Research in the United States and Abroad*, pp 113-114. http://www.walkinginfo.org/library/details.cfm?id=13
2. *An Analysis of Factors Contributing to 'Walking Along Roadway' Crashes: Research Study and Guidelines for Sidewalks and Walkways*. http://www.walkinginfo.org/library/details.cfm?id=51
3. *Pedestrian Facility User's Guide: Providing Safety and Mobility*, p. 56 http://drusilla.hsrc.unc.edu/cms/downloads/PedFacility_UserGuide2002.pdf
4. *A US DOT Policy Statement Integrating Bicycling and Walking into Transportation Infrastructure* http://www.fhwa.dot.gov/environment/bikeped/design.htm
5. *Guide for the Planning, Design, and Operation of Pedestrian Facilities, American Association of State Highway and Transportation Officials, 2004.* [Available for purchase from AASHTO]
6. Pedestrian Bicycle Information Center – Engineer Pedestrian Facilities - http://www.walkinginfo.org/engineering/
7. FHWA Office of Safety Bicycle and Pedestrian Safety - http://safety.fhwa.dot.gov/ped_bike/

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