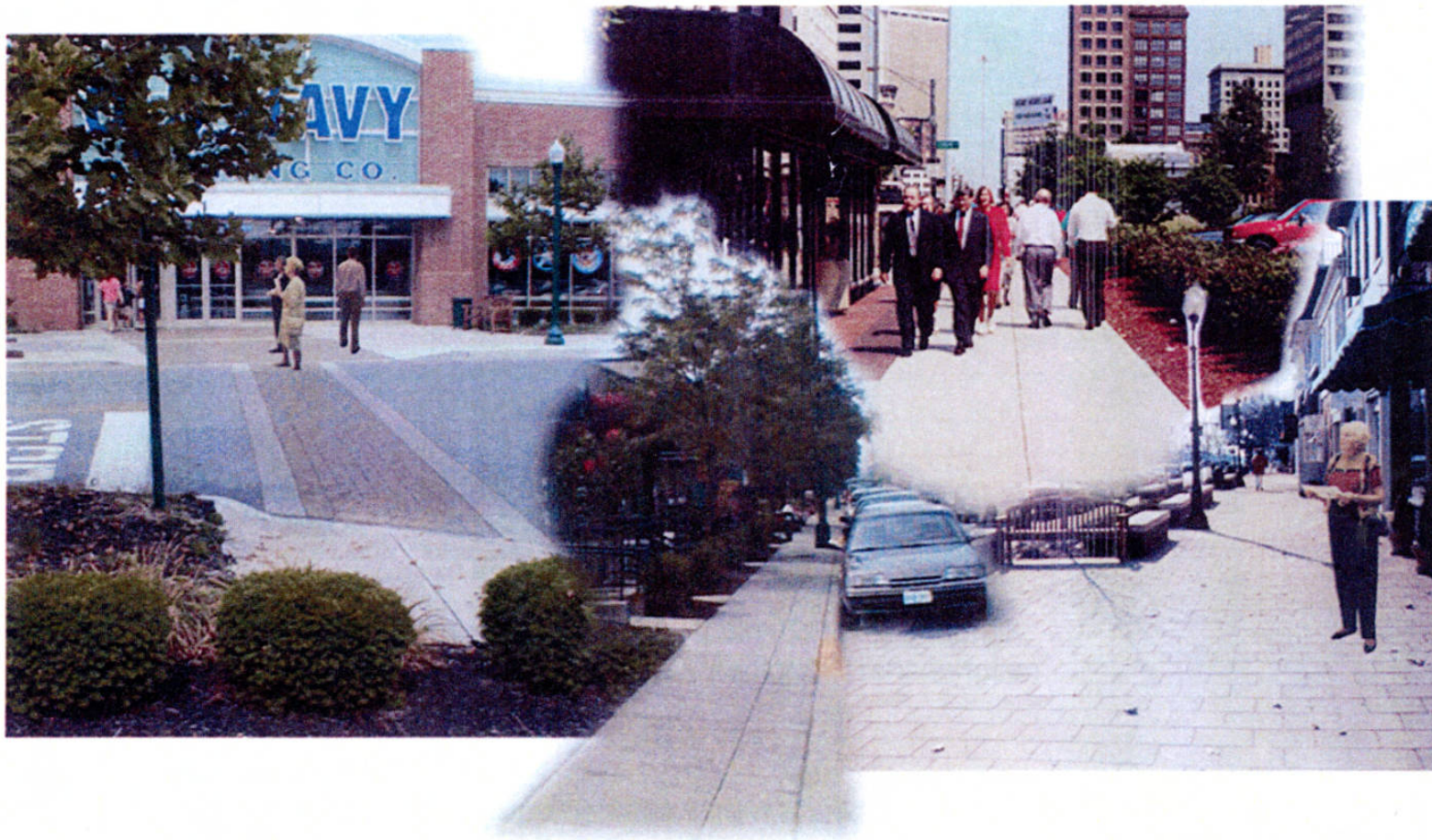


Pedestrian Facilities



Best Practices 1999

PEDESTRIAN FACILITIES
BEST PRACTICES – 1999

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JULY 1999

Preparation of this document was financed by appropriations from Franklin, Delaware, Licking and Fairfield counties, and municipalities in Delaware and Franklin counties, together with planning funds from the Federal Highway Administration and the Federal Transit Administration with the Ohio Department of Transportation.

“Information and statistics referenced herein were obtained from the identified sources. Photographs are of actual intersections and are illustrative of current conditions and practices. The best practice recommendations herein are not express or implied opinions, suggestions or statements that any current condition or practice violates an applicable safety regulation or standard.”

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INTRODUCTION

Regardless of the distance between land uses, there are individuals who cannot or have no desire to operate a motor vehicle. Walking and bicycling becomes their primary mode of transportation. Unfortunately there are no complete and continuous systems in place that accommodates these individuals. The lack of facilities and the increase in automobile congestion creates havoc and often intimidate those wishing to travel short distances.

The issues of pedestrian facilities, pedestrian safety and amenities are becoming more prevalent as neighborhoods and local communities search for ways to make their communities more livable and pedestrian friendly. This endeavor, however, can prove costly while attempting to retrofit existing development and revise zoning ordinances. The conflict between the motor vehicle and pedestrian use of roadways continue to present a challenge as traffic engineers add pedestrian facilities to the transportation system. The identification of deficiencies is the first step in providing facilities for pedestrians.

This report presents information on best practices that can be utilized to improve the deficiencies identified in the metropolitan planning area. Chapter 1 gives a brief overview of existing conditions in the central Ohio area

which include issues such as land use, deficiencies, and safety. Chapter 2 compiles best practices found to improve the deficiencies found in Chapter 1. Chapter 3 describes in more detail, traffic operation techniques and pedestrian facilities; when and where they are best used and pros and cons to their use. Chapter 4 provides strategies, actions, and policies used to integrate pedestrian facilities in all stages of local planning. Chapter 4 also discusses how pedestrian facilities can be constructed and supported by local communities using the four E's; engineering, enforcement, education and encouragement. Chapter 5 discusses funding options.

BACKGROUND

The Mid-Ohio Regional Planning Commission (MORPC), as a metropolitan planning organization for the central Ohio area, is required to develop transportation plans and programs which must provide for the development of transportation facilities, including pedestrian facilities, and which will function as an intermodal transportation system for the metropolitan area.

The transportation planning area for MORPC includes Franklin and Delaware counties, Violet and Bloom townships in Fairfield County, Etna Township and Pataskala that is part of the former Lima Townships in

Licking County. The planning of transportation facilities must include the planning area, both urban and rural, and conform to the Intermodal Surface Transportation Efficiency Act (ISTEA) components of continuity and linkage of local jurisdictions.

Since MORPC is not an implementer of transportation projects, the responsibility for pedestrian facilities rests with local jurisdictions. However, any pedestrian facilities of regional significance or are incorporated in a highway project, must be included in the transportation plan and the TIP in order to receive federal aid funds.

In the Transportation Improvement Program (TIP) pedestrian improvement facilities will be categorized to support programming of pedestrian projects. The categories are listed as follows:

Pedestrian Sidewalks

NEW	1 or 2 sides		
REPLACE	1 with 1 side, 1 with 2 sides, 2 with 2 sides		
Pedestrian Signals	NEW	REPLACE	
Pedestrian Lighting	NEW	REPLACE	
ADA RAMPS	NEW	REPLACE	

The public right-of-way represents the thread that ties individual land uses together. It is land dedicated to the public sector to assure access to all parcels of land. The space provided in the right-of-way is used for the construction of transportation facilities and the placement of the various utilities necessary to support development.

Walking facilities are also provided in the right-of-way to provide for both the lateral movements of pedestrians across streets and longitudinal movement between the various parcels of abutting land.

Facilities to accommodate pedestrian include more than just sidewalks. These facilities also include walkways, curb ramps, crosswalks, traffic control devices, pedestrian signals, special walkways found on some portions of freeway rights-of-way, curb cuts and ramps for the handicapped, parts of bus stops or loading areas, grade separations and stairs or escalators related to these facilities.

The ultimate desire in pedestrian-friendly design is not only to maximize safety and convenience, but also to make the walk pleasant and enjoyable. The pedestrian is exposed to traffic, noise and environmental elements and is more sensitive to the condition of the walking surface. Design should seek to minimize the potential negative influences and emphasize the positive ones. One of the attractive features about walking is being able to observe more detailed features of the landscape or streetscape. These opportunities should be enhanced.

CHAPTER 1

Land Use

The transportation climate in central Ohio clearly depicts a dependency on automobile use. Land use patterns in many parts of the Columbus metropolitan area require the use of automobiles. These patterns force residents to work, live and shop outside the same neighborhood. While some communities may have policies for the installation of sidewalks in zoning ordinances, most have no policy for the installation of sidewalks or pedestrian facilities between subdivisions or for connecting origins to traffic-generating destinations. Even though most of the older urbanized areas have an excellent system of sidewalks, fragmented walkway systems or no systems at all appear between urban and suburban areas that have experienced new or rapid growth.

Between 1990 and 2020, population in the central Ohio area is expected to increase by 47 percent. With the increase in population, comes an increase in housing, both single-family and multi-family homes. This increase places an additional burden on the existing transportation infrastructure. Active measures should be enacted which will create a pedestrian circulation system in conjunction with proposed and scheduled improvements to the transportation system.

While ISTEA contains explicit language on providing pedestrian provisions, the Clean Air Act Amendments of

1990 (CAAA) and the Americans with Disabilities Act of 1990 (ADA) also reinforce the need for pedestrian facilities. MORPC, while in the process of creating a regional pedestrian facilities plan, developed a vision for the central Ohio area. The following Vision, developed by a committee created to review pedestrian issues in the central Ohio area, was designed to address existing and new facilities, comprehensive and master plans, ordinances, public policy and land use. Coordinating policies, goals and strategies were adopted which address pedestrian issues and access.

Pedestrian Vision

A committee representing local communities, special interest groups, schools, environmental agencies, state and county agencies, and neighborhoods was created to develop a vision for pedestrian facilities in the central Ohio area. The Regional Pedestrian Facilities Plan envisions for the central Ohio area a transportation system which:

- Meets the needs of all walkers.
- Supports, encourages and accommodates pedestrian travel.
- Provides pedestrian access to other modes of transportation, destination-oriented facilities, and existing linkages within development areas.
- Ensures the development of pedestrian facilities and reduces dependence on single- occupancy motorized vehicles especially for the young and

the elderly.

- Supports effective pedestrian-friendly land-use planning and development.
- Ensures a safe and secure pedestrian environment.

Deficiencies

The central city is developed in a grid pattern with through north-south and east-west streets. Most arterial and neighborhood streets are lined with sidewalks. Many of the sidewalks have a 2-to-3 foot grassy buffer separating them from the road while others are located adjacent to the road. Most of the streets in the residential areas have parking that may also serve as a buffer between the road and the sidewalks.

The area outside of the central city is developed in a mixture of grid and subdivision patterns. Most of the major arterials serving the suburbs do not have sidewalks. Many of the areas in the older subdivisions do not have sidewalks. As well, many of the arterials serving the subdivisions do not have sidewalks in areas where grid development terminates. Footpaths along arterials mark evidence of pedestrian use. Neighborhood yards show the effort of property owners in redirecting pedestrian traffic to use the street or take another route.

A review and survey of MORPC's planning area were initiated to determine if the pedestrian circulation system could fulfill the objectives of ISTEA and provide an

alternative to the motor vehicle. The review found that within the central city an adequate pedestrian circulation system did exist, but within and between the suburban and urbanizing rural areas the transportation system did not sufficiently serve bicycles or pedestrians due to the following deficiencies:

- Difficulty crossing wide heavily trafficked arterial and collector streets.
- Lack of pedestrian facilities along major highways.
- Incomplete and ineffective pedestrian facilities.
- Lack of convenient and safe access to destinations.
- Lack of access to transit stops.
- Total disregard for pedestrian use of the roadway.
- Physical barriers.
- Improper design of handicapped accessible ramps.
- Inappropriate signalization.
- Lack of continuity between jurisdictions.

The pedestrian survey administered by MORPC in December of 1995 created an awareness for pedestrian facilities in local communities. Designed to identify community needs for pedestrian facilities, the survey also attempted to gauge how well walking served as an alternative mode of transportation. The survey caused the communities to consider:

- who was walking within their neighborhoods,
- why did people walk,

- if pedestrians were safe while walking,
- location and design standards for facilities in new developments,
- established policies to install facilities where they currently do not exist in established development,
- compliance with ADA requirements,
- the conditions of the facilities, and
- unmet pedestrian needs.

While many communities do not have plans to install pedestrian facilities in existing development, most of the communities have complied with the ADA location and design requirements for curb ramps in newly constructed or reconstructed areas. However, in reviewing the major unmet pedestrian needs of their communities, the respondents have identified a deficiency in sidewalks in three primary areas:

1. Need for sidewalks along existing roadways, collectors and arterials.
2. Need for reconstructing sidewalks in existing developed areas.
3. Need for sidewalks to connect existing facilities.

Communities have further identified a need for pedestrian facilities in areas with high pedestrian activity. The two primary areas of deficiencies identified in community plans include the:

1. Need for pedestrian facilities in areas of high pedestrian activity.
2. Need for pedestrian facilities providing linkage to areas of high pedestrian activities.

The lack of pedestrian facilities in many communities has not gone unnoticed. Several community plans in the Columbus metropolitan area identified the need for additional pedestrian facilities.

Safety

Pedestrian safety was another deficiency identified by a local community addressing pedestrian crashes of children ages 5 to 14. The city of Columbus formed the Columbus Area Pedestrian Safety (CAPS) Committee in 1997 as a result of citizen concerns regarding the safety of children while walking and playing near roadways. The Community Relations Division of the city of Columbus brought interested individuals from various sectors of the community together to discuss the scope and seriousness of these concerns. The committee is composed of individuals representing:

AAA Ohio Auto Club
 Central Ohio Safe Kids Coalition
 Children's Hospital
 Columbus Community Relations Department
 Columbus Health Department

Columbus Traffic Engineering and Parking
Doctors Hospital
The Mid-Ohio Regional Planning Commission
The Ohio Department of Public Safety
The Ohio State University Transportation and Parking
Operation Slow Down

as well as citizens from the community concerned about children safety.

The committee is organized to assess the extent of pedestrian related injuries and automobile crashes in Franklin county, where they are occurring, who is involved, what are the causes, what changes can be made or lessons taught that can reduce them, and who needs to be part of this process. CAPS goals are to:

- Encourage education and development of programs to reduce pedestrian accidents and fatalities in central Ohio.
- Encourage, educate and provide direction and resources to the community.
- Encourage our central Ohio community leaders to adopt appropriate land use policies and zoning to develop safer, more "walkable" communities. Development and road design should always assume pedestrian use.
- Encourage engineering designs that feature enhancements for pedestrian safety in central Ohio communities. Road engineering designs that "calm

traffic" or slow vehicle speeds in residential areas will be promoted.

- Encourage our leaders to hire an official "pedestrian safety coordinator" to promote, educate and encourage pedestrian safety.
- Encourage local school districts to assume an important role in pedestrian safety education.

Many neighborhood groups are requesting traffic calming measures to reduce speed and improve conditions for pedestrians. Geared toward local and collector streets, the Residential Traffic Mitigation Program in the city of Columbus is committed to the safety and livability of its neighborhoods. It is a community-based approach to traffic calming, designed to educate and empower neighborhoods with tools to evaluate, develop, and implement traffic management solutions.

The Residential Traffic Mitigation Program (RTMP) has evaluated 16 collector street segments and 42 local streets in response to resident complaints. They compared volume, speed, and accident histories among the two groups, assigned a Traffic Calming Priority Index (TCPI) to each street section, then ranked them numerically.

A TCPI of 100 would indicate that a street is average in its group. The higher the TCPI, the more severe the actual problems. Of the 58 streets ranked, the TCPI numbers ranged from 45 to 154. The top ten for the spring of 1997 were:

Rank	Street	Limits	Type	TCPI
1.	Dana	Town-Broad	Local	154
2.	Dresden	Weber-N Brdwy	Collector	151
3.	Linwood	Livgstn-Moobry	Local	151
4.	Kelton	Whittier-Livgstn	Local	143
5.	Franklin Pk W	All	Collector	142
6.	Brehl	Town-Broad	Local	136
7.	Glenmont	High-Indianola	Local	132
8.	Gould	Fair-Broad	Local	128
9.	Ziegler	High-Parsons	Local	126
10.	Tompkins	High-Indianola	Local	121

Other local efforts include the installation of medians on arterial roads such as Hard Road to provide assistance to pedestrian crossings. Traffic islands will be placed on Neil Avenue in Victorian Village to calm traffic and make the area more pedestrian friendly.

The top pedestrian accident locations in Columbus between 1994 and 1997 were:

	1994	1995	1996	1997	TOTAL
11 th and High	6	7			13
10 th and High	5		2	2	9
High and Whittier	2	4		2	8
Cleveland and 25 th	2	3	3		8
Broad and High		2	4	2	8
Belvidere Av and Sullivant	2	3	2		7
Lane and Neil			7		7
Cleveland and Weber			5	2	7
Cleveland and Windsor	4		2		6

Cleveland and Morse	3	3		6
15 th and High	2	4		6
17 th and Hamilton		4	2	6
Hamilton and Livingston		4	2	6
Broad and James			6	6
Alum Creek and Winslow	3		2	5
Broad and Okley	3		2	5
Frambes and High	3	2		5
High and Long	3		2	5
Broad and Weyant			4	4
Broad and Ogden	4			4
5 th Ave and High	4			4
Courtright and Livingston			3	3
Karl and Morse			3	3
Lane and Neil			3	3
Livingston and Lockbourne			3	3
Burgess Ave and Olive St.	3			3
Broad and Harris	3			3
Cleveland and 17 th	3			3
Columbus and Parsons	3			3
5 th Ave and St. Claire	3			3
Graceland and High	3			3
Sullivant and Wayne	3			3
Broad and Hague		3		3
Broad and Princeton		3		3

Changes in land use or traffic patterns may be the primary cause for the increase or decrease of pedestrian accidents in these areas from one year to the next.

East Corridor

A preliminary analysis of the pedestrian facilities in the east corridor of Franklin County was conducted. The east corridor is bound by the Conrail railroad track on the

north, west side of downtown near SR 315 on the west, Etna and Lima townships in Fairfield County and SR 104 on the south. The major east-west arterials include Broad Street, Main Street, Livingston Avenue and Refugee Road. Major north-south arterials include High Street, Third Street, Fourth Street, Parsons Avenue, Cleveland Avenue, Lockbourne Road, Fairwood Avenue, Alum Creek Drive, James Road, Hamilton Road, and Brice Road.

The examination revealed the following:

In 1997 there were 53 pedestrian crashes in the east corridor of Columbus. Of the crashes, 43 occurred at 9 locations: Broad & Weyant, Broad Street & High, Broad & James, Livingston & Courtright, Alum Creek & Winslow, Lockbourne & Livingston, Champion & Whittier, Fairwood & Livingston, Whittier & Carpenter.

The 43 pedestrian crashes that occurred in the east corridor of Columbus for the year 1997 revealed:

- 12 mid-block crossing
- 10 left turns hit in crosswalk
- 5 right turn hit in crosswalk
- 5 hit in street
- 4 hit in crosswalk
- 4 hit in informal crosswalk
- 3 jaywalk in crosswalk

Crosswalks appear at all major intersections of arterials in the east corridor. Crosswalks also appear at intersections adjacent to schools. The crosswalks are marked and are accompanied by traffic and walk signals. Major intersections are usually accompanied by pedestrian activated signals. Examination of many of the pedestrian actuated signals shows that the timing is not sufficient to allow for an able bodied individual to cross before the onset of the flashing don't walk sign.

Traffic signals are used at all major intersections. The intersection of two major arterials also use a left-turn signal and in some locations, a right-turn signal. Several areas have a no-right-turn-on-red sign posted along with a right-turn signal. One such location is the intersection of Livingston Avenue and James Road.

The freeways I-70, I-71, I-270, SR 104 and SR 33 are barriers to pedestrians. The bridges constructed to cross the freeways are often void of any facility to assist the pedestrian. Many of the access ramps also have no provisions to accommodate pedestrians as well as continuous right turns onto intersecting major arterials.

Further analysis of the intersections with a high number of pedestrian crashes reveals:

Broad and James

The average daily traffic (ADT) on Broad Street east of James Road is 30402 and James Road south of Broad is 22702.

Broad Street and James Road are both 5 lanes, major arterials. Each leg of the intersection has crosswalks and handicap ramps. There are left turn and right turn signals on both Broad and James. There are sidewalks on Broad and James Road.

Observation shows that the pedestrian actuated signal to cross Broad Street either doesn't work or the timing is way too long. The timing for the walk/don't walk is extremely short and does not allow pedestrians to walk 2 seconds into the crosswalk before the "don't walk" flash.



Land use includes a Rally's fast food restaurant and a car wash on the northwest corner,



a Shell gas station and Bagels fast food restaurant on the northeast corner,



Mayfair Center (drug store, beauty shop, fast food restaurant) on the southeast corner. There is a COTA bus stop in front of the Mayfair Center and in front of the Shell gas station. There are young trees as part of the landscape in front of Mayfair Center.



a BP gas station and convenient mart on the southwest corner.

Behind the commercial area are multifamily apartments north and south of Broad Street. There is single-family housing located along James Road and multifamily apartments east of James Road on Broad Street. There were six pedestrian accidents at Broad and James in 1997.

- 1 Right Hit in Street
- 2 Left Turn hit in Crosswalk
- 2 Mid-Block
- 1 Right Turn hit in Crosswalk

Broad Street and Weyant

The average daily traffic (ADT) on Broad Street east of Weyant is 29402 and west of Weyant is 30002.

Broad Street continues to be 5 lanes with sidewalks on both sides of the street. At the intersection of Weyant, however, there is a 2-foot grassy buffer along the south side of Broad. Weyant is a two-lane collector with no sidewalks on either side north of Broad Street. There are no turn signals at this intersection.

There are crosswalks on all four legs of the intersection. There is a pedestrian actuated signal to cross Broad Street and a walk/don't walk signal. There are no pedestrian signals to cross Weyant. On observation, there are handicap ramps on the each corner, however, they appear to be in poor condition and don't appear to meet ADA standards.



Land use includes a Dean and Barry Paint Store and a Full City Coffee store on the northwest corner of Broad and Weyant,



a McDonalds and K-Marts on the north east corner, and Blockbuster, Mr. Hero , and Kahiki restaurant on the south east corner. There are no buffers in front of the Broadmor Market and along Broad Street east of McDonalds. There are trees in front of McDonalds and low shrubs in front of Blockbuster. There is a bus shelter in front of McDonalds on Broad Street with newspaper stands and a trash recepticle.



a Broadmor Market on the south west corner,



Behind the commercial area both north and south of Broad Street are multi-family apartments. There are two schools, Eastmoor and Waverly, south of Broad Street. There were four pedestrian accidents at Broad and Weyant in 1997.

- 1 Hit in Crosswalk
- 2 Left turn hit in Crosswalk
- 1 Jaywalk hit in Crosswalk

Livingston Avenue and Courtright Road

The ADT on Livingston Avenue east of Courtright is 27102 and west of Courtright is 25202.

Livingston Avenue is a 5 lane major arterial. Courtright Road is a 3 lane arterial. Courtright Road deads end into

Livingston Avenue. There is a no-turn-on-red sign onto Livingston with a right turn signal. There is a left turn signal for Livingston Avenue traffic heading west. There is a pedestrian actuated signal to cross Livingston, but none to cross Courtright Road. There are crosswalks at all 3 legs of the intersection.

Sidewalks along both sides of Livingston and Courtright have 2-ft. grassy buffers. There are no trees or other landscaping.



Land use includes a Fast Lube and multi-family apartments north of Livingston,



a small car dealership, McDonalds, strip center, Flea Market on the south west corner,



and Defab Company on the south east corner of Livingston and Courtright. Multi-family apartments are also located immediately behind the strip center south of Livingston. There were three pedestrian accidents at or near Livingston and Courtright in 1997.

- 1 Hit in Crosswalk
- 2 Left Turn hit in Crosswalk

Livingston and Lockbourne Road

The ADT on Lockbourne south of Livingston near Deshler is 11701. The ADT on Livingston east of Lockbourne is 20509.

Livingston is a 4 lane arterial with parking allowed on each side. Lockbourne, which dead ends into Livingston, is a 2-lane arterial with parking allowed only on the east side. There are pedestrian actuated signals to cross Livingston. All 3 legs of the intersections have crosswalks. Sidewalks are located on both sides of Livingston and Lockbourne.





Land use includes Kimball Place Plaza and bar on the north side of Livingston,



Family Health Center on the south west corner. There is a COTA bus stop one block west of Courtright on the south side of Livingston. In 1997 there were three pedestrian accidents at or near the corner of Livingston and Lockbourne.

- 1 Hit in Crosswalk
- 1 Left Turn hit in Crosswalk
- 1 Mid-block Crossing

Champion and Whittier

The ADT on Champion north of Whittier is 705 and south of Whittier is 805. The ADT on Whittier east of Champion is 6505 and west Champion 6405.

Whittier is a 2 lane arterial with parking allowed on each side. Champion is a 1 lane one way street heading north with parking on each side. There are walk/don't walk signals but no pedestrian actuated signals. There are crosswalks on each leg of the intersection. Sidewalks are located on all sidewalks with a 2-ft grassy buffer. Handicap ramps are on 2 corners.



Land use includes a COTA bus stop on Champion south of Whittier,



Whittier east of Champion and Whittier west of Champion, multi-family apartments on three corners. There is convenient mart one block east on Whittier on the south side of the street. Champion and Whittier appeared in a report entitled, Top Ten Areas Most Dangerous for Pedestrian ages 0 to 14 in Franklin County from 1995 to 1997. There were 3 pedestrian crashes at or near this intersection.

Livingston and Fairwood

The ADT on Fairwood north of Livingston is 7502 and south of Livingston is 7302. The ADT on Livingston east of Fairwood is 17302 and west of Fairwood is 16402.

Livingston is a 4-lane arterial with parking on each side. Fairwood is a 2-lane arterial with parking along one side.

There are walk/don't walk signals to cross Livingston.
There are sidewalks on all sides with no landscaping or trees.



Land use includes a COTA bus stop on Livingston with a shelter east of Fairwood,



a vacant bar and commercial store on the north west corner,





a market and retail clothes shop, pager store on the south west corner,



and multi-family apartments on the north and south east corners. Fairwood and Livingston appear on the Top Ten Areas Most Dangerous for Pedestrians 0 to 14 years in Franklin County from 1995 to 1997. There were 3 pedestrian crashes at or near this intersection.

Alum Creek Drive and Winslow Drive

The ADT on Alum Creek Drive south of Winslow Drive is 15409.

Alum Creek Drive is a 2-lane arterial with no sidewalks and heavy truck traffic. There is a gravel shoulder in places along Alum Creek Drive. Winslow Drive is a local street providing access to a subdivision. There is a don't walk/walk light to cross Alum Creek Drive. However, there are no crosswalks. A sidewalk is located right next to the apartment complex and abruptly ends at the end of the building.

Land use includes a public school, Alum Crest, at the corner of Alum Creek and Winslow. There is a COTA bus stop on Winslow near the corner. There are fast food restaurants, De Vry, a retail record store, and commercial areas approximately 2 miles north on Alum Creek Drive.

CHAPTER 2

Best Practices

Best practices can be defined as those that offer exemplary or model planning guidelines, design standards, development strategies and management programs that lead to successful pedestrian systems and programs. Also defined are those guidelines and standards that most effectively promote safety, are inexpensive to implement and manage and provide the most effective service to the users.

The deficiencies identified in the survey, local plans and the high incidence of pedestrian crashes can be improved by best practices used in other areas. While these best practices cannot be used in every situation, they can stimulate creativity for finding solutions to especially challenging situations. A listing of the deficiency, along with examples and in some instances costs of improvements, follows. A more detailed description of each pedestrian facility appears in Chapter 3.

Problem:

- Difficulty crossing wide heavily trafficked arterial and collector streets.
- Fear of being hit in crosswalks due to speeding and drivers inattentiveness.



Pedestrian crossing Morse Road in front of Northland Mall.

The extent to which crossings are made mid-block depends largely on intersection spacing and on land use on either side of the roadway.

CAN THE PEDESTRIAN CROSS?

WITHOUT MEDIAN



Requires one 14 second gap
Pedestrian must look in both directions. Statistically two 8 second gaps are more likely than one 14 second gap.

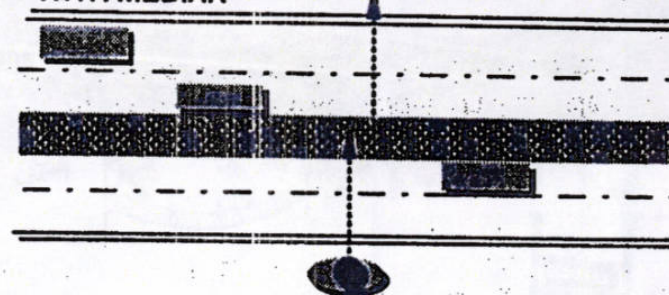
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Best Practice:

- Raised median for pedestrian refuge.
- If intersections are spaced far apart, mid-block crosswalk, with pedestrian crosswalk signal and signage.
- **Painted or marked crosswalk using a zebra or ladder design or brick pavement.**
- **Pedestrian actuated signal with appropriate timing.**
- If high pedestrian usage, no or limited right-turn-on-red.
- Traffic signals set to allow pedestrians to cross before automobiles, during an all red phase.

IS THIS EASIER AND SAFER TO CROSS?

WITH MEDIAN



- Requires two 8-second gaps
- Pedestrian only has to look in one direction

Problem:

Lack of pedestrian facilities along major highways.



Best Practice:

- Require sidewalks in zoning and comprehensive plans.
- Develop an assessment program to retrofit major highways along traffic generators and areas destined for high pedestrian usage.
- Construct sidewalks with reconstruction or construction of major highways. In rural areas, shoulders are appropriate.



Problem:

inconvenient and unsafe access to destinations.

Problem:

Incomplete and ineffective pedestrian facilities.



- Inadequate pedestrian facilities at intersections
- Inadequate pedestrian facilities along corridors
- Inadequate pedestrian facilities at destinations

Best Practices:

Best Practice:

- Continuity of sidewalks must be provided to ensure linkage with existing facilities beyond the intersection.
- Ensure continuity by including sidewalks in zoning and comprehensive plans. Develop assessment programs to retrofit existing development.
- In areas of high pedestrian use, sidewalks should be at least 5 ft with a clear effective walkway width. When sidewalks are placed on only one side of the road, they should be 8 ft wide (this occurs where sidewalks are not provided on the other side due to conflicts). Where sidewalks must be placed immediately adjacent to the curb and this is discouraged, they should be at least 6 feet wide.
- Landscaped grassy buffers provide shade and a pleasant walking experience. Benches, located outside the effective walkway width, provide a resting place for seniors.



New development in Easton



Lennox Center

Best Practices

Problem:

Lack of convenient and safe access to destinations.



International Drive – Port Columbus



Morse Road in front of Northland Mall

Best Practice:

- Require sidewalks or walkways leading from the commercial or residential subdivision to arterials or collector streets.
- Sidewalks in isolated areas and areas of high pedestrian use should be well lit.
- Landscaping should be low and maintained to discourage crime.
- Overpasses may be appropriate in areas where separation from the road is necessary.



Transit stop on Morse Road west of Sunbury Road

Problem:
Lack of access to transit stops.



Cassady in front of the Raddison Hotel

Best Practices:

- Provide pedestrian accommodations in the vicinity of bus stops and other transit facilities. If the bus stop location results in substantial hazard or inconvenience to even a few transit riders, there is reason enough to install at least some type of mud-free surface set back from traffic.
- On roads with narrow shoulders, consideration should be given to spot shoulder widening at bus stops, supplemented by small concrete (or other appropriate materials) pads.
- The transit stop should be considered as a significant pedestrian destination, and the same analysis of linkages conducted as would be undertaken for a large development project.



Broad Street at James Road



High Street north of Morse Road

Problem:

Total disregard for pedestrian use of the roadway.



Pedestrian walking along Lockbourne Road.

Best Practices:

Provide separate pedestrian facilities. Design roadways and the adjacent facilities to not only maximize safety and convenience but also to make the walk pleasant and enjoyable. In areas of high pedestrian use, provide facilities and amenities creating an atmosphere where drivers would rather walk than drive.



Best Practices:

Problem:

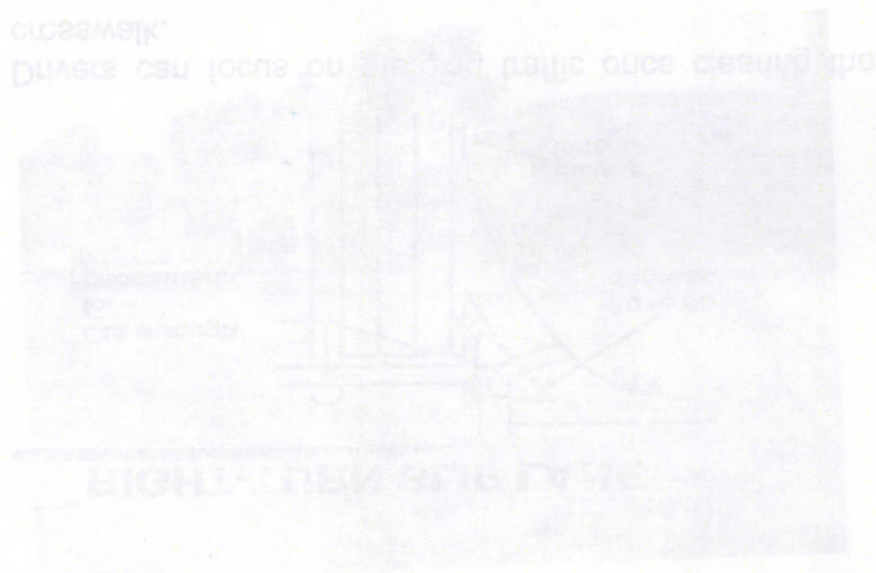
Physical barriers. Physical barriers include freeways, major highways and bridges.



Morse and Sunbury Road



Main Street exit ramp



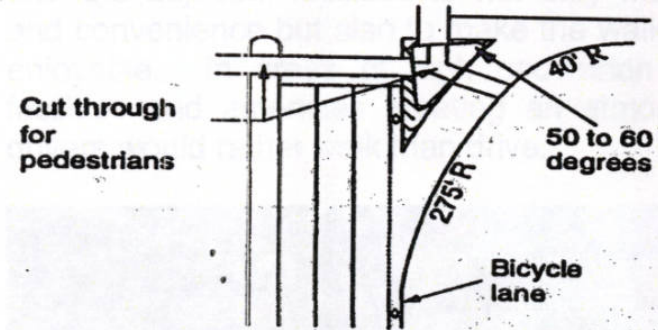
Best Practices:

- Provide pedestrian facilities with high visible crosswalks. Use raised pedestrian refuge islands with pedestrian actuated signals and signs.
- The design of the interchange at exit and entrance ramps to freeways should slow the traffic at the intersection and place crosswalks at an angle where the drivers are facing the crosswalk and attention is not entirely focused on merging with traffic. Interchanges with access ramps connecting to local streets at a right angle are easiest for pedestrians to negotiate.



Long Street

RIGHT-TURN SLIP LANE



Drivers can focus on merging traffic once clearing the crosswalk.

Problem:

- Lack of and Improper design of handicapped accessible ramps. Many ramps do not have adequate landing, grade or width and cannot be used by those who must use a wheelchair.



Best Practices:

- Handicapped ramps should be designed according to ADA standards. Simply installing ramps is not sufficient or efficient if it cannot be used. Width, grade, cross-slope, curb-cuts and landing must be according to ADA standards. See Facilities for the Handicapped and Older Adults.



Drivers can focus on traffic flow while also seeing the crosswalk.



Problem:

Inappropriate signalization.

Best Practices:

Signalization should be designed and timed to accommodate pedestrians and traffic. Medium to heavy pedestrian use requires different signalization than light or none at all. Areas with high concentration of seniors or children should play a role in the timing and type of signalization. Traffic use and speed must also be taken into consideration.



Problem:

Lack of continuity between jurisdictions.

Best Practices:

Coordination between two adjoining jurisdictions is paramount in the alignment and design of connecting pedestrian facilities. Facilities should be jointly designed between jurisdictions to smooth the transition. Continuity can occur either through the material used or the alignment of the facility.

FACILITIES FOR THE HANDICAPPED AND OLDER ADULTS

Elderly and handicapped persons who experience greater than normal levels of risk include:

- developmentally restricted people (based on size and maturity),
- users of wheelchairs,
- people with impairments to their lower extremities (legs and feet) who walk with special aids,
- and people with severe sight impairments.

Numerous types of traffic-control measures are in use for addressing the special needs of the handicapped including signal-related measures. These include audible pedestrian signals, which use buzzers, bells, horns, birdcalls, or other sounds to indicate to pedestrians when the WALK interval is on.

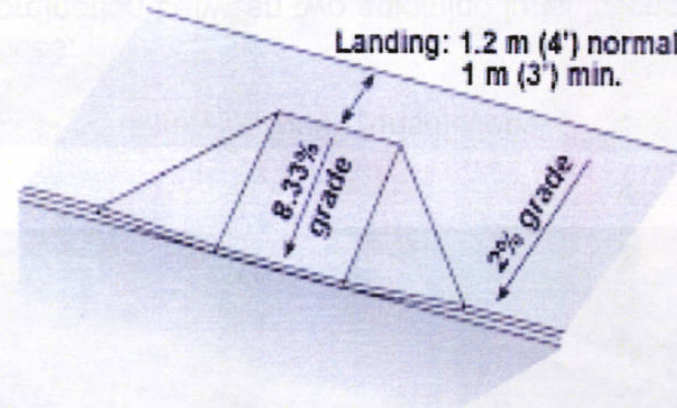
Sign-related measures.

These include Braille maps and also warning signs aimed at motorists to indicate that handicapped people are in the area.

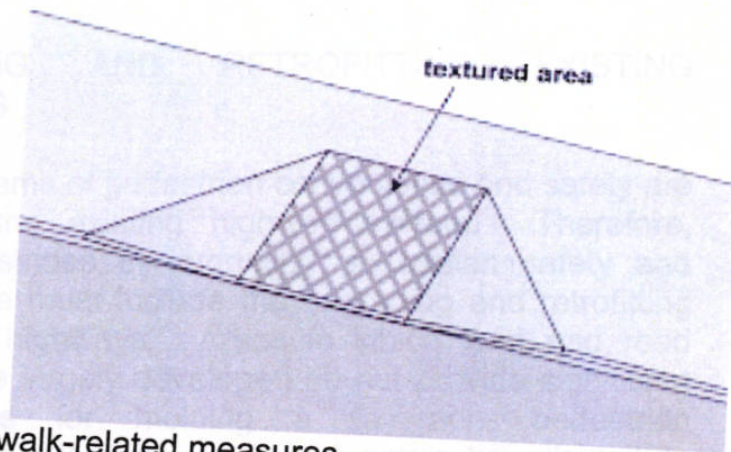
Sidewalk-related measures.

Curb ramps are used in many areas as an aid to those in wheelchairs, for baby carriages, for

people on crutches, or for older adults. Guidestrips (tactile strips made of sand or glass beads set in thermoplastic paint placed on a walkway) are used to aid the blind. The placement of handrails (to assist those with visual problems, equilibrium problems, or mobility problems) and careful placement of street furniture (to minimize obstacles) are also helpful.



Note the 3 feet minimum for the landing.



Crosswalk-related measures.

Guidestrips are raised markings made of epoxy and gravel that can be felt by blind people with a cane. When placed within a crosswalk, they can be helpful to blind people crossing the street.

Seeking involvement from people with disabilities will aid in the planning of facilities. While some facilities help one disability, that same facility may hamper another. The gradual decline of a ramp is difficult for the blind and guide dogs to determine where the sidewalk ends. Upright bricks will aid the blind with determining where the sidewalk ends but may hamper a person using a wheelchair. Guide dogs see black and white only. In the past, the white granite at the end of the curb was the visual cue for the dog to stop at the intersection. With the new ramps the band of white has sometimes been eliminated. The blue and white wheelchair designs that

are placed on concrete ramps cause the dogs to hesitate giving the blind person a cue.

The effectiveness of such facilities in reducing pedestrian accidents is relatively unknown, although they can definitely improve the ability of many pedestrians with disabilities to travel more freely from place to place.

TRANSIT STOPS

The potential for pedestrian integration with transit is enormous. While this integration not only induces environmental benefits by reducing automobile emissions, it also creates a viable multimodal use of transportation for low-income people, people with disabilities, seniors and children. However, in order for this multimodal use of transportation to be successful, it must have adequate and appealing pedestrian facilities.

Every transit trip requires two walk trips, one at the origin and one at the destination. Part of the walk trip at the origin end usually also requires a period of waiting for the transit vehicle to arrive. Observation of pedestrian facilities at or around transit stops in suburban areas revealed a wide disparity of accommodations.

On some highways in developing areas, bus stops were commonly placed in areas without sidewalks. It is not

uncommon to find locations where pedestrians would be forced to stand in dirt (mud in rainy weather), in high grass, or along the shoulder adjacent to high-speed traffic. If the bus stop location results in substantial hazard or inconvenience to even a few transit riders, there is reason enough to install at least some type of mud-free surface set back from traffic. On roads with narrow shoulders, consideration could be given to spot shoulder widening at bus stops, supplemented by small concrete (or other appropriate materials) pads.

If the bus stop is on an arterial street, the nearest cross streets are usually at least collectors, and these should be checked for the presence of sidewalks. Linkages between the stops and major destinations should receive particular scrutiny. The transit stop should be considered a significant pedestrian destination, and the same analysis of linkages should be conducted as would be undertaken for a large development project.



Bus stop on High Street in Worthington

The Americans with Disabilities Act requires sidewalks when necessary for individuals with disabilities to benefit from the services of a public entity (Title II). Fixed route bus service is a public service. Therefore, public transit stops must be connected via accessible walkways, which by definition must have a firm and stable surface and meet ADA requirements for such walkways. According to Section 10.1 of the ADA regulations:

“every station, bus stop, bus stop pad, terminal, building or other transportation facility, shall comply with applicable provisions of 4.1 through 4.35, sections.....”

UPGRADING AND RETROFITTING EXISTING HIGHWAYS

Many problems of pedestrian convenience and safety are built into the existing highway system. Therefore, significant strides in improving pedestrian safety and convenience must include the upgrading and retrofitting of existing highways. Areas in which land and road systems are largely developed do not provide significant opportunities for molding a favorable pedestrian environment. Widening should never be allowed to eliminate a sidewalk, even if only on one side. Closing of a crosswalk should only be considered as a last resort.



Morse Road bridge near Sunbury Road

At least a 2-ft separation between the sidewalk and traffic lanes should be maintained. On lower speed roads, the

planting strip could be eliminated if the additional width must be found. If sufficient land is available outside the right-of-way, every effort should be made to maintain the separation by relocating the walkways to private property using pedestrian easements.

Evidence indicates that providing separate pedestrian walkways or wider shoulders will reduce pedestrian accidents in suburban and rural areas. Walkways or sidewalks in the highway right-of-way represent the major element of pedestrian facilities serving longitudinal movement. The AASHTO Green Book acknowledges the need for walkways even in many rural areas, because of high vehicular speeds and inadequate lighting.



CHAPTER 3

Cross-section design elements have perhaps the most significant bearing on overall pedestrian convenience and safety in suburban and rural areas. Important cross-section elements include road width, number of lanes, and right-of-way limits, shoulders and curbs, medians and refuge islands, walkways, and landscaping and aesthetic features. The AASHTO Green Book provides design guidance on cross-section elements, intersections, interchanges, and in general terms, discusses pedestrian considerations. Good cross-section design seeks to provide as much separation as practical under the constraints of cost, right-of-way, building setbacks, terrain, and other factors.

Sidewalks, Walkways and Shoulders

In most urban and suburban settings, the appropriate pedestrian facilities are sidewalks. Sidewalks should be wide enough to facilitate two-way pedestrian travel. One of the major deficiencies in the pedestrian system is the lack of sidewalks and walkways where they ought to exist.

A major problem with providing sidewalk continuity is in the staging of development. Development takes place over time, and the sidewalk on each property frontage, if constructed at all, has traditionally been built or improved only when the site is developed or redeveloped. Arterial and collector highways in high activity areas are likely to

incur significant pedestrian volumes as they develop and will clearly warrant facilities. Continuity of sidewalks must be provided to ensure linkage with existing facilities beyond the intersection.

Consideration should also be given to future pedestrian use as well as existing use. The only convenient opportunity to fund a pedestrian facility needed in the future may be to construct it along with a current highway project or during development or redevelopment.

While sidewalks are not appropriate on limited access freeways, they are common on urban parkways. These parkways often have freeway-style designs such as merging lanes and exit ramps rather than simple intersections.



Where there is a service road, sidewalks should ideally be placed on both sides of the service road. If only one side can be accommodated, place it on the side of the service road closest to the main highway.

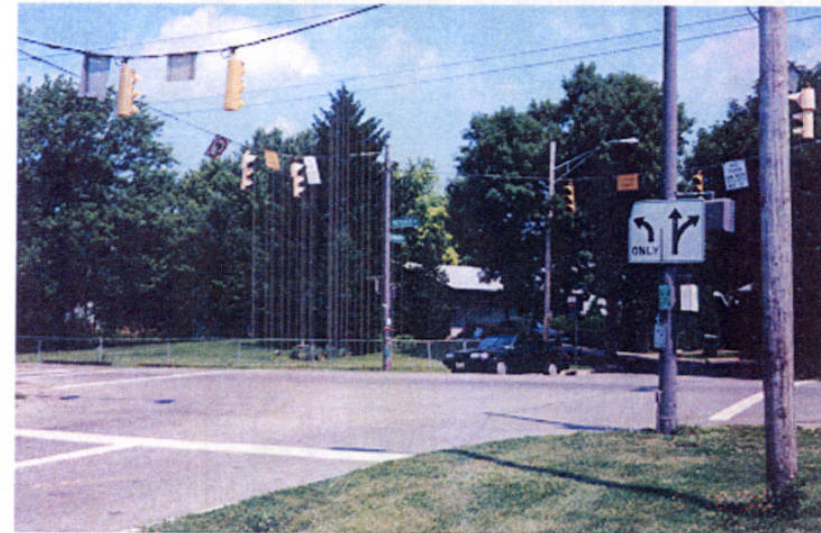
Concrete sidewalks are usually more appropriate in curb and gutter sections, while asphalt walkways are preferred in many situations without curb and gutter. Asphalt walkways are being increasingly used because they can be constructed at lower costs and has a more appealing appearance in natural settings. Walkway width in commercial area should typically be at least 5 ft.

Where sidewalks must be placed immediately adjacent to the curb and this is discouraged, they should be at least 6 feet wide. When sidewalks are placed on only one side of the road, they should be 8 ft wide (this occurs where

sidewalks are not provided on the other side due to conflicts). If sidewalks are intended for joint use by pedestrians, they should be at least 10 ft wide (this situation should be avoided wherever possible).

CROSSWALKS

The primary types of pavement markings that relate to pedestrian safety and movement include: stop lines (limit lines) which are painted strips across a traffic lane to indicate where vehicles should stop at a stop sign, traffic signal and crosswalks.



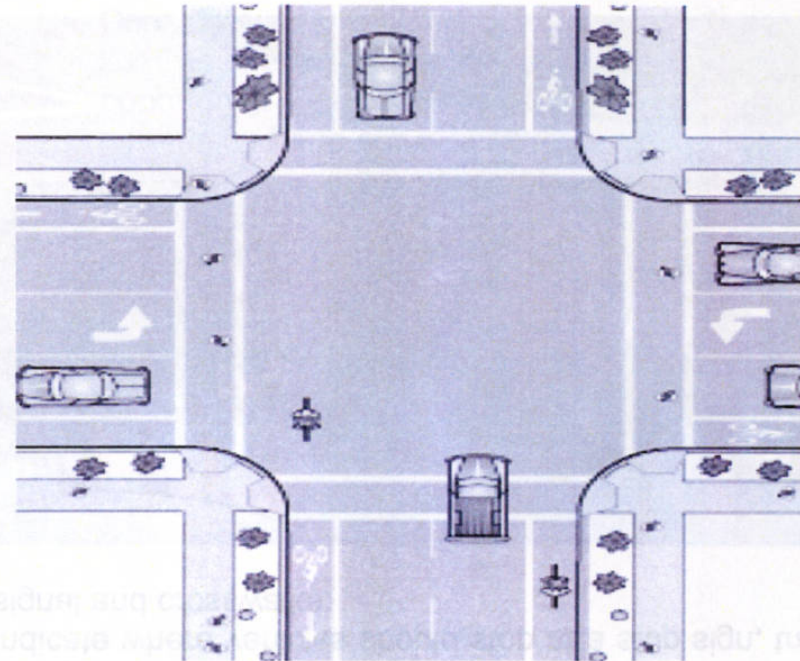
Painted or marked crosswalks provide a delineated path for pedestrians to cross the street. Unmarked crosswalks are simply the extension of the sidewalks leading up to

the street while marked crosswalks are generally located at all signalized intersections. Marked crosswalks may be painted either at intersections or at midblock crossing locations, and generally are one of the following types: solid parallel lines, zebra, which has diagonal lines painted between the parallel lines, ladder design, which consist of short trips painted parallel to the direction of the traffic flow and solid marking made by painting the entire area within the crosswalk lines.



Marked or unmarked, crosswalks are the continuation of the sidewalk. They should be kept as short as possible. This can be achieved by making the radius of a corner as short as needed to accommodate design vehicles. At signalized intersections, curb extensions improve signal

timing by reducing the time needed for the pedestrian phase. Use islands to interrupt extremely long crosswalks. A right-angle intersection with a median island is easiest for pedestrians to cross.



Conditions where marked crosswalks are most beneficial:

- signalized intersections with heavy pedestrian volumes, particularly with complex intersection geometrics.
- Midblock crossing locations that are controlled by traffic signals and pedestrian signals.

- School crossing locations that are controlled by adult crossing guards during school crossing periods.

Conditions when least beneficial or possibly harmful:

- Unsignalized midblock crossings.
- Unsignalized intersections.
- Locations with low pedestrian-crossing volumes.
- When markings are overused in a city or area and/or when two or more crosswalks are closely spaced.
- When poorly located (e.g. not well seen by approaching motorists because of poor sight distance).
- When crosswalks are painted in an attempt to relocate pedestrian movements.

Advantages:

- can channel pedestrians across complex or dangerous intersections.
- Can help position pedestrians where they can best be seen by drivers.
- Midblock crosswalks tend to be used by pedestrians when they are available and may reduce crossings from behind parked vehicles and running in the road.

Disadvantages:

- pedestrians may feel overly secure near marked crosswalks. Motorists don't notice marked crosswalks as well as pedestrians may think.
- Overuse of such markings may cause disrespect for other pedestrian and traffic-control devices. Pedestrians won't use them if they feel they are inconvenient.
- Midblock crosswalks may increase vehicular traffic delay.

Crosswalks should be 10 ft wide or the width of the approaching sidewalk if it is greater. Two techniques to increase the visibility and effectiveness of crosswalks are:

- Striped, ladder or zebra markings which are more visible than double lines.
- Textured crossings using non-slip bricks or pavers, which raise a driver's awareness through increased noise and vibration. Colored pavers increase the visibility of the crosswalk.



Raised crosswalks, especially if textured and colored, are also very visible. They also act as speed humps and may be used in areas where excessive speeds are a problem. Raised crosswalks and intersections have additional advantages:

- It is easier to meet certain ADA requirements, as the crosswalk is a natural extension of the sidewalk, with no change in grade, but they require special treatment to be detected by the visually impaired.
- Raised intersections can simplify drainage inlet placement, as all surface water will drain away from the intersection.

Two innovative solutions for better crosswalks come from Cambridge, Massachusetts and Salt Lake City, Utah. In Cambridge, a textured thermoplastic crosswalk is being placed in the pavement while the hot asphalt is being rolled. This provides a much longer lifespan for the pavement marking material, which heightens long-term visibility and retroreflectivity. The Cambridge crosswalks are being installed with ladder style markings, which are both more visible and longer lasting than the basic two-stripe crosswalk.

Salt Lake City has gone one step further in this direction, installing two sections of ladder-style markings on either side of a section of unmarked asphalt. This provides nearly identical visibility to the approaching motorist, but leaves the center of the crosswalk free of pavement marking materials that can be slippery when wet. Both of these solutions are cost-effective and applicable in all weather conditions, making crosswalk markings more effective for pedestrians and easier to maintain for public works departments.

The city of Columbus has an exceptional design at Long and 6th Street. The crosswalk has continental style markings, raised ridges which are retroreflective, and skid-resistant glass chards. The crosswalk is accompanied by an overhead lighted sign. A similar pedestrian design also appears on High Street in Worthington south of SR 161.



Long Street



High Street in Worthington

Crosswalk Policy Recommendations:

- A prohibition of right-turn-on-red should be considered at those intersections where pedestrian volumes are significant and field studies suggest this treatment.
- Install two pedestrian curb ramps per corner, as near as possible to the pedestrian pushbutton. A single ramp is not desirable, as it will direct pedestrians into through-traffic.
- Medians are recommended wherever the crossing distance exceeds 60 feet to provide a refuge for slow or late crossing pedestrians.
- Refuge islands should preferably be at least 6 feet and in no case less than 4 feet wide to reduce the danger to island users.

Crosswalk Design Recommendations:

- Include the use of traditional neighborhood developments and grid systems to reduce the need for pedestrians to use a signalized intersection to reach their destination. Construct T-intersections, which have fewer conflict points for pedestrians.

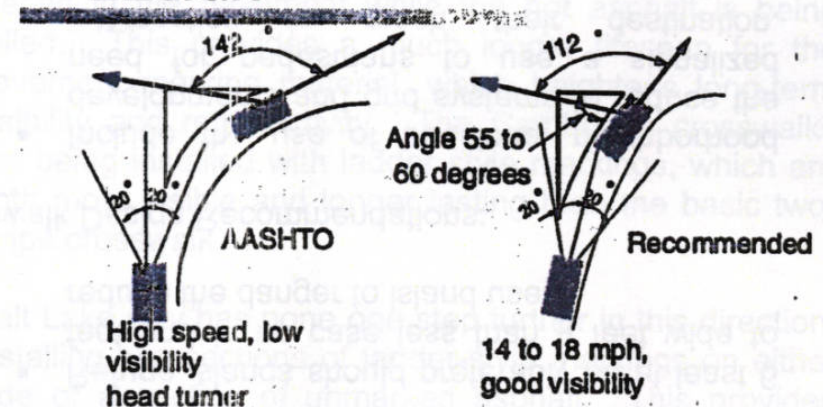
- Where large truck or bus turning movements must be accommodated, compound curves reduce the distance for pedestrians at crosswalks.

RIGHT-TURN LANES

Right-turn lanes should be used only where warranted by a traffic study, as they present problems for pedestrians. The additional lane width adds to the pedestrian crossing distance and right-turn moves are made easier for motorists that may cause inattentive drivers to not notice pedestrians on the right.

The design shown below demonstrates pedestrian safety and convenience, the following concerns must be addressed: The angle of approach of right-turning cars must be such that the crossing pedestrian is clearly visible; and where possible, pedestrian refuges should be provided to reduce the total crossing distance.

RIGHT-TURN SLIP LANE DESIGN



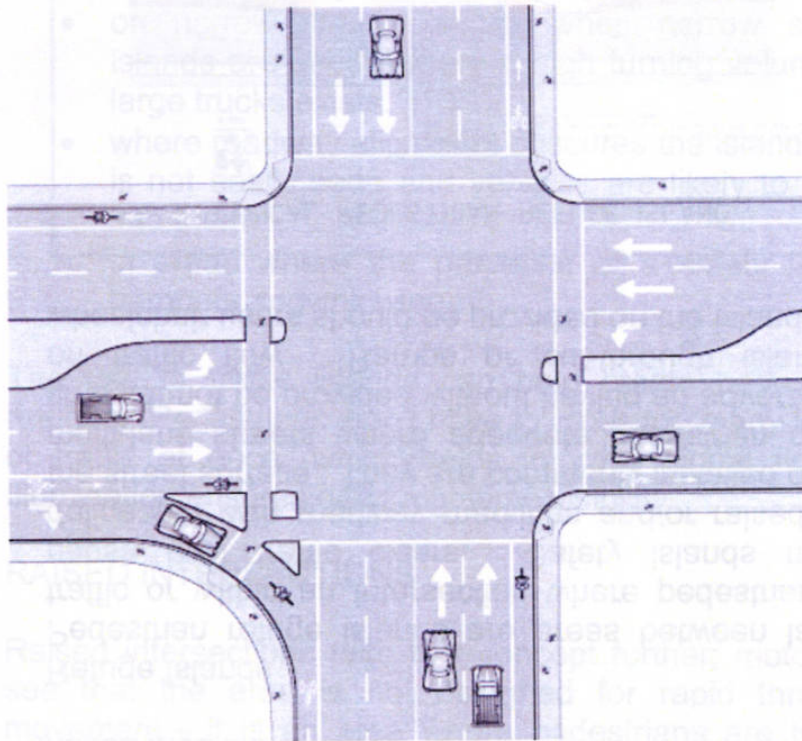
CURB EXTENSIONS

Curb extensions reduce the pedestrian crossing distance and improve the visibility of pedestrian by motorists. Curb extensions should be considered at all intersections where on-street parking is allowed. Reducing pedestrian crossing distance improves signal timing if the pedestrian phase controls the signal.

Non-signalized intersections also benefit from curb extensions; reducing the time pedestrians are in a crosswalk improves pedestrian safety and vehicle movement.

RAISED MEDIANS AND REFUGE ISLANDS

Raised medians and refuge islands benefit pedestrians on two-way, multilane streets, as they allow pedestrians to cross only one direction of traffic at a time. Where it is not possible to provide a continuous raised median, island refuges can be created between intersections and other accesses. These should be located across from high pedestrian generators such as schools, park entrances, libraries, parking lots, etc.



Multi-lane highways with medians are substantially more convenient for pedestrians to cross than comparable

highways without medians. Medians should be provided as a standard feature of multi-lane suburban highways. The AASHTO Green book states that "a median is a highly desirable element on all arterials carrying four or more lanes".

Medians are one of the most significant benefits to pedestrian convenience and (potentially) safety on multi-lane highways. This is particularly true at mid-block locations or unsignalized intersections, as medians greatly simplify the pedestrian's task of crossing the street. The pedestrian need only look in one direction to cross to the median and in the opposite direction when crossing from the median to the far side of the street. (See page 20) The ability to segment the crossing into two simpler parts not only increases the safety of the crossing but also reduces the delay. The heavier the traffic volume, the more important a median becomes in facilitating street crossings.

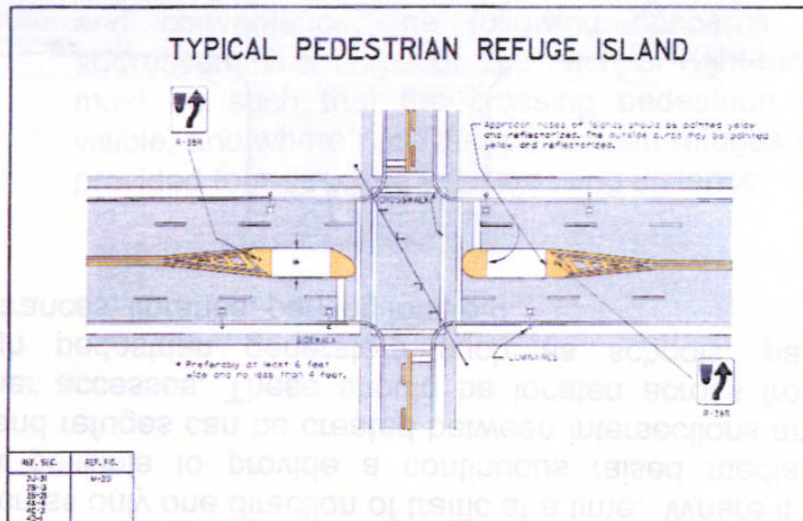
Although this design principle becomes more important where there are attracting pedestrian magnets on opposite sides of the roadway, there should virtually never be an occasion for omitting a median on a new road facility, because future development or redevelopment always raises the potential for pedestrian traffic. This should be reflected in the acquisition of right-of-way and in the establishment of state and local highway design policies.

The width of a median is not a major issue in pedestrian crossings, as long as it is at least 4 ft wide. A simple, but

less effective, approach to providing medians on existing highways is to provide a 4-ft striped median rather than a raised median.

Refuge Islands

Pedestrian refuge islands are areas between lanes of traffic or within an intersection where pedestrians may pause until traffic clears. Safety islands may be delineated with roadway markings and/or raised above the street surface. They are commonly installed on wide, multi-lane streets where adequate pedestrian crossing time cannot be provided without having an adverse effect on traffic flow. Ramps or cut-through islands for wheelchair users should be provided on the islands.



At wide intersections, there is often a triangular area between a through lane and a turn lane unused by motor vehicle traffic. Placing a raised island in this area benefits pedestrians by:

- allowing pedestrians to cross fewer lanes at a time, and to judge conflicts separately;
- providing a refuge so that slower pedestrians can wait for a break in the traffic stream;
- reducing the total crossing distance (which provides signal timing benefits); and providing an opportunity to place easily accessible pedestrian push-buttons.

An island can also be provided in the middle of an intersection. An island must be a minimum of 4 ft wide, preferably 8 ft or more and should be well signed, marked, and lighted. Islands must be large enough to provide refuge for several pedestrians waiting at once. For wheelchair accessibility, it is preferable to provide at-grade cuts rather than ramps. Poles must be mounted away from curb cuts and out of the pedestrian path.

Conditions where refugee islands are most beneficial:

- wide two-way streets with high vehicle volumes, high speeds of travel, and large pedestrian volume.

- wide streets where elderly, handicapped, and/or child pedestrians cross regularly.
- streets where signal timing is not sufficient for pedestrians to cross safely.
- wide, two-way intersections with heavy traffic volumes and crossing pedestrians.

Conditions where refuge islands are least beneficial or possibly harmful:

- on narrow streets and/or when narrow safety islands are used. Where a high turning volume of large trucks exists.
- where roadway alignment obscures the island so it is not easily seen and vehicles are likely to drive into them.
- in areas where the presence of a safety island hampers snowplowing.

The use of traffic islands can help create pedestrian refuges. Pedestrians won't have to cross too many lanes of traffic at once, which helps improve signal timing. Illumination ensures good nighttime visibility.

RAISED INTERSECTIONS

Raised intersections take this concept further; motorists see that the area is not designed for rapid through movement - it is an area where pedestrians are to be expected. The driver must be cautious in approaching

the intersection and be ready to yield the right-of-way to pedestrians. This facility is often used for traffic calming.

INTERSECTIONS

Most conflicts between roadway users occur at intersections, where one group of travelers crosses the path of others. Good intersection design indicates to those approaching the intersection what path they must follow and who has the right-of-way, including pedestrians and bicyclists whose movements are complicated by their lesser speed and visibility.

All legs of an intersection should be open to pedestrians. The pedestrian's path of travel should be direct with minimal out-of-direction travel. Pedestrians should not have to travel over an excessive expanse of uninterrupted pavement. At signalized intersections, pedestrian signal heads should be clearly visible - this requires that they not be placed too far from the nearest safe refuge. Additional pedestrian refuges should be used to decrease crossing distances.

Access management practices should be used to remove additional conflict points. Signals should be timed so they do not impede bicycle or foot traffic with excessively long waits or insufficient crossing times. Good intersection designs are compact and avoid free-flowing movements. Simple right angle intersections are usually the simplest to treat for bicycle and pedestrian movement. The

problems are more complex at skewed and multiple intersections.

The roadway cross section can be narrowed at intersections on streets with parking without significant impact on traffic flow. This provides several major benefits to pedestrians. Narrowing of the cross section (through widening of the sidewalk) has proved to be a design strategy that favors pedestrians while causing minimal interference with vehicular needs. It can be considered at intersections and mid-block pedestrian crossings where vehicular capacity is not an overriding concern. This technique is commonly called the sidewalk flare, cub-bulb, neck-out or safe-cross.

SIDEWALK FLARE

The sidewalk flare reduces the curb-to-curb pedestrian crossing distance. It is similar to a curb extension. It elevates the pedestrian above the pavement surface, to provide the pedestrian with better visibility of vehicles and vehicles with better visibility of pedestrians, particularly young pedestrians. It tends to slow traffic at intersections or at midblock locations where sidewalk flares are provided. The design is not usually appropriate where the right lane is important for vehicular capacity. Locations with 24-hour curb parking are ideal for this design, since the flare is assured of having little or no impact on vehicular capacity. The design is not appropriate for high-speed arterial and collector streets,

and is primarily suited to more compact commercial areas.

AT-GRADE CROSSINGS OF THOROUGHFARES

At-grade crossings introduce conflict points, and grade separation should be sought, as most path users expect continued separation from traffic. The greatest conflicts occur where paths cross freeway entrance and exit ramps. Motorists using these ramps are seeking opportunities to merge with fast moving traffic; they are not expecting bicyclists and pedestrians at these locations.

When grade separation structures cannot be justified, signalization or other measures should be considered to reduce conflicts. Good sight distance must be provided so vehicle drivers can see approaching path users. One method is to provide a median island on multilane roadways as a refuge.

Where a path must cross a roadway at an intersection, improvements to the alignment should be made to increase the visibility of approaching path users. One method is to curve the path slightly, so that it is not parallel to the adjacent roadway.

INTERCHANGES

Designs that encourage free-flowing motor vehicle traffic movements are the most difficult for pedestrians to negotiate safely and comfortably. Conversely, designs that provide safe and convenient pedestrian passage may require some slowing or stopping of motor vehicle traffic.



Many suburban interchanges appear to be designed assuming there will be no pedestrian demand to traverse them. Most suburban interchanges do have pedestrians crossing them, and this demand need to be anticipated in design. Pedestrians attempting to negotiate an interchange area face long walking distances, grade changes, exposure to high-speed traffic, numerous

conflict points and a generally uncomfortable walking experience. Thus, interchange areas must be considered as a major impediment to pedestrian movement.

Possible treatments include providing pedestrian information/directional signing, installing pedestrian crossing signals, illuminating the interchange/walkway areas, installing vehicle warning signs, marking crosswalks, regulating traffic speeds and movements, channelizing vehicular and pedestrian traffic, constructing pedestrian barriers, utilizing overpasses and underpasses to separate pedestrian traffic, and installing traffic signals.

Freeways in urban areas often present barriers to pedestrian circulation. Though interchanges function as freeway crossings they can be obstacles to walking if they are poorly designed. Pedestrians should be accommodated on the intersecting and parallel local roads and streets in urban areas.



At intersections of expressway ramps with local streets, high-speed vehicles exiting from the expressways often are still traveling at a relatively high rate of speed when they pass through the intersection or merge with surface street traffic. Also, exiting motorists may be looking for oncoming traffic and not pedestrians. Pedestrian safety is severely threatened at intersections where freeway off-ramps intersect with local streets, because of the high-speed traffic mixing with crossing pedestrians. However, the level of hazard can be reduced through the use of proper intersection design; grade separation, where appropriate; and/or adequate traffic-control devices (e.g. signs and signals) to reduce vehicle speeds and alert pedestrians and motorists.

In rural areas, traffic volumes are usually lower, little pedestrian use is expected. To alleviate conflicts, more non-interchange crossings of freeways should be provided, with these advantages to pedestrians:

- Pedestrians can cross the freeway at locations with fewer conflicts with vehicles entering and exiting freeway ramps;
- and the additional crossing will relieve some cross traffic from the interchanges, making it easier for pedestrians who must cross at these locations.

Interchanges that use a rural design create more difficult crossing movements for pedestrians, as motor vehicle speeds are higher and movements are less restricted. Configurations with free-flowing right turns and dual left- or right-turns are difficult for pedestrians to negotiate safely. They are particularly vulnerable where a high-speed ramp merges with a roadway.

If these configurations are unavoidable, mitigation measures should be sought. Special designs should be considered that allow pedestrians to cross ramps in locations with good visibility and where speeds are low.

It is important to consider both convenience and safety when providing for pedestrian travel near interchanges. If facilities are not used because of perceived inconvenience, the issue of safety becomes moot. The expected path of pedestrians must be obvious and

logical, with minimal out-of-direction travel and grade changes.

Interchanges with access ramps connecting to local streets at a right angle are easiest for pedestrians to negotiate; the intersection of the ramp and the street should follow established urban intersection design. The main advantages are: the distance that pedestrians must cross at the ramps is minimized; signalized intersections stop traffic and visibility is enhanced.

Traffic entering or exiting a roadway at high speeds creates difficulties for slow moving pedestrians. The following designs help alleviate these difficulties:

RIGHT-LANE MERGE

It is difficult for pedestrians to traverse the undefined area created by right lane merge movements, because, the acute angle of approach creates visibility problems, motor vehicles are often accelerating to merge into traffic and speed differential between motorists and cyclists is high.

The design on page 43 guides cyclists and pedestrians in a manner that provides: a short distance across the ramp at close to a right angle, improved sight distance in an area where traffic speeds are slower than further downstream; and a crossing in an area where driver's attention is not entirely focused on merging with traffic.

Exit Ramps

Exit ramps present difficulties for bicyclists and pedestrians because: motor vehicles exit at fairly high speeds; the acute angle creates visibility problems and exiting drivers often do not use their right turn signal, confusing pedestrians and bicyclists seeking a gap in traffic.

The above design guides cyclists and pedestrians in a manner that provides: a short distance across the ramp, at close to a right angle; improved sight distance in an area where traffic speeds are slower than further upstream; and a crossing in an area where the driver's attention is not distracted by other motor vehicles.

Dual Right-Turn Lanes

This situation is particularly difficult for bicyclists and pedestrians. Warrants for dual turn lanes should be used to ensure that they are provided only if absolutely necessary.

The design for single right turn lanes allows bicyclists and motorists to cross paths in a predictable manner, but the addition of a lane from which cars may also turn adds complexity. Some drivers make a last minute decision to turn right from the center lane without signaling, catching bicyclists and pedestrians unaware.

One design places an island between the right-turn lane and the optional through/right turn lane. This creates a more conventional intersection, separating the conflicts. This design is also better for pedestrians, as the island provides a refuge.



Grade-Separated Crossings

Where it is not possible to accommodate pedestrians with at-grade crossings, grade separation should be considered. Grade-separated facilities are expensive; they add out-of-direction travel and will not be used if the added distance is too great. This can create a potentially hazardous situation if pedestrians ignore the facility and try to negotiate the interchange at grade with no sidewalks or crosswalks.

In some instances, a separated path can be provided on only one side of the interchanges which leads to awkward crossing movements: Pedestrians must cross prior to the interchange (signs should be used to direct them at the nearest signalized crossing). To ensure proper use by pedestrians, structures must be open, with good visibility - especially undercrossings.

Grade-separated pedestrian crossings are facilities allowing for the free-flowing movement of vehicles and pedestrians, and such facilities are located on one or more levels above or below the vehicle level. The effectiveness of grade-separated crossings depends on their use by pedestrians, and many pedestrians may be unwilling to use those facilities. The use of such facilities depends on convenience and walking distances, compared with alternative crossing locations.



Conditions where grade-separated crossings are most beneficial include:

- where pedestrian demand is moderate to high to cross freeways or expressways;
- large volume of young children (near schools) who regularly must cross a high-speed and/or high-volume road,
- streets with high vehicle volumes and high pedestrian crossing volumes and where extreme hazard exists for pedestrians (e.g., high-speed traffic, wide street, poor sight distance);
- one or more of the conditions stated above in conjunction with well-defined pedestrian origin and destination (e.g., residential neighborhood to school, parking structure to university, apartment complex to shopping mall).

Conditions where least beneficial or possibly harmful:

- in high-crime areas,
- when the facility is poorly designed and inconvenient for use by handicapped or other pedestrians,
- when no physical barriers are built to control at-grade crossing activity,
- in areas where the majority of pedestrians are unlikely to use the facility (e.g. near high schools).

Structures

The width of multi-use path structures is the same as the approach paved path, plus a 2-ft shy distance on both sides. For example, a 10-ft wide path requires a 14-ft wide structure.

The standard overhead clearance of undercrossings is 10 ft; an 8-ft minimum may be allowable with good horizontal and vertical clearances, so users approaching the structure can see through to the other end. Undercrossings should be visually open for the personal security of users. Illumination is needed in areas of poor visibility.

The key to the success of pedestrian overpasses and underpasses is the timesavings afforded the pedestrian, ensuring that the underpass would be used in deference to crossing at-grade.

There are advantages and disadvantages to both overcrossings and undercrossings:

Under-crossings

Advantages: They provide an opportunity to reduce approach grades, as the required 10 ft clearance is less than the clearance required for crossing over a roadway. If the roadway is elevated, an undercrossing can be constructed with little or no grade. They are often less expensive to build.

Disadvantages: They may be present security problems, due to reduced visibility. An open, well-lighted structure may end up costing as much as an over-crossing. They may require draining if the sag point is lower than the surrounding terrain.

Over-crossings

Advantages: They are more open and present fewer security problems.

Disadvantages: They require longer approaches to achieve the standard 17-ft of clearance over most roadways. With an additional structural depth of 3 ft, the total rise will be 20 ft. At 5 percent, this requires a 400-ft approach ramp at each end, for a total of 800 ft. This can be lessened if the road is built in a cut section.

Note: 23-ft clearance is required over railroad tracks.

SIGNALIZATION

Where pedestrian use is high, signal timing should take into account the convenience of pedestrians.

Signalization, as it relates to pedestrians, include the presence of traffic signals, signal timing, and turn phasing. A pedestrian activated signal may be warranted

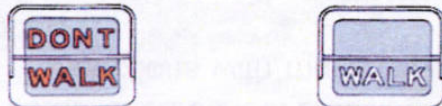
where the expected number of people needing to cross a roadway at a particular location is significant. Anticipated use must be high enough for motorists to get used to stopping frequently for a red light. **Refer to the MUTCD for pedestrian signal warrants.**

The use of pedestrian signals (i.e. walk/don't walk or symbolic signals) timing of signals (standard timing, early release, late release, exclusive pedestrian interval, etc) and type of signal indications (symbolic or word message) should all be considered when installing signals. In terms of the types of pedestrian signal face designs, a 1977 study by Robertson found that the symbolic displays are preferable to the stand word messages.

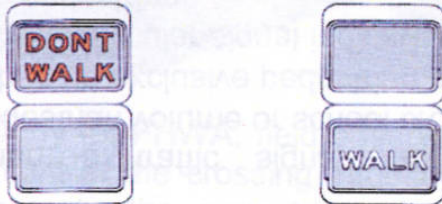
TYPICAL PEDESTRIAN SIGNAL FACE DESIGNS



Single Section with Three Lines



Single Section with Two Lines



Two Section Type



Two Section Symbolic Type

REF. SEC.

6D-4

Pedestrian-signal indications (walk/don't walk or symbolic signals) are usually timed according to one of the following patterns:

- concurrent (standard) timing provides for pedestrians to walk concurrently (parallel) with traffic flow on the walk interval. Vehicles are generally permitted to turn right (or often left) on a green light while pedestrians are crossing on the walk interval.
- Early release timing gives pedestrians a walk indication earlier than parallel traffic is given a green light. Thus, pedestrians are permitted to have a head start into the crosswalk before motor vehicles are permitted to turn.
- Late release timing holds pedestrians until a certain portion of the signal phase has been given to turning vehicles, and then pedestrians are released with a walk interval.
- Exclusive timing involves providing a separate exclusive signal interval when traffic is stopped in all directions during an interval and pedestrians are allowed to cross in any direction.

The sequence of most pedestrian signals during routine operation, according to MUTCD is:

- the steady don't walk indication indicates that pedestrians shall not enter the roadway.
- The flashing don't walk indication means that pedestrians should not enter the roadway, but if

pedestrians entered the road on the walk indication, they should continue to cross to the other side of the street or safety island.

- The walk indication implies that pedestrians may proceed in the direction of the indication.

Several studies have found that only about 2 percent of pedestrians fully understand the meaning of the steady "walk" and that only about half of pedestrians understand the flashing "don't walk".

Conditions where pedestrian signals are most beneficial: when one or more of the following conditions exists (as specified in the MUTCD), pedestrian signals "shall be installed":

- when a traffic signal meets the minimum pedestrian volume or school crossings warrant.
- When an exclusive pedestrian phase is provided.
- When vehicular signal indications are not visible to the pedestrian.
- At established school crossings.
- At intersections with multiphase (left-turn phasing) signals.
- At intersections with complex designs. In cities where pedestrian compliance is high.
- At intersections or midblock locations where pedestrian push buttons are used. In areas with considerable volumes of young children and/or older adults.

Conditions where pedestrian signals are least beneficial or possibly harmful:

- where there are very low pedestrian volumes with high-speed traffic.
- Where there is a long delay in signal cycle between walk intervals.
- Where pedestrians rely on the pedestrian signals to protect them.
- Where signals are not timed to provide adequate walk and clearance time.

Another consideration with pedestrian signals is the possible use of push buttons to extend the crossing period and/or provide a crossing interval for pedestrians.





In a 1982 study for FHWA, field observations found that only 51 percent of the crossing pedestrians pushed the button to actuate the pedestrian signal and that 66 percent of pedestrians began crossing illegally (on the steady or flashing don't walk). Numerous problems were found with the design and operation of the push-button signals.

Several considerations were recommended as they relate to pedestrian push-button signals:

- actuation devices must be properly maintained and in good operation to be effective.
- Signals with pedestrian-actuation devices should be timed to provide a reasonable waiting time (e.g. 30 seconds or less) to the pedestrian after the

button is actuated. Otherwise, pedestrians may assume the push button is not working and begin to cross illegally.

Supplemental signs designating the specific streets (e.g. push button to cross main street) can increase pedestrian use of push buttons. Use of a special device (e.g. a light that comes on when the button is pushed) can increase pedestrian use and respect for push buttons. This may help pedestrians to see that by pushing the button, their request was accepted. If a pedestrian device is designed to operate only for specific times of the day (e.g. off-peak traffic periods) a sign should accompany the actuation device (e.g. push button is not in operation from 2 to 6 p.m. on weekdays). Numerous types of signs and markings may also be installed to supplement and help explain the pedestrian signals.

Traffic signals are timed to accommodate smooth motor vehicle flows at a desired operation speed. In urban areas, this ranges from 15 to 45 mph. These speeds are higher than typical walking speeds 2 to 3 mph.

Traffic signals are usually installed at intersections if they satisfy 1 or more of the 11 signal warrants, as specified in the MUTCD:

- Warrant 1 - minimum vehicular volume.
- Warrant 2 - interruption of continuous traffic.
- Warrant 3 - minimum pedestrian volume.
- Warrant 4 - school crossings.

- Warrant 5 - progressive movement.
- Warrant 6 - accident experience.
- Warrant 7 - systems.
- Warrant 8 - combination of warrants.
- Warrant 9 - four-hour volumes.
- Warrant 10 - peak-hour delays
- Warrant 11 - peak-hour volume.

Theoretically, the addition of traffic signals can be of value to pedestrians at sites where there are insufficient numbers of adequate gaps in traffic for pedestrians to cross safely and artificial gaps in traffic flow are created by traffic signals for pedestrians to cross. However, they are rarely warranted in suburban areas on the basis of pedestrian use alone. There are many factors that may actually affect pedestrian-accident experience at signalized intersections, including the pedestrian and motorist compliance with the signals.

Advantages:

- Traffic signals can create artificial gaps in traffic flow, so pedestrians may cross the street while traffic is stopped.
- Are understood and obeyed by pedestrians more frequently than pedestrian signals.
- Can improve the traffic capacity of intersections. Pedestrian signals warn pedestrians and motorists of an impending signal change sooner than the vehicle amber signal does.
- Can give pedestrians more time to cross the street. Exclusive phase signals will result in

completely separate intervals for pedestrians and vehicles as long as pedestrians and motorists all obey their signals. (e.g. pedestrians crossing during the don't walk interval and motorists running the red light present the risk of a pedestrian accident).

Sight-distance must be adequate to ensure that motorists will see the light in time to stop. Warning signs should be installed on the approaching roadway.

Disadvantages:

- traffic signals are more expensive than many other facilities (except grade-separation and horizontally separated pedestrian environments).
- May increase pedestrian congestion on sidewalks and pedestrian delay at corners. Suspended overhead often cannot be seen by pedestrians standing on the corner. In such cases, pedestrian signals (walk/don't walk) are needed.
- Are often disobeyed by drivers and pedestrians.

Pedestrian Signals

- there is a failure by pedestrians to understand the meaning of the don't walk.
- Younger pedestrians often disregard the pedestrian signal or depend too much on it.

- Pedestrians may feel overly safe (from turning vehicles and other traffic) when they see a walk indication.
- Many pedestrians will not use the pushbutton.
- Separated signal phasing can cause serious vehicle and pedestrian delay.

Pedestrian signals may be combined with curb extensions, raised medians and refuges.

The safety effects of pedestrian signals and various signal-timing options were investigated. Sites with exclusively timed pedestrian signals were associated with significantly lower pedestrian accidents than were sites with either standard signal time or with no pedestrian signals. However, the presence of concurrently timed pedestrian signals had no significant effect on pedestrian accidents, compared with the absence of any pedestrian signals. The possible reasons for the lack of effectiveness of concurrently time pedestrian signals:

- poor compliance and respect by pedestrians for pedestrian-signal indications in some of the test cities, false sense of security by some pedestrians from the signal indications,
- lack of understanding by many pedestrians of the flashing walk and flashing don't walk signals and infrequent use of pedestrian push buttons to actuate the walk interval. (1982 study by Zegeer et al. for FHWA).

Although pedestrian signals may not be highly effective when overused or inappropriately used, the MUTCD lists conditions under which pedestrian signals are necessary, including;

- when traffic signals are installed based on meeting the minimum pedestrian volume or school crossing warrants.
- when an exclusive pedestrian interval is provided i.e., with all conflicting vehicular traffic being stopped.
- when the vehicle signals are not visible to pedestrians.
- at signalized intersections within established school crossing locations.

Leading Pedestrian Interval Signal Phase

Most traffic signals are designed to release pedestrians and turning vehicles concurrently, providing little or no time separation. One technique that can be used to separate pedestrian and turning vehicles in time is to provide a leading pedestrian interval (LPI) which permits pedestrian traffic to begin crossing several seconds before the release of potentially conflicting motor vehicles. Research by Van Houten et al. (1997) has examined the influence of a three-second LPI on pedestrian behavior and conflicts with turning vehicles.

The introduction of a three second LPI reduced conflicts between pedestrians and turning vehicles, reduced the

incidence of pedestrians yielding the right of way to turning vehicles, and made it somewhat easier to cross the street by allowing pedestrians to occupy the crosswalk before turning vehicles were permitted to enter the intersection. Once pedestrians were in the crosswalk, drivers acknowledged their presence and were more likely to yield the right-of-way. Also this allows drivers time to turn during a green phase on their light. Often drivers will rush a green light if they feel they won't get a chance to complete their turn before pedestrians have cleared the crosswalk.

Improvements for pedestrians include:

- Incorporating a pedestrian phase in the signal sequence, rather than on-demand, in locations with high pedestrian use;
- Placing pedestrian push-buttons in locations that are easy to reach, facing the sidewalk and clearly in-line with the direction of travel (this will improve operations, as many pedestrians push all buttons to ensure that they hit the right one)
- Placing additional actuators prior to the intersection, to decrease pedestrian waiting time;
- and adjusting the signal timing to accommodate average walking speeds, or to limit the time a pedestrian has to wait.

Signing

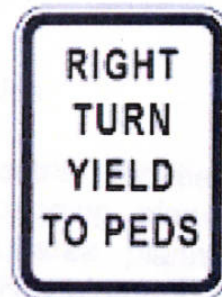
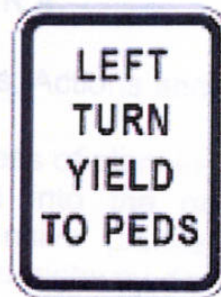
Recommended signs include both advance warning signs and pedestrian crossing signs at the crossing itself, and regulatory signs at intersections to reinforce the message that motorists must yield to pedestrians.



These signs should only be placed at warranted locations, because excessive signage leads to signs being missed or ignored.

Right Turn on Red

Right-turn-on-red, or RTOR, refers to the practice of legally allowing motorists to turn right on a red signal indication at intersections after stopping and yielding to pedestrians and other vehicles having the right of way unless there is a sign prohibiting such movement.



RTOR is now allowed through out the United States (unless otherwise signed), except in New York City, where a RTOR maneuver is prohibited unless specifically permitted by sign.

In a study for FHWA by Zegeer and Cynecki, 30 different countermeasures were developed for accidents related to RTOR pedestrian hazards. No turn on red when pedestrian are present with a red ball in the center was effective at several sites at which right-turn vehicle volumes were low or moderate. However, it was less effective when RTOR volumes were high.

Left-Turn Phasing and Restrictions

One of the major causes of pedestrian accidents at intersections is a vehicle that turns right or left and strikes pedestrians in crosswalks. (See Safety page 8) Poor driver visibility from within the vehicle and bad driving habits are the major contributing causes of left-turn pedestrian accidents. The blockage of vision for left-turn

motorists is supported by the higher percentage of drivers cited as being at fault in pedestrian left-turn accidents compared with pedestrian right-turn accidents.

Some of the methods that have been tested for reducing the number of left-turn pedestrian accidents at an intersection include:

- prohibiting left turns and providing exclusive left-turn phasing. Prohibiting left turns at an intersection is only effective at intersections with heavy pedestrian activity and a low to moderate left-turn volume with adjacent intersections at which the left turn maneuvers can be made much more safely. Otherwise, this action merely moves the problem to another location.
- Providing separate left-turn phasing only reduces the conflict between pedestrians and motor vehicles when pedestrians are provided with a don't walk signal during the interval when the green arrow is given to left-turning motorists and pedestrians are in compliance with the pedestrian signal. Left-turn signals are often installed at intersections with heavy left-turn and through volumes, where left-turn motorist would otherwise have insufficient gaps to turn. However, adding an exclusive left-turn signal may mean longer waiting periods between walk intervals and pedestrian

compliance with the don't walk signal is important.

ROADWAY LIGHTING

Conditions where roadway lighting is most beneficial:

- Arterial streets and other roadways with high traffic volumes, particularly near intersections.
- Streets or areas with high nighttime pedestrian activity, particularly where other high-pedestrian areas in the city or area are also lighted.
- Streets or intersections with a high incidence of nighttime accidents, dark residential streets with high volumes of child and/or older adult pedestrians.

Conditions where least beneficial or possibly harmful:

- where placed improperly
- where light intensity is insufficient
- where the poles interfere with pedestrians.



CHAPTER 4

Strategies, Actions and Policies

The process of planning pedestrian facilities must be fully integrated into the other ongoing planning activities, comprehensive planning, subarea planning, site plan review and highway design. Key elements that appeared to be consistently present in jurisdictions adequately treating pedestrian accommodations include:

- policy statements in the comprehensive plan that relate to pedestrian needs and objectives,
- inclusion of pedestrian facility elements in the comprehensive plan,
- preparation of subarea or sector plans for areas needing special coordination
- and designation of a knowledgeable person or persons on the planning and/or engineering staff to serve as the in-house pedestrian advocate.

Effective pedestrian-oriented land-use planning will have the most significant impact on pedestrian travel of any pedestrian strategy.

Another important element of local planning must involve problem identification. An on-going process that should take place at all levels is the identification of the major deficiencies that have become pervasive over the years (e.g., failing to require sidewalks along major highways)

as well as the day-to-day isolated problems that occur (e.g., signs down, malfunctioning signals, etc). Both public agencies and private citizens are an integral part of the problem identification process. The following policies, goals, strategies and actions provide a guide to local agencies in the central Ohio area to improve pedestrian travel in the region and make areas more pedestrian friendly.

POLICIES AND GOALS

1. Provide pedestrian service to major centers of activity;
 - a. *Pedestrianways should be fully integrated with and connected to transit centers, stops and parking facilities both on and off street.*
 - b. *Where there exists the potential for a large volume of pedestrian traffic, local governments are encouraged to retrofit existing developments to facilitate pedestrians.*
 - c. *Encourage second-level walkways.*
2. Create an environment conducive to walking;
 - a. *Local governments are encouraged to conduct a comprehensive review of all major thoroughfares which do not have*

pedestrian facilities and initiate efforts to provide any needed missing segments as needed to accommodate existing and/or projected pedestrian demand. In making such an analysis local governments should also evaluate the degree to which barriers and intrusions exist and take the necessary steps to eliminate them.

- b. Local governments should design "pedestrian-friendly" facilities to encourage use. All designs should adhere to Americans with Disabilities Act of 1990 requirements and traffic control measures should be appropriately signed for the area.*

3. Encourage walking as an alternative to the motor-vehicle trip;

- a. In urban and suburban areas, and with a sensitivity to permanent structures such as bridges, abutments, underpasses and overpasses, continuous pedestrianways should be provided on both sides of all streets, roadways (except freeways) and where possible, detached from the roadway.*

- b. In rural areas, where pedestrian volumes tend to be low, hard-surfaced shoulders of adequate width or designated pathways are*

recommended along highways separating pedestrians from the traveled roadway.

4. Assure that pedestrian facilities are considered when appropriate in project design implementation through the Transportation Improvement Program;

5. Encourage continuity of facilities across jurisdictional boundaries;

- a. Pedestrian facilities that cross jurisdictional boundaries should have smooth transitions.*

6. Encourage the provision of pedestrian transportation facilities in comprehensive planning documents and city codes;

- a. Local governments should include pedestrian facilities in comprehensive plans, master plans or general plans governing land use and public facility development.*

- b. Local governments should require the provision of pedestrian facilities in all new and redeveloped areas. Subdivision, zoning, site plan criteria, development ordinances and regulations need to include good pedestrian access on the periphery of the development; among residential areas, arterial and collector roads, parking lots,*

places of worship, transit stops, shopping facilities, schools, employment sites and recreational facilities, as well as provide for internal pedestrian circulation.

7. Provide for the safe and convenient movement of all pedestrians in urban, suburban and rural areas;

a. Local governments should design and retrofit pedestrian facilities in accordance with the Americans with Disabilities Act of 1990 and any state or local access requirements.

b. To improve safety and provide for a sustainable neighborhood, local governments should consider the implementation of traffic control measures and traffic calming techniques. The installation of traffic control measures and traffic calming techniques should be designed to increase community safety and "calm" traffic by reducing speeds, volumes and accidents.

c. Consideration should be given to the addition of pedestrian-scaled lighting, especially at pedestrian crossings and locations where drivers may experience multiple operational and pedestrian conflicts.

d. Local governments should consider the crime element when developing facilities near pedestrian activity centers. In remote or low visibility areas, pedestrian-scaled lighting and emergency call boxes must be considered.

e. Local governments should educate the public on the proper use and operation of pedestrian signals by involving law enforcement officials..

f. Local governments should educate the public on the economical, environmental and health benefits of walking as an alternative to driving.

g. In all urban and suburban areas, local governments should ensure property owners comply with ordinances to maintain sidewalks, control vegetation and promptly remove snow from walkways.

8. Encourage the dedication of local funding sources and land for pedestrian improvements;

Local governments should, when appropriate, reserve easements and rights-of-way to accommodate pedestrian facilities.

9. Integrate in the project design phase, the appropriate review of and sensitivity to pedestrians;

Specific attention should be given to pedestrian needs in the design of intersections and traffic signalization. Counter measures to reduce conflicts with pedestrians need to be considered. Right-turn-on-red should be reviewed where high pedestrian volumes exist.

10. Encourage pedestrian-oriented developments for all types of land use.

11. Encourage the State to dedicate a portion of Transportation Enhancement Funds to build and/or improve pedestrian facilities.

ISSUES, STRATEGIES AND ACTIONS

The development of any good transportation system, must include the four E's, Engineering, Enforcement, Education and Encouragement. The issues and related strategies are organized in the four categories.

PLANNING AND ENGINEERING

Issue 1 Include pedestrian facilities in planning.

- a. **Identify and determine community priority on pedestrian facilities.**

Strategy/Action The beginning of the transportation system planning process or comprehensive planning is the best time to determine and identify the communities' priority on pedestrian facilities.

- b. **Identify the need for pedestrian facilities.**

Strategy/Action Whenever rapid expansion is occurring or forecasted or there is significant change in the community which will attract traffic or pedestrians, the need for pedestrian facilities should be examined. The

development of a subdivision, school, entertainment complex, strip center, video store or mall all should red flag the need to consider pedestrians.

- c. **Identify the location where facilities are needed.**

Strategy/Action

Once the need has been established, it is equally just as important to identify the location for facilities. Misplaced locations will not get used and may force pedestrians into unsafe walking situations. While it may seem trivial at the onset, the research necessary to place effective and efficient pedestrian facilities is paramount.

- d. **Study pedestrian behavior.**

Strategy/Action

Whenever there is a change in the community or prior to transportation improvement changes, pedestrian behavior should be researched to determine the most effective and efficient facilities. Often pedestrian behavior is a clue to where facilities should be placed.

e. Obtain pedestrian accident data.

Strategy/Action Pedestrian accident data can be used to determine specific facilities and changes in traffic control measures.

f. Obtain pedestrian counts, model pedestrian travel and other data.

Strategy/Action Whenever transportation improvements are being considered, pedestrian counts, behavior, and other data should be reviewed to determine the most effective and efficient facilities.

Issue 2 Include pedestrian facilities in community design.

a. Review and revise zoning codes and development/subdivision regulations to ensure appropriate pedestrian facilities are included in all new development.

Strategy/Action When revisions or updates are scheduled.

b. Review traffic control devices for appropriateness in timing,

signalization, striping and as identified in the Manual for Uniform Traffic Control Devices. Provide as needed for pedestrian use.

Strategy/Action Whenever signals are being considered, where there are high pedestrian/vehicle accidents, or new pedestrian use is being considered.

Issue 3 Provide/install pedestrian facilities.

a. Connect pedestrian facilities and provide continuity to and through jurisdictional boundaries.

Strategy/Action All designs for road improvements should include facilities.

b. Provide/install appropriate facilities along roads.

Strategy/Action When new development is planned or considered.

c. Consider connecting neighborhoods to schools, retail establishments, neighborhoods, major activity centers, commercial and industrial areas.

Strategy/Action Whenever road improvements or new developments are being considered or where no facilities currently exist.

- d. **Connect pedestrian facilities to other transportation modes.**

Strategy/Action Whenever new transit stops/routes, new development or road improvements are planned or considered.

- e. **Provide/install traffic calming to slow traffic in appropriate areas.**

Strategy/Action During middle to high pedestrian usage where the speed limit is inappropriate for pedestrian use, cut-through traffic or excessive volume.

Issue 4. Make Pedestrian Facilities Accessible.

- a. **Provide pedestrian access to schools, retail establishments, major activity centers, commercial and industrial areas, and between streets and setbacks from the road.**

Strategy/Action Whenever new development is considered and planned, where high pedestrian use exists or when a need has been established such as footpaths and pedestrians walking in the street.

- b. **Provide pedestrian access to transit stops.**

Strategy/Action Whenever new transit stops/routes, road improvements are being developed, planned or considered.

- c. **Make pedestrian facilities accessible to persons with disabilities and senior adults.**

Strategy/Action Whenever new development, road improvements or change in land use are being considered, planned or developed and in compliance with ADA regulations.

- 1. **Review the location, design and configuration of handicap ramps.**

Strategy/Action New handicapped facility, near senior citizen area or whenever the facility is shown to be unsafe.

2. Review the location, design and configuration of all pedestrian facilities.

Strategy/Action Whenever road improvement, new development, or signal change, are being considered, planned or developed or high accident rates are occurring.

- d. Review and mitigate physical barriers (i.e., ravines, rivers, interstates, bridges, railroad lines, large structures, etc.) for the installation and continuity of pedestrian facilities.**

Strategy/Action Whenever road improvements or new road construction is considered, planned or developed.

- e. Provide/install pedestrian facilities on bridges when replaced or reconstructed.**

Strategy/Action During the initial design phase.

- f. Review railroad crossings for appropriate pedestrian facilities.**

Strategy/Action During road improvement, medium to high pedestrian accident rates or if complaints occur.

- g. Provide overpasses/underpasses, tunnels where applicable.**

Strategy/Action Where no alternate route exists, right-of-way is available and there is a feasible design.

ENFORCEMENT AND SAFETY

- a. Maintain pedestrian facilities.**

Strategy/Action Whenever safety is an issue or complaints have been made.

- b. Provide/install buffers along sidewalks.**

Strategy/Action During new development or road improvements and where sufficient right-of-way is available.

- c. Create, review and enforce design standards.**

Strategy/Action During the planning and engineering phase.

- d. **Consider traffic calming and rerouting to slow traffic in appropriate areas.**

Strategy/Action When cut-through traffic or speed occurs in neighborhoods with medium to high pedestrian use.

- e. **Consider the crime element when developing pedestrian facilities.**

Strategy/Action During the initial planning and development phase for new pedestrian facilities.

- f. **Provide emergency call boxes.**

Strategy/Action During the initial design phase and development

- g. **Provide pedestrian lighting where appropriate.**

Strategy/Action During initial design phase and in the instance of medium to high pedestrian traffic and in high pedestrian activity areas.

- h. **Review laws and standards that relate to pedestrian facilities, use and construction.**

Strategy/Action During planning and engineering, zoning and subdivision revisions and site plan criteria.

EDUCATION

- a. **Educate the public on how to share pedestrian facilities with other users.**

Strategy/Action Where there is medium to high pedestrian traffic, high rate of accidents or children.

- b. **Educate the public on the proper use of pedestrian signals.**

Strategy/Action During installation.

- c. **Include non-motorized transportation course work in college curriculum for planners and engineers.**

Strategy/Action During course scheduling.

- d. Educate all public decision makers as to the need for pedestrian facilities.**

Strategy/Action *During the prioritization of community needs and development of comprehensive and master plans.*

ENCOURAGEMENT

- a. Make all facilities pedestrian-friendly.**

Strategy/Action *During the initial design when medium to high pedestrian use is predicted.*

- 1. Consider the needs of children, people with disabilities and senior adults.**

Strategy/Action *In areas with schools, handicap and senior citizen facilities.*

- b. Encourage walking as a mode of transportation as facilities become available.**

Strategy/Action *During the completion of new facilities.*

CHAPTER 5

Funding

In 1991, Congress passed landmark transportation legislation, the Intermodal Surface Transportation Efficiency Act (ISTEA), that recognized the increasingly important role of bicycling and walking in creating a balanced, intermodal transportation system. Building on ISTEA, the new legislation provides the funding, planning, and policy tools necessary to create more walkable and bicycle-friendly communities.

The Transportation Equity Act for the 21st Century (TEA-21) continues and expands provisions to improve facilities and safety for bicycles and pedestrians. The eligibility of NHS funds is broadened to include pedestrian walkways, and safety and educational activities are now eligible for Transportation Enhancement funds. Other changes ensure the consideration of bicyclists and pedestrians in the planning process and facility design.

Bicycle and pedestrian projects are broadly eligible for funding from most of the major Federal-aid highway, transit, safety, and other programs. Bicycle project must be "principally for transportation, rather than recreation, purposes" and must be designed and located pursuant to the transportation plans required of States and Metropolitan Planning Organizations.

Federal-Aid Highway Program

National Highway System funds may be used to construct bicycle transportation facilities and pedestrian walkways on land adjacent to any highway on the National Highway System including Interstate highways.

Surface Transportation Program (STP) funds may be used for either the construction of bicycle transportation facilities and pedestrian walkways, or non-construction projects (such as maps, brochures, and public service announcements) related to safe bicycle use and walking. TEA-21 adds "the modification of public sidewalks to comply with the Americans with Disabilities Act" as an activity that is specifically eligible for these funds.

Ten percent of each State's annual STP funds are set aside for Transportation Enhancement Activities (TEAs). The law provides a specific list of activities that are eligible TEAs and this list includes "provision of facilities for pedestrians and bicycles, provision of safety and educational activities for pedestrians and bicyclists," and the "preservation of abandoned railway corridors (including the conversion and use thereof for pedestrian and bicycle trails)".

Another 10 percent of each State's STP funds is set aside for the Hazard Elimination and Railway-Highway Crossing programs, which address bicycle and pedestrian safety issues. Each State is required to

implement a Hazard Elimination Program to identify and correct locations that may constitute a danger to motorists, bicyclists, and pedestrians. Funds may be used for activities including 1) a survey of hazardous locations and 2) projects on any publicly owned bicycle or pedestrian pathway or trail, or 3) any safety-related traffic calming measure. Improvements to railway-highway crossings "shall take into account bicycle safety".

Congestion Mitigation and Air Quality Improvement program funds may be used for either the construction of bicycle transportation facilities and pedestrian walkways, or non-construction projects (such as maps, brochures, and public service announcements) related to safe bicycle use.

Recreational Trails Program funds may be used for all kinds of trail projects. Of the fund apportioned to a State, 30 percent must be used for motorized trail uses, 30 percent for non-motorized trail uses, and 40 percent for diverse trail uses (any combination).

Provisions for pedestrians and bicyclists are eligible under the various categories of the Federal Lands Highway Program in conjunction with roads, highways, and parkways. Priority for funding projects is determined by the appropriate Federal Land Agency.

National Scenic Byways Program funds may be used for construction of a facility along a scenic byway for pedestrians and bicyclists.

Job Access and Reverse Commute Grants are available to support projects, including bicycle-related services, designed to transport welfare recipients and eligible low-income individuals to and from employment.

High Priority Projects and Designated Transportation Enhancement Activities identified by TEA-21 include numerous bicycle, pedestrian, trail, and traffic calming projects in communities throughout the country.

Federal Transit Program

Title 49 U.S.C. (as amended by TEA-21) allows the Urbanized Area Formula Grants, Capital Investment Grants and Loans, and Formula Program for Other than Urbanized Area transit funds to be used for improving bicycle and pedestrian access to transit facilities and vehicles. Eligible activities include investments in "pedestrian and bicycle access to a mass transportation facility" that establishes or enhances coordination between mass transportation and other transportation.

TEA-21 also created a transit Enhancement Activity program with a 1 percent set-aside of Urbanized Area Formula Grant funds designated for, among other things, pedestrian access and walkways, and "bicycle access, including bicycle storage facilities and installing equipment for transporting bicycles on mass transportation vehicles."

Highway Safety Programs

Pedestrians and bicyclist safety remain priority areas for State and Community Highway Safety Grants funded by the Section 402 formula grant program. A State is eligible for these grants by submitting a Performance plan (establishing goals and performance measures for improving highway safety) and a Highway Safety Plan (describing activities to achieve those goals).

Research, development, demonstrations, and training to improve highway safety (including bicycle and pedestrian safety) is carried out under the Highway Safety Research and Development (Section 403) program.

Federal/State Matching Requirements

In general, the Federal share of the costs of transportation projects is 80 percent with a 20 percent State or local match. However, there are a number of exceptions to this rule.

Federal Lands Highway projects and Section 402 Highway Safety funds are 100 percent federally funded.

Bicycle-related Transit Enhancement Activities are 95 percent federally funded.

Hazard elimination projects are 90 percent federally funded. Bicycle-related transit projects (other than

Transit Enhancement Activities) may be up to 90 percent federally funded.

Individual Transportation Enhancement Activity projects under the STP can have a Federal match higher or lower than 80 percent. However, the overall Federal share of each State's Transportation Enhancement Program must be 80 percent.

States with higher percentages of Federal Lands have higher Federal shares calculated in proportion to their percentage of Federal lands.

The State and/or local funds used to match Federal-aid highway projects may include in-kind contributions (such as donations). Funds from other Federal programs may also be used to match Transportation Enhancement, Scenic Byways, and Recreational Trails program funds. A federal agency project sponsor may provide matching funds to Recreational Trails funds provided the Federal share does not exceed 95 percent.

ACKNOWLEDGEMENTS

Special thanks and appreciation are extended to the following for the use of charts, diagrams, photographs and assistance in the development of the Vision, Strategies, Actions and Policies incorporated in this guide.

Michael Ronkin
Bicycle and Pedestrian Program Manager
Oregon Department of Transportation

Dan Burden
Florida Department of Transportation

Traffic Crash Reports
Ohio Department of Public Safety

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BIBLIOGRAPHY

United States Department of Transportation, A Summary, Bicycle and Pedestrian Provisions of the Federal-Aid Program, as amended by the Transportation Equity Act for the 21st Century, 1998.

United States Department of Transportation, Federal Highway Administration, National Bicycling and Walking Study, Case Study No. 24.

United States Department of Transportation, Federal Highway Administration, National Bicycling and Walking Study, Case Study No. 21.

Transportation Research Board, National Research Council, Planning and Implementing Pedestrian Facilities in Suburban and Developing Rural Areas, #294A Research Report.

Rails-to-Trails Conservancy and the Association of Pedestrian and Bicycle Professionals, Improving Conditions for Bicycling and Walking, A Best Practices Report", January 1998.

Transportation Research Board, National Research Council, Pedestrian and Traffic-Control Measures, #139

Oregon Department of Transportation, OREGON BICYCLE AND PEDESTRIAN PLAN, An Element of the Oregon Transportation Plan, 1995.

Dan Burden and Michael Wallwork, P.E., Handbook for Walkable Communities, Spring/Summer, 1995.

Ohio Department of Transportation, Division of Operations, Bureau of Traffic, Ohio Manual of Uniform Traffic Control Devices for Streets and Highways", American Association State Highway and Transportation Officials (AASHTO) Green Book.

Ohio Department of Public Safety, Ohio Traffic Crash Reports.

City of Columbus, Residential Traffic Mitigation Program.

Status Report, Three-Second Head Start Gives Pedestrian Advantage at Intersections, Volume 32, No. 7, August 30, 1997.

Columbus Area Pedestrian Safety Committee, TOP TEN Areas Most Dangerous for Pedestrians (0-14) in Franklin County, 1995-1997.

Florida Department of Transportation, Safety Office, Florida Pedestrian Safety Plan, February 1992.

Americans with Disabilities Act, Title II, Section 35, 1991.

Denver Regional Council of Governments, Pedestrian and Bicycle Element of the Regional Transportation Plan.