OREGON
BICYCLE AND PEDESTRIAN PLAN

An Element of the Oregon Transportation Plan

OREGON DEPARTMENT OF TRANSPORTATION

STATUS OF LONG RANGE PLANS

		Proposed Schedule
• Oregon Transportation Plan	Dave Bishop	Adopted 1992
• Aviation System Plan	Gary Viehdorfer	Incremental
• Bicycle and Pedestrian Plan	Michael Ronkin	Adopted 1995
• Corridor Plans	Ed Lee	Incremental
• Highway Plan	Don Byard	Adopted 1991
• Intermodal Plan	Steve Kale	Spring 1996
• Public Transportation Plan	Bob Sherman	Adopted 1997
• Rail Freight Plan	Ed Immel	Adopted 1994
• Rail Passenger Policy and Plan	Bob Krebs	Adopted 1992
• Transportation Safety Action Plan	June Ross	Adopted 1995

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OREGON
BICYCLE AND PEDESTRIAN PLAN

AN ELEMENT OF THE OREGON TRANSPORTATION PLAN

ADOPTED BY THE OREGON TRANSPORTATION COMMISSION
JUNE 14, 1995

Implementation of the Oregon Bicycle and Pedestrian Plan is dependent upon the availability of funding. Adoption of the plan by the Oregon Transportation Commission does not guarantee adequate financial resources to carry out the projects nor can the Commission commit the financial resources of other agencies or public bodies.

OREGON DEPARTMENT OF TRANSPORTATION
BICYCLE AND PEDESTRIAN PROGRAM

ACKNOWLEDGEMENTS

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Special thanks to the hundreds of people (the citizens of Oregon, local and ODOT staff) who contributed their ideas and recommendations regarding bicycle and pedestrian transportation.

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PREFACE

PURPOSE OF THE PLAN

Bicycling and walking are important components of Oregon's multimodal transportation mix. This plan is a tool Oregonians can use to increase their transportation choices.

The Oregon Department of Transportation has jurisdiction over approximately 12,000 km (7,500 mi) of highways. This plan does not propose specific projects on each section of highway, but offers the general principles and policies that ODOT follows to provide bikeways and walkways along state highways. It also provides the framework for cooperation between ODOT and local jurisdictions, and offers guidance to cities and counties for developing local bicycle and pedestrian plans.

This plan serves the following purposes:

1. To implement the Actions recommended by the Oregon Transportation Plan;
2. To guide ODOT, MPO's, the cities and counties of Oregon and other agencies in developing bikeway and walkway systems;
3. To explain the laws pertaining to the establishment of bikeways and walkways;
4. To provide information to citizens interested in bicycle and pedestrian transportation;
5. To fulfill the requirements of the Intermodal Surface Transportation Efficiency Act (ISTEA), whereby each state must adopt a statewide bicycle and pedestrian plan;
6. To fulfill the requirements of Oregon Administrative Rule 660-12 (Transportation Planning Rule 12); and
7. To provide standards for planning, designing and maintaining bikeways and walkways.

ORGANIZATION OF THE PLAN

As there are similarities and differences between bicycling and walking; combining the two modes in one document ensures that both bicycling and walking receive full consideration as valid transportation options. Because bicyclists and pedestrians operate in different manners along the roadway, the design section of this plan addresses these differences.

This document consists of two sections and appendices:

- Section One, the POLICY & ACTION PLAN, contains background information, such as the importance of bicycling and walking, legal mandates and current conditions. This is followed by the goals, actions and implementation strategies ODOT proposes to improve bicycle and pedestrian transportation.
- Section Two, BIKEWAY & WALKWAY PLANNING, DESIGN, MAINTENANCE & SAFETY, will assist ODOT, cities and counties in designing, constructing and maintaining pedestrian and bicycle facilities. Design standards are recommended to ensure that a safe, attractive and convenient network of walkways and bikeways is established. The information on safety will assist law enforcement agencies, educators and others in developing programs to improve safety for all roadway users.
- The APPENDICES include a glossary, relevant statutes, sample forms, etc.

A pleasant walking environment enhances Oregon's quality of life

OTHER RELATED PLANS

This plan considers bicycling and walking transportation along public rights-of-way.

Recreational bicycling and walking and trail issues are addressed in the "Oregon Recreational Trails Plan." For information on this plan, contact:

Recreation Trails Coordinator
Oregon Parks and Recreation Department
1115 Commercial Street NE
Salem, OR 97310

Safety policies and programs are addressed in the "Transportation Safety Action Plan." For information on this plan, contact:

Transportation Safety Program
Mill Creek Office Park
555 13th Street NE
Salem, OR 97310

THE BICYCLE & PEDESTRIAN PLAN & THE TRANSPORTATION PLANNING PROCESS

The Oregon Transportation Plan (OTP) drives all transportation planning in Oregon. The Modal Plans, including the Bicycle and Pedestrian Plan, are elements of the OTP.

Using the policies established in these documents, Corridor Plans, Metropolitan Planning Organization (MPO) plans and local government Transportation Systems Plans (TSP) are developed to provide recommendations for improvements. Projects, including bicycle and pedestrian improvements, are then programmed in either the State Transportation Improvement Program (STIP) for state projects, or in local TIP's for local projects (*See the diagram on page xi for an illustration of the interrelationship of the various phases of the planning process*).

PUBLIC INVOLVEMENT

The recommended goals, actions and strategies of this plan were drafted in response to the following input from the public:

- The Oregon Bicycle and Pedestrian Advisory Committee (OBPAC), with Bicycle and Pedestrian Program staff, have held quarterly public meetings around the state since 1973.
- The Oregon Transportation Plan was developed with comprehensive public participation; the need for improved bicycle and pedestrian facilities was expressed as a high priority.
- In January 1994, input from cities, counties and interested citizens was sought via direct mailing and news releases.
- In August 1994, staff toured the state seeking input at public meetings.
- After review by ODOT staff, OBPAC and the Oregon Transportation Commission, a public review draft was circulated to all known interested parties from December 21, 1994 to February 10, 1995.
- A public hearing was held in January 1995 before adoption by the Oregon Transportation Commission on June 14, 1995.

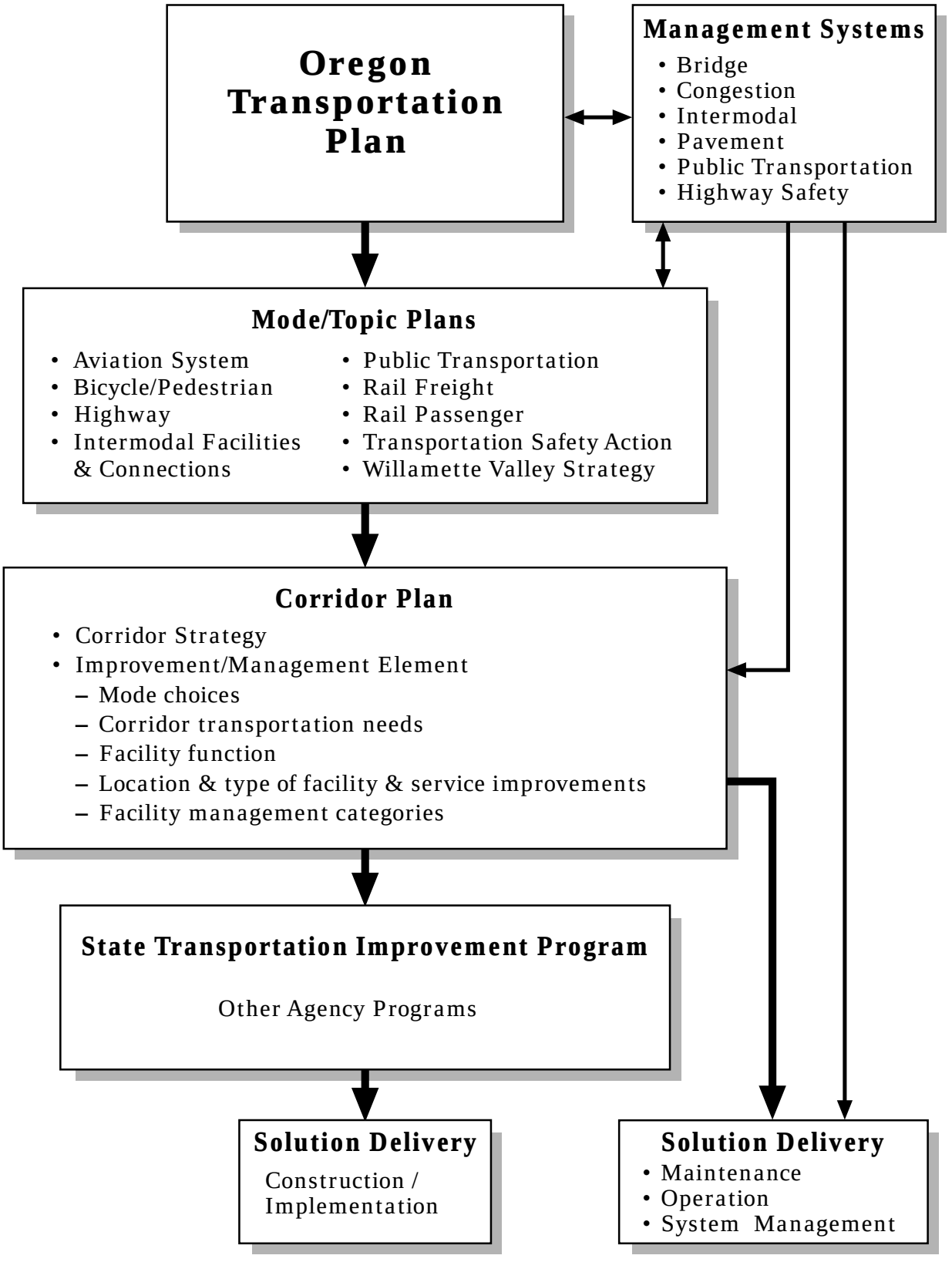
PREVIOUS PLANS

ODOT has previously adopted three Bicycle Plans, in 1984, 1988 and 1992. The present document is the first Bicycle and Pedestrian Plan, and supersedes all previous Bicycle Plans.

OTHER RELATED DOCUMENTS

See Appendix B for a listing of other related documents, such as research studies and design manuals.

INTEGRATED TRANSPORTATION PLANNING



The Transportation Planning Process

Oregonians enjoying an afternoon break on downtown benches

Riverfront path enjoyed by many users

EXECUTIVE SUMMARY

PURPOSE AND ORGANIZATION

The Oregon Bicycle and Pedestrian Plan is a modal element of the Oregon Transportation Plan. It provides direction to ODOT in establishing bicycle and pedestrian facilities on state highways. It also guides cities and counties, as well as other organizations and private citizens, in establishing facilities on local transportation systems.

The plan consists of two sections: one establishes *policies and implementation strategies*; the second presents *design, maintenance and safety* information. The appendices contain relevant statutes, proposed projects, sample forms, etc.

SECTION 1: POLICY AND ACTION PLAN

Vision: *Oregon envisions a transportation system where walking and bicycling are safe and convenient transportation modes for urban trips.*

Background Information: The importance of these modes is explained from environmental, economic and social perspectives. Bicycling and walking are often the only modes available to the "transportation disadvantaged" (the young, the elderly, the poor). Potential impacts of increased use of these modes are discussed. Many other factors, such as land use, influence walking and bicycling and are beyond the scope of this plan; their importance is mentioned to put the plan's goals in context.

The plan focuses on existing street systems in urban areas, where short trips are more realistic and where most congestion problems occur. Renovating existing streets with bikeways and walkways is emphasized, because these streets are already in place and serve community needs.

State and Federal Laws: Laws that govern the establishment of bicycle and pedestrian facilities include ORS 366.514 (the "Bike Bill"), the Statewide Planning Goals, the Transportation Planning Rule and the Americans with Disabilities Act. The "Bike Bill" is interpreted in detail, to guide ODOT and as a recommendation for cities and counties.

Current Conditions for Pedestrians and Bicyclists: An overview of conditions on both the rural and urban highway systems: conditions are generally good for bicyclists on rural highways, not very good or poor for bicyclists and pedestrians on many urban highways. Local systems with good walking and bicycling conditions are highlighted as examples to emulate.

Policy, Goals and Actions: ODOT will provide appropriate pedestrian and bicycle facilities to meet the following goal and actions:

GOAL: *To provide safe, accessible and convenient bicycling and walking facilities and to support and encourage increased levels of bicycling and walking.*

- ***ACTION 1:*** *Provide bikeway and walkway systems that are integrated with other transportation systems.*
- ***ACTION 2:*** *Create a safe, convenient and attractive bicycling and walking environment.*
- ***ACTION 3:*** *Develop education programs that improve bicycle and pedestrian safety.*

Each action is refined with specific strategies.

Implementing the Actions: ODOT will cooperate with local jurisdictions in a comprehensive planning process, the results of which will be included in corridor plans for rural highways and in local Transportation System Plans for urban highways. After determining needs and priorities, bikeway and walkway systems will be established in the following ways:

Rural highways will have shoulders widened in the course of modernization projects, as well as on many preservation overlays, where warranted.

Urban Highways require a more complex implementation strategy:

- As part of modernization projects (bike lanes and sidewalks will be included);
- As part of preservation projects, where minor upgrades can be made;
- By restriping roads with bike lanes;
- With minor betterment projects, such as completing short missing segments of sidewalks;
- As bikeway or walkway modernization projects;
- By developers as part of permit conditions, where warranted.

Cost to Implement the Plan: The overall cost to retrofit the existing urban highway system with appropriate facilities is estimated at $150 to $200 million. This would require expending $7.5 to $10 million per year to accomplish the goal in 20 years; this doubles the current ODOT expenditures on pedestrian and bicycle facilities.

SECTION 2: DESIGN, MAINTENANCE AND SAFETY

This section establishes standards for safe and attractive bikeways and walkways; maintenance practices are recommended; safety considerations are explained to assist educators and law enforcement personnel in their duties.

High standards are established so facilities do more than just accommodate current walkers and bicyclists: the purpose is also to attract new users. Other considerations, such as traffic calming, bicycle boulevards, roundabouts, etc. are presented.

Planning Walkway and Bikeway Networks: The general principles of on-street networks are presented: the importance of arterials and the relationship with other planning considerations such as land use, public transit and access management. Appropriate types of facilities are explained, as well as techniques to overcome barriers to walking and biking (busy streets, freeway crossings, etc.).

Bikeway Design: The various types of bikeways (shared roadway, shoulder bikeway and bike lanes) are discussed, as well as special considerations such as railroad crossings.

Bicycle Parking: General recommendations for cities to use in their local ordinances.

Bike Lane Restriping Guidelines: An effective and inexpensive treatment for improving conditions for bicyclists on existing roads.

Walkway Design: The basic urban walkway is a sidewalk; standards are established to meet ADA requirements; other considerations such as bus stops and planting strips are presented.

Street Crossings: The greatest challenge to pedestrian mobility is crossing the street; improvements such as islands and curb extensions are presented.

Multi-Use Paths: Previously called “bike paths,” these serve pedestrians and other users. The opportunities and challenges associated with separated paths are presented.

Intersections and Interchanges: These present challenges to users and designers, since conflicts occur where paths cross; designs to improve bicycle and pedestrian safety are presented.

Signing: Standardized signs and markings are proposed for state and local systems.

Maintenance: Recommendations are presented that will enable ODOT, cities and counties to keep facilities in a usable condition.

Safety Considerations: The major causes of pedestrian and bicycle crashes are explored. Engineering, education and enforcement solutions are presented. The information contained in this section will be refined and used to develop safety programs.

Bicycle Maps: Standards are presented so that bicycle maps have uniform legends statewide.

FIRST PART:

THE POLICY AND ACTION PLAN

THE VISION

The Oregon Bicycle and Pedestrian Plan envisions a transportation system where:

- **People can bicycle or walk safely and conveniently to all destinations within reasonable walking or bicycling distance;**
- **People can walk or ride to and from their transit stops and have a comfortable and convenient place to wait or transfer;**
- **Touring bicyclists can enjoy Oregon's natural beauty on roads and highways that are designed for bicycle travel;**
- **Appropriate transportation choices are available to all; and**
- **Streets, roads and highways are designed to encourage bicycling and walking.**

1. THE IMPORTANCE OF BICYCLING & WALKING

INTRODUCTION

Walking is the most basic form of transportation. Everyone is a pedestrian, including persons using wheelchairs and other forms of mobility assistance. Transit or automobile trips begin and end with a walk. Walking is often the quickest way to accomplish short trips in urban areas.

Bicycling is the most energy efficient form of transportation ever devised, getting the energy equivalent of up to 1,500 miles per gallon (according to an MIT study).

People who walk or ride bicycles are the most vulnerable road users, being less protected from the weather and more likely to be injured in a collision with a motor vehicle; they must often use facilities that were designed primarily for automobiles.

This plan will assist Oregonians in creating a transportation system that is readily accessible to bicyclists and pedestrians.

AN OVERVIEW OF BICYCLING IN AMERICA

Bicycles gained prominence as transportation vehicles over 100 years ago. Many early efforts to improve road conditions were sponsored by organizations such as the League of American Bicyclists. But when automobiles emerged, the situation changed rapidly. Unlike Europe, where motoring superseded cycling gradually, American cyclists had less of a chance to coexist with motorists. The bicycle's status has fluctuated through the years, and has been more often considered a child's toy than a valid mode of transportation.

In the sixties, bicycling made a comeback as people turned to bicycles for transportation and recreation, but many inexperienced riders feared motor vehicles. This viewpoint led to the bike path trend of the 1970's. Paths attempted to separate the two vehicle types to reduce conflicts. Keeping cyclists off the road with paths was not the total answer - paths function well in some areas and poorly in others.

Today, cyclists and motorists share the road. The two modes are integrated by improving roadways to accommodate cyclists, conserving funds and uniting users under one set of rules for better cooperation and safer operation. Modern bikeways do more than accommodate bicyclists - they invite them to use the roads.

The development of mountain bikes in the 1980's and hybrids in the 1990's led to another bicycle revival. Their upright sitting position, modern gear shifters and brakes, light weight, rugged construction and maneuverability make them well-suited for urban travel, especially when equipped with fenders, lights and luggage racks.

Bicycles are found in most American households; the number of cyclists is rising, particularly among adults, who outnumber child cyclists.

Bicycling in the 1950's

Established business districts traditionally see high pedestrian use

AN OVERVIEW OF WALKING IN AMERICA

Everyone is a pedestrian, and walking is not dependent on technology and fashion. Yet it too has fallen out of favor at times. Whenever alternatives were available, whether it be horses, trolleys or automobiles, walking has rarely been considered a worthy option for transportation in America. The post-war boom of the suburbs was the period in which walking suffered the greatest setback, as many streets were built without sidewalks and crossing opportunities.

Walking is often recommended as a gentle exercise for people of all ages, but the transportation role of walking is still vastly underutilized. Many people may not realize how much walking they do, since most other trips (driving or transit) are linked by walks. The exercise benefits of walking are being promoted, which could lead to increased walking as a transportation mode.

Many cities are creating pedestrian-oriented zones, which are very popular.

A. BENEFITS OF BICYCLING & WALKING

Increased bicycling and walking will help:

- Reduce traffic congestion;
- Reduce air and noise pollution;
- Reduce wear and tear on our roads;
- Reduce consumption of petroleum;
- Reduce crashes and property damage;
- Reduce the need for additional roads, travel lanes and parking; and
- Improve Oregonians' health and well-being through regular exercise.

Providing bikeways and walkways also helps meet the needs of a large segment of the population who do not have access to an automobile - the "transportation disadvantaged":

- The poor;
- The young;
- The elderly;
- People with disabilities; and
- Others who do not use a motor vehicle for a variety of reasons.

Bicycling and walking are low-cost transportation modes available to all.

In Oregon, approximately 16% of the adult population do not have a valid driver's license. Walking and bicycling are often their only transportation choices, especially in areas not served by public transportation. Walkways and bikeways create new opportunities for these groups to participate in the social, cultural and economic life of the community.

School-age children make up approximately 13% of Oregon's population. Walkways and bikeways enable school children to walk or bike more safely and conveniently to school, reducing the need for busing or automobile trips by parents.

Good bicycle and pedestrian facilities also benefit other transportation modes:

- Transit users benefit from safer, more convenient access;
- Motorists and freight carriers benefit from reduced congestion and wear and tear on our roads when more people switch from driving to other modes;
- Paved shoulders on rural highways have many safety benefits for motorists and reduce roadway maintenance costs; and
- Motorists benefit from an improved pedestrian environment: where there are sidewalks and street crossing opportunities, a person can park a car once to access several destinations. This reduces the need for additional parking spaces, "circling the block," or driving from one shopping center to the next, common behavior in urban areas without good pedestrian systems.

A bicycle and pedestrian friendly environment can have impacts beyond transportation:

- Many cities throughout the country have experienced economic benefits by enhancing non-auto transportation. Businesses benefit from improved access and an environment more conducive to "window-shopping" and strolling. Local examples include downtown Portland and Ashland.
- The number of people who feel comfortable walking or riding bicycles is a measure of the quality of life of a city, county or state.
- The presence of pedestrians and bicyclists in a city indicates that the sense of community is strong, people feel safe being outdoors, social interactions can occur openly, and children and the elderly can have access to public and private facilities.
- Tourism is an important industry, and Oregon's natural beauty and bicycle-friendly reputation attract many riders from out of state. The Oregon Coast Bike Route enjoys an international reputation. Communities benefit from bicycle riders who purchase food and other needs locally.

Trees, awnings and a sidewalk cafe contribute to a pleasant walking environment

B. WALKING & BICYCLING TRIPS

With minimal physical exertion, a person in reasonable physical condition can walk up to one kilometer, or ride a bicycle up to five kilometers or more, in less than twenty minutes - shorter than many automobile or transit commutes. It is estimated that one Oregonian in two owns a bicycle. Everyone owns shoes, and new wheelchair technology greatly increases the mobility of pedestrians with disabilities.

While bicycling and walking won't replace all trips, walking or biking can be practical for many:

- Trips to work or school;
- Visits to friends and relatives;
- Visits to offices for an appointment;
- Errands such as buying milk;
- Children's sports or music practice;
- Combined trips, such as a recreational bike ride while looking at garage sales; and
- Trips combined with other modes, such as walking to a bus stop or riding a bicycle to a car pool or park-and-ride facility.

C. BICYCLING & WALKING IN URBAN AREAS

Most of the planning and design information in this plan pertains to urban systems (all incorporated cities and some unincorporated rural communities are considered urban). Urban areas benefit most from improved bicycle and pedestrian transportation facilities because:

- Most people live in urban areas;
- Urban areas have the highest concentration of origin and destination points;
- Grocery stores, shops and services are more accessible to those without cars; and
- Average trip distances are short (typically under five kilometers), and short trips are the ones most easily made by bicycling or walking. Short automobile trips:
  1) Create much of the congestion on urban arterials;
  2) Contribute disproportionately to urban air pollution due to cold starts; and
  3) Contribute to many of the crashes in urban areas.

D. ACCOMMODATING BICYCLISTS & PEDESTRIANS ON EXISTING STREETS

Effective walkway and bikeway networks are best achieved by modifying the existing street system, rather than trying to create a separate network, for several reasons:

- **The street system already exists:** most streets have been in place since before the wide-spread use of the automobile. Many resources have been dedicated to creating this system. Creating a totally new infrastructure for pedestrians and bicyclists is not financially or physically feasible;
- **Streets take people where they want to go:** virtually all destinations are located on a street, such as homes, businesses, shops and schools. People walking or bicycling need access to these same destinations; and
- **Streets can be made safer:** most bicycle crashes are not a result of collisions with motor vehicles; bicyclists riding responsibly with traffic are at relatively low risk. Pedestrians are safer and more secure when they are on sidewalks and visible.

Good transportation policies are based on the premise that the public right-of-way is to be shared by all travel modes: well-designed roads accommodate all users.

Various travel modes are mixed in this typical Dutch street scene

Bicyclist enjoys shoulders of country road

be located in corridors that serve the transportation needs of a community, as well as providing recreational benefits - projects in more isolated rural areas often require an automobile trip just to access the path; and
- Most sources of state and federal funding are dedicated to transportation. Bicycle and pedestrian facilities must serve primarily a transportation function to be eligible under most programs.

In contrast, the benefits of walking and bicycling as transportation will never be fully realized by providing facilities for recreational use only.

E. THE COMPLEMENTARY ROLES OF RECREATION & TRANSPORTATION

Although the renewed interest in bicycling and walking arises form the transportation value of these modes, though recreational use remains significant. Walkways and bikeways designed primarily for transportation benefit people who walk or bike for recreation and exercise as well. The recreational benefits of providing transportation-oriented bicycle and pedestrian facilities include:

- The old-fashioned "walk around the neighborhood" is made possible, enhancing to the cohesiveness of a community;
- Casual bike rides can be made within the immediate vicinity of one's home;
- Longer bike rides can start at home, avoiding the need to strap bicycles to the back of a car and to travel to a bike-friendly area;
- Facilities that have been provided primarily for recreational use (off-street paths) can be linked together to serve transportation purposes, especially where these paths provide short-cuts;
- Rails-to-Trails projects in urban areas can

F. THE DESIRE FOR IMPROVED BICYCLING & WALKING CONDITIONS

Though there are many competing demands on limited transportation funds, users have repeatedly stated their desire for more and better bikeways and walkways:

- At the national level, in a 1995 Harris Poll survey, 20% of Americans said they would commute by bicycle or on foot more regularly if better facilities were provided.
- At the state level, in the ODOT Customer Satisfaction and User Demand Statewide Assessment, 30% of Oregonians stated that providing these facilities is extremely important.
- At the local level, in the 1993 Gresham Transportation Choices Survey, more than 50% of residents thought that providing bike lanes and sidewalks was very important.
- In the 1994 City of Corvallis Citizens' Attitude Survey, 64% of residents used the existing bike lanes and paths, and 89% said the facilities were excellent or good.

G. INCREASING BICYCLING & WALKING TRIPS

The Oregon Transportation Plan calls for doubling the number of bicycling and walking trips over the next 20 years.

The National Bicycling and Walking Study (commissioned by the Federal Highway Administration for the US Department of Transportation) recommends doubling the current modal share of bicycling and walking, and decreasing bicycle and pedestrian injuries and deaths by 10% over the next twenty years.

This plan's primary purpose is to implement a network of bikeways and walkways. ODOT, in cooperation with cities, counties and other agencies such as the Department of Energy, is pursuing strategies to promote greater use of alternatives to the private automobile, including public transit, carpooling, flex-hours and telecommuting.

While higher in some communities, bicycling and walking for transportation use is fairly low: statewide, approximately 4% of work trips are accomplished on foot and 1% by bicycle, (1990 US census). The census only measures work trips by people over age 15; more data are being collected to determine the share of walking and bicycling in relation to total trips.

To meet the need for low-cost, efficient transportation, planners are recognizing the benefits of bicycling and walking, and are encouraging greater use of these modes. The basic steps that can be taken are:

1. Providing bicycle and pedestrian facilities, as well as changing associated land use and building orientation;
2. Promotional campaigns; and
3. Incentives for walking and bicycling.

G.1. CONSTRUCTION OF FACILITIES

Physical improvements to the system are a logical first step. Without safe and convenient facilities, few people will walk or bike - the potential to increase use is limited by the quality of available facilities. Examples from around the nation and Oregon indicate a positive correlation between the provision of good bikeway and walkway networks and higher use:

- The National Bicycling and Walking Study indicates that one factor influencing bicycle usage in urban areas is the percentage of arterial streets with bike lanes (others factors are land use, terrain, etc.).
- Eugene* and Corvallis* experience the greatest use of bicycles for commuting to work in Oregon (6% and 8% respectively, 1990 US census). The many miles of arterial streets with bike lanes are a contributing factor in both cities; Eugene has also developed miles of multi-use paths along its rivers and canals.
- Ashland* has the highest walk to work rate (15% of trips, 1990 US census). Ashland is a compact city with transportation and land use policies that enhance the pedestrian environment.

** Note: the statistics for these "college towns" are based on surveys answered by adult heads of household. They represent the population as a whole, not the student population.*

G.2. PROMOTIONAL CAMPAIGNS

Increases in recycling and seat belt use have resulted from successful campaigns aimed at changing behavior. Similar efforts could be applied to encourage increased bicycling and walking. Successful campaigns portray a positive image of walkers and bicyclists, emphasize the benefits of bicycling and walking, and inform the public of the drawbacks associated with over-reliance on the automobile.

Even in countries with high bicycle use, promotional campaigns make a difference: the Netherlands has the highest rate of bicycle use in Europe (close to 30% of all trips); yet the city of Groningen has promoted bicycle use to an impressive 50% of all trips.

G.3. INCENTIVES

People who walk or bicycle are often at a disadvantage, facing impediments such as roads designed primarily for motor vehicles, lack of protection from the weather, inadequate

parking for bicycles at destinations and inadequate connections with other modes. To encourage greater use, incentives and rewards can include:

- Financial incentives such as tax breaks or compensation for not using automobile parking spaces;
- Facilities such as secure bicycle parking, showers and changing rooms;
- Work schedules that allow commuters to ride or walk in daylight hours in the winter;
- Relaxed dress codes;
- "Guaranteed Ride Home" by taxi, for emergencies when walking and cycling aren't practical; and
- Awards and other forms of recognition.

G.4. OTHER FACTORS

Establishing walkways and bikeways along roadways is only part of what is needed to create a pedestrian and bicycle-friendly environment. There are many improvements that make a transportation system more accessible and hospitable to pedestrians and bicyclists.

Some of these issues can be dealt with by transportation officials, and others require support from other agencies and citizens to bring about changes. These include amending land use zoning laws, enforcing traffic laws that protect pedestrians and an overall commitment to create a more human-scale urban landscape.

G.4.a. Weather

Oregon is blessed with a mild climate: moderate amounts of precipitation east of the Cascades and mild temperatures in the Willamette Valley and Southern Oregon. The state's exaggerated reputation for rain doesn't deter many cyclists and walkers from using these modes year-round. Surveys taken in Eugene, Corvallis and Bend indicate that a third of regular bicycle commuters ride year-round; others ride from March to November. Traveling in the dark may be more of a deterrent than weather.

A year-long survey conducted by an ODOT employee bicycling to work in Salem every day dispelled the myth that the climate is too wet, too cold or too dark for year-round commuting. Out of a total of 492 trips (one-way), the following conditions were recorded:

Precipitation:
- 14 trips (3%) occurred in heavy rain;
- 75 trips (15%) occurred in light rain;
- 403 trips (82%) occurred with no rain.

Surface moisture:
- 137 trips (28%) occurred on wet pavement;
- 355 trips (72%) occurred on dry pavement.

Temperature:
- 37 trips (8%) occurred in cold weather;
- 310 trips (63%) occurred in cool weather;
- 145 trips (29%) occurred in warm weather.

Light Conditions:
- 8 trips (2%) occurred in darkness;
- 81 trips (16%) occurred at dawn or dusk;
- 403 trips (82%) occurred in daylight.

Overall, 293 trips (60%) occurred under "fair-weather" conditions: daylight, no rain, dry pavement and cool or warm temperatures. A person can commute by bicycle for more than half the year in the Willamette Valley under these conditions. With lights, fenders and waterproof clothing, a person can ride year-round.

For walking, the conditions are even more conducive, since wet pavement and darkness are less of a deterrent.

G.4.b. The Ease of Using an Automobile

The experience of campaigns to promote alternate modes indicates that increasing the attractiveness of these modes is often insufficient to make substantial changes in travel behavior. When driving is inexpensive and convenient, other modes such as walking, bicycling and mass transit cannot compete effectively.

Reducing the attractiveness of driving alone can help make other means of transportation relatively more attractive. Observations of travel patterns in other developed nations indicate a correlation between the relative ease of driving and the use of other modes.

Some factors that decrease the attractiveness of driving alone are high gasoline prices, vehicle registration fees and parking rates; low availability of parking; and restricted driving privileges in downtown and other high pedestrian use areas. New car prices and insurance costs are rising faster than inflation rates; these factors could also have an impact on the cost of driving.

With increases in traffic congestion and other related problems, the public, transportation planners and elected officials increasingly recognize the desirability to decrease auto use and increase alternatives.

G.4.c Land Use

Many land use practices result in long distances between origin and destination points, requiring an automobile for most trips.

Zoning for high densities of employment, housing and mixed-use development places origin and destination points closer together, creating a more pedestrian and bicycle-friendly environment. This can be done more easily in new developments, but can be retrofitted into established areas with neighborhood commerce zoning.

Traditional corner store is within walking distance of residential area

G.4.d Connecting Streets

Disconnected streets and cul-de-sacs create long travel distances, even though the actual distance from origin to destination may be fairly short, making walking and bicycling impractical.

A grid street system provides continuity for pedestrians and bicyclists along the shortest routes; lacking this, disconnected streets can be improved with connecting paths (see figure 8, page 54).

G.4.e Street Crossings

Wide multi-lane roadways are difficult to cross on foot.

Crossing opportunities can be provided with techniques such as raised medians, refuge islands, curb extensions and pedestrian signals, where appropriate.

Pedestrians are vulnerable when crossing streets

G.4.f. Intersections

Intersections built for the movement of motor vehicles can be very difficult for pedestrians and bicyclists to cross. A network of streets with sidewalks and bike lanes does not fully accommodate pedestrians and bicyclists if intersections present obstacles. Free-turning movements for vehicles are particularly difficult situations.

Improvements for pedestrians include refuge islands, shorter crossing distances, reduced curb radii, crossings at right angles and slower traffic speeds. At busy interchanges, grade-separation for bicyclists and pedestrians may be needed.

G.4.g. Access Management

Every driveway creates conflicts for pedestrians and bicyclists.

One component of access management deals with the number of driveways connecting to the road. Reducing the number of driveways and limiting access from one or more directions improves pedestrian and bicyclist safety and comfort.

G.4.h. Public Transit

Transit use is highly dependent on pedestrian access, yet some bus routes are located on streets without sidewalks. The adjacent land use must also be conducive to transit use. Bus stops located in areas where the wait is unpleasant, with inadequate protection from the weather, reduce transit use.

Shelters, benches and lighting increase the comfort of transit users. Bike parking at transit stops increases the area served by transit.

G.4.i. Building Orientation

Buildings that are set back from the road with large parking lots in front are uninviting and difficult for pedestrians to access.

Buildings close to, and oriented toward sidewalks, with parking in the rear or on the side, are more likely to encourage pedestrian use and are more transit-friendly.

G.4.j. Traffic Noise & Perception of Danger

Roadways with sidewalks directly adjacent to noisy, high-speed travel lanes are perceived by most people as being undesirable for walking.

Greater separation, as with planting strips (especially with trees), and slower traffic speeds increase the level of comfort for pedestrians.

G.4.k. Lighting

People may be intimidated by dark streets at night; good lighting can make pedestrians feel safer.

G.4.l. Topography

Road designers and engineers have very little control over the natural lay of the land, and residential areas built in hilly terrain will generate less potential foot or bicycle traffic than those built in flatter areas.

See Part 2, Planning Principles, for a more detailed discussion of some of these factors.

Many busy urban arterials create a hostile pedestrian environment

H. POPULATION & TRANSPORTATION PROJECTIONS

Oregon's population is projected to grow faster than the nation's for most of the next 40 years (from 2.8 million in 1990 to 3.8 million in 2012 and to almost 4.0 million in 2030, according to ODOT forecasts).

Most of the growth will be in the cities of the Willamette Valley, where population densities will approach those of more urban states. Other areas that will experience rapid growth are central and southern Oregon and pockets on the coast.

Implications for Bicycling and Walking

If current usage rates stay constant, the number of bicyclists and pedestrians will increase with population; the increase will be greater if usage rates rise. The demand for more and better bicycling and walking facilities will increase.

Currently, the increase in Vehicle Miles Traveled (VMT's) per capita is outpacing population growth (four times faster). If this trend continues, the increased traffic on roads could act as a deterrent to bicycling and walking and there will be competition for road space among the surface modes (auto, truck, transit, bicycle and pedestrian). Conversely, increased congestion could prompt modal shifts, if attractive alternatives are available.

Planning for an increase in population can lead to higher urban densities, with the transportation advantages outlined in prior land-use discussions.

The transportation implications of an aging population must also be considered. Many of today's adults will live longer, yet may have mobility restrictions in their later years, increasing the need to provide fully accessible pedestrian facilities. The largest component of the population increase in the next 20 to 40 years will be the elderly, as the baby-boom generation ages. The elderly tend to have more leisure time and will demand safe and convenient places to walk or bike.

Densely populated European cities have enhanced livability by improving the pedestrian environment

2. STATE & FEDERAL LAWS RELATING TO BICYCLE & PEDESTRIAN FACILITIES

1953: ORS 366.460: Construction of sidewalks within highway right of way

This statute allows ODOT to construct sidewalks, bicycle paths and equestrian trails within highway right-of-way, provided the Department finds that such facilities will contribute to the safety of pedestrians, the motoring public or persons using the highway. By adoption of this plan, the Department of Transportation finds that sidewalks are necessary to contribute to pedestrian safety in urban and urbanized areas.

1971: ORS 366.514: Use of highway fund for footpaths and bicycle trails

Often referred to as the "Oregon Bike Bill," this law applies equally to bicycle and pedestrian facilities. The law, the first of its type in the nation, requires the development of bikeways and walkways. The intent was to ensure that future roads be built to accommodate bicycle and pedestrian travel, where warranted. It also enables road funds to be used for constructing bikeways and walkways along existing roads.

The main provisions of this statute are:

1. It requires ODOT and the cities and counties of Oregon to expend reasonable amounts of the highway fund to provide bikeways and walkways.
2. It requires the inclusion of bikeways and walkways whenever highways, roads and streets are constructed, reconstructed or relocated, with three exemptions (where there is no need or probable use, where safety would be jeopardized, or where the cost is excessively disproportionate to the need or probable use).

ORS 366.514 drives most of ODOT's bicycle and pedestrian activities. Some of the provisions of this bill have been misunderstood or misapplied, particularly the provision to expend a minimum of one percent of the highway fund on bicycle and pedestrian facilities. See Appendix C for ODOT's interpretation of ORS 366.514.

1973: ORS 366.112: The Oregon Bicycle Advisory Committee

This eight-member committee, appointed by the governor, acts as a liaison between the public and ODOT. In 1995, the Transportation Commission officially recognized their role in pedestrian issues; the committee became the Oregon Bicycle and Pedestrian Advisory Committee. They advise ODOT in the regulation of bicycle and pedestrian traffic and the establishment of bikeways and walkways. Members serve four years and hold meetings quarterly. Members include:

- An employee of a unit of local government employed in land-use planning;
- A representative of a recognized environmental group;
- A person engaged in the business of selling or repairing bicycles;
- A member designated by the Oregon Recreation Trails Advisory Council;
- At least one member under the age of 21 at the time of appointment; and
- Three members at large.

1974: Statewide Planning Goals

Senate Bill 100 created the Land Conservation and Development Commission (LCDC), which established 19 statewide planning goals aimed at preserving the natural resources, farmland and livability of the state. Goal 12 pertains to transportation and land use; it guides many of ODOT's current programs.

GOAL 12: To provide and encourage a safe, convenient and economic transportation system:

"A transportation plan shall (1) consider all modes of transportation including mass transit, air, water, pipeline, rail, highway, bicycle and pedestrian; (2) be based upon an inventory of local, regional and state transportation needs; (3) consider the differences in social consequences that would result from utilizing differing combinations of transportation modes; (4) avoid principal reliance upon any one mode of transportation; (5) minimize adverse social, economic and environmental impacts and costs;

(6) conserve energy; (7) meet the needs of the transportation disadvantaged by improving transportation services; (8) facilitate the flow of goods and services so as to strengthen the local and regional economy; (9) conform with local and regional comprehensive land use plans. Each plan shall include a provision for transportation as a key facility."

1980: Article IX, Section 3A of the Oregon Constitution

Through this constitutional amendment, the voters of Oregon limited expenditures of the state highway fund for use on streets, roads and highways only. The major effect this had on bicycle and pedestrian facilities was that highway funds could no longer be used for constructing paths in parks and other recreational areas, rails-to-trails conversions or education and promotion programs.

1991: OAR 660-12: The Transportation Planning Rule

The Land Conservation and Development Commission adopted OAR 660-12, the Transportation Planning Rule, to implement Goal 12 of the Statewide Planning Goals. It was drafted in cooperation with ODOT. In essence, the rule requires ODOT and the cities and counties of Oregon to cooperate and to develop balanced transportation systems. Two important aspects of this rule are:

- It ties land use to transportation: and
- It mandates that transportation planning reduce reliance on any one mode of transportation.

The link between land use and bicycling and walking is paramount. Most walking and bicycle trips are short. Long distances between destinations are deterrents to walking and bicycling, as are destination points designed for access only by automobile. Land use patterns created with automobiles as the intended mode facilitate their use, perpetuating transportation patterns that discourage walking and bicycling.

The Transportation Planning Rule addresses these issues through land use regulations and the provision of transit and bicycle and pedestrian facilities.

Elements that Pertain to Bicycling and Walking

The Rule requires local Transportation System Plans to include a Bicycle/Pedestrian component, establishing a network of biking and walking facilities throughout the planning area (660-12-020(2)(d)).

Some of the key requirements relating to bicycling and walking are in 660-12-045 (3):

Local governments shall adopt land use or subdivision regulations for urban areas and rural communities as set forth below. The purposes of this section are to provide for safe and convenient pedestrian, bicycle and vehicular circulation consistent with access management standards and the function of affected streets, to ensure that new development provides on-site streets and accessways that provide reasonably direct routes for pedestrian and bicycle travel in areas where pedestrian and bicycle travel is likely if connections are provided, and which avoids wherever possible levels of automobile traffic which might interfere with or discourage pedestrian or bicycle travel.
(a) Bicycle parking facilities as part of new residential developments of four units or more, new retail, office and institutional developments and all transit transfer stations and park and ride lots.
(b) On-site facilities shall be provided which accommodate safe and convenient pedestrian and bicycle access from within new subdivisions, multi-family developments, shopping centers and commercial districts to adjacent residential areas and transit stops, and to neighborhood activity centers within one half-mile of the development. Single family residential developments shall generally include streets and accessways. Pedestrian circulation through parking lots should generally be provided in the form of accessways.
(A) "Neighborhood activity centers" includes, but is not limited to, existing or planned schools, parks, shopping areas, transit stops or employment centers.
(B) Bikeways shall be required along arterials and major collectors. Sidewalks shall be required along arterials, collectors and most local streets in urban areas, except that sidewalks are not required along controlled access roadways, such as freeways.

Detailed discussions of these requirements can be found in the design section of this plan, including bicycle parking requirements and a model for developing local Transportation System Plans.

Relationship between the Transportation Planning Rule and ORS 366.514

Subsection 660-12-020 (2)(D)(d) of the Rule refers to the requirements of ORS 366.514 when it addresses bicycle and pedestrian facilities; ORS 366.514 requires ODOT to recommend construction standards.

One of the purposes of this plan is to specify the appropriate types of bikeways and walkways that will fulfill the requirements of the Transportation Planning Rule. For example, bike lanes are the appropriate type of bikeway for arterials and major collectors; refer to the design section of this plan for more details.

1991: Oregon Benchmarks

Senate Bill 636 requires the State to establish benchmarks to measure progress in critical areas. The Oregon Progress Board was created to track these measures. Benchmarks are adopted as a tool for stating concrete objectives, setting program and budget priorities, and measuring performance. Transportation issues are listed under *Benchmarks for Quality of Life.*

The 1994 benchmark that applies directly to this plan is:

138b. Percentage of streets in urban areas that have adequate pedestrian and bicycle facilities.

Benchmarks that apply indirectly to this plan are:

128. Percentage of new development where occupants are within one-half a mile of a mix of stores and services, transit, parks and open spaces.

129. Percentage of existing development where occupants are within one-half a mile of a mix of stores and services, transit, parks and open spaces.

139. Percentage of Oregonians who commute to and from work during peak hours by means other than a single-occupancy vehicle.

140. Vehicle miles traveled per capita in Oregon metropolitan areas (per year).

1991: Intermodal Surface Transportation Efficiency Act (ISTEA)

The importance of integrating all modes of transportation is demonstrated by the following excerpt:

It is the policy of the United States to develop a National Intermodal Transportation System that is economically efficient and environmentally sound, provides the foundation for the Nation to compete in the global economy, and will move people and goods in an energy efficient manner.

ISTEA recognizes the transportation value of bicycling and walking, and offers opportunities to increase consideration of bicyclists' and pedestrians' needs within the National Intermodal Transportation System.

1992: The Americans With Disabilities Act (ADA)

The ADA is a civil rights bill that affects both the private and public sector, which must provide **accessible routes** for all individuals.

A walker improves this elderly pedestrian's mobility

Exterior accessible routes include parking access aisles, curb ramps, crosswalks at vehicular ways, walkways, ramps and lifts. ODOT considers its walkways as accessible routes and is dedicated to upgrading them to ADA standards. The design chapters of this plan contain information to guide agencies in meeting these requirements.

1992: Oregon Transportation Plan (OTP)

The OTP directs ODOT and the cities and counties to integrate all modes of transportation and encourages use of the mode that is the most appropriate for each type of travel. The people of Oregon who participated in the process emphasized that all modes of transportation should be accommodated and that over-reliance on the use of the automobile should be reduced. See Appendix D for the OTP Goals, Policies and Actions related to bicycling and walking.

Walking is an important element of Oregon's transportation policy

3. THE SYSTEM ELEMENT: CURRENT CONDITIONS FOR PEDESTRIANS & BICYCLISTS

INTRODUCTION

Walking is practical for short trips, or trips with many stops; bicycles provide similar flexibility, but for longer distances, through town or to neighboring towns. Roadways designed primarily to facilitate high-speed trips by automobile can be obstacles to walking and bicycling. Yet most people will feel comfortable walking and bicycling along a roadway if well-designed facilities are provided.

For people who do not have access to an automobile, walking or bicycling are their only transportation choices. They will walk or ride on busy urban thoroughfares with no sidewalks or bikeways, since most destination points, such as stores and offices, are located along these roads. Transit users require proper walkways to walk to and from their transit stops.

Traffic counts taken in urban locations throughout the state indicate that well-designed thoroughfares with appropriate bicycle and pedestrian facilities are used more by pedestrians and bicyclists than roads without facilities.

Sidewalks and bikeways along a road are only part of the solution; many busy streets and intersections are difficult to cross and can be barriers to walking and bicycling.

A. THE RURAL ENVIRONMENT

A.1. WALKING

Pedestrian activity in rural areas is limited because travel distances tend to be great. State highways and county roads with wide paved shoulders usually provide adequate room for walking. Many older roads and highways are narrow, with poor sight distances, and do not serve pedestrians well.

There are many rural unincorporated communities in Oregon that straddle a state highway or major county road. Where population densities and roadside activity are sufficiently high, these areas deserve special consideration when planning for pedestrian access.

A.2. BICYCLING

Rural highways and county roads are considered suitable for cycling if they have paved shoulders or relatively low traffic volumes. State highways and county roads provide good opportunities for long-distance touring and shorter recreational rides. Closer to cities, these roads serve as commuter routes into the urban area from outlying residential areas.

A.3. CONDITIONS ON RURAL HIGHWAYS

Of the approximately 9,800 km (6,150 mi) of non-interstate rural state highways (outside of city limits), 78% are generally suitable for bicycling:

- 68% in western Oregon (Regions 1, 2 & 3)
- 86% in eastern Oregon (Regions 4 & 5)

45% have paved shoulders 1.2 m (4 ft) or wider:

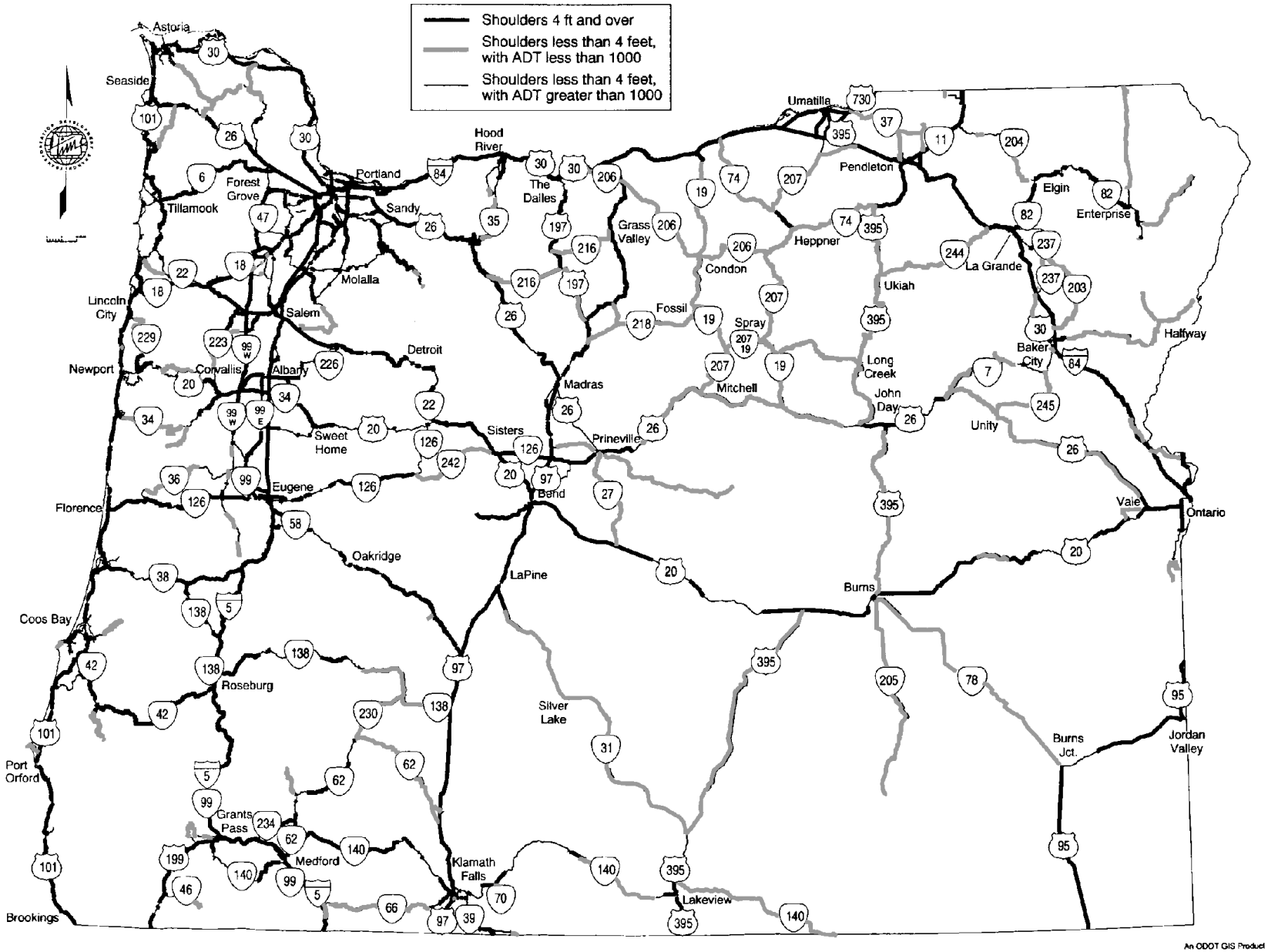
- 52% in western Oregon
- 40% in eastern Oregon

33% have paved shoulders narrower than 1.2 m, but with daily average traffic of less than 1,000 vehicles a day, which also makes them generally suitable for cycling:

- 16% in western Oregon
- 46% in eastern Oregon

Many county roads link rural destinations. The more populated counties of Oregon construct many of their roads with paved shoulders. County roads with low traffic volumes serve bicyclists well as shared roadways.

ODOT's commitment to providing wide paved shoulders as part of its standard construction practices has benefited touring, recreational and commuter cyclists, and the occasional pedestrian, while improving safety for motor vehicle traffic.



Map 1: Conditions for bicyclists on rural highways

B. THE URBAN ENVIRONMENT

INTRODUCTION

Most walking and bicycling occurs in cities, large and small. Higher population densities and closely linked destination points make walking an efficient way to cover short distances. Many older downtown areas in large cities and central business districts in smaller towns provide an environment that is conducive to walking, with sidewalks provided on most streets.

As cities grew, many once quiet streets now carry large volumes of high-speed traffic with no pedestrian or bicycle facilities, discouraging many people from using these modes. Retrofitting these streets with walkways and bikeways will make them accessible to bicyclists and pedestrians again.

B.1. LOCAL BIKEWAY MODELS

Cities that provide good bikeway networks generally experience high bicycle use. Two outstanding examples are Eugene and Corvallis:

- Eugene (pop. 117,000) is one of the leading bicycling communities in the nation. The city has built 25 miles of separated paths along the Willamette River and through parks. This path system is supplemented with 52 miles of on-street bike lanes, to form an extensive and integrated bikeway network used for recreation and commuting.
- Corvallis (pop. 46,000) has 50 miles of striped bike lanes. With 95% of its arterial and collector streets bicycle-friendly, one can ride a bicycle virtually everywhere with ease. This has contributed to the highest rate of bicycle commuting in the state (8.2%, US Census, 1990).

B.2. CONDITIONS ON URBAN STATE HIGHWAYS

In most cities, state highways serve as major arterials, potentially the most important element of a complete network of bikeways and walkways: they are the backbone into which local arterials and collectors feed. In smaller communities, the state highway is often the only arterial, connecting virtually all destination points.

Some cities have created pedestrian only areas.

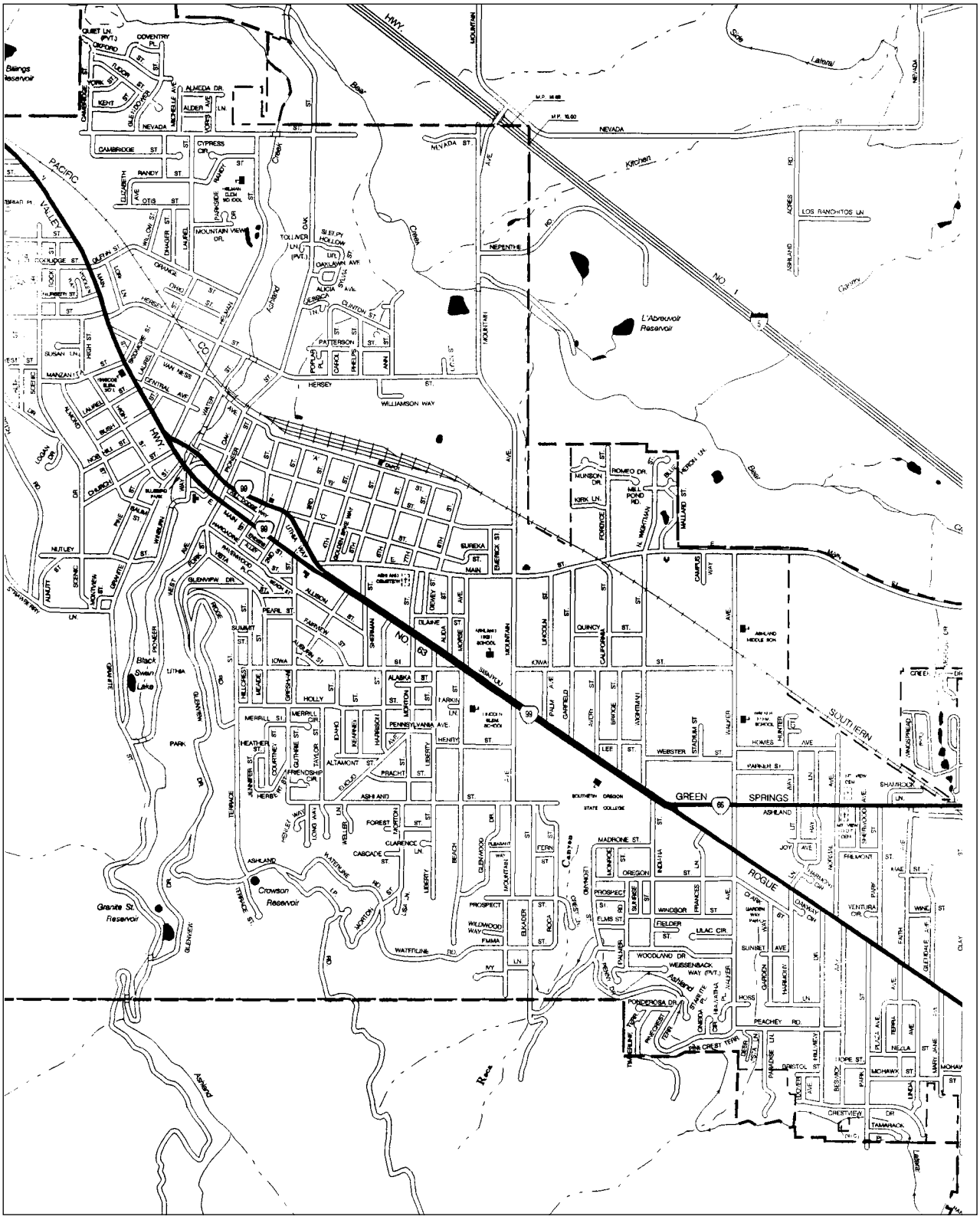
In 1993, ODOT conducted an inventory of highways in urban areas (cities with a population of 500 and above). The inventory (updated in 1994) showed that of the 1011 km (632 mi) of urban highways:

- 320 km (205 mi) (32%) have bikeways on both sides of the road (shoulders or bike lanes);
- 307 km (192 mi) (30%) have sidewalks on both sides of the road; and
- 59 km (37 mi) (6%) have bikeways and sidewalks on both sides of the road.

This last figure is low due to several circumstances:

- Sections of highway that approach urbanized areas often have adequate shoulders but no sidewalks;
- Sections within urbanized areas often have sidewalks but no shoulders or bike lanes;

A complete report breaks down the figures by region, city and highway. Other information includes the condition of sidewalks and the presence of planting strips. Maps of each city are available. Conditions on local streets are currently being assessed by cities and counties. Contact the Bicycle and Pedestrian Program for more information.



Map 2: Ashland is an example of a community where the State Highway is the main thoroughfare linking up most destination points of the community

4. THE BICYCLE & PEDESTRIAN POLICY, GOALS, ACTIONS & STRATEGIES

GOAL: TO PROVIDE SAFE, ACCESSIBLE AND CONVENIENT BICYCLING AND WALKING FACILITIES AND TO SUPPORT AND ENCOURAGE INCREASED LEVELS OF BICYCLING AND WALKING.

ACTION 1: Provide bikeway and walkway systems that are integrated with other transportation systems.

STRATEGY 1A. Integrate bicycle and pedestrian facility needs into all planning, design, construction and maintenance activities of the Oregon Department of Transportation, local governments and other transportation providers.

STRATEGY 1B. Retrofit existing roadways with paved shoulders or bike lanes to accommodate bicyclists, and with sidewalks and safe crossings to accommodate pedestrians.

STRATEGY 1C. Provide financial and technical assistance to local governments for bikeway and walkway projects on local streets.

ACTION 2: Create a safe, convenient and attractive bicycling and walking environment.

STRATEGY 2A. Adopt design standards that create safe and convenient facilities to encourage bicycling and walking.

STRATEGY 2B. Provide uniform signing and marking of all bikeways and walkways.

STRATEGY 2C. Adopt maintenance practices to preserve bikeways and walkways in a smooth, clean and safe condition.

ACTION 3: Develop education programs that improve bicycle and pedestrian safety.

STRATEGY 3A. Monitor and analyze bicyclist and pedestrian crash data to formulate ways to improve bicyclist and pedestrian safety.

STRATEGY 3B. Publish bicycling and walking maps and guides that inform the public of bicycle and pedestrian facilities and services.

STRATEGY 3C. Develop bicycling and walking safety education programs to improve skills and observance of traffic laws, and promote overall safety for bicyclists and pedestrians.

STRATEGY 3D. Develop safety education programs aimed at motor vehicle drivers to improve awareness of the needs and rights of bicyclists and pedestrians.

STRATEGY 3E. Develop a promotional program and materials to encourage increased usage of bicycling and walking.

BACKGROUND

The Oregon Transportation Plan:

The Oregon Transportation Plan regards bicycling and walking as essential transportation modes:

Bicycle and pedestrian networks should be developed and promoted in all urban areas to provide safe, direct and convenient access to all major employment, shopping, educational and recreational destinations in a manner that would double person trips by bicycle and walking.

POLICY 2D of the plan defines ODOT's policy regarding pedestrians and bicyclists:

It is the policy of the State of Oregon to promote safe, comfortable travel for pedestrians and bicyclists along travel corridors and within existing communities and new developments.

ACTION 2D.1 implements this policy:

Make walkways, pedestrian shelters and bikeways an integral part of the circulation pattern within and between communities to enhance safe interactions between motor vehicles and pedestrians and bicyclists, using techniques such as:

- *Renovating arterials and major collectors with bike lanes and walkways and designing intersections to encourage bicycling and walking for commuting and local travel.*
- *Developing all transit centers near residential areas to be safely and expeditiously accessible to pedestrians and bicyclists.*

Current Policy:

In 1993, ODOT adopted the following policy to establish walkways and bikeways:

The Oregon Department of Transportation shall provide safe, accessible and convenient bicycle and pedestrian facilities in urban areas. The intent is to encourage walking and bicycling as a mode of transportation. All walkways shall meet or exceed the minimum requirements of the Americans with Disabilities Act (ADA).

1. *ODOT shall include the appropriate bikeways and walkways on modernization projects inside a UGB, except on controlled access freeways, as required by ORS 366.514. Bikeways and walkways are not required if one of these three exceptions is met:*
   a) *The establishment of bikeways and walkways is contrary to public safety;*
   b) *The cost of establishing bikeways and walkways is excessively disproportionate to the need or probable use; or*
   c) *Sparsity of population, other available ways or other factors indicate an absence of any need for bikeways and walkways.*

If one or more of these exceptions are met, and bikeways or walkways will not be included on a project, the design shall not preclude their construction in the future. The design of intersections and interchanges shall accommodate bicyclists and pedestrians in a manner that is both safe and convenient.

2. *On other projects, such as preservation, 3R (resurfacing, restoration and rehabilitation), operation or safety improvements, ODOT will consider the need for bikeways and walkways.*
3. *In the development of the State Transportation Improvement Program (STIP), ODOT will consider projects that upgrade the roadway with bikeways and walkways to provide continuity.*
4. *ODOT may require developers to provide adequate bikeways and walkways.*
5. *Funding:*
   a) *ODOT will negotiate with a local jurisdiction to share cost.*
   b) *In absence of an agreement, ODOT is obligated to provide bikeways and walkways when constructing, reconstructing or relocating a highway, as required by ORS 366.514.*
6. *Responsibility for maintenance of bikeways and walkways shall be covered in the agreement with local jurisdiction.*

Exceptions for non-inclusion of bikeways and walkways shall be approved by the Region Manager and the Technical Services Managing Engineer. The exceptions shall be documented by the Project Development Team or the Project Development Team Manager, with supporting data that indicates basis for decision.

5. IMPLEMENTATION

Implementation of the Oregon Bicycle and Pedestrian Plan is dependent upon the availability of funding. Adoption of the plan by the Oregon Transportation Commission does not guarantee adequate financial resources to carry out the projects. Nor can the Commission commit the financial resources of other agencies or public bodies.

A. IMPLEMENTING THE ACTIONS

A.1. ACTION 1

Provide bikeway and walkway systems that are integrated with other transportation systems.

A.1.a. Implementing Strategies 1A & 1B on Rural Highways

STRATEGY 1A. *Integrate bicycle and pedestrian facility needs into all planning, design, construction and maintenance activities of the Department of Transportation and local units of government.*

STRATEGY 1B*. Retrofit existing roadways with wide paved shoulders or bike lanes to accommodate bicyclists, and with sidewalks and safe crossings to accommodate pedestrians.*

Relevant Plans and Programs

ODOT establishes priorities for rural modernization projects based on:

- **Corridor Plans** – detailed studies of statewide transportation corridors, used to determine long-term needs and to ensure that resources are spent effectively. Deficiencies are identified and projects are rated and developed to make the needed improvements. Paved shoulders will accommodate bicycle travel.
- The **Oregon Coast Highway Corridor Master Plan** – which identifies the need for paved shoulders in rural sections. The Oregon Coast Bike Route is a popular bicycle touring route which follows the Oregon Coast Highway as a shoulder bikeway, except where it follows county roads or city streets that are more scenic and have lower traffic volumes than the highway. The route is signed and ODOT publishes a map.
- The **Access Oregon Highways (AOH) Program**, – which gives priority to designated routes of statewide importance. These routes will benefit touring cyclists as they are upgraded with paved shoulders.

Bicycle and Pedestrian Improvements

Bicycle and pedestrian needs on rural highways are met through modernization or preservation projects:

- **Modernization:** When a highway is constructed, reconstructed or relocated, ODOT includes paved shoulders according to adopted standards, which take into account traffic conditions. The recommended shoulder widths are usually more than enough to accommodate bicycle and pedestrian travel.
- **Preservation:** When roadway conditions do not warrant reconstruction, a preservation project is programmed to maintain the surface in usable condition. Other needed improvements are considered, including shoulder widening. Where warranted and feasible, ODOT strives to provide wider shoulders on preservation projects.

Bicycle and Pedestrian Improvement Priorities

Sections of rural highways that link schools, parks, residential areas and other trip generators to the nearest urban area will receive high consideration. Some sections may warrant a path for pedestrian use.

Special consideration will be given to rural highways near urban areas (where traffic volumes are relatively high) to facilitate bicycle commuting - wide shoulders will increase safety and encourage more riders. Recreational riders who start their ride from the city will also benefit from wider shoulders.

A.1.b. Implementing Strategies 1A & 1B on Urban Highways

Relevant Plans and Programs

ODOT establishes priorities for urban modernization projects based on:

- **Corridor Plans:** In urban areas, the process is coordinated with local jurisdictions and the results are incorporated into the area's Transportation System Plan.
- **Transportation System Plans:** ODOT cooperates with cities and counties in developing local Transportation System Plans, to provide a comprehensive network of walkways and bikeways throughout the planning area. ODOT will offer to retrofit its urban highways with bikeways, walkways and crossing opportunities, as needed, to provide access on and across state highways. Deficiencies will be identified and projects will be prioritized and developed to make the needed improvements.

URBAN BICYCLE AND PEDESTRIAN IMPROVEMENT METHODS

Urban bikeways and walkways will be provided:

1. **As part of road construction projects:** ODOT will incorporate needed bicycle and pedestrian facilities on construction, reconstruction and relocation projects, subject to the provisions of ORS 366.514. Facilities may be provided on local streets that provide a better alternative to the highway. Costs may be shared with local jurisdictions on a mutually agreed upon ratio.

2. **As part of preservation projects:** These projects will be evaluated for their potential for pedestrian and bicycle improvements. These include bringing sidewalks up to ADA standards, constructing missing segments of sidewalks or widening pavement to provide bike lanes. Costs may be shared with local jurisdictions on a mutually agreed upon ratio.

3. **By developers as part of the permit conditions:** ODOT may require developers to provide needed bicycle and pedestrian facilities when modifications are made to the road. Incidental projects such as utility work will also be viewed as opportunities to make improvements.

4. **With minor betterment projects:** ODOT will make improvements such as widening shoulders prior to overlays, constructing short sections of sidewalk and constructing curb cuts and ramps. Costs may be shared with local jurisdictions on a mutually agreed upon ratio.

5. **By restriping roads with bike lanes:** ODOT will coordinate with local jurisdictions to restripe urban highways with bike lanes after overlay projects, where feasible, or retrofit bike lanes through stripe removal and repainting.

6. **As stand-alone bikeway and/or walkway projects (within right-of-way):** ODOT, in cooperation with local jurisdictions, will develop projects to construct bikeways and walkways where critical sections are missing. The primary purpose is to provide bicycle and pedestrian facilities. These projects are not generally associated with other highway improvements, but other needs may also be considered. Costs may be shared with local jurisdictions on a mutually agreed upon ratio.

Note: the improvements are not numbered in order of preference or priority.

Table 1: Bikeway and walkway implementation strategies

A.1.c. Priorities for stand-alone bikeway or walkway projects:

ODOT will develop bikeways and walkways based upon adopted project ranking criteria (see Appendices G & H): Special consideration will be given to:

1. Urban highways that have nearly complete bikeway and/or walkway systems;
2. Sections of urban highways that have many potential trip generators (schools, residential and commercial areas, etc.);
3. Urban highways that serve as "Main Street" through a community;
4. Sections of urban highways that complete commuter corridors and link local bikeways and walkways;
5. Sections of urban highways that are on transit routes;
6. Spot problem areas with high bicycle or pedestrian crash rates or potential for crashes; and
7. Sections of urban highways that are difficult to cross.

Local streets that tie into urban highways will also be considered for cooperative projects.

Many sections fulfill several priorities; for example, a state highway may run the entire length of a community, connect to a local network and serve schools and a transit system.

Note: the priorities are not numbered in order of preference.

GUIDELINES FOR PROVIDING BIKEWAYS AND WALKWAYS ON ROUTES PARALLEL TO STATE HIGHWAYS

There are occasions when it is infeasible or impractical to provide bikeways and walkways on a state highway, or the state highway does not serve the mobility and access needs of bicyclists and pedestrians, such as on limited access expressways. The following guidelines should be used to determine if it is more appropriate to provide facilities on a parallel local street:

1. a. Conditions exist such that it is not economically or environmentally feasible to provide adequate bikeways and walkways on the state highway; or
   b. State highway does not provide adequate access to destination points within reasonable walking or bicycling distances; or
   c. Bikeways and walkways on the state highway would not be considered safe;
2. Parallel route must provide continuity and convenient access to facilities served by the state highway;
3. Costs to improve parallel route should be no greater than costs to improve the state highway; and
4. Proposed facilities on parallel route must meet state standards for bikeways and walkways.

The above criteria should be satisfied and considered along with other factors when considering parallel routes for the provision of bicycle and pedestrian facilities. ODOT and the appropriate local government agency or agencies should negotiate cooperative cost sharing based on usage and benefits to the local and state system.

Table 2: Guidelines for providing facilities on parallel routes

PERFORMANCE MEASURES FOR STRATEGIES 1A & 1B

To ensure that ODOT is meeting its goals, the Bicycle/Pedestrian Program tracks four measures related to Strategies 1A and 1B:

1. Projects that meet criteria for accommodating pedestrians and bicyclists

Background: To fulfill the requirements of ORS 366.514, ODOT is responsible for ensuring that all construction projects funded, administered or constructed by ODOT include walkways and bikeways, unless one of three exemptions is met (absence of any need, excessive costs, or contrary to public safety).
Baseline: In fiscal year 1993-1994, 97% of projects met these requirements.
Goal: 100% compliance by 1995.

2. Bikeway and walkway projects that meet adopted criteria

Background: Many stand-alone bikeway and walkway projects are funded, administered or constructed by ODOT. All projects should meet the selection criteria outlined in Appendix G and H.
Baseline: In fiscal year 1993-1994, about 80% of projects met adopted criteria.
Goal: 100% by 1995.

3. Miles of rural state highways suitable for bicycling

Background: Rural state highways that have shoulders of 4 feet or greater, or daily average traffic volumes of less than 1000 per day, are considered suitable for bicycling.
Baseline: 89% in 1994
Goal: Add appropriate shoulders to highways as they are constructed or reconstructed.

4. Miles of urban state highways that accommodate pedestrians and bicyclists

Background: Urban state highways should have shoulders or bike lanes for bicyclists, sidewalks and safe crossings for pedestrians.
Baseline: In 1994, 32% of urban highways had bike lanes or shoulders, 30% had sidewalks on both sides of the road.
Goal: By 2005, provide needed bike lanes and sidewalks on 80% of urban highways.
By 2015, provide needed bike lanes and sidewalks on 100% of urban highways.

Table 3: Bicycle and pedestrian performance measures

A.1.d. The Statewide Transportation Improvement Program (STIP)

After a need has been identified in a plan, major roadway improvements are considered for inclusion in the STIP. Cities, counties, local groups or citizens who have identified a bikeway or walkway need may submit a project proposal to the local ODOT Region Manager; the proposal will be evaluated and considered for inclusion in the STIP. Citizens may also participate in the form of oral or written statements in support of bikeway and walkway improvements. After evaluation, recommended projects are submitted to the Transportation Commission for adoption in the final STIP.

A.1.e. Implementing Strategy 1C

STRATEGY 1C. *Provide financial assistance through grants to local governments for bikeway and walkway projects on local streets.*

ODOT provides grants to local governments for their bikeway and walkway projects within road or street right-of-way. The grant process helps ensure that facilities are well-conceived and built to high standards. Approved projects require a local match.

ODOT ranks applications using the criteria outlined in Appendices G and H. Projects are rated favorably if an important corridor is served, existing elements of a system are linked, the potential usage is high, the cost is reasonable, the project removes a deterrent to bicycling or walking and high design standards are used.

A.2. ACTION 2

Create a safe, convenient, and attractive bicycling and walking environment.

A.2.a. Implementing Strategies 2A and 2B

STRATEGY 2A. *Adopt design standards that create safe and convenient facilities to encourage bicycling and walking.*

STRATEGY 2B. *Provide uniform signing and marking of all bikeways and walkways.*

These strategies are implemented through the design section of this Plan.

A.2.b. Implementing Strategy 2C

STRATEGY 2C. *Adopt maintenance practices to preserve bikeways and walkways in a smooth, clean and safe condition.*

ODOT maintains its existing bikeways and walkways; the costs may be shared with local jurisdictions on a mutually agreed upon ratio. Maintenance costs are a relatively small portion of bicycle and pedestrian expenditures, but will rise as more bikeways and walkways are built. Most bikeway maintenance is performed as part of regular highway maintenance, such as sweeping or repair of shoulders, and incur little additional cost. However, some maintenance activities require special attention or a separate trip to repair facilities.

Refer to Section 2, Part IV for ODOT maintenance recommendations.

A.3. ACTION 3

Encourage and promote bicycle and pedestrian safety education programs.

A.3.a. Implementing Strategy 3A

STRATEGY 3A. *Monitor and analyze bicyclist and pedestrian crash data to devise strategies to improve bicyclist and pedestrian safety.*

ODOT publishes a yearly "Bicycle/Motor Vehicle Crash Report." A summary of the results can be found in the Safety Section of this plan. ODOT will begin publishing a "Pedestrian/Motor Vehicle Crash Report."

A.3.b. Implementing Strategy 3B

STRATEGY 3B. *Publish bicycling and walking maps and guides that inform the public of bicycle and pedestrian facilities and services.*

ODOT publishes two bicycle maps of statewide interest: the "Oregon Bicycling Guide" and the "Oregon Coast Bike Route" map. Both are available from bike shops, chambers of commerce, tourism offices and ODOT.

The **Oregon Bicycling Guide** serves touring bicyclists. It describes state highways and major county roads with conditions that are important to cyclists: traffic volumes, the presence of paved shoulders, grades, campgrounds, etc.

The **Oregon Coast Bike Route** map covers the coast in greater detail, with added features such as insets for portions of the route off the main highway, an elevation profile and narrative descriptions.

ODOT also provides grants to cities and counties for publishing local maps. Cities publish color-coded maps that show existing bikeways and other roads suitable for bicycling. Counties publish color-coded maps that indicate the conditions of existing roadways for cycling; counties may enter into

agreements with other counties to develop regional maps. ODOT will also consider grants for local walking maps.

A.3.c. Implementing Strategies 3C & 3D

STRATEGY 3C. *Develop bicycling and walking safety education programs to improve skills and observance of traffic laws, and promote overall safety for bicyclists and pedestrians of all ages.*

STRATEGY 3D. *Develop safety education programs aimed at motor vehicle drivers to improve awareness of the needs and rights of bicyclists and pedestrians.*

The Safety Section of Part 2 presents information that can be used to develop safety programs. Implementation of statewide bicycle and pedestrian safety programs is through the Transportation Safety Action Plan. In 1996, ODOT published the *Oregon Bicyclist's Manual,* a pamphlet designed to encourage safe riding practices.

A.3.d. Implementing Strategy 3E

STRATEGY 3E. *Develop a promotional program and materials to encourage increased usage of bicycling and walking.*

To meet future transportation needs in a cost-effective manner, ODOT will develop strategies to promote increased use of walking, bicycling, mass transit, carpooling, telecommuting and other transportation options.

To implement OTP Action 4.H.5 *(establish a demonstration program to encourage alternatives to the use of the automobile),* the Transportation Commission recommended selecting a city and promoting bicycling and walking to determine if doubling of bicycling and walking rates is a realistic goal.

The Oregon Bicycle and Pedestrian Advisory Committee developed guidelines and recommended selecting two cities:

- One city with existing facilities, to test the effectiveness of promotional campaigns (estimated cost: $300,000-600,000); and
- One city with incomplete facilities, to test the effectiveness of providing bikeways and walkways (estimated cost: $10 million-$50 million, depending on size of city).

The Department will evaluate these proposals to determine if they are cost-effective ways to implement successful promotional campaigns.

"Bike-to-work" events attract new riders to bicycle commuting

B. FINANCIAL CONSIDERATIONS

B.1. COSTS

B.1.a. Costs for Rural Highways

The cost of providing paved shoulders as part of highways improvements is incorporated into the overall cost of a project, since shoulders are provided primarily for motor vehicle safety and to reduce long-term maintenance costs.

The cost of adding paved shoulders to an existing roadway ranges widely:

- Adding paved shoulders can cost as little as $50,000/mile (both sides) if there are already graded, stable shoulders in place, if there are no additional needs such as culvert extensions or ditch regrading, and if the project is built in conjunction with a preservation overlay (paving materials costs are lower when large quantities are purchased).
- Adding paved shoulders can cost over $300,000/mile (both sides) if the shoulders need grading, if a ditch must be relocated, if there are geological or environmental constraints, and if right-of-way must be purchased.

B.1.b. Costs for Urban Highways

The cost of bicycle and pedestrian facilities is accounted for in urban modernization projects. Examples include sidewalks, pedestrian signals, and the extra width required for bike lanes when these are over and beyond the standard shoulder width for the roadway.

The cost range is wider than with rural projects: right-of-way costs vary throughout the state, and adding curbs and sidewalks usually requires drainage system improvements, or installation of a drainage system where there is none.

Bike lane striping can cost as little as $2,000 per mile, but reconstructing a roadway requiring right-of-way and drainage improvements can cost as much as $2 million per mile.

B.1.c. Other Costs

Local Grant Programs

ODOT currently expends approximately $450,000 per year on local grants.

Maintenance Costs

ODOT spends approximately $120,000 per year maintaining the existing bicycle and pedestrian facilities on state highways. As facilities are added, and as frequency of maintenance increases, this cost will rise.

Administrative Costs

The ODOT Bicycle/Pedestrian Program is currently staffed by two full-time employees. Administrative costs of approximately $140,000 per year include the costs of:

- Salaries and benefits for 2 FTE's;
- Printing maps and publishing reports;
- Providing training and organizing conferences;
- Travel expenses for the Oregon Bicycle and Pedestrian Advisory Committee; and
- Office overhead.

The overall cost to retrofit the sections of urban highways needing sidewalks and/or bike lanes is estimated at between $120 and $150 million (1994 dollars); The breakdown for the 6 categories outlined in A.1.a are:

1. As part of construction projects: $60 million
2. As part of preservation projects: $10 million
3. By striping roads with bike lanes: $1 million
4. By developers: not available
5. With minor betterment projects: $10 million
6. As stand-alone bikeway or walkway projects: $60 million

Most of the costs are for sidewalks, which are more expensive to provide than bike lanes.

Table 4: Urban bikeway and walkway costs on state system

B.2. FUNDING SOURCES

Introduction

Although there are few funding sources specifically dedicated to providing bicycle and pedestrian facilities, most transportation funds may be used for bikeways and walkways. Walkways and bikeways can be constructed if sufficient funds are dedicated from all available sources; the few available special funding sources are generally insufficient.

ODOT will seek adequate funding for the provision of bicycle and pedestrian facilities, by combining state, federal and other available funding sources.

B.2.a. State Funding

The major source of funding for bikeways and walkways constructed by ODOT is the Highway Fund, as intended by ORS 366.514, which requires that reasonable amounts be expended, as necessary, to provide bikeways and walkways. ORS 366.514 requires ODOT and cities and counties to provide bikeways and walkways wherever a road, street or highway is being constructed, reconstructed or relocated. Highway funds may also be used to fund bicycle and pedestrian projects independently of other road construction, but within highway right-of-way.

The State Highway Fund is comprised of weight-mile taxes, fuel taxes, licensing and registration fees and truck load violations. Approximately 40% is disbursed to cities and counties for highway purposes. ODOT receives the remaining 60% for its highway purposes.

The use of these funds is limited by Article IX, Section 3a, of the Oregon Constitution, which restricts the use of the Highway Fund to highway purposes. Allowable uses include bicycle and pedestrian facilities within street, road and highway rights-of-way that are open to motor vehicle traffic. Highway Funds cannot be spent on paths in parks or anywhere else outside of a highway, road or street right-of-way, or for general bicycle safety education, bicycle law enforcement or promotional campaigns.

Highway Funds are expended for the following purposes:

- Construction and engineering costs of bicycle and pedestrian facilities within street, road and highway right-of-way, as well as auxiliary facilities such as signs, curb cuts, ramps and bicycle parking;
- Maintenance costs of bikeways and walkways within highway right-of-way;
- Bicycle and pedestrian grants to cities and counties;
- Developing bicycle and pedestrian plans;
- Publishing bicycle maps;
- Administrative costs of the Bicycle and Pedestrian Program office and staff; and
- Expenses incurred by the Bicycle and Pedestrian Advisory Committee.

B.2.b. Federal Funding

Several federal statutes address bicycle and pedestrian concerns or make funds available for their construction. 23 CFR 652.5 states: “The safe accommodation of pedestrians and bicyclists should be given full consideration during the development of federal-aid highway projects.”

23 USC, Section 109(n) prohibits “the severance or destruction of an existing major route for non-motorized transportation traffic and light motorcycles unless such project provides a reasonable alternative route or such a route exists.”

Federal-aid money is available for bicycle and pedestrian facilities as part of normal federal-aid highway construction projects and at the same financial match ratio as the other highway work. Bikeway and walkway projects independent of other construction projects, as well as non-construction projects related to safe bicycle use, can be funded with an 80 percent federal share as provided in 23 USC, Section 217. Section 217 also states that bikeway projects must be principally for transportation rather than recreation purposes.

ISTEA states that it is federal transportation policy to promote increased use of bicycling, to accommodate bicycle and pedestrian needs in designing transportation facilities for urban and suburban areas, and to increase pedestrian safety.

The following ISTEA funding sources may be used for bicycle and pedestrian purposes:

- Section 1007: the Surface Transportation Program (STP)
- Section 1006: the National Highway System (NHS)
- Section 2002: Highway Safety Programs
- Section 1024: Metropolitan Planning (planning for MPO's)
- Section 1025: Statewide Planning
- Section S25: Federal Transit Funding (for bicycle and pedestrian access to facilities and shelters).
- Section 402: Funding for Safety Programs

Table 5: Federal funding sources for bikeways and walkways

The two sections of ISTEA that specify independent bicycle and pedestrian projects as allowable expenditures are:

Enhancement Funds:

Section 1007 requires that 10% of STP funds be used for Transportation Enhancement Activities, including facilities for pedestrians and bicyclists and the preservation of abandoned railway lines, including the conversion and use for pedestrian or bicycle trails. Bikeways and walkways must serve a transportation purpose to be eligible for ISTEA enhancement funds.

Congestion Mitigation and Air Quality (CMAQ):

Section 1008 funds can be used in areas that are not in compliance with federal air quality standards. They may be used for constructing bikeways and walkways, as well as such facilities as bike racks, lockers and showers.

Both the enhancement and CMAQ programs require a local match.

Most other sections of the ISTEA allow bicycle and pedestrian facilities to be constructed using federal funds (see table 5).

B.2.c. Other Funding

Although State Highway Fund monies provide the basic funding source for bikeways and walkways, local jurisdictions may also provide revenues from local sources such as:

- General funds;
- Special bond levies;
- Transportation impact fees;
- System development charges;
- Local Improvement Districts (LID's);
- Charges to adjacent property owners; and
- HUD (Housing and Urban Development) - the Community Block Grant Program includes sidewalks among its eligible uses.

Cooperative projects have also been funded with utility districts or companies to jointly build paths or structures to accommodate utility lines and bicycle and pedestrian traffic.

If particular roadway conditions create an immediate hazard for bicycle and pedestrian travel, federal safety program funds can be used, including Hazard Elimination Program funds.

SECOND PART:

THE PLANNING, DESIGN, MAINTENANCE & SAFETY OF BIKEWAYS & WALKWAYS

INTRODUCTION

This Design Guide implements Action 2 of the Policy and Action Plan:

Create a safe, convenient and attractive bicycling and walking environment.

- ***STRATEGY 2A.*** *Adopt design standards that create safe and convenient facilities to encourage bicycling and walking.*
- ***STRATEGY 2B.*** *Provide uniform signing and marking of all bikeways and walkways.*
- ***STRATEGY 2C.*** *Adopt maintenance practices to preserve bikeways and walkways in a smooth, clean and safe condition.*

A. THE IMPORTANCE OF GOOD DESIGN

Well-designed bicycle and pedestrian facilities are safe, attractive, convenient and easy to use. It is costly to plan, design and build a facility that is little used, or is used irresponsibly because of poor design. *Inadequate facilities discourage users and unnecessary facilities waste money and resources.*

Bicycle and pedestrian facilities must be considered at the inception of transportation projects and incorporated into the total design, so that potential conflicts with the safety and level of service for various modes are resolved early on. Bikeways and walkways may be under-designed if they are considered add-on features.

Sidewalk on arterial

Good design cannot solve all safety problems: enforcement and education are needed to make all road users aware of the presence of others.

Good design does more than provide a facility for people already bicycling or walking; ODOT encourages greater use of non-motorized transportation. Examples of facilities that encourage use are:

Bike lanes: By providing cyclists with their own space on the road, bike lanes improve access to destinations and commute options. Bike lanes on arterials:

- Establish the correct position of bicyclists on the roadway;
- Reduce bicycle/pedestrian conflicts as fewer cyclists ride on sidewalks;
- Provide bicyclists a space to travel at their own speed next to motorists;
- Guide bicyclists through intersections;
- Allow bicyclists to pass motor vehicles backed up at intersections (a bike lane is a legal travel lane); and
- Send a message to motorists that bicyclists have a right to the roadway.

Planting Strips: Sidewalks separated from the roadway with a planting strip create a pleasant environment for pedestrians. Besides creating a buffer from the noise and splash of moving vehicles, planting strips provide:

- Room for street furniture such as signs, utility and signal poles, mailboxes, parking meters, fire hydrants, etc.;
- An opportunity for aesthetic enhancements such as landscaping and shade-producing trees, increasing the appeal of a roadway and pedestrians' sense of comfort; and
- A better environment for wheelchair users, as sidewalks can be kept at a constant grade without dipping at every driveway.

B. BICYCLISTS & PEDESTRIANS: SIMILARITIES & DIFFERENCES

Many early bikeway designs assumed that bicyclists resemble pedestrians in their behavior. This led to undesirable situations: bicyclists are under-served by inadequate facilities, pedestrians resent bicyclists in their space, and motorists are confused by bicyclists entering and leaving the traffic stream in unpredictable ways.

Only under special circumstances should designs allow bicyclists and pedestrians to share the same space, e.g. on multi-use paths.

The modes are similar in three ways:

- LOCATION: Bicycle and pedestrian facilities, though separate from each other, are found at the roadway edge and often allocated insufficient space for their needs. This puts them close to the right-of-way line and in conflict with other demands such as parking, utility poles and signs. This creates competition for this valuable space.
- EXPOSURE: Pedestrians and bicyclists are exposed to the elements and are more vulnerable than motorists.
- BEHAVIOR: Pedestrians and bicyclists can be of any age and no license is required. Their actions and reactions change with age and are sometimes unpredictable.

B.1. BICYCLIST BEHAVIOR

Bicycle riders are legitimate road users. They are, however, slower, less visible and more vulnerable than motorists. They need special treatment on busy, high-speed roads and at complex intersections. In congested urban areas, bicyclists can often proceed faster than motorists if well-designed facilities are provided.

Bicyclists have certain unique characteristics: they are operating vehicles, yet they are exposed to the elements and use their own power; they don't like to interrupt their momentum; they are vulnerable in crashes; they must constantly maintain their balance; and they can interact socially with other bicyclists and pedestrians.

Well-designed bicycle facilities guide cyclists of various skill levels to ride on the roadway in a safe manner that conforms to the vehicle code. This is in the same direction as traffic, usually in a position 1 to 1.2 m (3 to 4 ft) from the edge of the roadway or parked cars, to avoid debris, drainage grates and other potential hazards. Bikeways should allow cyclists to proceed through intersections in a manner that is as direct, predictable and safe as possible.

Bicyclists and pedestrians do not mix well on sidewalks

B.2. PEDESTRIAN BEHAVIOR

Pedestrians prefer greater separation from traffic and are slower than bicyclists. They need extra time for crossing roadways, special consideration at intersections and traffic signals, and other improvements to enhance the walking environment.

Pedestrians are the most vulnerable of roadway users, as they are exposed to the weather and are often not visible to motorists. They are also the least tolerant of out-of-direction travel, and will often take short cuts where there is no convenient or direct facility. Pedestrian facilities must be designed to meet or exceed the requirements of the Americans with Disabilities Act (ADA).

Some design details are important for their contribution to safety (e.g. pedestrian signals, illumination), some because they make walking more convenient (e.g. paths that provide short-cuts), and others because they make the walking experience more pleasant and minimize the sensory impact of adjacent motor vehicles (e.g. planting strips).

Standard intersection treatment guides bicyclists in a predictable manner

C. STANDARD BIKEWAY & WALKWAY DESIGN

To establish primary design practices, ODOT has adopted the American Association of State Highway and Transportation Officials' (AASHTO) standards. Most ODOT highway design standards are contained in the "Highway Design Manual," available from ODOT. AASHTO also publishes the "Guide for the Development of Bicycle Facilities."

ODOT has adopted several design standards that are greater than AASHTO, e.g. 1.8 m (6 ft) bike lane and sidewalk width. Also included in this plan are several standard designs that ODOT has developed, most notably for intersections, that are not covered by AASHTO.

ODOT encourages local agencies to use the AASHTO guidelines and ODOT standards recommended in this plan.

Traffic control devices must conform to the "Manual on Uniform Traffic Control Devices" (MUTCD) as supplemented and adopted by the Oregon Transportation Commission. All bikeway signing and striping plans should be reviewed by a traffic engineer.

D. STANDARDS & MINIMUMS

Standards are developed to create conditions for users that are safe and comfortable under optimum conditions. Whenever possible and appropriate, facilities should be built to standard.

There are situations where a standard cannot be maintained due to geometric, environmental or other constraints, or may not be appropriate, due to the nature of the surroundings or users. In these circumstances, a design using dimensions less than the standard may be acceptable; however, a facility should not be built to less than minimum standards.

There is always a range between the standard and the minimum, so intermediate values may be used. For example, the standard width for a sidewalk is 1.8 m, with a minimum of 1.5 m; sidewalks may also be 1.7 or 1.6 m wide, depending on circumstances.

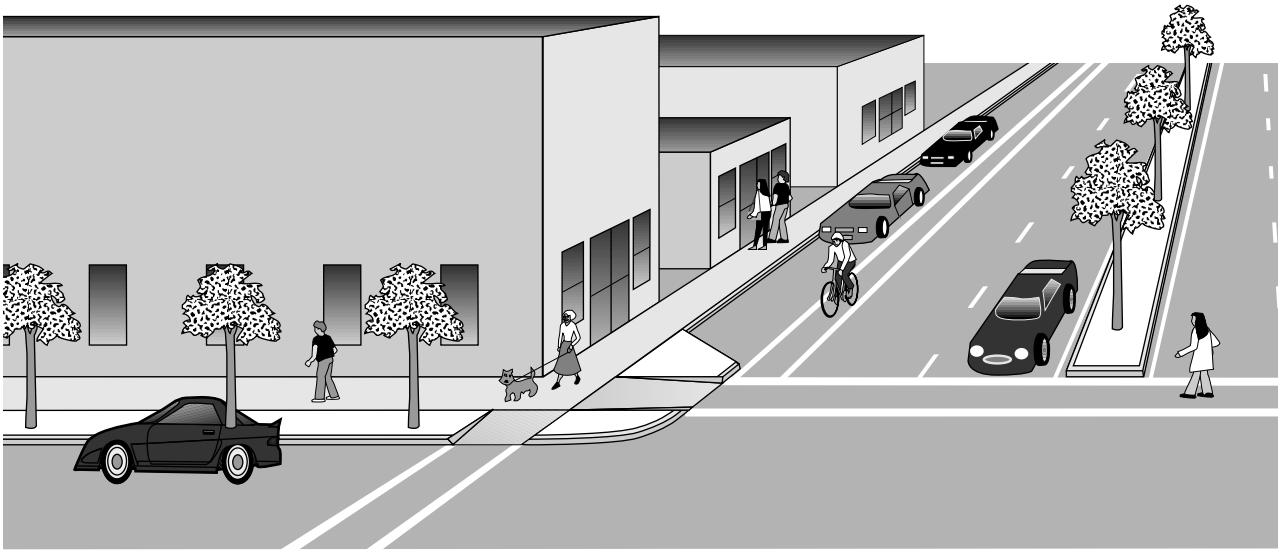


Figure 1: Urban arterial cross-section that accommodates all modes

E. OTHER INNOVATIVE DESIGNS

There are many innovative designs that facilitate bicycling and walking that are not yet found in existing design manuals. Some chapters present ideas that have been implemented successfully in Oregon, other parts of the country or other countries. Some designs enhance the roadway environment for bicyclists and pedestrians, such as contra-flow bike lanes, while others lessen the negative impacts of designs aimed at improving motor-vehicle flow, such as dual right-turn lanes.

Sections where these practices are presented are preceded with the following paragraph:

These concepts are presented as information, to help ODOT, cities and counties to come up with new solutions to common problems.

Colored bike lanes are commonly used in Europe

Raised and textured crosswalk (Switzerland)

I. PLANNING WALKWAY & BIKEWAY NETWORKS

I.1. BACKGROUND

INTRODUCTION

Successful bikeway and walkway plans are integrated into the overall transportation plan of a city, region or state. They reflect the mobility and access needs of a community, and are placed in a wider context than simple movement of people and goods. Issues such as land use, energy, the environment and livability are important factors.

Bikeway and walkway planning undertaken apart from planning for other modes can lead to a viewpoint that these facilities are not integral to the transportation system. If bikeways and walkways are regarded as amenities, bicycling and walking may not receive sufficient consideration in the competition for financial resources and available right-of-way. ODOT proposes a comprehensive vision for establishing bikeway and walkway networks.

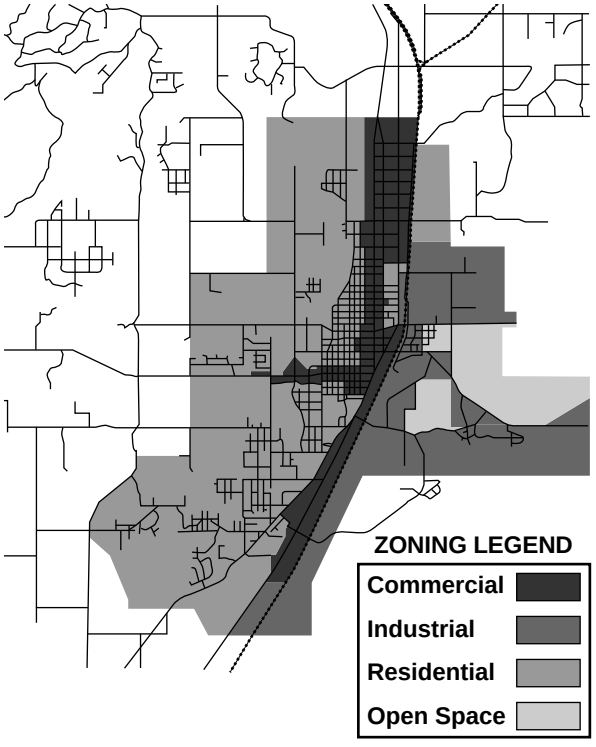


Figure 2: Segregated land-use increases travel distance

A. RELATED PLANNING ISSUES

A.1. LAND USE

The ease of bicycling and walking is often determined by land use patterns. Much of recently built development creates a situation where an automobile is required for most trips:

- Segregated land use increases the distance between origin and destination points;
- Businesses are designed to be readily accessible by automobile: buildings are set back and separated from the roadway with parking;
- The transportation system discourages bicycling and walking, due to high traffic volumes and speeds.

Land use patterns conducive to bicycling and walking include:

- **Greater housing densities** allow more residents to live closer to neighborhood destinations such as stores and schools;
- **Mixed-use zoning** allows services such as stores and professional buildings to be closer to residential areas, making it easier to access these facilities on foot or by bicycle;
- **Multiple-use zoning** allows residences and businesses to share the same structure, reducing travel demands;

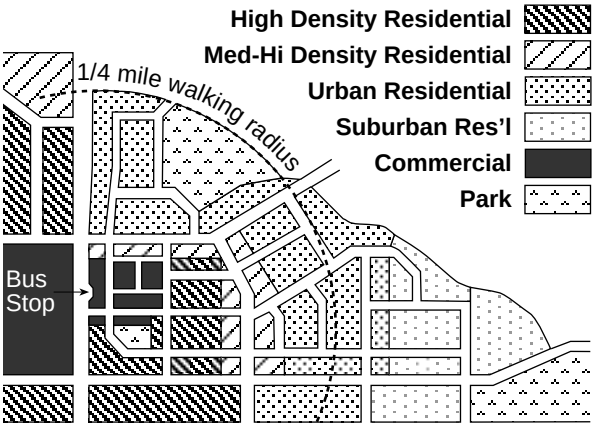


Figure 3: Mixed land use encourages walking, bicycling and transit

- **Locating buildings close to the street** allows easy access by pedestrians;
- **The preservation of open spaces between communities** creates a greenbelt, a natural buffer that helps prevent urban sprawl; and
- **Resolving conflicts** with neighborhood traffic management (traffic calming) makes streets more inviting to walkers and cyclists.

Buildings oriented to the street facilitate walking

Integrating land-use and transportation planning allows new developments to implement these strategies from the onset. Communities planned to support balanced transportation make walking, bicycling and public transit attractive options (adjacent land-use affects transit ridership).

Shopping centers fronted by parking are difficult to access on foot

In established communities, many of these goals can be met with "in-fill development" to increase density, changes in zoning laws to allow mixed-use development, and building bicycle and pedestrian connections.

Pedestrians and bicyclists are vulnerable to left-turning cars

A.2. ACCESS MANAGEMENT

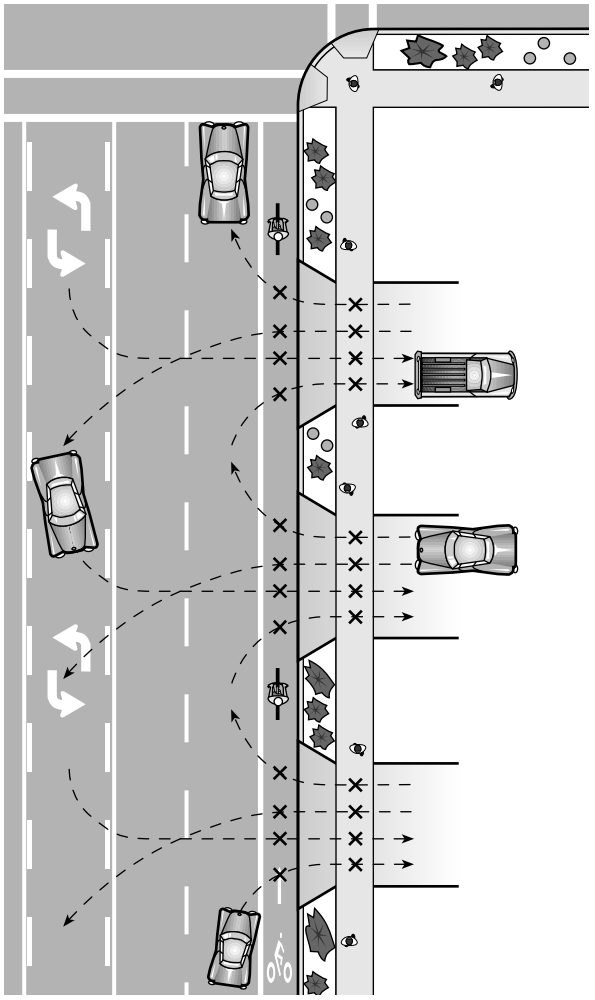
A.2.a. Problems with Uncontrolled Access

Urban thoroughfares should accommodate bicyclists and pedestrians, but these streets are often perceived as undesirable for non-motorized travel because of high traffic volumes and speeds. Yet conflicts rarely occur with users traveling in the same direction: most conflicts occur at intersections, driveways and alleys.

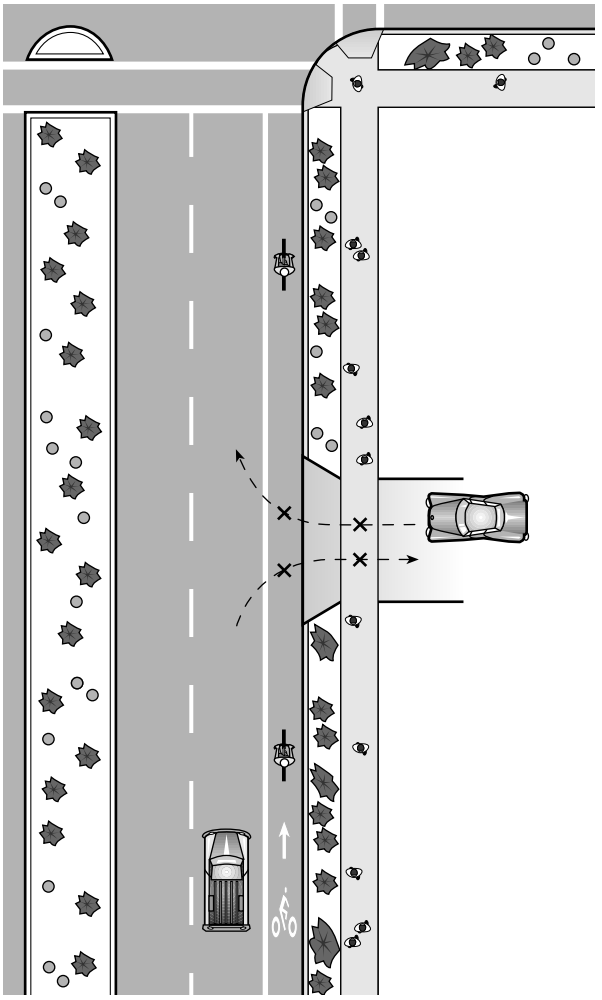
Unlimited access creates many conflicts between cars entering or leaving a roadway and bicyclists and pedestrians riding or walking along the roadway, who are vulnerable if motorists fail to see or yield to them.

Pedestrians crossing a roadway require gaps in the traffic stream, but with unlimited access, vehicles entering the roadway quickly fill available gaps.

Fewer driveways means fewer conflicts



Uncontrolled accesses create 8 potential conflict points at every driveway.



A raised median and consolidating driveways reduce conflict points.

Figure 4: Benefits of access management for bicyclists and pedestrians

A.2.b. Benefits of Access Management to Bicyclists & Pedestrians

By limiting and consolidating driveways, by providing raised or landscaped medians, or by creating frontage roads, bicyclists and pedestrians benefit in several ways:

- The number of conflict points is reduced; this is best achieved by replacing a center-turn lane with a raised median (left turns account for a high number of crashes with bicyclists and pedestrians);
- Motor vehicles are redirected to intersections with appropriate control devices;
- Pedestrian crossing opportunities are enhanced with an accessible raised median and fewer conflicts with turning cars;
- Accommodating the disabled is easier, as the need for special treatments at driveways is reduced;
- Traffic volumes on the arterial may decrease if local traffic can use other available streets or frontage roads for local destinations; and
- Improved traffic flow may reduce the need for road-widening, allowing part of the right-of-way to be recaptured for bicyclists, pedestrians and other users.

While new roads can be designed using these principles, it is more difficult to retroactively reduce, consolidate or eliminate existing accesses. Yet this is an important strategy to make existing roads more attractive to bicyclists and pedestrians.

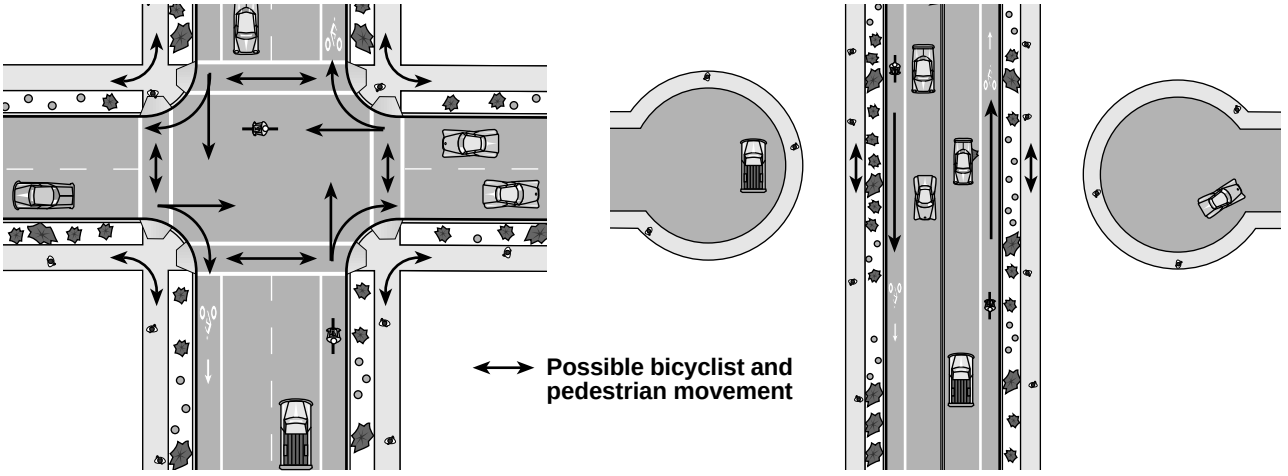


Figure 5: Reducing the number of street connections reduces pedestrian mobility and crossing opportunities

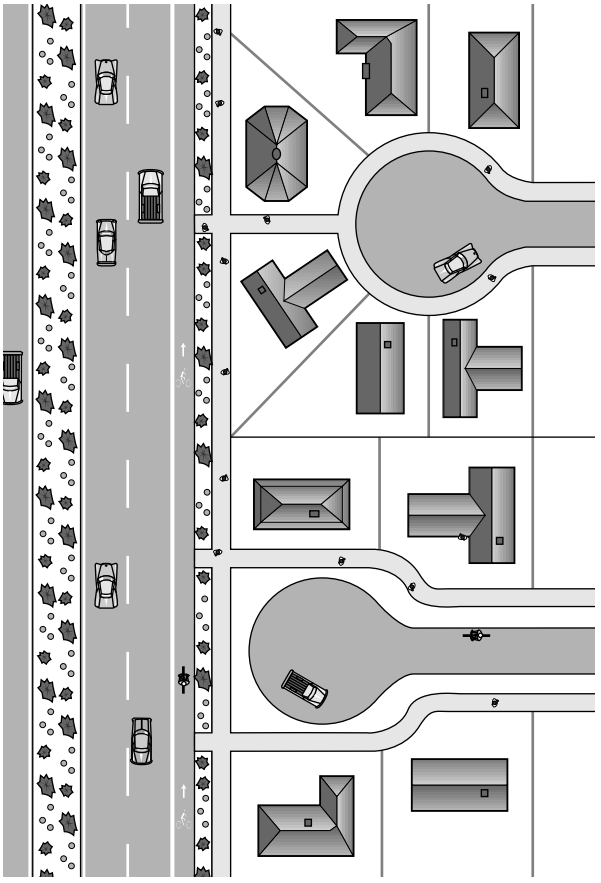


Figure 6: Connecting cul-de-sacs to arterial with open pathways

A.2.c. Negative Impacts of Access Management to Bicyclists & Pedestrians

Limiting the number of street connections may have a negative impact on non-motorized mobility, especially for pedestrian crossings:

- Creating a thoroughfare may increase traffic speeds and volumes;
- Eliminating local street crossings eliminates pedestrian crossing opportunities, reduces pedestrian and bicycle travel choices, and may increase out-of-direction travel;
- Reduced access to businesses may require out-of-direction travel, discouraging walking and bicycle trips;
- Placing concrete barriers down the middle of the road (rather than a raised or landscaped median) effectively prohibits pedestrian crossings; and
- Improperly designed raised medians act as barriers: pedestrians should be able to see to the other side of the street (vegetation should not decrease visibility) and curbs should be no more than standard height.

Where limited access thoroughfares exist in urban areas, safe and frequent crossings should be provided. Parallel local streets should be improved for bicycle and pedestrian circulation as well.

Concrete barrier in median prevents pedestrian crossing

Traditional land use allows a mix of businesses and residences, which is more conducive to walking and transit

A.3. PUBLIC TRANSIT

Transit trips begin and end with a walk or bike ride. Pedestrian and bicycle facilities in transit corridors make transit systems more effective. Therefore, high priority should be given to providing sidewalks and bikeways on transit routes and on local streets feeding these routes from neighborhoods.

Transit users need to cross the road safely at stops: on a typical two-way street with residences and development on both sides, half the riders will need to cross a road when boarding or exiting a bus.

Bus stops should provide a pleasant environment for waiting passengers, with shelters, landscaping, adequate buffering from the road and lighting. Bus stop design should minimize conflicts with other non-motorized users, such as bicyclists on bike lanes or pedestrians walking past passengers waiting to board.

Bus stop with shelter

Bus stops should be placed in locations that are readily accessible by pedestrians, or that can be made accessible by changing the configuration of adjacent land use. This can be done by:

- Orienting building entrances to the transit stop or station;
- Clustering buildings around transit stops; and
- Locating businesses close to transit stops.

Transit stop close to high-density housing development

Regional and statewide public transportation systems benefit from bicycle facilities such as:

- Accommodating bicycles on buses and trains;
- Bikeways leading to stations, transit centers and park-and-ride lots; and
- Secure bicycle parking provided at these locations.

Bus equipped with bike rack

A.4. TRANSPORTATION DEMAND MANAGEMENT

Transportation Demand Management (TDM) includes transportation actions that reduce peak period Single Occupant Vehicle (SOV) travel, spread traffic volumes away from the peak period or improve traffic flow. TDM is intended to ease demand on the transportation system by using low-cost strategies that encourage a more efficient use of existing facilities.

Commonly used strategies include park-and-ride lots, carpooling, vanpools, express bus service, bicycling, walking, group transit passes, parking management, impact fees, ramp metering, reversible lanes, signal synchronization, bus bypass lanes, trip reduction ordinances, compressed or staggered work schedules, flex-time and telecommuting.

These strategies tend to be most successful where there are:

- Heavily congested commuter corridors;
- Clearly identifiable work trip travel patterns;
- Clearly identifiable trip origins and destinations;
- Large employer work sites or clusters of small employer work sites;
- Environmentally concerned employers;
- Community commitment to clean air;
- Constrained parking at employer work sites; and
- Available transportation alternatives.

TDM is most effective where strategies are linked and users are offered a combination of viable transportation choices and incentives.

The relationship between TDM and bicycling and walking is two-fold:

1. Encouraging more employees to commute by bicycle and on foot can be part of a package of incentives; and
2. Successful TDM strategies can reduce the volumes of traffic on roadways at peak hours, with the following consequences for bicyclists and pedestrians:
   - Reduced traffic volumes may render the roads less intimidating to bicyclists and walkers;
   - Reduced traffic volumes may decrease the need for additional capacity, freeing up funds and right-of-way for bicycle and pedestrian facilities.

Escorted group rides are an effective form of encouragement

B. PRIOR PLANNING METHODS

Two prior planning concepts have not proven effective in establishing networks: designating "Bike Routes" and classifying bicycle riders into different types. These designations are not used in this plan.

B.1. DESIGNATED BIKE ROUTES

Most bikeway planning has depended on designated Bike Routes; some attempts have also been made to designate Pedestrian Routes. Problems arise when the needs of bicyclists and pedestrians are not taken into consideration, with routes chosen mainly to minimize the impact on motor vehicle traffic.

Disadvantages of plans based on bike or pedestrian routes are:

- *The best routes are not chosen:* if routes are indirect, inconvenient or don't serve origin and destination points, current riders and walkers may ignore them, while others see no incentive to take them; pedestrians tolerate very little out-of-direction travel.
- *Other potential routes are missed:* roads that are not yet built should be designed to accommodate bicyclists and pedestrians; existing streets may need to better accommodate bicyclists and pedestrians if their functional classification is upgraded.
- *Thoroughfares are excluded:* arterials usually serve the community well, with many origin and destination points; well-traveled streets provide a sense of security for walkers, due to the presence of other people.
- *It may be implied that bicyclists and pedestrians should only use certain streets:* the public right-of-way should include, not exclude, bicyclists and pedestrians; roads should be designed to properly accommodate them.
- *Improvements may go no further than the placement of BIKE ROUTE signs:* allocating road space to bicyclists, improving road conditions or removing obstacles to bicycling are more effective ways to make streets more "bicycle-friendly."
- *Improvements for walking and bicycling are restricted to the routes:* bikeways and walkways are often built as part of road improvement projects, or when other opportunities arise; opportunities may be missed when modifications are made to roads not on designated routes (every road project is a potential bikeway and walkway project).

ODOT Approach: All roads open for public use should be considered for their potential to improve bicycling and walking, based on need and road characteristics.

B.2. DEFINING BICYCLE TRAVEL & RIDER TYPES

Some plans have segregated bicyclists into four general use categories (recreational, commuting, touring and racing), or according to skills - riders with highly developed skills, riders with moderate skills, and children and beginners.

ODOT Approach: Facilities should safely accommodate the majority of users. Roads designed to accommodate cyclists with moderate skills will meet the needs of most riders; special consideration should be given close to school areas, where facilities designed specifically for children should be provided. Roads designed to accommodate young, elderly and disabled pedestrians serve all users well.

This busy Dutch street accommodates many travel modes

I.2. PLANNING PRINCIPLES

A. THE IMPORTANCE OF THE STREET SYSTEM

For a roadway network to serve the transportation needs of a community, it must serve all users. Bikeway and walkway planning addresses how existing and future roads can meet bicycle and pedestrian needs. It is physically, financially and politically impractical to provide a new and separate network in built-up urban environments. In planning new developments, it may be possible to incorporate a separate system of pathways, but the street system will link all destinations together.

ODOT has adopted a comprehensive concept in designing bikeway and walkway systems, based on the premise that the public right-of-way should serve all users; people riding bicycles or walking need to use the same facilities that provide access and mobility to motorists.

By designing roads for all travel modes, in a safe, attractive and convenient manner, bicycle and pedestrian systems can gradually evolve. Often, only minor improvements are needed to accommodate bicyclists and pedestrians.

Most bicycling and walking occurs on the existing roadway system for several reasons:

- It is already in place;
- It serves all destinations; and
- Safety is improved when cyclists and walkers are visible to motorists and obey the same traffic laws and control devices.

Examples of successful examples include:

- Corvallis and Eugene have most of their arterial and collector streets striped with bike lanes; bicycle use is high, as one can ride virtually anywhere with ease;
- Downtown Portland is a pedestrian-friendly environment, with sidewalks on all streets, short blocks, traffic signals that accommodate pedestrian movements, and many destinations accessible on foot, such as offices, stores, restaurants and residences; walking use is high;
- Ashland is a small community with compact development and a high rate of walking; and
- Many communities in central, eastern and southern Oregon are very walkable due to their relatively small size.

B. THE 4 PRINCIPLES OF BIKEWAY & WALKWAY PLANNING

Effective bikeway and walkway networks depend on:

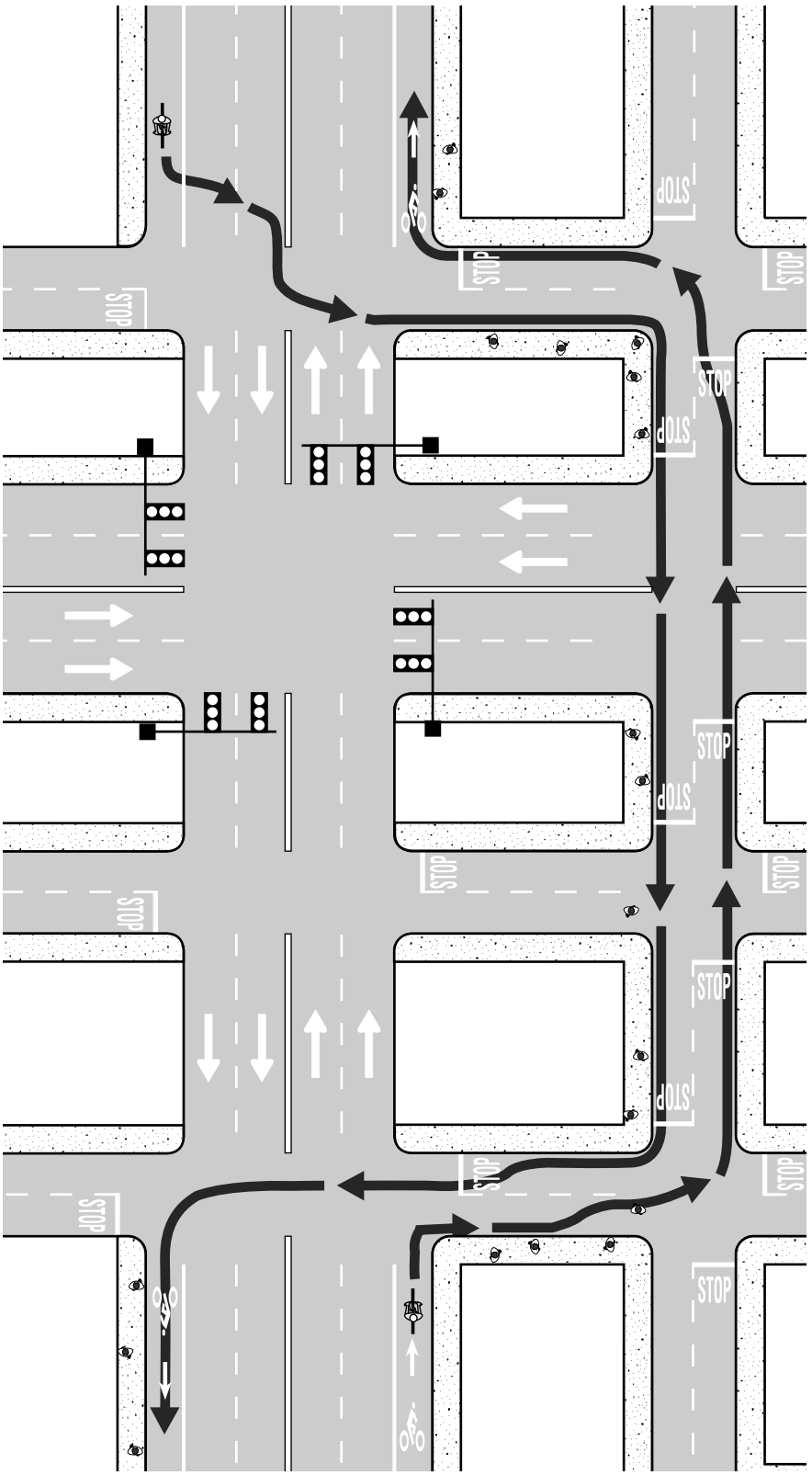
1. Accommodating bicyclists and pedestrians on arterial and collector streets;
2. Providing appropriate facilities;
3. Creating and maintaining a system of closely spaced, interconnected local streets; and
4. Overcoming barriers such as freeway crossings, intersections, rivers and canyons.

B.1. ARTERIAL & COLLECTOR STREETS

B.1.a. The Importance of Main Streets

Arterials and collectors are the backbone of urban transportation systems, and failure to accommodate non-motorized travel on thoroughfares leads to fragmented systems that do not realize their full potential, denying access to non-motorized users and creating hazardous conditions for motorists, pedestrians and bicyclists. Arterials and collectors are important because they:

- Serve the mobility and access needs of the community;
- Provide direct, continuous and convenient access to most destination points;
- Have many destination points located on them;
- Provide controlled crossings of other arterials; and
- Bridge obstacles such as rivers, freeways and railroad tracks.



Why bicyclists and pedestrians prefer to stay on the thoroughfare:

- The thoroughfare provides the most direct route for bicyclists and pedestrians;
- There may be destinations along the thoroughfare that are inaccessible from side streets;
- Less-traveled streets will often have many stop signs, whereas traffic on the through street has the right-of-way or signals that favor through traffic; and
- Potential conflict points are increased with rerouting, especially for cyclists and pedestrians who must cross the thoroughfare (some cyclists have the added difficulty of additional left turns).

Consequences of rerouting without providing adequate facilities:

- Many cyclists and pedestrians stay on the thoroughfare, causing possible safety problems and reduced capacity (bicyclists riding slowly in a narrow travel lane can cause traffic delays);
- Pedestrians and bicyclists may be routed through uncontrolled crossings of thoroughfares;
- Circuitous route signing that is ignored breeds disrespect for other signing;
- Some motorists will not respect bicyclists or pedestrians who are perceived to be where they don't belong; and
- The importance of bicyclists and pedestrians in the transportation network is diminished.

Figure 7: Why bicyclists and pedestrians should be accommodated on thoroughfares

B.1.b. Problems with Existing Streets

Existing streets are often difficult for bicyclists and pedestrians to use for several reasons:

- High traffic volumes and speeds may intimidate people who want to bike or walk;
- Busy intersections can be difficult for bicyclists and pedestrians to cross;
- Existing bicycle and pedestrian facilities may be absent, inadequate, discontinuous or poorly maintained; and
- Local streets are often disconnected, requiring a person to take a circuitous route; they have fewer destination points; arterial crossings are unsignalized, or signalized to favor through traffic on the arterial.

Sidewalk ends abruptly

B.1.c. How to Make Needed Improvements

Arterials and collectors can be made more bicycle and pedestrian friendly by:

- Including bikeways and walkways when roads are built or reconstructed;
- Renovating roads with bikeways and walkways;
- Improving pedestrian crossing opportunities; and
- Improving and better maintaining existing, but inadequate, facilities.

In built-up urban environments there is often little opportunity to add bikeways and walkways by widening roadways, because rights-of-way are often fully used and building setbacks are shallow. Some roadway space may have to be reallocated for provide bikeways and walkways.

B.1.d. Alternatives to Thoroughfares

Expressways

Along limited access expressways with no destinations directly on the roadway, it is appropriate to accommodate bicycle and pedestrian traffic on parallel streets or frontage roads. These should be direct, convenient routes that serve local and longer trips. Ideally, a frontage road should be provided on each side of an expressway, as well as crossing opportunities, either at-grade or with grade-separation.

Other Arterials

When it is not feasible or practical to provide bikeways and walkways on an arterial, or if an arterial does not serve the mobility and access needs of bicyclists and pedestrians, other options may be explored on a parallel and adjacent street. To determine if it is better to provide facilities on a parallel street, the following guidelines should be used:

1. There are compelling safety, economic or environmental reasons that preclude providing adequate bikeways and walkways on the arterial;
2. The arterial does not provide adequate access to destination points within reasonable walking or bicycling distances;
3. Parallel streets provide continuity and convenient access to facilities served by the arterial;
4. The costs to improve parallel streets are no greater than the costs to improve the arterial; and
5. The proposed facilities on parallel streets can be built to proper bikeway and walkway standards.

Other factors may need to be considered. The appropriate government agency or agencies should negotiate cooperative cost-sharing based on usage and benefits to the system.

Note: Emphasizing arterials and collectors does not preclude making improvements on other facilities or providing multi-use paths; arterials and collectors are the backbone to which other facilities will connect.

B.2. APPROPRIATE FACILITIES

Well-designed bicycle and pedestrian facilities attract users, while inadequate bikeways or walkways discourage users. Making urban streets more inviting to bicyclists and pedestrians also requires that adjacent land use, traffic speeds, transit access and street connectivity be considered in urban designs. Refer to design chapters for standards.

B.2.a. Rural Bikeways

On most rural roadways, shoulder bikeways are appropriate, accommodating cyclists with few conflicts with motor vehicles. In general, the shoulder widths recommended by AASHTO for rural highways are adequate for bicycle travel. These standards take into account traffic volumes and other considerations.

Shared roadways are adequate on low-volume rural roads, where motor vehicle drivers can safely pass bicyclists due to the low likelihood of encountering on-coming traffic.

Shoulder bikeways can be added to roads with high bicycle use, such as in semi-rural residential areas or close to urban areas. It may be appropriate to stripe and mark shoulders as bike lanes near schools or other areas of high use.

Even adding minimal-width shoulders can improve conditions for bicyclists on roads with moderate traffic volumes. On roads with high use, it may be necessary to add full-width shoulders in areas of poor visibility due to topography.

Rural shoulder bikeway

B.2.b. Rural Walkways

In sparsely populated areas, the shoulders of rural roads usually accommodate pedestrians. There are, however, roadways outside urban areas where the urban character creates a need for sidewalks, such as on highly developed commercial strips or in residential clusters along county roads or state highways. Where sidewalks are not provided, shoulders should be wide enough to accommodate both pedestrians and bicyclists.

Paths provided on one or both sides of a roadway in a rural community may be appropriate for providing access to schools. These paths will also serve the needs of young bicycle riders.

Bike lanes used by pedestrians

B.2.c. Urban Bikeways

In urban areas, the need to provide special facilities for bicycle use is determined by the speed and volume of motor vehicle traffic.

Arterials and Major Collectors

The appropriate facilities are bike lanes, which:

- Help define the road space;
- Provide bicyclists with a path free of obstructions;
- Decrease the stress level of bicyclists riding in traffic; and
- Signal to motorists that cyclists have a right to the road.

Bike lanes also provide advantages for other users: they help buffer pedestrians from traffic, and increase motorist safety by improving sight distance.

On retrofit projects, where it is not physically possible to provide bike lanes due to constraints such as existing buildings or environmentally sensitive areas, a wide outside lane may be substituted. A wide outside lane should only be considered after other options have been pursued, such as narrowing or removing travel lanes or parking. Wide lanes allow motor vehicles to pass a bicyclist in the lane, but provide few of the benefits of bike lanes. Bike lanes should resume where the constraint ends.

Effectively reducing running (actual) speeds to less than 40 km/h (25 MPH) creates a more comfortable environment for bicycling where there is insufficient width for bike lanes. This may be appropriate for Central Business Districts.

Bike lane on urban arterial

Minor Collectors and Local Streets

The appropriate facilities for bicyclists are shared roadways, as low traffic speeds and volumes allow bicyclists and motorists to safely share the road.

Bike lanes are appropriate on minor collectors with high average running speeds (above 40 km/h [25 MPH]) or high traffic volumes (ADT over 3000). These numbers reflect practices in cities where bike lanes are common. Local conditions may dictate different thresholds. Bike lanes on minor collectors are also appropriate to connect up with other bike lanes or to extend bike lanes to destination points that generate high bicycle use, such as schools, parks and multi-family housing units.

B.2.d. Urban Walkways

The appropriate facilities for pedestrians are sidewalks. A sidewalk provides positive separation from traffic, an all-weather surface and access for the disabled. They are readily identifiable by both pedestrians and motorists. Planting strips are desirable to buffer pedestrians from traffic, increasing their sense of comfort and safety, and to provide better access for the disabled at driveways.

Arterials and Major Collectors

Sidewalks must be provided on both sides of all arterial and collector streets, unless there are physical limitations and land use characteristics that render a sidewalk unsuitable on one side. In these situations, safe and convenient crossing opportunities must be provided to allow pedestrians to proceed on the side with sidewalks.

Minor Collectors and Local Streets

Sidewalks on both sides of the street are the appropriate facility. There is a point below which sidewalks on both sides of a local street may not be critical: e.g. on short dead-end streets with few potential residences and with no access to other facilities.

Trees and separation from roadway enhance the walking environment

B.3. AN OPEN GRID STREET SYSTEM

A system of interconnected streets offers direct routes with minimal out-of-direction travel. Street patterns that include cul-de-sacs and dead-end streets require a long circuitous route to cover a short distance, increasing out-of-direction travel for what could otherwise be a fairly short bicycle or walking trip.

The best solution is to link disconnected streets together with through streets. Where the right-of-way is insufficient for a street, or where cul-de-sacs are incorporated into a development, a path can be provided for bicycle and pedestrian access (see Figure 6, page 44).

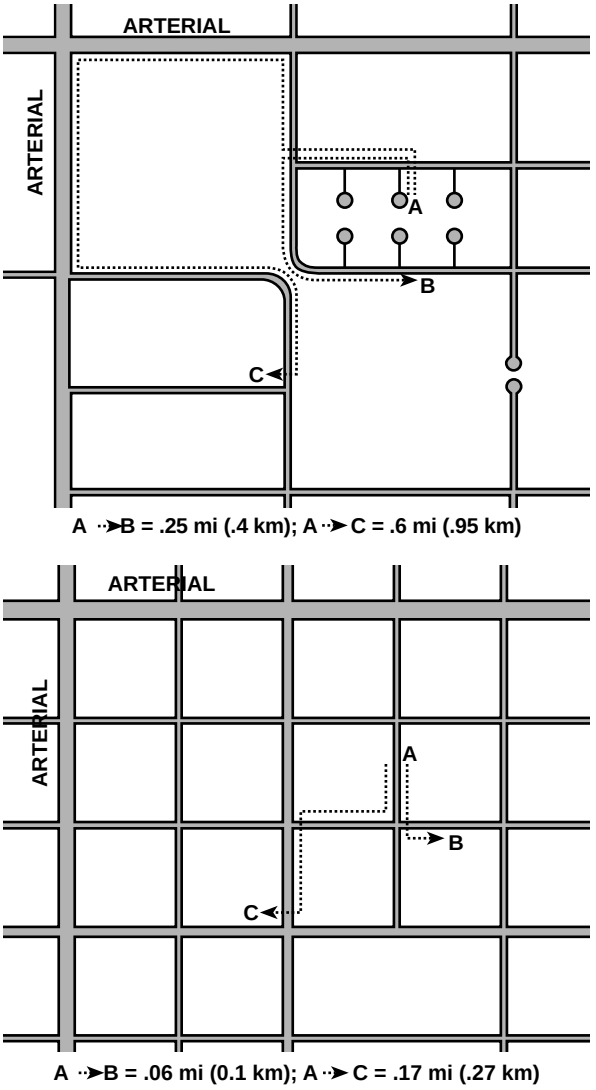


Figure 8: Travel distance savings with an open street grid

B.4. OVERCOMING BARRIERS

Establishing bikeways and walkways along streets is not enough to fully accommodate bicycle and pedestrian travel. The major barriers, and ways to overcome them, are:

- **Freeways, rivers and canyons** often divide a community if there are few crossing opportunities.
  Solutions: bridges built to accommodate all modes: existing and planned bridges must include the appropriate bicycle and pedestrian facilities. For security reasons, these are preferable to separate bicycle-pedestrian bridges. If bicycle-pedestrian bridges are needed, they should be located so they are visible, accessible from the existing roadway network and close to areas with high potential use, such as residential and commercial areas, schools or parks.
- **Wide streets**, if improperly designed, can be barriers to pedestrian and bicycle cross-movement when they carry large volumes of traffic.
  Solutions: pedestrian crossing treatments, such as raised median islands and curb extensions.
- **Intersections** are difficult areas for pedestrians and bicyclists when designed for high speed, free-flowing motor vehicle traffic.
  Solutions: special treatments such as islands, smaller radius corners and through bike lanes.
- **At-grade railroads crossings** are often difficult for bicyclists to negotiate; when crossings are eliminated, pedestrian and bicycle crossing opportunities are also removed.
  Solutions: maintaining existing crossings in safe condition for bicyclists and pedestrians, and keeping pedestrian and bicycle access across railroad tracks if street crossings are closed.
- **Heavy motor vehicle traffic volumes** discourage many walkers and bicyclists from using certain streets.
  Solutions: Well-designed bicycle and pedestrian facilities will attract hardy users; more timid users, who perceive that they are no longer alone, will also be attracted; Transportation Demand Management practices and traffic calming can help reduce traffic volumes and speeds at peak hours.

C. OTHER PLANNING CONSIDERATIONS

C.1. SUBURBS

Legally, land use designations for transportation purposes are either rural or urban. Yet many areas have land use characteristics commonly known as suburban, incorporating both urban and rural elements: streets tend to be wide, with high traffic speeds and volumes, busy intersections and many accesses. Discontinuous streets and cul-de-sacs are common. Destinations tend to be widely separated. These factors create an environment that is not conducive to walking or bicycling.

Most suburbs are within an urban growth boundary. Others are not, yet have the characteristics of urban areas. These "urbanized" areas should be considered urban when planning for bicycle and pedestrian travel.

Many enhancements other than providing bikeways and walkways are needed to make a suburban environment more conducive to bicycling and walking:

- Controlling private accesses on arterials;
- Providing safe pedestrian and bicycle access to shopping malls;
- Redesigning parking lots to allow better pedestrian access and circulation;
- Providing safe crossings of multi-lane roads;
- Encouraging land-use patterns that place origin and destination points within reasonable walking and bicycling distance;
- Connecting cul-de-sacs and dead-end streets with streets or paths; and
- Shortening travel distances with multi-use paths.

The appropriate bicycle facilities on suburban arterials and major collectors are bike lanes. Shoulder bikeways are appropriate on roadways with a more rural character. Bike lanes or shoulder bikeways may be appropriate on minor collectors where speeds and traffic volumes are high, or where visibility is impaired due to topography.

The appropriate pedestrian facilities on suburban arterials and collectors are sidewalks.

C.2. MULTI-USE PATHS

Multi-use paths can enhance bicycle and pedestrian travel in urban areas where the existing road system does not serve bicyclists and pedestrians well, or where abandoned railroads or other open spaces provide a corridor free of obstacles. Discontinuous street systems benefit from paths to reduce out-of-direction travel. Paths function best where street crossings can be eliminated or minimized.

The following guidelines ensure that a path system is an effective component of a walkway and bikeway network:

1. Neighboring jurisdictions should coordinate planning to link elements when paths cross jurisdictional boundaries (state, county or city rights-of-way or parks; and private property, including railroads).
2. Paths must connect to the street system in a safe and convenient manner - busy streets should accommodate bicyclists and pedestrians, with bike lanes and sidewalks.
3. Connections should be well-signed with destination and directional signing.
4. Paths should not substitute for a good system of on-street facilities.
5. Paths must be located in corridors that serve origin and destination points, such as residential areas, schools, etc.; they should not lead to nowhere.
6. Paths should be built in locations that are visible and easily accessible, for the personal safety of users.
7. Paths should be located where motor vehicle crossings can be eliminated or minimized; paths rarely function well when placed adjacent to a roadway, because of conflicts at intersections.
8. Crossings must be well-designed.
9. Paths should be built to high standards, with sufficient width and clearance to allow users to proceed at reasonable speeds, and constructed so they are durable, with low long-term maintenance requirements.
10. Paths should be maintained in a usable condition year-round, including snow removal in areas of heavy snowfall. Maintenance agreements should reflect the various jurisdictions' responsibilities.

See Figure 77 on page 114 for examples of multi-use paths in urban areas.

Bicycle boulevards include traffic-calming techniques such as traffic circles

C.3. BICYCLE BOULEVARDS

Bicycle boulevards can improve safety and mobility for bicyclists in areas with well-developed grid street patterns where alternatives are not feasible: urban multi-use paths are expensive to construct, and bike lanes on arterial streets may be difficult to implement if the street space is limited. As a result, many local plans show paths and bike lanes that may be difficult to implement.

The bicycle boulevard is a refinement of the shared roadway concept: the operation of a local street is modified to function as a through street for bicycles while maintaining local access for automobiles. Traffic controls limit conflicts between automobiles and bicycles and give priority to through bicycle movement. Traffic calming devices reduce automobile speeds and through travel.

C.4. TRAFFIC CALMING

In many cases, local streets would be more attractive to pedestrians and bicyclists if traffic speeds and volumes were reduced. See page 159 for information on traffic calming.

C.5. BICYCLE TOURING ROUTES

Bicycle touring is an important activity in Oregon with many economic benefits. The Oregon Coast Bike Route generates $2,000,000-$3,000,000 annually from out-of-state tourists. Cycle Oregon is a major annual event, attracting 2,000 riders, many from out of state.

Regional governments, chambers of commerce, cities and counties can cooperate to develop guides, maps and brochures to increase interest in their bicycling environment. Specific tour routes can be designated. Special signing along the route requires agreements from the responsible jurisdictions.

There are also several private bicycle tour operators who organize cycling vacations in Oregon; these attract many cyclists from out of state.

Bicycling in the Historic Columbia River Gorge

D. IMPLEMENTING BIKEWAY & WALKWAY PLANS

INTRODUCTION

Once a plan has been adopted, its successful implementation depends on the commitment of the governing jurisdiction(s) to ensure that the planned facilities are constructed. All interested parties should be aware of the plan; these include public works officials, planners, construction and maintenance engineers, regulatory agencies, citizen advisory committees and virtually any institution, private or public, that deals with transportation and land-use.

There are many levels at which bikeways and walkways are implemented. Complete networks will not be built all at once; they require a step-by-step process. As sections of walkways and bikeways are established, use may not increase immediately: users must first become familiar with the new facility, or a section may not be fully operational until other missing sections are completed.

D.1. PROJECT SELECTION

Good planning efforts should lead to a comprehensive list of projects designed to meet transportation needs, with many projects proposed for inclusion in a TIP. See Appendices G and H for the selection criteria ODOT uses when evaluating projects.

D.2. PROJECT PRIORITIZATION

Needs assessments should result in a prioritization of projects, balancing immediate needs with available funding. Highest priority should be given to projects that create new opportunities for bicycling and walking, such as:

- Providing access to trip generators such as schools, employment centers, recreational facilities and multi-family housing;
- Opening up corridors with constraints such as narrow bridges or travel lanes;
- Addressing specific hazards such as railroad crossings or busy intersections;
- Providing access to transit facilities; and
- Adding continuity to existing but incomplete facilities.

However, prioritization should not be used too strictly - because of unforeseen opportunities, such as grants or other construction activities, some projects of lower priority may be completed before others of higher priority. This is especially true in regards to road reconstruction: ORS 366.514 requires providing bikeways and walkways. Costs and needs should be balanced - some lower priority projects may be constructed simply because they are inexpensive and easy to fund.

D.3. COORDINATION

All jurisdictions should be aware of the pedestrian and bicycle needs of a community. Cities, counties and the state should cooperate with each other and with transit providers, parks districts, utility companies, etc., to take advantage of all opportunities whenever projects impact the potential walkway or bikeway system.

Examples include using utility company rights-of-way, linking up recreational trails to the street network, providing bike racks on buses, etc.

D.4. IMPLEMENTATION METHODS

D.4.a. General Road Improvements

The basic principle of ORS 366.514 is that wherever a road, street or highway is constructed, reconstructed or relocated, bikeways and walkways must be provided, unless one of three exceptions is met (cost, safety or absence of need). This may create temporarily incomplete bikeway and walkway segments, but as road improvements continue, these segments will become linked.

There are two ways to avoid dead-ending bikeways and walkways:

1. By extending the bikeway or walkway portion of a road project to link up with existing bikeways or walkways. On intersecting side streets, sidewalks that wrap around intersection corners should be extended to a logical point, preferably to existing sidewalks; and
2. Through stand-alone bikeway or walkway projects.

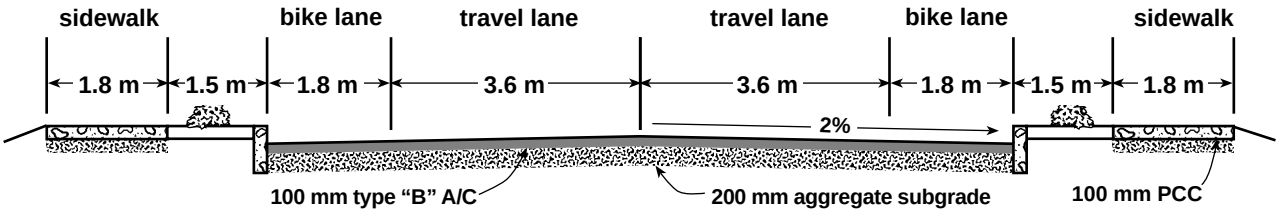


Figure 9: Typical urban roadway cross-section with bike lanes and sidewalks

D.4.b. Stand-Alone Bikeway or Walkway Projects

Missing links in bikeway and walkway networks should be constructed to complete a corridor or to link up existing bikeways and walkways.

Improvements range from simple bike lane restriping or sidewalk paving to major road-widening projects. The latter are expensive in urban areas, if right-of-way, drainage and utility relocation are needed. The scoping of bikeway or walkway projects may bring to light other needed roadway improvements, presenting an opportunity to implement access management techniques, improve road alignment, repave the road surface, etc. This may increase costs, but will provide an overall benefit to the corridor.

See Appendices G and H for a copy of ODOT's bicycle and pedestrian project selection criteria.

D.4.c. Maintenance Preservation Overlays

Though pavement overlay projects are designed to preserve the existing roadway surface, some low-cost improvements can be incorporated to provide benefits to bicyclists and pedestrians.

Rural Overlay Projects

On uncurbed roads with wide, stable gravel shoulders, there are often opportunities to widen shoulders without major grading. If the shoulders are paved prior to a resurfacing project, the ensuing overlay provides seamless shoulders and a roadway that is safer for all users.

Some sections of roadway may require minor grading to provide additional width; this can be justified on roads with high or potentially high bicycle use.

Bicycle and Pedestrian Program staff review construction plans for bicycle and pedestrian compatibility

Urban Overlay Projects

In areas where widening isn't possible because of existing curbs and sidewalks, the most effective way to provide bike lanes is by reconfiguring lanes after paving. This saves the expense and inconvenience of removing existing stripes. Coordination with local stakeholders ensures that all interested parties agree, especially when parking removal is required.

Low-cost pedestrian improvements that can be made during urban paving projects include completing segments of missing sidewalk and adding accessible curb ramps.

A beaten path indicates need for a sidewalk here

D.4.d. Minor Betterment Projects

Many inexpensive improvements can be made to enhance the bicycling and walking environment:

For bicyclists

- Raising drainage grates flush with the road surface, or replacing them with curb inlets;
- Removing curbs, pavement markers and other obstructions;
- Improving sight distance at curves by regrading or removing vegetation;
- Fixing surface irregularities in bike lanes or shoulders; and
- Adjusting signal loop detectors to be more sensitive to bicycles.

For pedestrians

- Replacing sidewalks in disrepair;
- Filling in sections of missing sidewalks;
- Installing curb ramps at intersections;
- Improving crossing opportunities, such as with curb extensions; and
- Replacing abandoned, illegal approaches with sidewalks.

TIPS FOR LOW-COST IMPROVEMENTS

1. **Combine Projects:** Several small jobs of a similar nature can be combined into one larger project.
2. **Combine with other similar improvements:** Most bid items for bicycle and pedestrian projects (asphalt, concrete surfacing, curb, etc.) can be found in standard road construction; bicycle and pedestrian improvements can be added to many road projects.
3. **Combine with maintenance activities:** If a crew is working in an area, it may not take much more time, money and effort to make minor pedestrian/bicycle improvements.
4. **Bid in winter months:** Most contractors are very busy during the summer, but are looking for work in the winter and may bid low to keep their crews busy.

Table 6: Tips for low-cost improvements

D.4.e. Private Development

Many road improvements are made by private parties, such as widening the roads immediately adjacent to their property, providing new accesses, reconstructing existing roadways and intersections, and constructing new roads within a development.

The same standards should apply to privately funded transportation projects as to other public works projects. The need for sidewalks and bike lanes on urban roadways exists regardless of project origin. It is the responsibility of the agency with jurisdiction over the roadway to ensure that adequate provisions for bicyclists and pedestrians are provided.

All jurisdictions are encouraged to adopt ordinances requiring sidewalks on streets built by private parties. When roads are dedicated to the city or county, they become a public right-of-way; therefore, they should be built to the same standard as public roads. They can become a financial burden and a liability if they must be retrofitted later with sidewalks or bikeways at the public's expense.

I.3. LOCAL TRANSPORTATION SYSTEM PLANS

A. BACKGROUND

The Transportation Planning Rule requires communities with a population over 2500 to adopt a Transportation System Plan (TSP) as part of the local comprehensive plan.

A TSP provides for the development, operation and maintenance of an integrated network of transportation facilities and services that considers the various needs throughout an urban area; identifies solutions to transportation problems, determined through system analysis based on a 20-year time period; and recognizes and integrates all modes of transportation for the movement of people and goods through and within the community. Each mode's role, contribution and connection to the transportation network is considered.

To develop a plan that will be implemented with community support, the process must include opportunities for the public, stakeholders and other interest groups to participate and be heard. Identified improvements must be feasible, based on known environmental constraints and mitigation possibilities, as well as fundable, based on reasonable expectations of funding available over the planning period.

B. RELATION TO OTHER DOCUMENTS

The plan must be coordinated with regional (county and MPO) and state transportation plans (OTP, modal plans, corridor plans, etc.).

Integrating a bicycle and pedestrian plan into a TSP ensures that people with an interest in transportation and community development will be aware of the bicycle and pedestrian needs of the community. This includes planners, designers, architects, developers, engineers, etc. A stand-alone document runs a greater risk of being ignored. All discussions of surface transportation facilities within the planning area must include the need to accommodate bicyclists and pedestrians.

C. PUBLIC INVOLVEMENT & INTERAGENCY REVIEW

Public input is an essential component of good planning. Interagency review assures compatibility with local, regional and state plans. Public input can be in the form of workshops, public hearings, notices in the media and the formation of Bicycle/Pedestrian Advisory Committees.

Effective committees draw on people with diverse viewpoints, representing those in the community with a common interest in bicycling and walking: education groups, business leaders, law enforcement agencies, bike clubs, the disabled, the elderly and the poor. Local officials (elected and staff) responsible for implementation should attend meetings to clearly understand the committee's recommendations.

Interagency review assures involvement by all affected agencies. All city plans must be compatible with county and state plans. There must be agreement when a planned facility runs through several jurisdictions.

D. THE BICYCLE & PEDESTRIAN ELEMENT OF A LOCAL TSP

A plan based on this model will meet the requirements of the Transportation Planning Rule and ORS 366.514. ODOT will apply these principles when cooperating with local jurisdictions in the development of their TSP's, or when reviewing draft TSP's prior to adoption.

D.1. STATEMENT OF PURPOSE

This section defines the role of bicycling and walking within the community, and how the plan will guide local planning efforts. The overall goal is to provide non-motorized travel within the community. Current and anticipated usage should be discussed; if current bicycle and pedestrian usage is low, the provision of bikeways and walkways may encourage greater use and decrease reliance on the automobile.

Bikeways and walkways also provide low-cost transportation options for people without cars (the young, elderly, poor and disabled). Specific local objectives should be stated.

D.2. EXISTING FACILITIES INVENTORY

The inventory should include a general assessment of streets, roads and highways by function, type, ownership, width and condition, as well as existing bikeways and walkways, plus paths and trails outside the street system; information on disabled access is needed too. This inventory will identify where walkway and bikeway deficiencies exist.

For large jurisdictions, it may be necessary to schedule an inventory over a period of years, by starting with the arterial and collector streets first, or by dividing the area into more manageable districts.

D.3. BICYCLE & PEDESTRIAN NEEDS

This section outlines the overall planned bikeway and walkway system. A realistic cost estimate can only be derived from a complete needs assessment.

D.4. IMPLEMENTATION STRATEGIES

Implementation strategies are necessary to meet identified needs, both on existing roadways and in the design of new roadways. A mechanism must be provided to ensure that all street, road and highway construction addresses bicycle and pedestrian needs, per ORS 366.514. Opportunities for low-cost improvements on incidental projects such as preservation overlays, utility work, etc. need to be identified. Local development ordinances may have to be modified to ensure that private development accommodates bicycle and pedestrian needs.

D.5. STANDARDS

Standards for the various road classifications must include the appropriate bikeway and walkway, as shown on roadway typical sections, including design standards for new subdivisions. The local plan may reference the state plan for bicycle and pedestrian facility standards.

D.6. BIKEWAY & WALKWAY PROJECTS

This section identifies and prioritizes bicycle and pedestrian construction projects, which should be included in a Transportation Improvement Program (TIP) and be given full consideration along with other transportation improvements. Projects should be identified by roadway name, beginning and end points, bikeway or walkway type, a description of the work needed, and the estimated cost.

The priority listing must be based on local goals and objectives. High priority should be given to projects that open up major corridors, overcome barriers and provide linkage or continuity to existing facilities.

D.7. BICYCLE PARKING

Bicycle parking needs are identified, as well as standards for spacing, numbers of spaces, placement, etc. Incorporating bicycle parking requirements into the local development code ensures that parking is provided as part of new development and redevelopment.

D.8. PLANNING MAPS

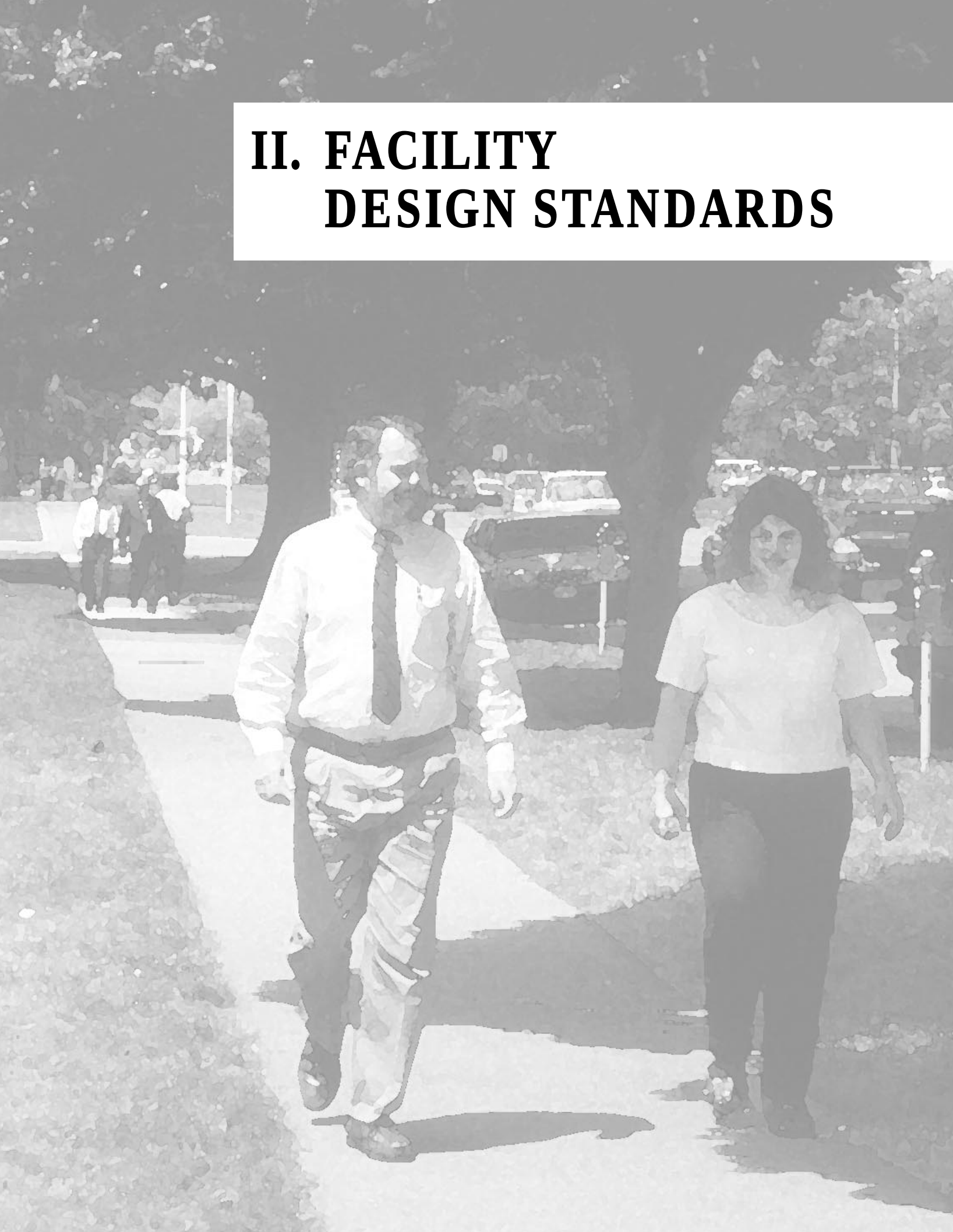
Maps provide interested parties an overview of existing and planned facilities; they can be used at meetings, by the media or for mailings.

Separate maps should be provided for bikeways and walkways. The existing and proposed system should be illustrated. Black and white maps are easier to copy and fax. Legends must clearly indicate the type of facility, and whether it is planned or existing. Proposed projects should be referenced on the planning map.

D.9. FINANCING PROGRAM

This section discusses the funding available for bicycle and pedestrian projects. The list of project priorities must reflect the availability of funds.

II. FACILITY DESIGN STANDARDS



BIKEWAY & WALKWAY STANDARDS

QUICK REFERENCE TABLE & METRIC CONVERSION

BIKEWAYS

	"ENGLISH"		METRIC	
Bike lane	6	feet	1.8	meters
Shoulder bikeway	6	feet	1.8	meters
Wide lane	14-15	feet	4.2-4.5	meters
Multi-use path	10	feet	3	meters
(high use)	12	feet	3.6	meters
Bike lane stripe	8	inches	200	millimeters
Shoulder stripe	4	inches	100	millimeters
Vertical clearance	10	feet	3	meters

WALKWAYS

	"ENGLISH"		METRIC	
Sidewalk*	6	feet	1.8	meters
(on bridge)	7	feet	2.1	meters
(high use)	8	feet	2.4	meters
Shy distance	2	feet	0.6	meters
Sign height	7	feet	2.1	meters

** Clear dimensions, exclusive of curb and obstructions*

II.1. ON–ROAD BIKEWAYS

A. TYPES OF BIKEWAYS

Bicycles are legally classified as vehicles and are ridden on most public roads in Oregon, which are open to bicycle traffic with a few exceptions (mostly the freeways in the metropolitan area of Portland). Roadways must be designed to allow bicyclists to ride in a manner consistent with the vehicle code.

A **bikeway** is created when a road has the appropriate design treatment to accommodate bicyclists, based on motor vehicle traffic volumes and speed. The basic design treatments used to accommodate bicycle travel on the road are: shared roadway, shoulder bikeway, or bike lane. Another type of facility is separated from the roadway: multi-use path.

SHARED ROADWAY – On a shared roadway, bicyclists and motorists share the same travel lanes. A motorist will usually have to cross over into the adjacent travel lane to pass a bicyclist. Shared roadways are common on neighborhood streets and on rural roads and highways. There are two treatments that enhance shared roadways for cyclists:

- WIDE OUTSIDE LANE – Where shoulder bikeways or bike lanes are warranted but cannot be provided due to severe physical constraints, a wide outside lane may be provided to accommodate bicycle travel. A wide lane usually allows an average size motor vehicle to pass a bicyclist without crossing over into the adjacent lane.

- BICYCLE BOULEVARDS – A modification of the operation of a local street to function as a through street for bicycles while maintaining local access for automobiles. Traffic calming devices control traffic speeds and discourage through trips by automobiles. Traffic controls limit conflicts between automobiles and bicycles and give priority to through bicycle movement.

SHOULDER BIKEWAY – Paved roadway shoulders on rural roadways provide a suitable area for bicycling, with few conflicts with faster moving motor vehicle traffic. Most rural bicycle travel on the state highway system is accommodated on shoulder bikeways.

BIKE LANE – A portion of the roadway designated for preferential use by bicyclists. Bike lanes are appropriate on urban arterials and major collectors. They may be appropriate in rural areas where bicycle travel and demand is substantial. Bike lanes must always be well marked to call attention to their preferential use by bicyclists.

MULTI-USE PATH (previously called “Bike Path”) – A facility separated from motor vehicle traffic by an open space or barrier, either within the roadway right-of-way or within an independent right-of-way. These are typically used by pedestrians, joggers, skaters and bicyclists as two-way facilities. Multi-use paths are appropriate in corridors not well served by the street system (if there are few intersecting roadways), to create short cuts that link destination and origin points, and as elements of a community trail plan. See chapter 3 for design standards.

Note: bikeways are listed in increasing order of complexity, with no implied order of preference.

This bridge was restriped to include wider shoulders

B. DESIGN STANDARDS

B.1. SHARED ROADWAYS

There are no specific bicycle standards for most shared roadways; they are simply the roads as constructed. Shared roadways function well on local streets and minor collectors, and on low-volume rural roads and highways. Mile per mile, shared roadways are the most common bikeway type.

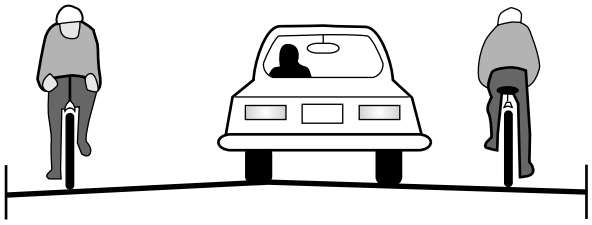


Figure 10: Shared roadway

Shared roadways are suitable in urban areas on streets with low speeds - 40 km/h (25 MPH) or less - or low traffic volumes (3,000 ADT or less, depending on speed and land use).

In rural areas, the suitability of a shared roadway decreases as traffic speeds and volumes increase, especially on roads with poor sight distance. Where bicycle use or demand is potentially high, roads should be widened to include shoulder bikeways where the travel speeds and volumes are high.

Residential street with young cyclist

Many urban local streets carry excessive traffic volumes at speeds higher than they were designed to carry. These can function as shared roadways if traffic speeds and volumes are reduced. There are many "traffic calming" techniques that can make these streets more amenable to bicycling on the road (see page 159 for more discussion of traffic calming and its effect on bicycling and walking).

B.1.a. Wide Curb Lanes

A wide curb lane may be provided where there is inadequate width to provide the required bike lanes or shoulder bikeways. This may occur on retrofit projects where there are severe physical constraints, and all other options have been pursued, such as removing parking or narrowing travel lanes. Wide curb lanes are not particularly attractive to most cyclists, they simply allow a motor vehicle to pass cyclists within a travel lane.

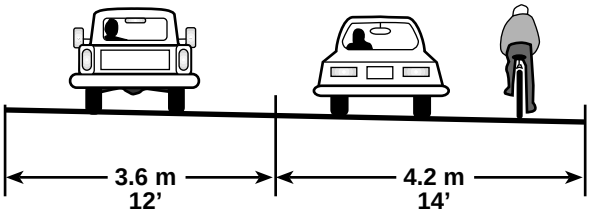


Figure 11: Wide curb lane

To be effective, a wide lane must be at least 4.2 m (14 ft) wide, but less than 4.8 m (16 ft). Usable width is normally measured from curb face to the center of the lane stripe, but adjustments need to be made for drainage grates, parking and the ridge between the pavement and gutter. Widths greater than 4.8 m (16 ft) encourage the undesirable operation of two motor vehicles in one lane. In this situation, a bike lane or shoulder bikeway should be striped.

Wide curb lane

	ADT under 250	ADT 250-400	ADT 400-DHV* 100	DHV 100-200	DHV 200-400	DHV over 400
Rural Arterials	1.2 m (4 ft)	1.2 m (4 ft)	1.8 m (6 ft)	1.8 m (6 ft)	2.4 m (8 ft)	2.4 m (8 ft)
Rural Collectors	0.6 m (2 ft)	0.6 m (2 ft)	1.2 m (4 ft)	1.8 m (6 ft)	2.4 m (8 ft)	2.4 m (8 ft)
Rural Local Route	0.6 m (2 ft)	0.6 m (2 ft)	1.2 m (4 ft)	1.8 m (6 ft)	1.8 m (6 ft)	2.4 m (8 ft)

**DHV (Design Hour Volume) is the expected traffic volume in the peak design hour (usually at commuter times); usually about 10% of ADT in urban areas, higher on rural highways with high recreational use (beach access, ski resorts, etc.)*

Table 7: Standard rural highway shoulder widths

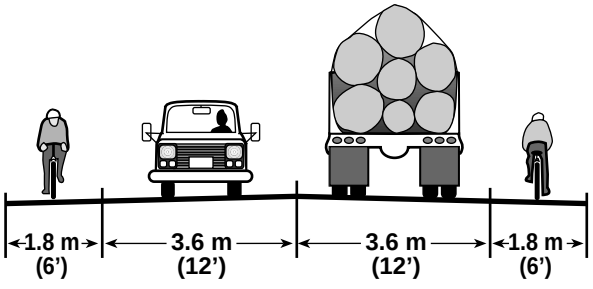
B.2. SHOULDER BIKEWAYS

Paved shoulders are provided on rural highways for a variety of safety, operational and maintenance reasons:

- Space is provided for motorists to stop out of traffic in case of mechanical difficulty, a flat tire or other emergency;
- Space is provided to escape potential crashes;
- Sight distance is improved in cut sections;
- Highway capacity is improved;
- Space is provided for maintenance operations such as snow removal and storage;
- Lateral clearance is provided for signs and guardrail;
- Storm water can be discharged farther from the pavement; and
- Structural support is given to the pavement.

B.2.a. Width Standards

In general, the shoulder widths recommended for rural highways in the ODOT Highway Design Manual serve bicyclists well. The above table should be used when determining roadway shoulder widths.



Min: 1.5 m (5') against curb, parking or guardrail, 1.2 m (4') open shoulder

Figure 12 : Shoulder bikeway

When providing shoulders for bicycle use, a width of 1.8 m (6 ft) is recommended. This allows a cyclist to ride far enough from the edge of pavement to avoid debris, yet far enough from passing vehicles to avoid conflicts. If there are physical width limitations, a minimum 1.2 m (4-ft) shoulder may be used. Shoulders against a curb face, guardrail or other roadside barriers must have a 1.5 m (5-ft) minimum width or 1.2 m (4 ft) from the longitudinal joint between a monolithic curb and gutter and the edge of travel lane.

Shoulder bikeway

On steep grades, it is desirable to maintain a 1.8 m (6-ft), (min. 1.5 m [5-ft]) shoulder, as cyclists need more space for maneuvering.

Note: many rural roads are 8.4 m (28 ft) wide, with fog lines striped at 3.3 m (11 ft) from centerline. The remaining 0.9 m (3 ft) should not be considered a shoulder bikeway (min. width 1.2 m {4 ft}); these are still considered shared roadways, as most cyclists will ride on or near the fog line.

Cyclist on shoulder bikeway

B.2.b. Pavement Design

Many existing gravel shoulders have sufficient width and base to support shoulder bikeways. Minor excavation and the addition of 75-100 mm (3-4") of asphaltic concrete is often enough to provide shoulder bikeways. It is best to widen shoulders in conjunction with pavement overlays for several reasons:

- The top lift of asphalt adds structural strength;
- The final lift provides a smooth, seamless joint;
- The cost is less, as greater quantities of materials will be purchased; and
- Traffic is disrupted only once for both operations.

When shoulders are provided as part of new road construction, the pavement structural design should be the same as that of the roadway.

On shoulder widening projects, there may be some opportunities to reduce costs by building to a lesser thickness. 50-100 mm (2-4") of asphalt and 50-75 mm (2-3") of aggregate over existing roadway shoulders may be adequate if the following conditions are met:

- There are no planned widening projects for the road section in the foreseeable future;
- The existing shoulder area and roadbed are stable and there is adequate drainage or adequate drainage can be provided without major excavation and grading work;
- The existing travel lanes have adequate width and are in stable condition;
- The horizontal curvature is not excessive, so that the wheels of large vehicles do not track onto the shoulder area (on roads that have generally good horizontal alignment, it may be feasible to build only the inside of curves to full depth); and
- The existing and projected ADT and heavy truck traffic is not considered excessive (e.g. under 10%).

The thickness of pavement and base material will depend upon local conditions, and engineering judgment should be used. If there are short sections where the travel lanes must be reconstructed or widened, these areas should be constructed to normal full-depth standards.

B.2.c. The Joint between the Shoulders and the Existing Roadway

The following techniques should be used to add paved shoulders to roadways where no overlay project is scheduled:

1. **Saw Cut:** A saw-cut 0.3 m (1 ft.) inside the existing edge of pavement provides the opportunity to construct a good tight joint. This eliminates a ragged joint at the edge of the existing pavement.

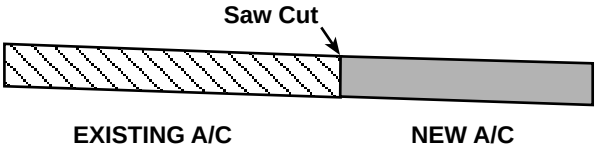


Figure 13 : Saw-cut joint

2. **Feathering:** "Feathering" the new asphalt onto the existing pavement can work if a fine mix is used and the feather does not extend across the area traveled by bicyclists.

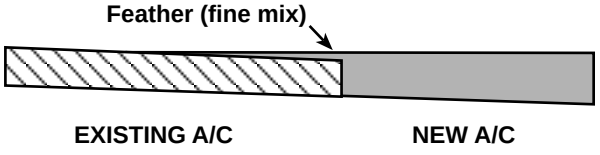


Figure 14: Asphalt feathering

3. **Grinder:** Where there is already some shoulder width and thickness available, a pavement grinder can be used to make a clean cut at the edge of travel lane, grade the existing asphalt to the right depth and cast aside the grindings in one operation, with these advantages:

   - Less of the existing pavement is wasted;
   - The existing asphalt acts as a base;
   - There will not be a full-depth joint between the travel lane and the shoulder; and
   - The grindings can be recycled as base for the widened portion.

New asphalt can then be laid across the entire width of the shoulder bikeway with no seams.

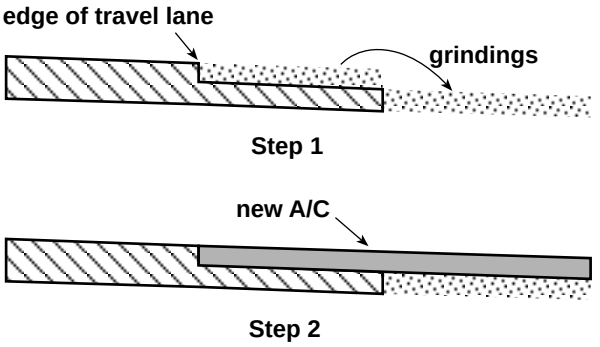


Figure 15 : Grinding out existing A/C

B.2.d. Gravel Driveways and Approaches

Wherever a highway is constructed, widened or overlaid, all gravel driveways and approaches should be paved back 4.5 m (15 ft) to prevent loose gravel from spilling onto the shoulders.

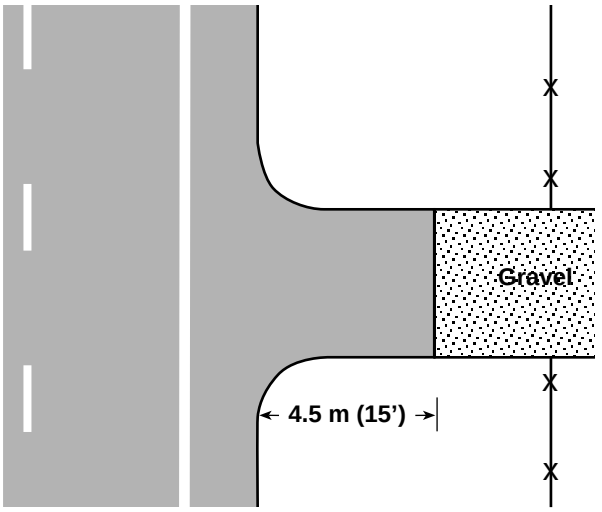


Figure 16: Paved driveway apron

Gravel driveway with paved apron

B.3. BIKE LANES

Bike lanes are provided on urban arterial and major collector streets. Bike lanes may also be provided on rural roadways near urban areas, where there is high potential bicycle use.

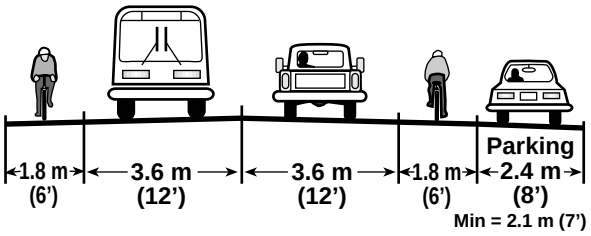
Bike lanes are generally not recommended on rural highways with posted speeds of 90 km/h (55 MPH): at channelized intersections, the speeds are too high to place a through bike lane to the left of right-turning vehicles (see chapter 4, Intersection Design). Shoulder bikeways, striped with a 100 mm (4") fog line, are the appropriate facility for these roads.

Bike lanes are one-way facilities that carry bicycle traffic in the same direction as adjacent motor-vehicle traffic; bike lanes should always be provided on both sides of a two-way street.

Well-designed urban arterials should have paved shoulders. Bike lanes are created by using a 200 mm (8") stripe and stencils. Motorists are prohibited from using bike lanes for driving and parking, but may use them for emergency avoidance maneuvers or breakdowns.

B.3.a. Width Standards

The standard width of a bike lane is 1.8 m (6 ft), as measured from the center of stripe to the curb or edge of pavement. This width enables cyclists to ride far enough from the curb to avoid debris and drainage grates, yet far enough from passing vehicles to avoid conflicts. By riding away from the curb, cyclists are more visible to motorists than when hugging the curb.



Min: 1.5 m (5') against curb, parking or guardrail; 1.2 m (4') open shoulder

Figure 17 : Bike lane standards

The minimum bike lane width is 1.2 m (4 ft) on open shoulders and 1.5 m (5 ft) from the face of a curb, guardrail or parked cars. A clear riding zone of 1.2 m (4 ft) is desirable if there is a longitudinal joint between asphalt pavement and the gutter section. On roadways with flat grades, it may be preferable to integrate the bike lane and gutter to avoid a longitudinal joint in the bike lane.

Bike lanes wider than 1.8 m (6 ft) may be desirable in areas of very high use, on high-speed facilities where wider shoulders are warranted, or where they are shared with pedestrians. Care must be taken so they are not mistaken for a motor vehicle lane or parking area, with adequate marking or signing.

A bike lane must always be marked with pavement stencils and a 200 mm (8") wide stripe. This width increases the visual separation of a motor vehicle lane and a bike lane. It is a legal requirement in Oregon (OAR 734-20-055). Refer to page 145 for bike lane marking standards.

If parking is permitted, the bike lane must be placed between parking and the travel lane, and have a minimum width of 1.5 m (5 ft).

Bike lane next to parking

B.3.b. Bike Lanes on One-way Streets

Bike lanes on one-way streets should be on the right side of the roadway, except where a bike lane on the left decreases the number of conflicts (e.g., those caused by heavy bus traffic or dual right-turn lanes), if cyclists can safely and conveniently return to the right.

See page 146 for detailed information on bike lane configuration at intersections.

C. PRACTICES TO BE AVOIDED

The Oregon Department of Transportation has over 20 years of experience designing bikeways, and has also learned from local city and county experiences; some practices have proven to be poor ones.

C.1. SIDEWALK BIKEWAYS

Some early bikeways used sidewalks for both pedestrians and bicyclists. While in rare instances this type of facility may be necessary, or desirable for use by small children, in most cases it should be avoided.

Sidewalks are not suited for cycling for several reasons:

- Cyclists face conflicts with pedestrians;
- There may be conflicts with utility poles, sign posts, benches, etc.;
- Bicyclists face conflicts at driveways, alleys and intersections: a cyclist on a sidewalk is generally not visible to motorists and emerges unexpectedly. This is especially true of cyclists who ride opposing adjacent motor vehicle traffic: drivers do not expect a vehicle coming from this direction; and
- Bicyclists are put into awkward situations at intersections where they cannot safely act like a vehicle but are not in the pedestrian flow either, which creates confusion for other road users.

Cyclists are safer when they are allowed to function as roadway vehicle operators, rather than as pedestrians.

Where constraints do not allow full-width walkways and bikeways, solutions should be sought to accommodate both modes (e.g. narrowing travel lanes or reducing on-street parking). In some urban situations, preference may be given to accommodating pedestrians. Sidewalks should not be signed for bicycle use - the choice should be left to the users.

C.2. EXTRUDED CURBS

These create an undesirable condition when used to separate motor vehicles from cyclists: either one may hit the curb and lose control, with the motor vehicle crossing onto the bikeway or the cyclist falling onto the roadway. At night, the curbs cast shadows on the lane, reducing the bicyclist's visibility of the surface. Extruded curbs make bikeways difficult to maintain and tend to collect debris. They are often hit by motor vehicles, causing them to break up and scatter loose pieces onto the surface.

Curb presents obstacle to cyclist

C.3. REFLECTORS & RAISED PAVEMENT MARKERS

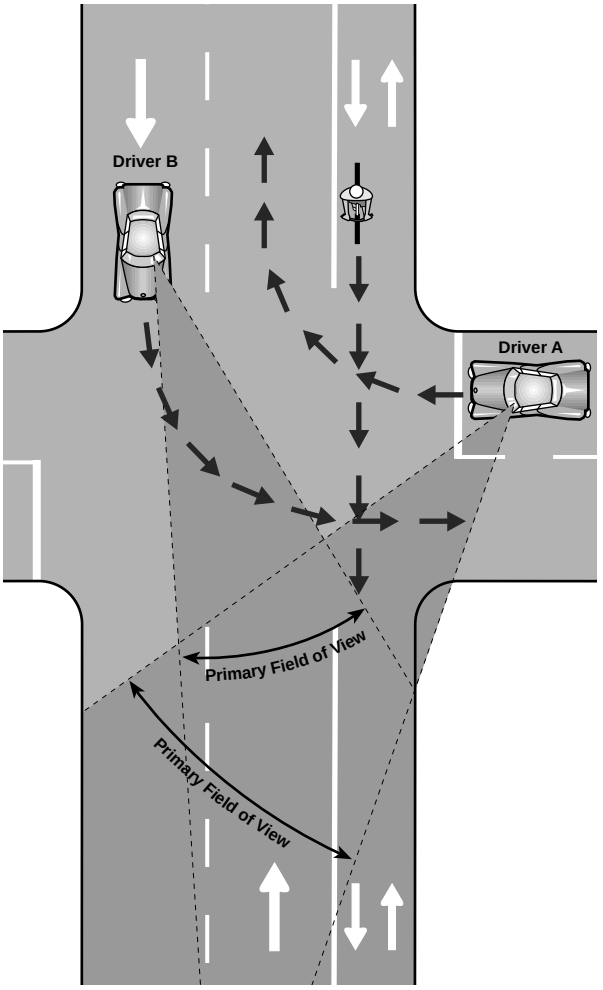
These can deflect a bicycle wheel, causing the cyclist to lose control. If pavement markers are needed for motorists, they should be installed on the motorist's side of the stripe, and have a beveled front edge.

Raised reflectors force cyclists into travel lane

C.4. TWO-WAY BIKE LANE

This creates a dangerous condition for bicyclists. It encourages illegal riding against traffic, causing several problems:

- At intersections and driveways, wrong-way riders approach from a direction where they are not visible to motorists;
- Bicyclists closest to the motor vehicle lane have opposing motor traffic on one side and opposing bicycle traffic on the other; and
- Bicyclists are put into awkward positions when transitioning back to standard bikeways.



**Right–turning driver A is looking for traffic on the left;
Left–turning driver B is looking for traffic ahead;
In both cases, a wrong–way bicyclist is not in the driver's main field of vision.**

Figure 18: Problems with two-way bike lane

If constraints allow widening on only one side of the road, the centerline stripe may be shifted to allow for adequate travel lanes and bike lanes:

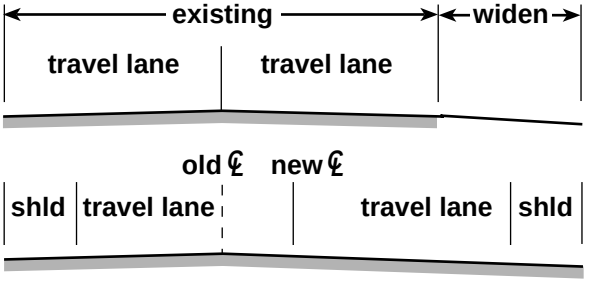


Figure 19: Shoulder widening on one side

C.5. CONTINUOUS RIGHT-TURN LANES

This configuration is difficult for cyclists: riding on the right puts them in conflict with right-turning cars, but riding on the left puts them in conflict with cars merging into and out of the right-turn lane. The best solution is to eliminate the continuous right-turn lane, consolidate accesses and create well-defined intersections.

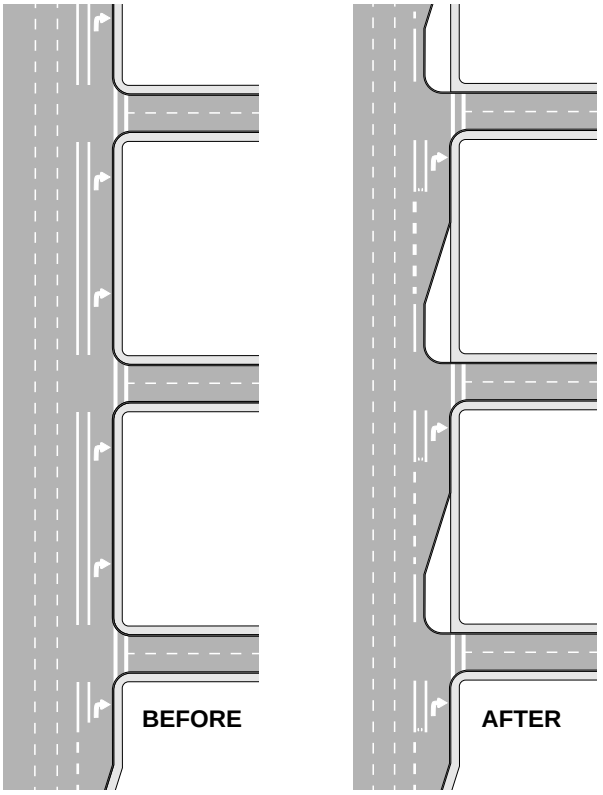


Figure 20: Continuous right-turn lane reconfigured to standard approaches

D. OTHER DESIGN CONSIDERATIONS

D.1. DRAINAGE GRATES

Care must be taken to ensure that drainage grates are bicycle-safe, as required by ORS 810.150. If not, a bicycle wheel may fall into the slots of the grate causing the cyclist to fall. Replacing existing grates (A, B, preferred methods) or welding thin metal straps across the grate perpendicular to the direction of travel (C, alternate method) is required. These should be checked periodically to ensure that the straps remain in place.

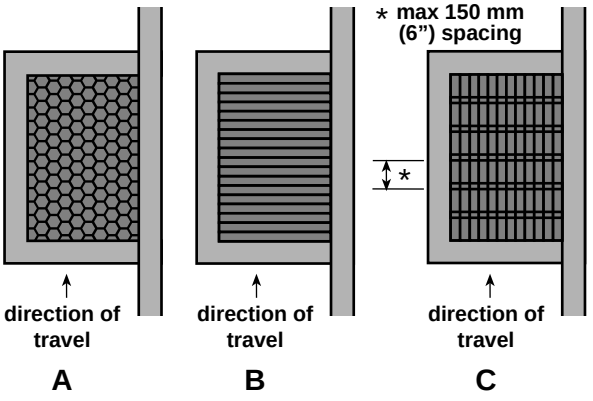


Figure 21: Bicycle safe grates

Note: grates with bars perpendicular to the roadway must not be placed at curb cuts, as wheelchairs could get caught in the slot.

The most effective way to avoid drainage-grate problems is to eliminate them entirely with the use of inlets in the curb face (type CG-3).

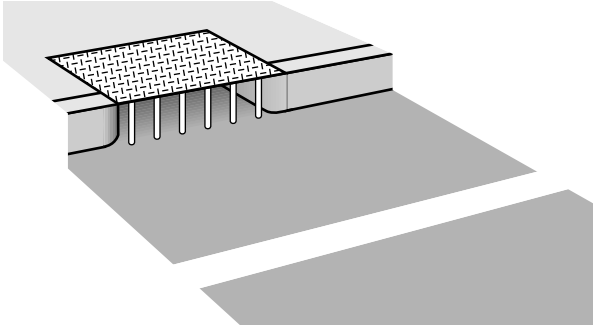


Figure 22: Inlet flush in the curb face

If a street-surface grate is required for drainage (types G-2 and CG-2), care must be taken to ensure that the grate is flush with the road surface. Types G-1 and CG-1 drainage grates that have bars parallel to the roadway should not be used in areas where bikes may be present.

Well placed drainage grate

Inlets should be raised after a pavement overlay to within 6 mm (1/4") of the new surface. If this is not possible or practical, the pavement must taper into drainage inlets so they do not cause an abrupt edge at the inlet.

Inlet in the curb face

D.2. RAILROAD CROSSINGS

Special care must be taken wherever a bikeway intersects railroad tracks. The most important improvements for bicyclists are smoothness, angle of crossing and flange opening.

D.2.a. Smoothness

Concrete performs best under wet conditions and, when laid with precision, provides a smooth ride. Rubberized crossings provide a durable, smooth crossing, though they tend to become slippery when wet. If asphalt pavement is used, it must be maintained in order to prevent a ridge buildup next to the rails. Timber crossings wear down rapidly and are slippery when wet.

D.2.b. Angle of crossing

The risk is kept to a minimum where the bikeway crosses the tracks at a 90° angle. If the skew angle is less than 45°, special attention should be given to the bikeway alignment to improve the angle of approach, preferably to 60° or greater, so cyclists can avoid catching their wheels in the flange and losing their balance.

This rubberized crossing is smooth, with a narrow flange opening

D.2.c. Flange Opening

The open flange area between the rail and the roadway surface can cause problems for cyclists, since it can catch a bicycle wheel, causing the rider to fall. Flange width must be kept to a minimum.

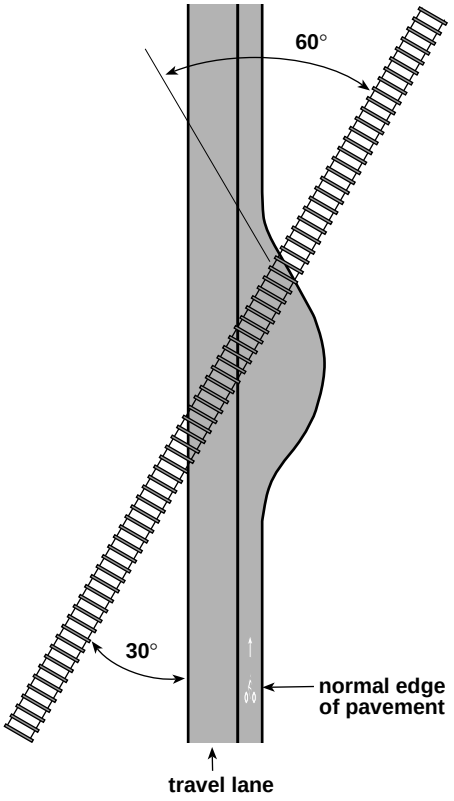


Figure 23: Bike lane or shoulder crossing railroad tracks

*Note: The **combination** of smoothness, angle and flange opening create conditions that affect cyclists. By improving smoothness and flange opening, the angle becomes less critical.*

Extremely undesirable condition

D.3. SIDEWALK RAMPS ON BRIDGES

These can help cyclists if the bridge sidewalks are wide enough for bicycle use (minimum 1.2 m [4 ft]). They should be provided where motor vehicle traffic volumes and speeds are high, the bridge is fairly long and the outside traffic lanes or shoulders on the bridge are narrow.

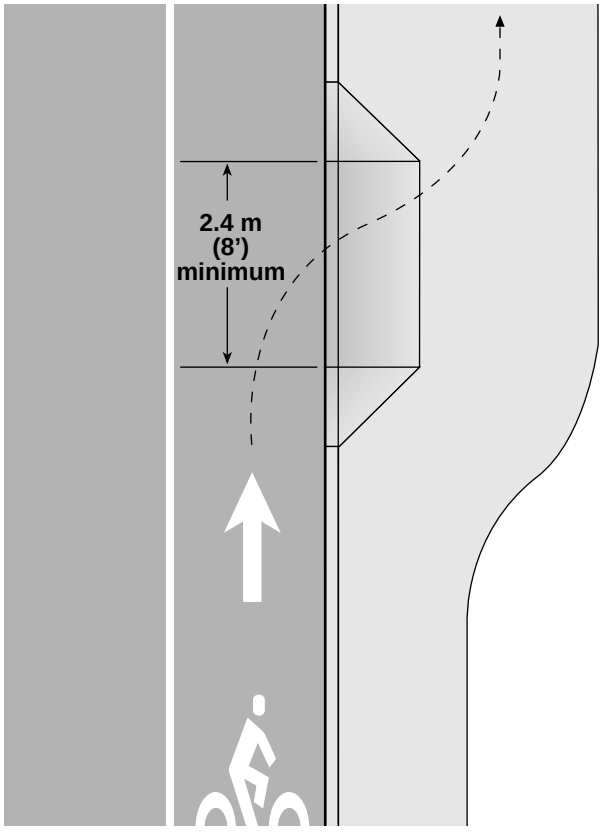


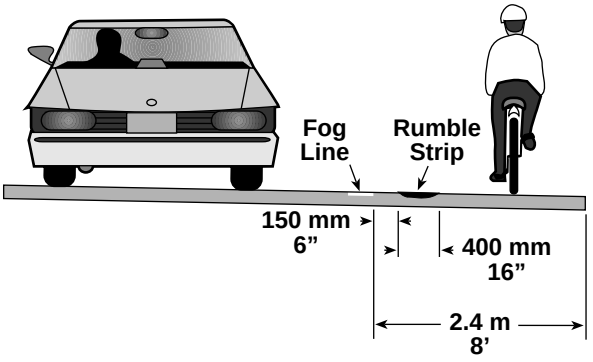
Figure 24: Ramp provides access to sidewalk

This ramp allows bicyclists to ride straight onto bridge sidewalk

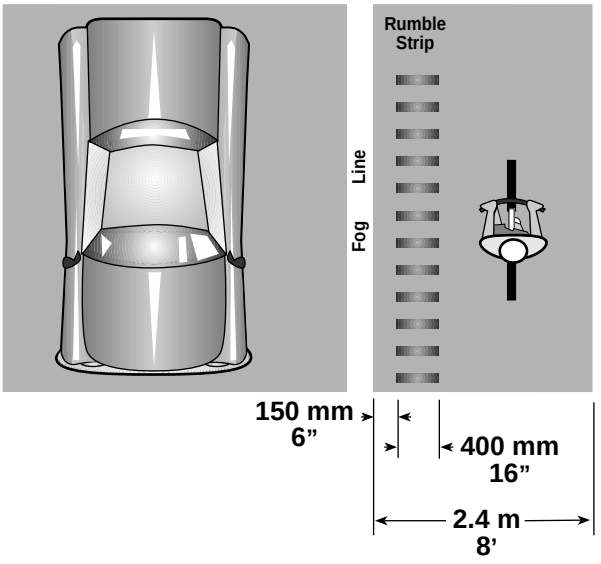
D.4. RUMBLE STRIPS

Rumble strips are provided to alert motorists that they are wandering off the travel lanes onto the shoulder. They are most common on long sections of straight freeways in rural settings, but are also used on sections of two-lane undivided highways. Early designs placed bumps across the entire width of the shoulder, which is very uncomfortable for cyclists.

A newer rumble strip design is more bicycle-friendly: 400 mm (16") grooves are cut into the shoulder, 150 mm (6") from the fog line. On a 2.4 m (8 ft) shoulder, this leaves 1.8 m (6 ft) of usable shoulder for bicyclists.



Cross-sectional view



Plan view

Figure 25: Bicycle-friendly rumble strip

E. OTHER INNOVATIVE DESIGNS

These concepts are presented as information, to help ODOT, cities and counties to come up with new solutions to common problems.

E.1. BICYCLE BOULEVARDS

The bicycle boulevard is a refinement of the shared roadway concept: the operation of a local street is modified to function as a through street for bicycles while maintaining local access for automobiles. Traffic calming devices reduce traffic speeds and through trips. Traffic controls limit conflicts between motorists and bicyclists and give priority to through bicycle movement.

Advantages of Bicycle Boulevards

- Opportunity - traditional street grids offer many miles of local streets that can be converted to bicycle boulevards;
- Low cost - major costs are for traffic control and traffic calming devices;
- Traffic calming techniques are increasingly favored by residents who want slower traffic on neighborhood streets;
- Bicycle travel on local streets is usually compatible with local land uses;
- Bicycle boulevards may attract new or inexperienced cyclists who do not feel comfortable on arterials and prefer to ride on lower traffic streets; and
- Bicycle boulevards can improve conditions for pedestrians, with reduced traffic and improved crossings.

Disadvantages of Bicycle Boulevards

- They are often located on streets that do not provide direct access to commercial land uses and other destinations; some cyclists may have to negotiate a hostile street environment to complete a portion of their trip;
- If improperly implemented, they can cause traffic diversion onto other streets;
- Failure to provide arterial crossings can result in unsafe conditions for bicyclists; and
- Traffic signals may be expensive or unacceptable for the traffic conditions.

Successful bicycle boulevard implementation requires careful planning with residents and businesses to avoid unacceptable impacts.

Elements of a Bicycle Boulevard

- Selecting a direct and continuous street, rather than a circuitous route that winds through neighborhoods. Bike boulevards work best on a street grid system;
- Turning stop signs towards intersecting streets, so bicyclists can ride with few interruptions;
- Placing motor vehicle traffic diverters at key intersections to reduce traffic volumes (the diverters must be designed to allow through bicycle movement);
- Placing traffic-calming devices on streets to lower traffic speeds;
- Placing directional signs to route cyclists to key destinations, to guide cyclists through difficult situations, and to alert motorists of the presence of bicyclists; and
- Providing protection where the boulevard crosses high-volume arterials with:
  1. Signals, where a traffic study has shown that a signal will be safe and effective; to ensure that bicyclists can activate the signal, signal loops should be installed where bicyclists ride, supplemented with a push button that won't require dismounting; or
  2. Median refuges, with gaps wide enough to allow bicyclists to pass through (min. 2.4 m [8 ft]); the median should be wide enough to provide a refuge (min. 3 m [10 ft]). The design should allow bicyclists to see the travel lanes they must cross.

Bike boulevard allows through bicycle movement

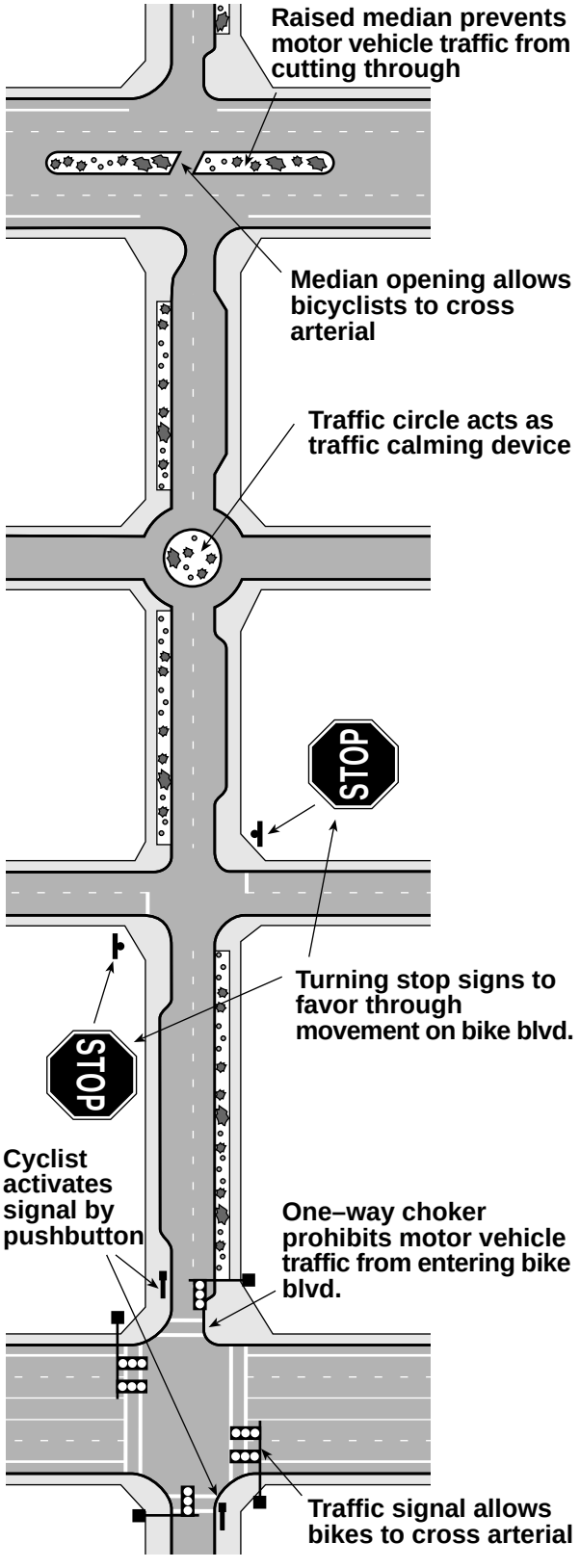


Figure 26: Elements of a bike boulevard, including street crossings

E.2. RAISED BIKE LANES

Normally, bike lanes are an integral portion of the roadway surface and are delineated from motor vehicle lanes with painted stripes. Though most bicyclists ride on these facilities with comfort, others prefer more positive separation, but separated paths are not practical in most urban settings.

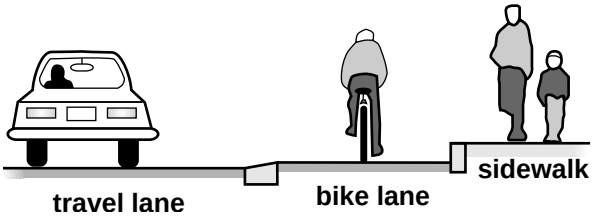


Figure 27: Raised bike lane

Raised bike lanes incorporate the convenience of riding on the street with the psychological separation of a barrier, with these advantages:

- A mountable curb allows cyclists to enter or leave the lane as needed for turning or overtaking;
- Motorists know they are straying from the travel lanes when they feel the slight bump created by the mountable curb; and
- Novice bicyclists are more likely to ride in the bike lane, leaving the sidewalk for pedestrians.

Raised bike lane

An effective design provides a gentle slope, with no lip, so a bicycle tire is not caught during crossing maneuvers. Using concrete curbs in an asphalt roadway increases the visibility of the bike lane stripe. The raised bike lane is dropped prior to intersections, where the roadway surfacing is uniform.

The disadvantage of raised bike lanes is the greater costs of construction: the travel lanes and bike lanes must be paved separately and a narrow paving machine is required for paving the bike lane.

The additional costs are mitigated by reduced long-term maintenance costs:

- The bike lane portion receives less wear and tear than the travel lanes;
- The bike lane accumulates less debris, requiring less frequent sweeping; and
- The bike lane stripe doesn't need frequent repainting.

Note: on roads with parking, the bike lane should be placed between the travel lanes and parked cars, elevating the parking lane.

E.3. CONTRA-FLOW BIKE LANES

Contra-flow bike lanes on a one-way street are not usually recommended. They may encourage cyclists to ride against traffic, which is contrary to the rules of the road and a leading cause of bicycle/motor vehicle crashes.

There are, however, special circumstances when this design may be advantageous:

- A contra-flow bike lane provides a substantial savings in out-of-direction travel;
- The contra-flow bike lane provides direct access to high-use destinations;
- Improved safety because of reduced conflicts on the longer route;
- There are few intersecting driveways, alleys or streets on the side of the contra-flow lane;
- Bicyclists can safely and conveniently reenter the traffic stream at either end of the section;
- A substantial number of cyclists are already using the street; and
- There is sufficient street width to accommodate a bike lane.

One-way street with bike lane and contra-flow bike lane

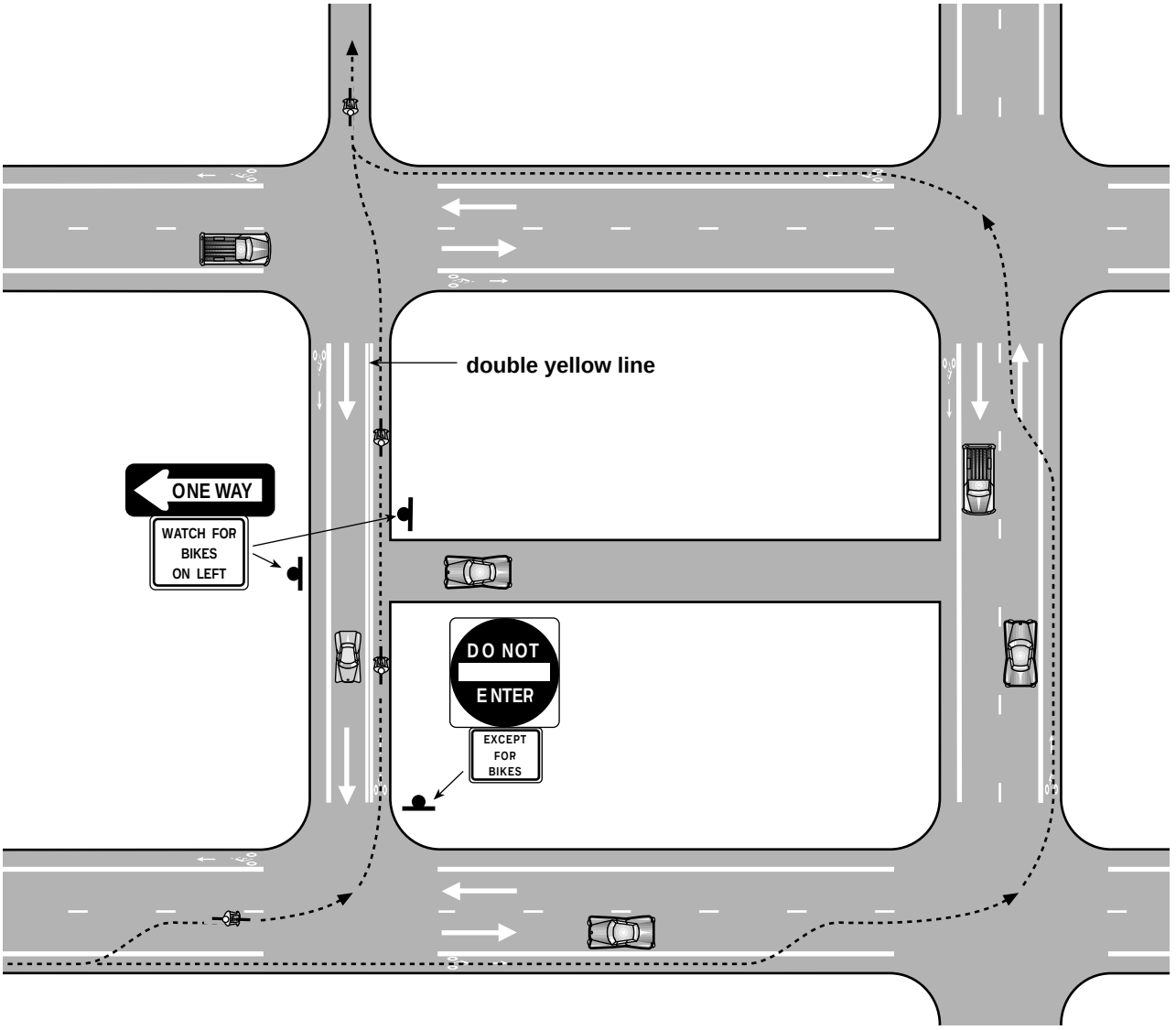


Figure 28: Contra-flow bike lane (Arrows indicate out-of-direction travel saved with contra-flow bike lane)

A contra-flow bike lane may also be appropriate on a one-way residential street recently converted from a two-way street (especially where this change was made to calm traffic).

For a contra-flow bike lane to function well, these special features should be incorporated into the design:

- The contra-flow bike lane must be placed on the right side of the street (to motorists' left) and must be separated from on-coming traffic by a double yellow line. This indicates that the bicyclists are riding on the street legally, in a dedicated travel lane.
- Any intersecting alleys, major driveways and streets must have signs indicating to motorists that they should expect two-way bicycle traffic.
- Existing traffic signals should be fitted with special signals for bicyclists; this can be achieved with either loop detectors or push-buttons (these should be easily reached by bicyclists without having to dismount).

NOTE: Under no circumstances should a contra-flow bike lane be installed on a two-way street, even where the travel lanes are separated with a raised median.

E.4. DIAGONAL PARKING

Diagonal parking causes conflicts with bicycle travel: drivers backing out have poor visibility of oncoming cyclists and parked vehicles obscure other vehicles backing out. These factors require cyclists to ride close to the center of a travel lane, which is intimidating to inexperienced riders.

Where possible on one-way streets, diagonal parking should be limited to the left side, even if the street has no bike lane; on one-way streets with bike lanes, the bike lane should placed adjacent to parallel parking (preferably on the right).

Bike lanes are not usually placed next to diagonal parking. However, should diagonal parking be required on a street planned for bike lanes, the following recommendations can help decrease potential conflicts:

- The parking bays must be long enough to accommodate most vehicles;
- A 200 mm (8”) stripe should separate the parking area from the bike lane; and
- Enforcement may be needed to cite or remove vehicles encroaching on the bike lane.

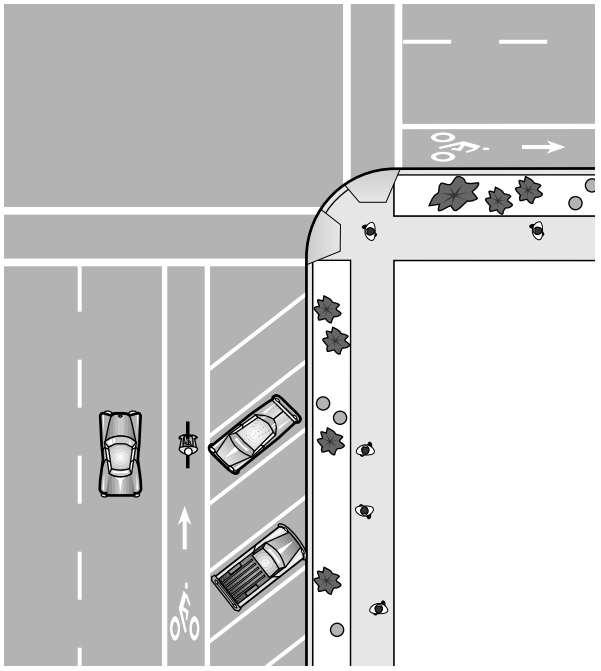


Figure 29: Bike lane next to diagonal parking

E.5. BIKE LANES & BUS LANES

In most instances, bicycles and buses can share the available road space. On routes heavily traveled by both bicyclists and buses, separation can reduce conflicts (stopped buses hinder bicycle movement and slower moving bicycles hinder moving buses).

Separate bus lanes and bike lanes should be considered, with the bus lane at the curb side, to reduces conflicts between passengers and bicyclists. Buses will be passing bicyclists on the right, but the fewer merging and turning movements reduce overall conflicts.

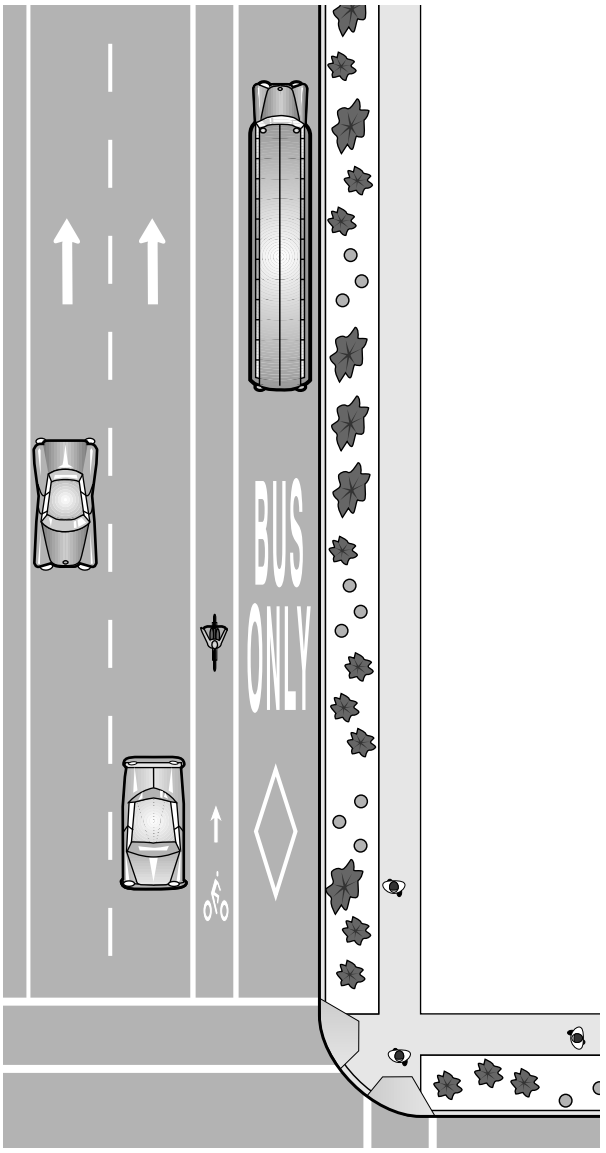


Figure 30: Bike lane adjacent to bus lane

II.2. RESTRIPING EXISTING ROADS WITH BIKE LANES

INTRODUCTION

To accommodate bicyclists on busy roadways in urban areas, bike lanes generally serve bicyclists and motorists best. Many roadways in urban areas were originally built without bike lanes. These roadways often act as deterrents to bicycle travel and may cause conflicts between bicyclists and motorists.

The needs of cyclists can be accommodated by retrofitting bike lanes onto many existing urban roadways using the following methods:

1. Marking and signing existing shoulders as bike lanes;
2. Physically widening the roadway to add bike lanes; or
3. Restriping the existing roadway to add bike lanes.

Method #1 is simple, and bike lane marking standards are outlined on page 145. Method #2 involves reconstruction, and standards are outlined on page 70. In many instances, existing curb-to-curb width allows only method #3 to be considered.

Where existing width doesn't allow full standards to be used, it may be possible to modify portions of the roadway to accommodate bike lanes. Current urban standards are: 4.2 m (14 ft) center turn lanes, 3.6 m (12 ft) travel lanes, 1.8 m (6 ft) bike lanes and 2.4 m (8 ft) parking lanes.

These guidelines should be used to determine how the roadway can be modified to accommodate bike lanes, without significantly affecting the safety or operation of the roadway. Reduced travel lane widths are within AASHTO minimums.

It is important to use good judgement, and each project should be reviewed by a traffic engineer.

Bike lanes were striped on this arterial by narrowing travel lanes

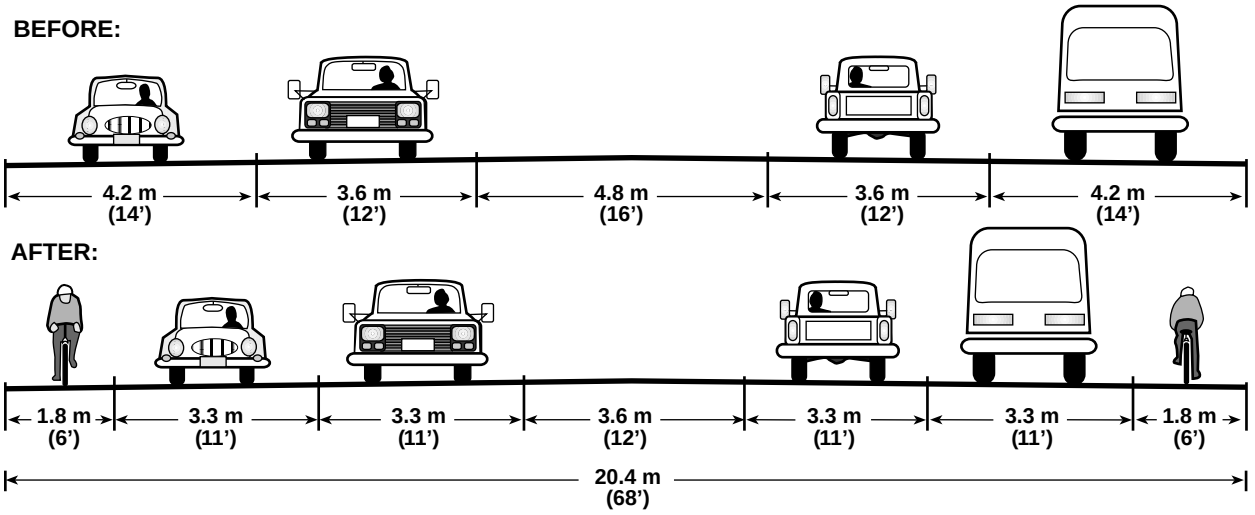


Figure 31: Reduced travel lane widths

A. REDUCE TRAVEL LANE WIDTHS

The need for full-width travel lanes decreases with speed:

- Up to 40 km/h (25 MPH): travel lanes may be reduced to 3 or 3.2 m (10 or 10.5 ft).
- 50 to 65 km/h (30 to 40 MPH): 3.3 m (11 ft) travel lanes and 3.6 m (12 ft) center turn lanes may be acceptable.
- 70 km/h (45 MPH) or greater: try to maintain a 3.6 m (12 ft) outside travel lane and a 4.2 m (14 ft) center turn lane if there are high truck volumes.

Bike lane created by narrowing travel lanes

B. REDUCE NUMBER OF TRAVEL LANES

Many one-way couplets were originally two-way streets. This can result in an excessive number of travel lanes in one direction. A study will determine if traffic can be handled with one less lane.

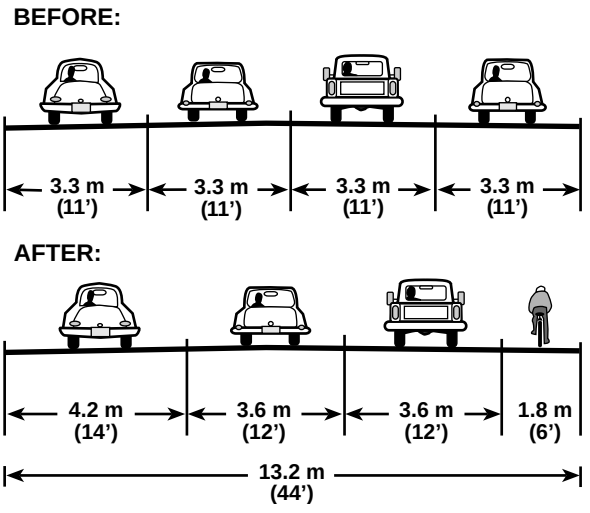


Figure 32: Travel lanes reduced from 4 to 3 on a one-way street

On two-way streets with four travel lanes and a significant number of left-turn movements, restriping for a center turn lane, two travel lanes, and two bike lanes can often improve traffic flow.

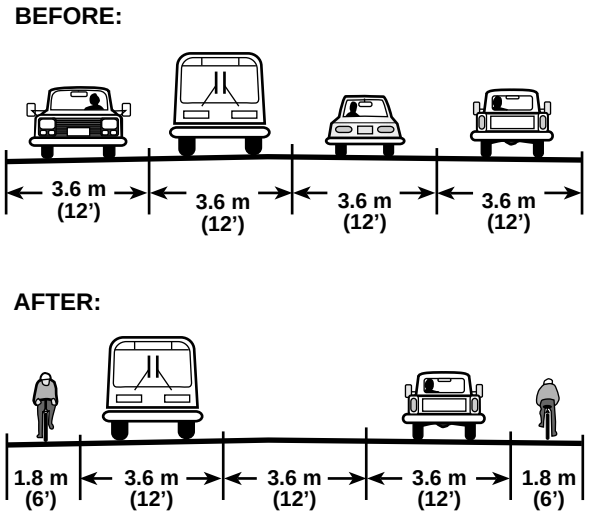


Figure 33: Travel lanes reduced from 4 to 2, with center turn lane

C. RECONSIDER THE NEED FOR PARKING

A roadway's primary function is to move people and goods, rather than to store stationary vehicles. When parking is removed, safety and capacity are generally improved. Removal of parking will require negotiations with the local governing body (such as city council), affected business owners and residents.

To stave off potential conflicts, careful research is needed before making a proposal, including:

- Counting the number of businesses/residences and the availability of both on-street and off-street parking.
- Selecting which side would be less affected by removal (usually the side with fewer residences or businesses, or the side with residences rather than businesses in a mixed-use neighborhood).
- Proposing alternatives such as:
  1. allowing parking for church or school activities on adjacent lots during services or special events,
  2. shared use by businesses, or
  3. constructing special parking spaces for residents or businesses with no other options.

Rather than removal of all on-street parking, several other options can be pursued:

C.1. NARROW PARKING LANE

Parking can be narrowed to 2.1 m (7 feet), particularly in areas with low truck parking volumes, as today's cars are smaller.

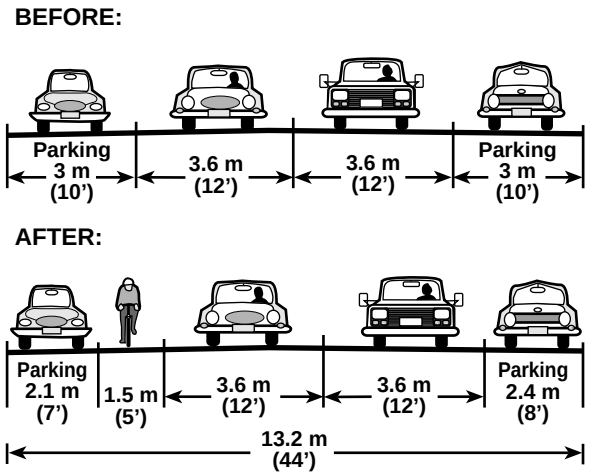


Figure 34: Narrowing parking on a one-way street

C.2. REMOVE PARKING ON ONE SIDE

In some cases, parking may be needed on only one side to accommodate residences and/or businesses. *Note: It is not always necessary to retain parking on the same side of the road through an entire corridor.*

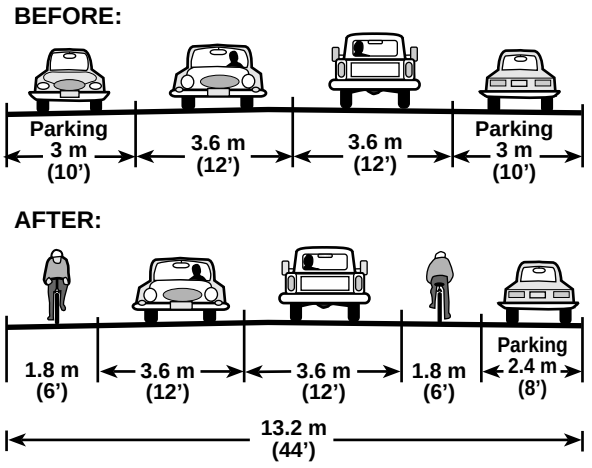


Figure 35: Parking removed on one side of a two-way street

Parking was removed from one side to provide bike lanes

C.3. CHANGE FROM DIAGONAL TO PARALLEL PARKING

Diagonal parking takes up an inordinate amount of roadway width relative to the number of parking spaces provided. It can also be hazardous, as drivers backing out cannot see oncoming traffic. Changing to parallel parking reduces availability by less than one-half.

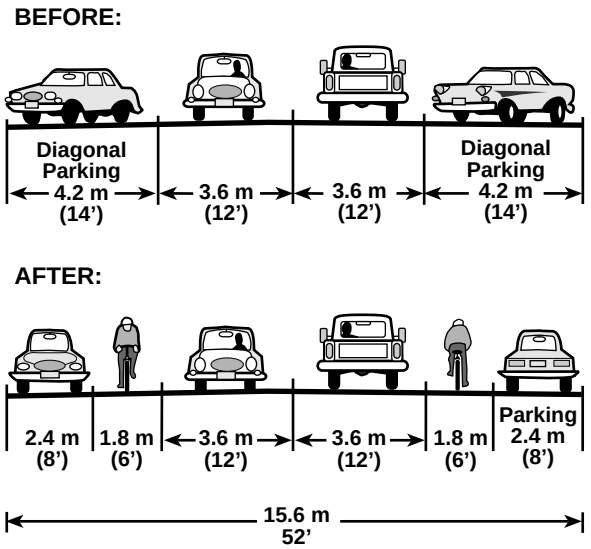


Figure 36: Changing from diagonal to parallel parking on two-way street

Special note: on one-way streets, changing to parallel parking on one side only is sufficient; this reduces parking by less than one-fourth.

C.4. PROHIBIT PARKING BY EMPLOYEES

Most business owners cite the fear of losing potential customers as the main reason to retain on-street parking. Many cities have had success with ordinances prohibiting employees from parking on the street. This could help increase the number of available parking for customers, even if the total number of parking spaces is reduced.

Special note: One parking place occupied by an employee for eight hours is the equivalent of 16 customers parking for half an hour, or 32 customers parking for 15 minutes.

C.5. REPLACING LOST PARKING

Where all of the above possibilities of replacing parking with bike lanes have been pursued, and residential or business parking losses cannot be sustained, innovative ideas should be considered to provide parking, such as with off-street parking.

Other uses of the right-of-way should also be considered, such as using a portion of a planting strip, where available:

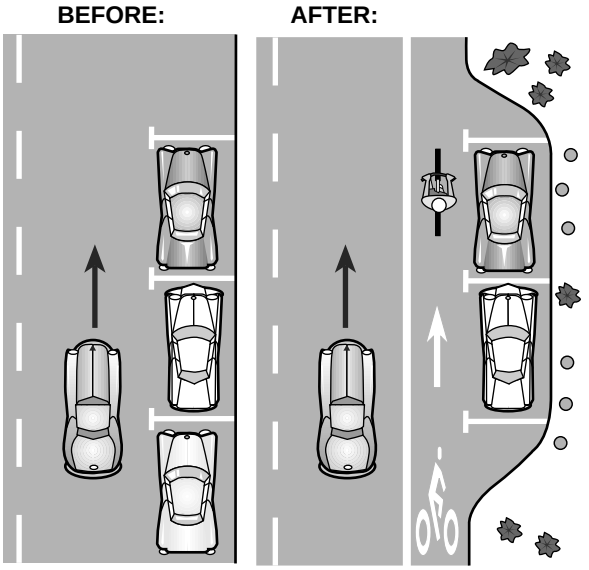


Figure 37: Providing parking when there are no reasonable alternatives

D. OTHER CONSIDERATIONS

Not all existing roadway conditions will be as simple to retrofit as those listed above. In many instances unique and creative solutions will have to be found.

Width restrictions may only allow for a wide curb lane (4.2-4.8 m/14-16 ft) to accommodate bicycles and motor vehicles.

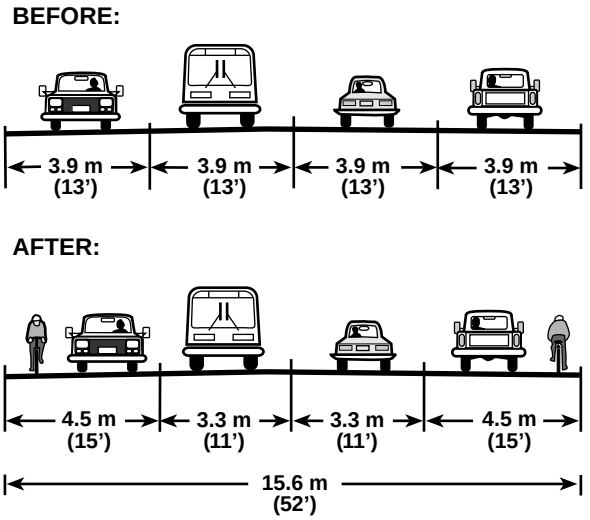


Figure 38: Restriping for wide curb lane

Bike lanes must resume where the restriction ends. It is important that every effort be made to ensure bike lane continuity. Practices such as directing bicyclists onto sidewalks or other streets for short distances should be avoided, as they may introduce unsafe conditions (See Figure 7, page 50).

Other minor improvements at the outer edge of the roadway should be made in conjunction with bike lane restriping, including:

- Existing drainage grates, manhole and utility covers should be raised flush to the pavement prior to striping a bike lane.
- Minor widening may be required to obtain adequate width; and
- Removal or relocation of obstructions away from the edge of roadway may gain some useable width. Obstructions can include guardrail, utility poles and sign posts.

E. ADDITIONAL BENEFITS

E.1. SAFETY BENEFITS

Safety is enhanced as travel lanes are offset from curbs, lanes are better defined, and parking is removed or reduced. Adding bike lanes can often improve sight distance and increase turning radii at intersections and driveways.

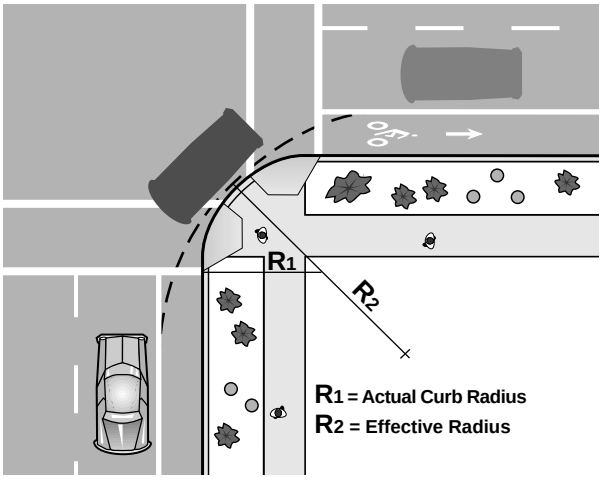


Figure 39: Effective radius at intersections is increased with bike lanes

E.2. PAVEMENT BENEFITS

Restriping travel lanes moves motor vehicle traffic over, which can help extend the pavement life, as traffic is no longer driving in the same well-worn ruts.

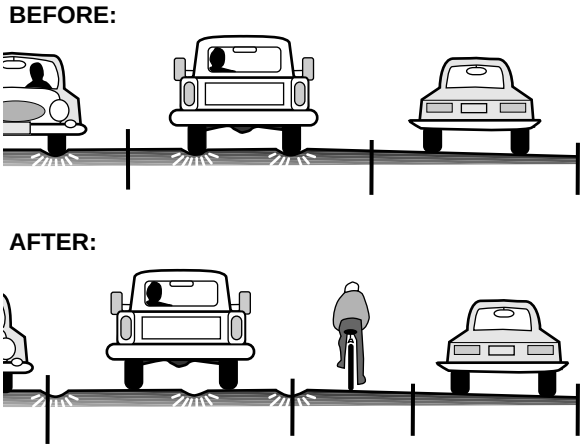


Figure 40: Motor vehicles no longer drive in wheel ruts after restriping

This street had four travel lanes before being reconfigured to three lanes and bike lanes

F. BIKE LANE WIDTHS

While it is important to maintain standards for bicycle facilities, there may be circumstances where restrictions don't allow full standards. The standard width for a bike lane is 1.8 m (6 ft).

Minimum widths are:

- 1.5m (5 ft) against a curb or adjacent to a parking lane, and
- 1.2 m (4 ft) on uncurbed shoulders. A 1.2 m (4-ft) curbed bike lane may be allowable where there are very severe physical constraints.

II.3. BICYCLE PARKING

INTRODUCTION

For a bikeway network to be used to its full potential, secure bicycle parking should be provided at likely destination points. Bicycle thefts are common and lack of secure parking is often cited as a reason people hesitate to ride a bicycle to certain destinations. The same consideration should be given to bicyclists as to motorists, who expect convenient and secure parking at all destinations.

Bicycle racks must be designed so that they:

- Do not bend wheels or damage other bicycle parts;
- Accommodate the high security U-shaped bike locks;
- Accommodate locks securing the frame and both wheels;
- Do not trip pedestrians;
- Are covered where users will leave their bikes for a long time; and
- Are easily accessed from the street and protected from motor vehicles.

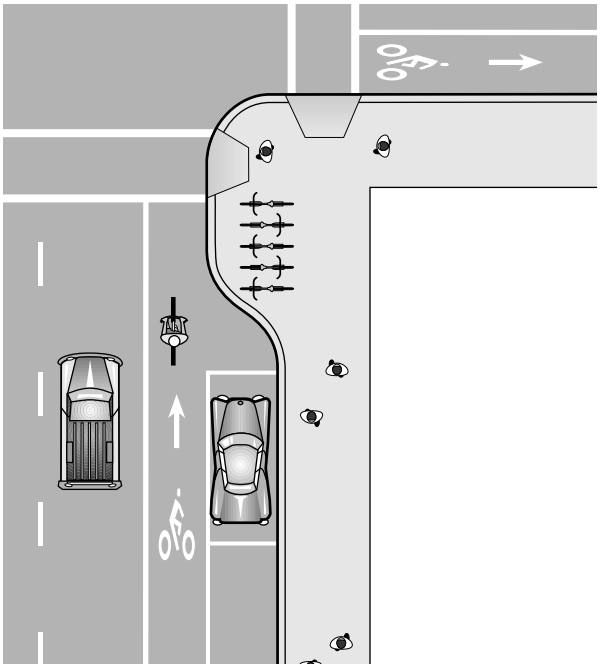


Figure 41: Bicycle parking provided away from main sidewalk area

Short-term parking by sidewalk cafe on downtown street

To provide real security for the bicycle (with its easily removed components) and accessories (lights, pump, tools and bags), either bicycle enclosures, lockers or a check-in service is required.

Bicycle parking facilities are generally grouped into 2 classes:

Long Term – Provides complete security and protection from weather; it is intended for situations where the bicycle is left unattended for long periods of time: apartments and condominium complexes, schools, places of employment and transit stops. These are usually lockers, cages or rooms in buildings.

Short Term – Provides a means of locking bicycle frame and both wheels, but does not provide accessory and component security or weather protection unless covered; it is for decentralized parking where the bicycle is left for a short period of time and is visible and convenient to the building entrance.

The following recommendations are presented to help cities and counties develop local bicycle parking ordinances.

A. RECOMMENDED STANDARDS

(The recommendations are in italics, followed by explanatory text)

A.1. DIMENSIONS

- *Bicycle parking spaces should be at least 1.8 m (6 ft) long and 0.6 m (2 ft) wide, and overhead clearance in covered spaces should be at least 2.1 m (7 ft).*
- *A 1.5 m (5 ft) aisle for bicycle maneuvering should be provided and maintained beside or between each row of bicycle parking.*
- *Bicycle racks or lockers should be securely anchored to the surface or a structure.*

These dimensions ensure that bicycles can be securely locked without undue inconvenience and will be reasonably safeguarded from theft as well as intentional or accidental damage.

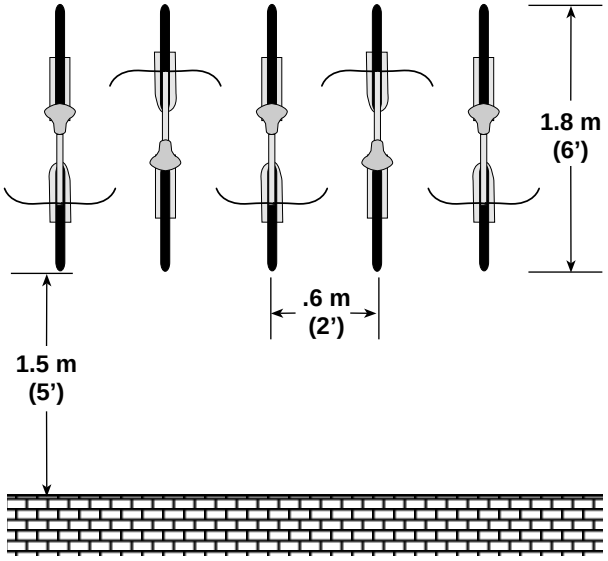


Figure 42: Bicycle parking dimensions

A.2. COVERED PARKING

- *Bicycle parking for residential, school and industrial uses should be covered.*
- *50% of bicycle parking for commercial uses should be covered.*
- *Where motor vehicle parking is covered, bicycle parking should also be covered.*
- *Where there are 10 or more bicycle parking spaces, at least 50% of the bicycle parking spaces should be covered.*

Pacific Northwest winters have mild temperatures and periods of intermittent rain. Many short trips can be made by bicycle without getting wet; however, if the bicycle must be left unattended for a long time, a rider might hesitate to leave it exposed to the weather.

Covered parking is necessary for long-term parking (mostly residential and employee uses). For customers, visitors and other occasional users, covered parking is also beneficial.

Covered spaces can be building or roof overhangs, awnings, lockers or bicycle storage spaces within buildings.

Covered parking needs to be visible for security, unless supplied as storage within a building. Covering should extend 0.6 m (2 ft) beyond the parking area, to prevent cross-winds from blowing rain onto bicycles.

A.3. LOCATION

- *Bicycle parking should be located in well lit, secure locations within 15 m (50 ft) of the main entrance to a building, but not further from the entrance than the closest automobile parking space, but in no case further than 15 m (50 ft) from an entrance where several entrances are involved.*

The effectiveness of bicycle parking is often determined by location. To reduce theft, a highly visible location with much pedestrian traffic is preferable to obscure and dark corners. Because of its smaller size, the bicycle can be parked closer to the rider's destination than a car.

Racks near entrances should be located so that there are no conflicts with pedestrians. Curb cuts at the rack location discourage users from riding the sidewalk to access the racks.

Many sites need two types of bicycle parking: short-term for customers, which should be up front; and long-term (covered) for employees, which may be placed farther away.

Separating bicycle from car parking by a physical barrier or sufficient distance protects parked bicycles from damage by cars.

Bicycle parking placed close to entrance of large retail store

- *Bicycle parking may also be provided inside a building in secure and accessible locations.*

This provides a high degree of security and protection, at the expense of some convenience. Dedicated rooms with card locks are very effective. Locating a room close to changing and showering facilities enhances its attractiveness.

- *Bicycle parking provided in the public right-of-way should allow sufficient passage for pedestrians: 1.8 m (6 ft)*

Bicycle parking may be provided within the public right-of-way in areas without building setbacks, subject to approval of local officials and provided it meets the other requirements for bicycle parking.

A.4. NUMBER OF SPACES

- *See Table 8 on page 90 for recommendations.*

The recommendations are based on specific and easily measurable criteria; e.g. size of buildings, number of residential units, number of classrooms, etc.

Combined parking could be allowed in areas of concentrated small businesses, such as downtowns and business parks. Publicly provided bicycle parking could also be used.

For park-and-ride lots, requirements need to relate the number of bicycle parking spaces to the probable service area; e.g. the number of residents within a five kilometer radius of a facility.

The amount, location and usage of bicycle parking should be monitored and adjusted to ensure that there is an adequate supply. If bicycle use increases, the need for bicycle parking may increase above that specified when facilities are constructed. Local jurisdictions may have to require additional bicycle parking to meet the demand.

Employment and retail centers should voluntarily provide additional parking to satisfy the demands of customers and employees.

B. SIGNING

- *Directional signs are needed where bicycle parking locations are not visible from building entrances or transit stops.*
- *Instructional signs may be needed if the design of bicycle racks isn't readily recognized as such.*
- *For security reasons, it may be desirable not to sign long-term employee parking within a building, to avoid bringing bicycles to the attention of potential thieves.*

C. OTHER RECOMMENDATIONS

Long-term bicycle parking spaces should be provided at no cost, or with only a nominal charge for key deposits, etc. This does not preclude the operation of private for-profit bicycle parking businesses. Residential parking spaces should be available to residents as part of rental or ownership contracts.

Short-term bicycle parking should be available near the building entrances of all land uses, and should be free.

LAND USE CATEGORY	MINIMUM REQUIRED BICYCLE PARKING SPACES	MINIMUM COVERED AMOUNT
Residential		
Multi-family residential, general	1 space per unit	100%
Multi-family residential, seniors or with physical disabilities	4, or 1 space per 5 units, whichever is greater	100%
Institutional		
Schools – Elementary	4 spaces per classroom	100%
Schools – Jr. Hi or Middle School	4 spaces per classroom	100%
Schools – Sr. High	8 spaces per classroom	100%
College	1 space per 4 students *(plus 1 space per student housing room/unit)*	100%
Transit Centers/Park & Ride Lots	5% of auto spaces *(or 100% of demand, depending on accessibility to bicyclists)*	100%
Religious Institutions	1 space per 40 seat capacity	25%
Hospitals	1 space per 5 beds	75%
Doctor, Dentist Offices	2, or 1 space per 1000 ft^2, whichever is greater	25%
Libraries, Museums, etc.	2, or 1 space per 1000 ft^2, whichever is greater	25%
Commercial		
Retail Sales	0.33 space per 1000 ft^2	50%
Auto-oriented Services	2 or 0.33 space per 1000 ft^2, whichever is greater	10%
Groceries/Supermarkets	0.33 space per 1000 ft^2	10%
Office	2, or 1 space per 1000 ft^2, whichever is greater	10%
Restaurant	1 space per 1000 ft^2	25%
Drive-in Restaurant	1 space per 1000 ft^2	25%
Shopping Center	0.33 space per 1000 ft^2	50%
Financial Institutions	2, or 0.33 space per 1000 ft^2, whichever is greater	10%
Theaters, Auditoriums, etc.	1 space per 30 seats	10%
Industrial		
Industrial Park	2, or 0.1 space per 1000 ft^2, whichever is greater	100%
Warehouse	2, or 0.1 space per 1000 ft^2, whichever is greater	100%
Manufacturing, etc.	2, or 0.15 space per 1000 ft^2, whichever is greater	100%

Notes:
Each individual use needs to be evaluated for bicycle parking - e.g. a commercial accessory use in an industrial district may have different requirements than the industrial uses around it. Similarly, in mixed-use developments, the amount of each use and required bicycle parking needs evaluation. Finally, within each use category one needs to consider the different user categories - residents, employees, customers, etc. - and parking requirements for each.

Jurisdictions may wish to develop provisions to allow requirement of additional bicycle parking exceeding these minimums where it is appropriate.

Table 8: Recommended bicycle parking spaces

II.4. WALKWAYS

A. TYPES OF WALKWAYS

Pedestrian Facilities include walkways, traffic signals, crosswalks and other amenities such as illumination and benches.

A Walkway is a transportation facility built for use by pedestrians and persons in wheelchairs. Walkways include:

SIDEWALKS, which are located along roadways, separated with a curb and/or planting strip, and have a hard, smooth surface. Sidewalks in residential areas are sometimes used by bicyclists, but cities may ban bicycle riding on sidewalks.

PATHS, which are typically used by pedestrians, cyclists, skaters and joggers (Multi-Use Paths). It is not realistic to plan and design a path for the exclusive use by pedestrians, as other users will be attracted to the facility. Paths may be unpaved, constructed with packed gravel or asphalt grindings, if they are smooth and firm enough to meet ADA requirements.

SHOULDERS, which can serve pedestrians in many rural areas. The shoulder widths recommended by AASHTO are usually adequate to accommodate pedestrians. In rural areas with a residential character, but with low population densities, shoulders should be wide enough to accommodate both pedestrian and bicycle traffic.

Wide planter strip increases pedestrian comfort

B. STANDARDS

B.1. SIDEWALKS

B.1.a. Width

The standard sidewalk width is 1.8 m (6 ft), exclusive of curb and obstructions. This width allows two pedestrians (including wheelchair users) to walk side by side, or to pass each other comfortably. It also allows two pedestrians to pass a third pedestrian without leaving the sidewalk. Where it can be justified and deemed appropriate, the minimum width may be 1.5 m (5 ft); on local streets, circumstances may include a combination of width constraints or low potential usage.

The minimum width for sidewalks directly adjacent to a motor vehicle lane is 1.8 m (6 ft). A level area outside the sidewalk should be provided on fills. Greater sidewalk widths are needed in high pedestrian use areas, such as central business districts.

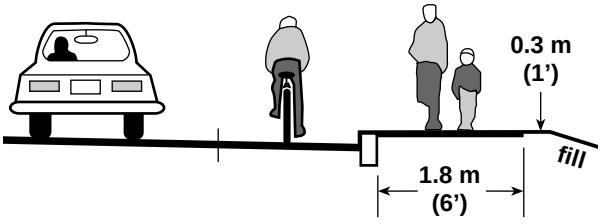


Figure 43: Standard sidewalk width

B.1.b. Obstructions

The standard sidewalk width is clear of obstructions such as sign posts, utility and signal poles, mailboxes, parking meters, fire hydrants, trees and other street furniture. Obstructions should be placed between the sidewalk and the roadway, to create a "buffer" for increased pedestrian comfort. Movable obstructions such as sign boards, tables and chairs must allow for a 1.8 m (6 ft) clear passage. Obstructions should not be placed in such a manner that they impair visibility by motorists.

Clearance to vertical obstructions (signs, trees, etc.) must be at least 2.1 m (7 ft):

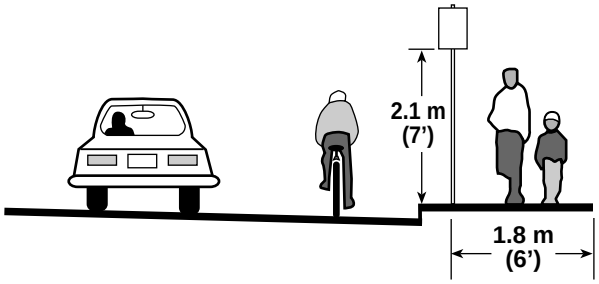


Figure 44: Sidewalk clearances

Cars parked perpendicular or diagonally to sidewalks can be obstructions if there is excessive overhang. Blocks can be used to prevent narrowing the usable sidewalk width:

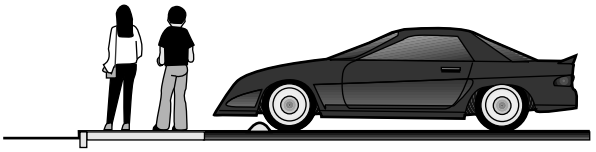


Figure 45: Reducing overhang from parked cars

B.1.c. Shy distance

An additional 0.6 m (2 ft) shy distance is needed from shoulder-high vertical barriers such as buildings, sound walls, retaining walls and fences:

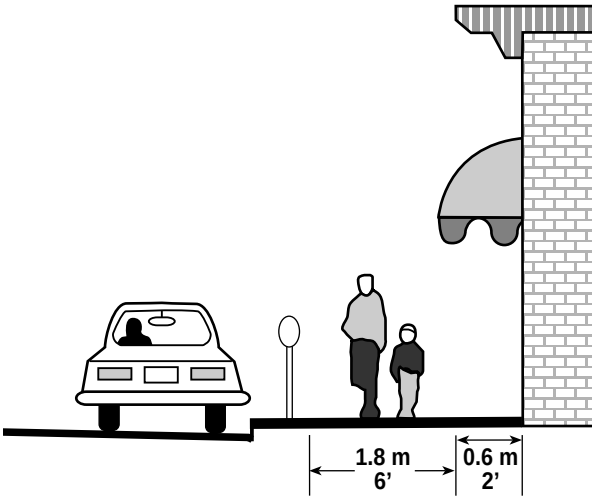


Figure 46 : Sidewalk against wall

Note: ADA requires that "objects protruding from walls (e.g. signs, fixtures, telephones, canopies) with their leading edge between 27" and 80" (685 and 2030 mm) above the finished sidewalk shall protrude no more than 4" (100 mm) into any portion of the public sidewalk." (ADAAG 14.2.2)

B.1.d. Planting Strips

Well-designed streets include planting strips. A planting strip should be 1.5 m (5 ft) wide or greater (min. 0.9 m [3 ft]), and landscaped with low-maintenance plantings.

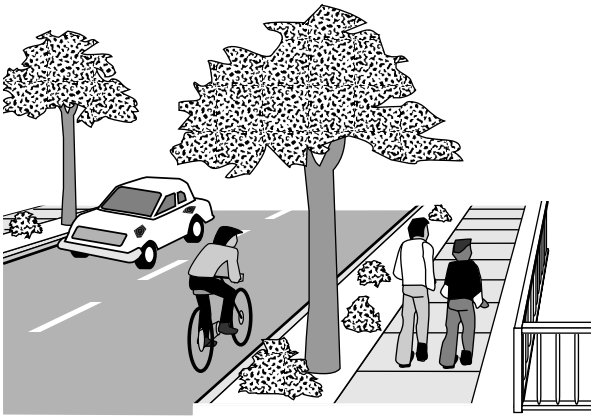


Figure 47 : Street with planting strip

The extra separation from motor vehicle traffic decreases road noise, prevents water in puddles from splashing onto sidewalk users and generally increases a walker's sense of security. Planting strips offer many other benefits to pedestrians:

- Room for street trees;
- Room for sign posts, utility and signal poles, mailboxes, parking meters, fire hydrants, etc.:

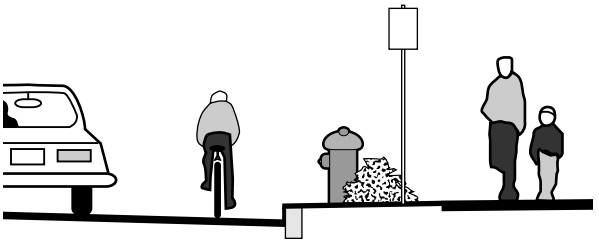


Figure 48: Sidewalk with planting strip

- When wide enough, a place for a motor vehicle to wait out of the stream of traffic while yielding to a pedestrian in a driveway:

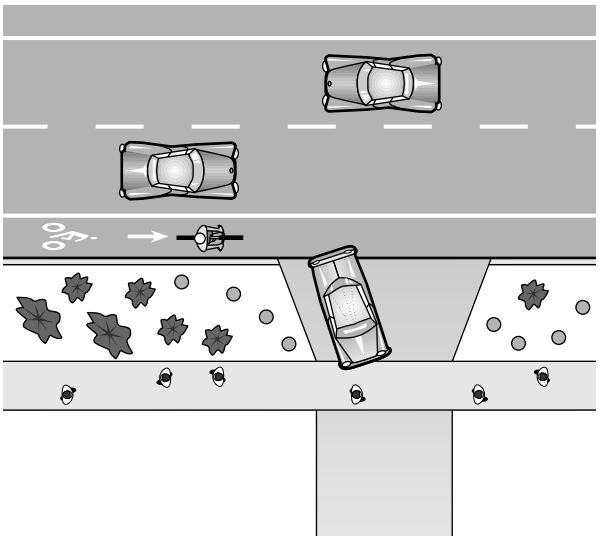


Figure 49: Wide planting strip adds room for turn movements

- The opportunity to line up sidewalks, curb cuts and crosswalks at intersections:

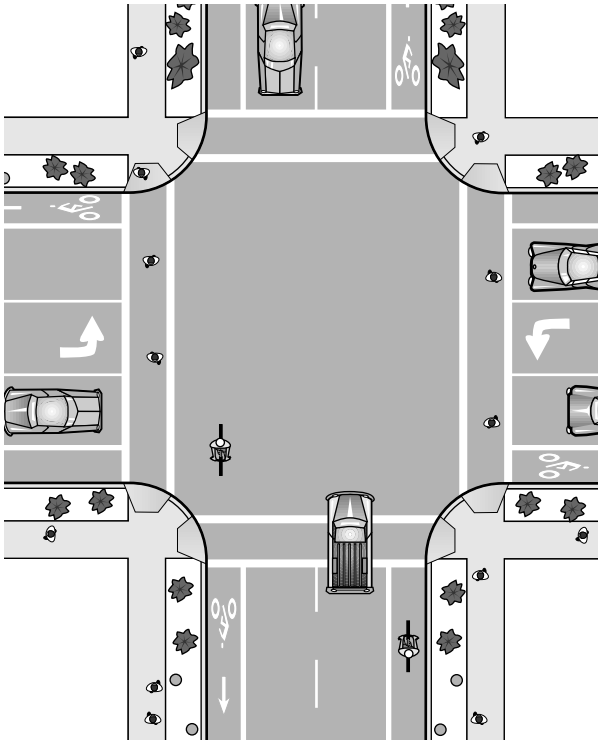


Figure 50: Sidewalks, curb cuts and crosswalks lined up

- An enhanced environment for wheelchair users, as the sidewalk can be kept at a constant side slope, with the slope for driveways built into the planting strip section:

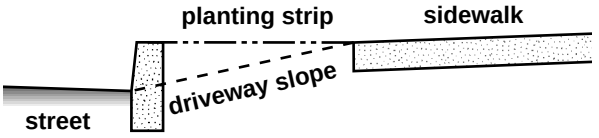


Figure 51: Planting strip at driveway (and effect on cross-slope)

- An opportunity for aesthetic enhancements such as landscaping (plants should be selected that require little maintenance and watering, and whose roots will not buckle sidewalks);
- Less runoff water, decreasing overall drainage requirements.
- A place to store snow during the winter.
- Easier identification of driveways by motorists.

Where constraints preclude the use of the same width throughout a project, the planting strip can be interrupted and resume where the constraint ends:

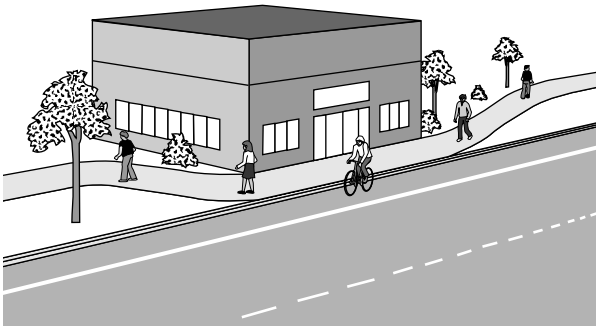


Figure 52: Planting strip constraints

Trees, street furniture and other objects should not obscure pedestrians, bicyclists and signs.

B.1.e. High-Speed Corridors

Sidewalks must not be placed directly adjacent to a high-speed travel lane (design speed 70 km/h [45 MPH] and above). Acceptable buffers include a planting strip, a shoulder barrier, a parking lane or a bike lane. Buffers are also beneficial on lower speed facilities.

Wide sidewalk on bridge with parking meters

B.1.f. Bridges

The standard width for sidewalks on bridges is 2.1 m (7 ft) (min. 1.8 m [6 ft]), to account for a shy distance from the bridge rail - some pedestrians feel uncomfortable walking close to a high vertical drop. The bridge sidewalk must not be narrower than the approach sidewalk; in instances where the approach sidewalks are of differing widths, the lesser of the two widths may be used on the bridge. Sidewalks on bridges with design speeds greater than 65 km/h (40 MPH) require a vehicle barrier at curb line. Bridge pedestrian rails should be the standard 1.1 m (42") height.

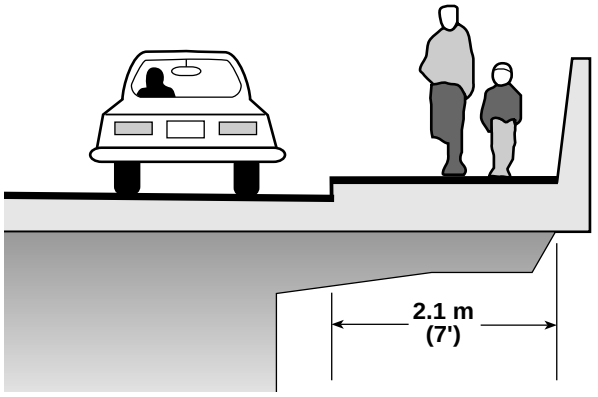


Figure 53: Sidewalk on bridge

B.1.g. Surfacing

The preferred material for sidewalks is Portland Cement Concrete (PCC), which provides a smooth, durable finish that is easy to grade and repair.

Asphaltic Concrete (A/C) may be used if it can be finished to the same surface smoothness as PCC. A/C is susceptible to break up by vegetation, requires more frequent maintenance and generally has a shorter life expectancy (15-20 years versus 40 years or more for PCC).

Brick pavers can provide an aesthetically pleasing effect if the following concerns are addressed:

- They should be laid to a great degree of smoothness;
- The surface must be slip-resistant when wet; and
- Long-term maintenance costs should be considered.

C. PATHS

C.1. UNPAVED PATHS

In general, the standard width of an unpaved path is the same as for sidewalks. An unpaved path should not be constructed where a sidewalk is more appropriate.

The surface material should be packed hard enough to be usable by wheelchairs and children on bicycles (the roadway should be designed to accommodate more experienced bicyclists).

Recycled pavement grindings provide a suitable material: they are usually inexpensive and easy to grade (this should be done in the summer, when the heat helps pack and bind the grindings).

C.2. PAVED PATHS

See page 117 for standards for multi-use paths.

D. SHOULDER STANDARDS

Refer to Table 7 on page 67. Where shoulders are expected to be used by bicyclists and pedestrians, shoulders should be 1.8 m (6 ft) or wider. High pedestrian use indicates that sidewalks are necessary.

E. TRANSIT STOPS

E.1. SIDEWALKS

At transit stops, sidewalks should be constructed to the nearest intersection or to the nearest section of existing sidewalk. It may be necessary to wrap a sidewalk around a corner to join an existing sidewalk on a side street. If a transit route does not have complete sidewalks, it is still important to provide a suitable area for waiting pedestrians.

ADA requires a 2.4 m (8 ft) by 1.5 m (5 ft) landing pad at bus entrances and exits. To avoid the choppy effect this creates at permanent bus stop locations, it may be preferable to construct a continuous 2.4 m (8 ft) wide sidewalk the length of the bus stop, or at least to the front and rear bus doors.

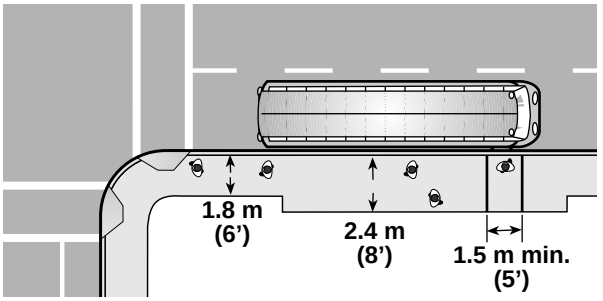


Figure 54: Bus stop pad

At stops in uncurbed areas, the shoulder should be 2.4 m (8 ft) wide to provide a landing pad.

E.2. BUS SHELTERS

A standard-size bus shelter requires a 1.8 x 3 m (6 x 10 ft) pad, with the shelter placed no closer than 0.6 m (2 ft) from the curb. The adjacent sidewalk must still have a 1.8 m (6 ft) clearzone. Orientation of the shelter should take into account prevailing winter winds. Bike racks should be considered at bus stops in urban fringe areas.

Each transit agency may have its own standards for bus shelter pads; walkway construction should be coordinated with local transit agencies to ensure compatibility.

E.3. BUS PULLOUTS

Where traffic conditions warrant a bus pullout at an intersection, a far-side location is preferred. The needs of passengers boarding or exiting a bus should not conflict with the needs of pedestrians and bicyclists moving through the area. A curb extension helps pedestrian crossing movements, prevents motorists from entering the bus pullout area and reduces conflicts with through bicyclists. Each pullout should be designed to meet roadway conditions and bus characteristics.

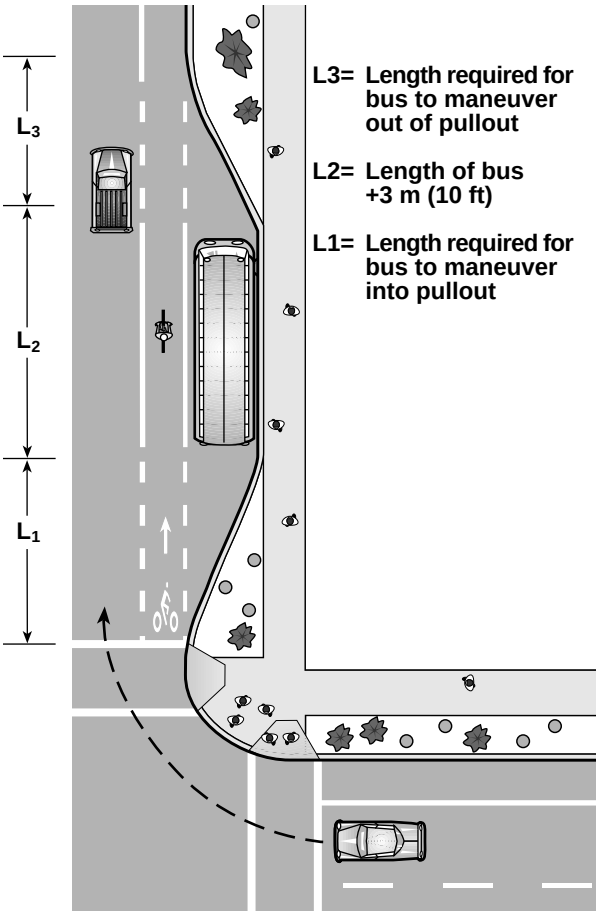


Figure 55: Far side bus pullout at intersection

On streets with parking, near-side bus stops also benefit from curb extensions, so passengers can board or dismount the bus directly without stepping onto the street. This also makes it easier to meet ADA requirements (the bus pulls up right next to the curb), and requires less removal of on-street parking (curb-side bus stops require up to 80' of no-parking zone).

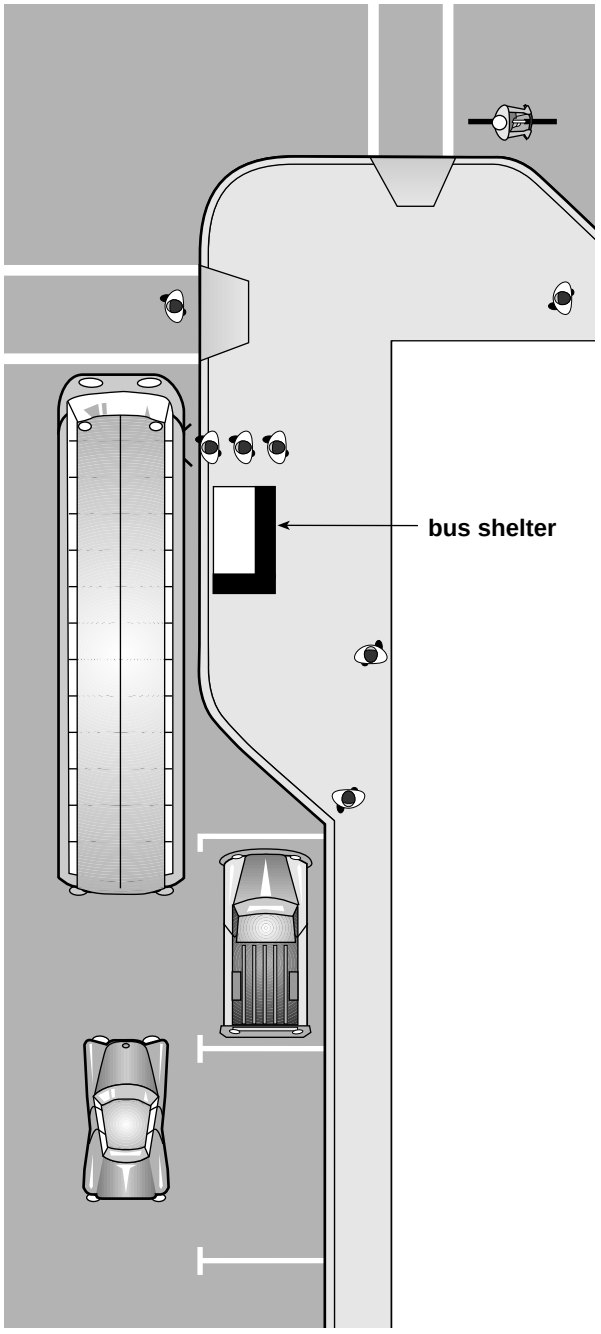


Figure 56: Near-side curb extension at intersection

Bus stop with curb extension

Bus pullout near shopping center

Transit stop at shopping mall entrance reduces walking distance

F. ACCOMMODATING THE DISABLED

The Americans with Disabilities Act (ADA) requires that transportation facilities accommodate the disabled. For most practical purposes, mobility- and vision-impaired pedestrians need special attention.

ODOT walkway standards meet or exceed minimum ADA requirements. Some minor improvements can greatly improve accessibility. The following general requirements are not discussed in detail; the ADAAG (Americans with Disabilities Act Accessibility Guidelines) and ODOT Standard Drawings should be used to construct curb cuts and driveways.

F.1. WIDTH

ADA requires a minimum passage of 1 m (3 ft). The standard sidewalk width of 1.8 m (6 ft) exceeds this requirement. If a 1 m (3 ft) walk is used, 1.5 m X 1.5 m (5 ft X 5 ft) passing areas are required at 60 m (200 ft) intervals (max.).

F.2. GRADES

The following standards pertain mostly to the grade of separated paths on independent alignments (sidewalk curb cuts have their own requirements). Where sidewalks are directly adjacent to a roadway, they may follow the natural grade of the land.

The maximum grade of ramps and separated pathways is 5%. A maximum grade of 12:1 (8.33%) is acceptable for a rise of no more than 0.75 m (2.5 ft) if a level landing at least 1.5 m (5 ft) long is provided at each end.

While this may be suitable for short distances, such as a ramp to the entrance of a building, a 12:1 slope followed by a level landing over a long distance creates a choppy effect that is hard to construct. The overall grade achieved by this design is 7.1%. It may be preferable to extend the ramp length to achieve a constant 5% grade.

A 1.5 m (5 ft) landing should also be provided wherever the grade changes abruptly, such as between closely-spaced driveways.

F.3. CROSS-SLOPE

The maximum allowable cross-slope for a walkway is 2%. At driveways, curb cuts and road approaches (in crosswalks, marked or unmarked), a 1 m (3 ft) minimum wide area must be maintained at 2%:

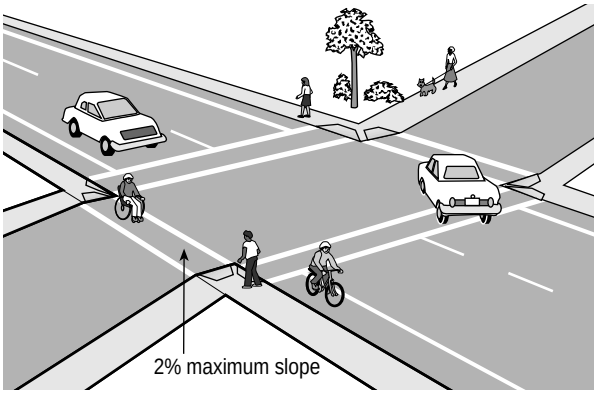


Figure 58: 2% Cross-slope maintained through crosswalk

Level area maintained in crosswalk

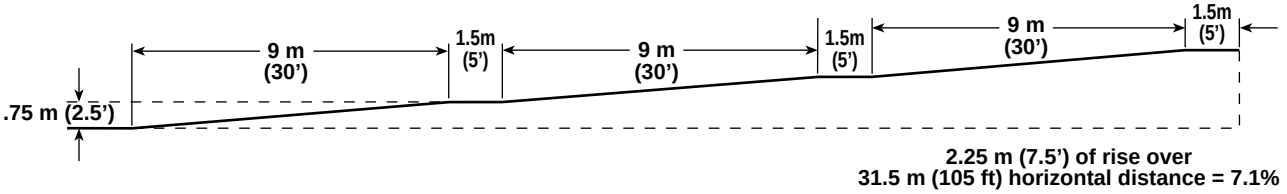


Figure 57: Maximum allowable grades

To facilitate wheelchair movement at driveways, the following techniques prevent an exaggerated warp and cross-slope:

- Reducing the number of accesses reduces the need for special provisions; this strategy should be pursued first;
- Constructing wide sidewalks avoids excessively steep driveway slopes; the overall width must be sufficient to avoid an abrupt driveway slope:

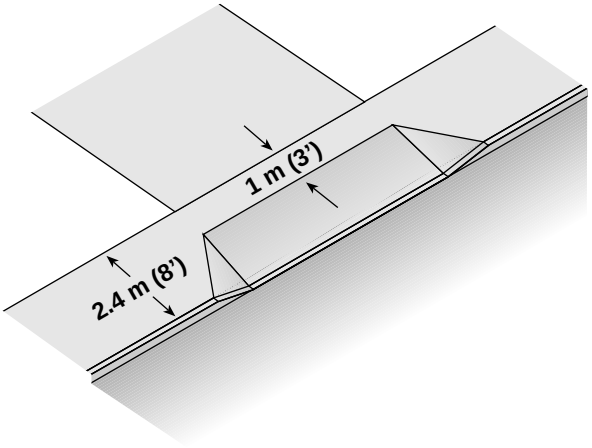


Figure 59: Wide sidewalk at driveway

- Planting strips allow sidewalks to remain level, with the driveway grade change occurring in the planting strip:

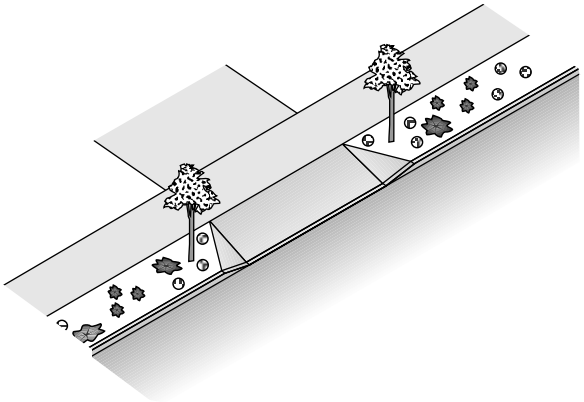


Figure 60: Driveway with planting strip

- Where constraints don't allow a planting strip, wrapping the sidewalk around driveway entrances has a similar effect (this method may have disadvantages for the vision-impaired who follow the curb line for guidance):

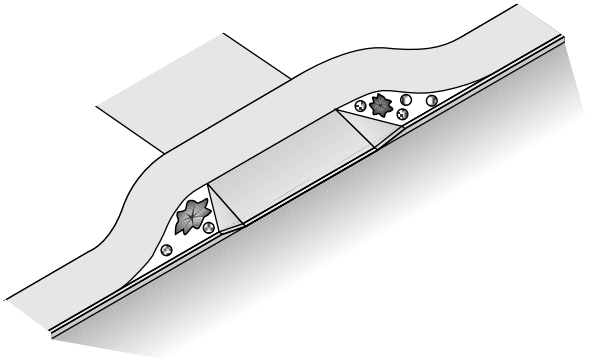


Figure 61: Sidewalk wrapped around driveway

- When constraints allow for only minimal sidewalks behind the curb, dipping the entire sidewalk at approaches keeps the cross-slope at a constant grade. This may be uncomfortable for pedestrians and may create drainage problems behind the sidewalk.

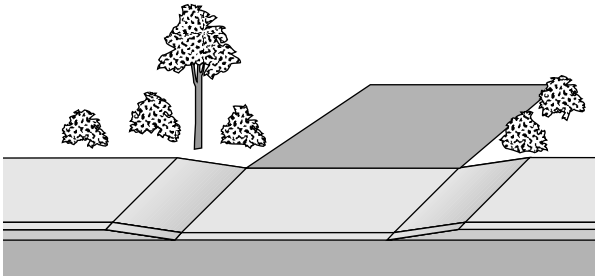


Figure 62: Entire sidewalk dips at driveway

Sloping driveway creates difficulties for wheelchair users

F.4. CURB-CUTS

ADA requires two curb-cuts per corner at intersections for new construction (one oblique cut may direct users into the travelway). A 1 m (3 ft) wide passage with a cross slope of 2% must be maintained behind curb cuts.

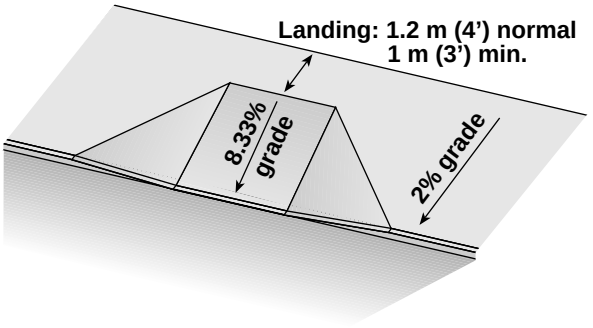


Figure 63: 1 m (3 ft) wide area at 2% cross-slope on sidewalks

F.5. FACILITIES FOR THE VISION-IMPAIRED

Pedestrian facilities should be designed so people with impaired vision can track their way across approaches and through intersections. Most recommended practices for sidewalk construction satisfy these requirements.

The most critical areas for the vision impaired are locations where the crossing points may not be readily apparent to motorists, for example at a corner with a large radius. There are several techniques that enhance the environment for the vision-impaired:

- Placing crosswalks in areas where they are expected (in line with curb cuts and sidewalks);
- Providing audible pedestrian signals at busy intersections; and
- Using special surface texture at curb-cuts to identify the placement of the crosswalk.

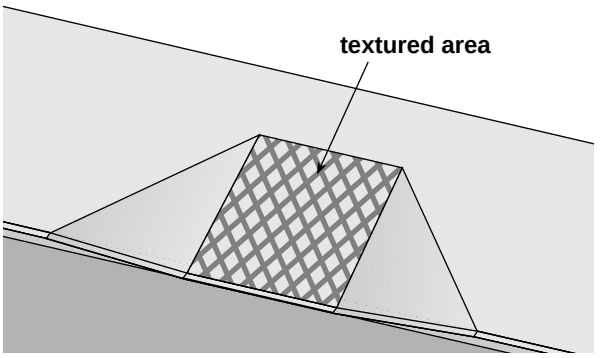


Figure 64: Textured ramp

Curb-cut retrofit projects improve accessibility

G. ADDITIONAL PEDESTRIAN FACILITIES

Since pedestrians are exposed to the weather and use their own energy to move, several low-cost improvements can be made to provide a better environment.

G.1. BENCHES

People walking want to sit down and rest occasionally. In an urban setting, wide sidewalks and curb extensions provide opportunities for placing benches outside of the pedestrian traffic stream.

G.2. SHELTERS

At bus stops, transfer stations and other locations where pedestrians must wait, a shelter makes the wait more comfortable. People are more likely to ride a bus if they don't have to wait in the rain.

G.3. AWNINGS

Where buildings are close to the sidewalk, awnings protect pedestrians from the weather and can be a visual enhancement to the shopping district.

G.4. LANDSCAPING

The outer edge of a roadway is often neglected and unpleasant; yet this is where pedestrians are expected to travel. Landscaping can greatly enhance the aesthetic experience, making the walk less stressful or tiring. Landscaping can increase the effectiveness of a planting strip as a buffer between travel lanes and sidewalks, as well as mask features such as soundwalls.

Choosing appropriate plants and ground preparation is important. The following guidelines should be considered:

- Plants should be adapted to the local climate and fit the character of the surrounding area - they should survive without protection or intensive irrigation, and should require minimal maintenance, to reduce long-term costs.
- Plants must have growth patterns that do not obscure pedestrians from motor vehicles, especially at crossing locations, nor must they obscure signs.
- Plants should not have roots that could buckle and break sidewalks (root barriers should be placed to prevent such buckling).
- Planting strips should be wide enough to accommodate plants grown to mature size.
- The soil should be loosened and treated (with mulching materials) deep enough so plants can spread their roots downward, rather than sideways into the walk area.

G.5. WATER FOUNTAINS & PUBLIC REST ROOMS

Strategically placed water fountains make it easier for pedestrians to be outdoors for a long time and to walk long distances.

Statues add interest to the streetscape

Well-placed public rest rooms make it easier for pedestrians to stay outdoors without worrying about where to find a business that will accommodate their needs.

G.6. MAPS

Local walking maps make it easier for pedestrians to find their way to points of interest in a new urban environment. They are especially useful when combined with transit maps. So far, no standards have been developed.

H. OTHER CONSIDERATIONS

H.1. ALLEYS

Alleys in urban areas can present problems for pedestrians if sight distance is limited and if the alley is surrounded by buildings adjacent to the sidewalk: pedestrians are often not noticed by drivers exiting an alley. Several measures can be taken to improve pedestrian visibility:

- Continuing the surface design (texture and color) of the sidewalk through the alley crossing, so motorists know they are entering a pedestrian zone;
- Placing stop signs;
- Placing a speed hump before the front of a vehicle protrudes onto the sidewalk; and
- Placing mirrors so drivers can see approaching pedestrians.

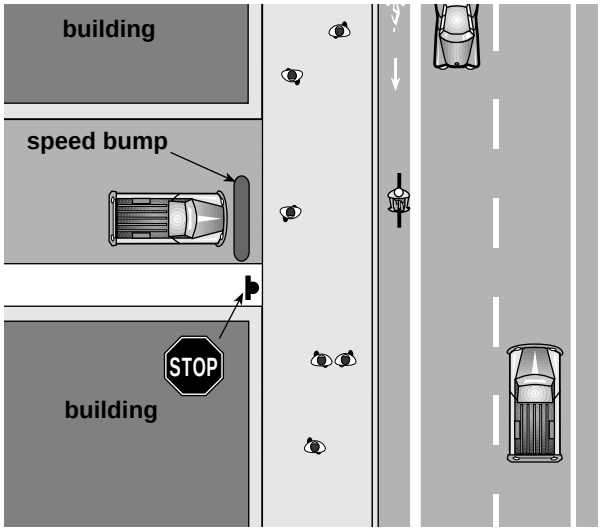


Figure 65: Alley approaching sidewalk

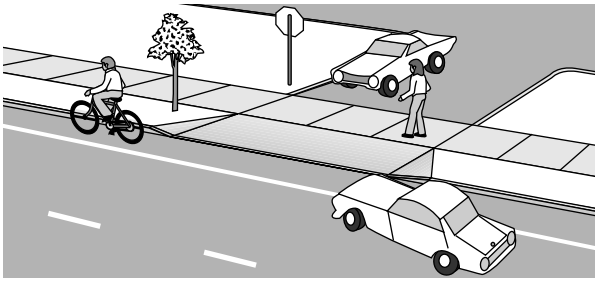
H.2. DRIVEWAYS

Accesses onto private property can be built as conventional driveways, or with designs that resemble street intersections. For pedestrian safety and comfort, the conventional driveway type is preferred, for the following reasons:

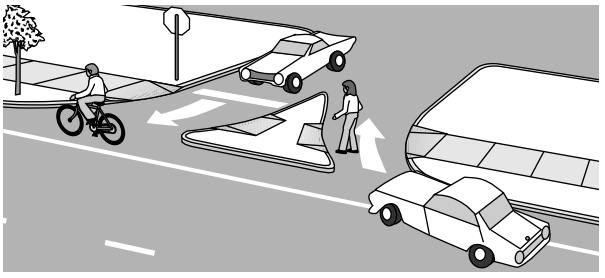
- Motorists must slow down more when turning into the driveway; and
- The right of way is clearly established, as motorists cross a sidewalk.

Intersection-type driveways have the following disadvantages for pedestrians:

- Motorists can negotiate the turn at faster speeds; and
- The right of way is not as clearly established, as the roadway appears to wrap around the curb line.



Conventional driveway slows turning vehicles



This style of driveway may encourage high-speed turns

Figure 66: Driveway configurations and their effect on pedestrians

Where an intersection-style driveway is used (such as to implement a “right-in, right-out” policy), the following techniques can be used to alleviate the above concerns:

- The street surface material should not carry across the driveway - rather, the sidewalk should carry across the driveway, preferably at sidewalk height, so motorists know they are entering a pedestrian area;
- The radius of the curb should be kept as small as possible;
- Driveway widths should be the minimum needed for entering and exiting vehicles; and
- Where the volume of turning vehicles is high, right-turn channelization should be considered, to remove slower turning vehicles from the traffic flow, allowing them to stop for pedestrians; or a traffic signal should be considered where the turning movements are very high.

I. PRACTICES TO BE AVOIDED

I.1. OBSTRUCTIONS IN SIDEWALK

The full sidewalk pavement width should be maintained to the extent possible. Permanent fixtures such as mailboxes, poles and sign posts should be placed outside of the sidewalk, or the sidewalk should be enlarged or wrapped around to avoid these obstructions.

Poles in sidewalk

Sidewalk wraps around poles

Signs in sidewalk

I.2. NARROW SIDEWALKS

Though ADA does specify a 1 m (3') minimum clear passage, this is inadequate for pedestrian use. The 1.5 m (5') ODOT minimum standard should be applied wherever possible.

This sidewalk, along a busy street, is too narrow for comfort

I.3. DISCONTINUOUS SIDEWALKS

Sidewalks must link up to each other, or to a defined origin or destination point.

Wheelchair user is forced into street where sidewalk is missing

I.4. STEEP CROSS-SLOPE

Severe cross-slopes hinder movements of wheelchair users. Where the ADA 2% maximum cannot be achieved, attempts should be made to reduce cross-slope as much as possible.

Steep cross-slope tilts wheelchair

I.5. BROKEN PAVEMENT

Sidewalks in poor repair are difficult for wheelchair users to negotiate. Even able-bodied pedestrians have difficulty walking through badly broken pavement.

Sidewalk in disrepair

Wheelchair can't proceed here

I.6. ENCROACHING VEGETATION

Bushes, shrubs and trees can reduce sidewalk width and obscure visibility. Maintenance should be scheduled to ensure that plants are trimmed on a regular basis.

Overgrown shrub obscures visibility of pedestrians

I.7. INACCESSIBLE CROSSWALKS

Any open leg of an intersection should lead to a sidewalk.

Crosswalk is inaccessible because of guardrail

J. OTHER INNOVATIVE DESIGNS

These concepts are presented as information, to help ODOT, cities and counties to come up with new solutions to common problems.

J.1. SIDEWALKS WITHOUT CURB & GUTTER

Most sidewalks are separated from the roadway with a curb. The main functions of a curb are for drainage and as a positive separation for motor vehicles. Curb and gutter add substantially to the cost of sidewalks in areas where no storm drain system is in place.

In situations where sidewalks are needed, but the high cost of curb and drainage cannot be justified, or where curbs don't fit the character of the street, two designs enable sidewalks to be constructed without curb and drainage: sidewalks behind the ditch and soft sidewalks.

J.1.a. Sidewalks Behind the Ditch

On roads with a rural character, where drainage is provided with an open ditch, and where there is sufficient right-of-way, sidewalks may be placed behind the ditch.

The sidewalk should be built to the same standard as curbed sidewalks: 1.8 m (6 ft) wide (1.5 m [5 ft] min.). If the traffic on the road is high, bicyclists should be accommodated with on-road bike lanes or shoulders. Gravel driveways should be paved back 5 m (15 ft) to avoid debris accumulation on the sidewalks.

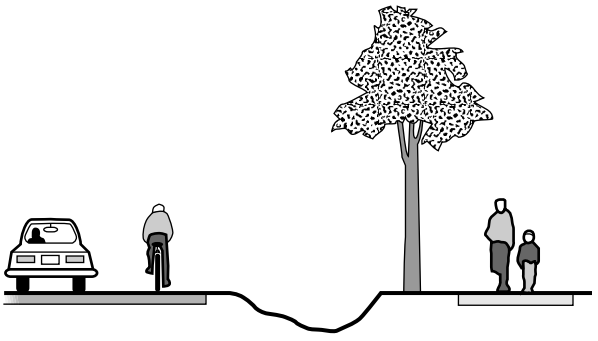


Figure 67: Sidewalk behind the ditch

J.1.b. "Soft Sidewalks"

A "soft sidewalk" has no curb separating the roadway from the walkway. This treatment may be appropriate in areas of moderate precipitation and low traffic volumes and speeds. Sidewalks are separated by a brick paver strip, gravel or other permeable material, so runoff water can percolate. A change in surface texture is needed for vision-impaired pedestrians to detect the edge of walkway with a cane.

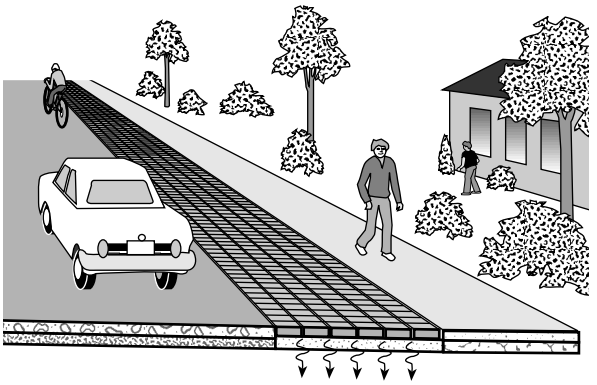


Figure 68: Soft sidewalk

Awning and trees provide shade

II.5. STREET CROSSINGS

INTRODUCTION

Walkways along a road provide mobility in one direction, but a successful pedestrian network also requires safe and convenient crossing opportunities. Wide roads carrying large traffic volumes can be obstacles to pedestrians, making facilities on the other side difficult to access.

Safe street crossings also benefit motorists: an automobile driver parking on one side of the road may desire access to points across the street. A pedestrian system with sidewalks and crossing opportunities allows a driver to park once and walk to several destinations.

Most pedestrian crashes occur when a pedestrian crosses a road, often at locations other than intersections. Mid-block crossings are a fact that planners and designers need to consider: people will take the shortest route to their destination. Prohibiting such movements is counter-productive if pedestrians dash across the road with no protection. It is better to design roadways that enable pedestrians to cross safely.

A. CROSSWALKS DEFINED

Oregon law defines a crosswalk as the prolongation of a curb, sidewalk or shoulder across an intersection, whether it is marked or not. Outside an intersection, a crosswalk is created with markings on the road. If a pedestrian is in a crosswalk, all drivers on that half of the street are required to yield the right of way to the pedestrians. See ORS 801.220 in Appendix I for the complete legal definition of a crosswalk.

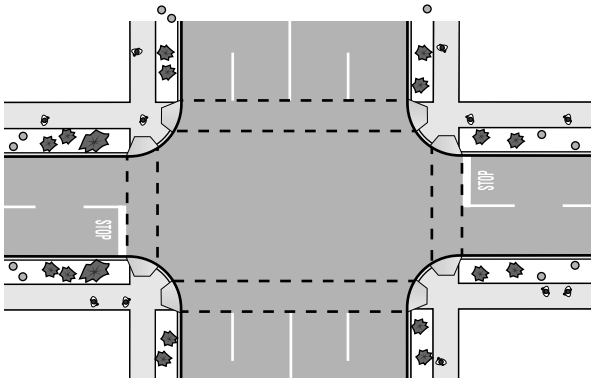


Figure 69: Unmarked crosswalks

B. LEGAL CROSSING MOVEMENTS

"Jay-walking" does not necessarily mean crossing a street outside of a crosswalk, marked or unmarked. The Oregon Vehicle Code states that it is illegal for pedestrians to:

- Cross a street against a traffic signal;
- Cross the street outside of a crosswalk without yielding to automobile traffic;
- Cross the street outside of a crosswalk at an intersection; and
- Proceed in a crosswalk in a manner that causes an immediate hazard to an approaching motor vehicle.

The right of way laws are:

- At crosswalks, marked or unmarked, the pedestrian has the right of way (ORS 811.010, 015 & 020).
- At other locations, crossing is allowed, but the pedestrian must yield to motor vehicles (ORS 814.040). Some local jurisdictions have passed ordinances prohibiting crossings outside of crosswalks in the Central Business District between signalized intersections.

Curb extension and refuge island

C. IMPROVING CROSSING OPPORTUNITIES

To increase pedestrian crossing opportunities and safety, two approaches can be considered:

1. Designing roads that allow crossings to occur safely by incorporating design features such as raised medians or signal timing that creates gaps in traffic; or
2. Constructing actual pedestrian crossings with pedestrian activated signals, mid-block curb extensions, marked crosswalks, etc.

C.1. ISSUES

Safe and convenient pedestrian crossings must be considered when planning and designing urban roadways. The following issues should be addressed when seeking solutions to specific problems:

C.1.a. Level of Service (LOS) & Design Standards

Appropriate design standards take into account the needs of all users. Pedestrian access and mobility should be considered when determining the desirable LOS for a roadway. In some areas, pedestrian needs should be elevated above the needs of motorized traffic (e.g. downtown, near schools or parks). Pedestrians are less visible and less protected than motorists; well-designed roads take this into account.

In general, there is an inverse relationship between traffic volumes or speeds and the ease of pedestrian crossing, which can lead to conflicting goals when determining priorities for a roadway:

- Some motor vehicle designs may reduce pedestrian crossing safety (e.g. a high number of wide travel lanes increases the distance a pedestrian must cross);
- Some designs that facilitate pedestrian crossings may reduce capacity (e.g. pedestrian signals);
- Other design features benefit all users (e.g. improved sight distance at intersections and raised medians).

In some cases, actual travel speeds may be higher than is appropriate for the adjacent land use, and improvements that facilitate crossing may be useful in reducing traffic speeds to desirable and legal limits. Minor collectors and residential streets often carry more fast-moving traffic than the street is designed to carry. The design of a road should not encourage excessive speeds; even a major arterial can be treated for pedestrian safety without degrading capacity.

Textured crosswalk

C.1.b. Land Use

As the number and density of pedestrian-accessible origin and destination points increase, so does the demand for pedestrian crossings. On corridors with scattered development and residences, it is difficult to predict where crossings may occur. On corridors with concentrated nodes of activity, special crossing treatments are easier to justify at locations where crossings will likely occur (apartment complexes, senior citizen centers, schools, parks, shopping areas, libraries, hospitals and other public or institutional uses).

Planners and transportation officials must work together to ensure that land use is compatible with the roadway design, and vice versa.

C.1.c. Transit Stops

Most transit users will have to cross the road to access a transit stop on one leg of their trip. Cooperation between public transit agencies and transportation designers is essential to

ensure safe pedestrian crossings. By coordinating land use, roadway design and transit stops, passengers will be more secure when boarding or leaving a bus, and walking to or from their destination at either end of the transit trip.

C.1.d. Signal Spacing

Signalized intersections may be the preferred pedestrian crossing points at peak traffic hours; other crossing opportunities close to signalized intersections benefit from a "platooning" effect, as traffic signals create gaps in traffic. The effect decreases:

- As the distance from the signalized intersections increases;
- As traffic volumes increase at peak hours; or
- If poor access management allows vehicles to continually enter the roadway.

C.1.e. Access Management

Many uncontrolled accesses to a busy road decrease pedestrian crossing opportunities: when a gap is created in the traffic stream, motorists entering the road fill the gap. Pedestrians seeking refuge in a center turn lane are unprotected. One access management tool benefits pedestrian crossing: well-designed raised center medians provide a refuge for pedestrians, so they can cross one direction of traffic at a time.

However, eliminating road connections and signals also eliminates potential pedestrian crossing opportunities. Creating an urban freeway can increase traffic speeds and volumes. Concrete barriers placed down the middle of the road (rather than a raised median) effectively prohibit pedestrian crossings. See Figure 5, page 44.

C.1.f. Perception of Safety at Crosswalks

Some studies have indicated that pedestrians may develop a "false sense of security" when crossing a road in marked crosswalks. Other studies have indicated that motorists are more likely to stop for pedestrians in marked crosswalks, especially where the right-of-way laws are enforced. Proper design makes it clear who has the right-of-way.

C.1.g. Grade-Separation & Out-of-Direction Travel

Though grade-separation may seem to offer greater safety, excessive added travel distance will discourage pedestrians who want to take a more direct route. Grade-separation must offer obvious advantages over an at-grade crossing. A structure that is unused because of inconvenience creates a situation whereby pedestrians are at risk when they attempt to cross the road with no protection.

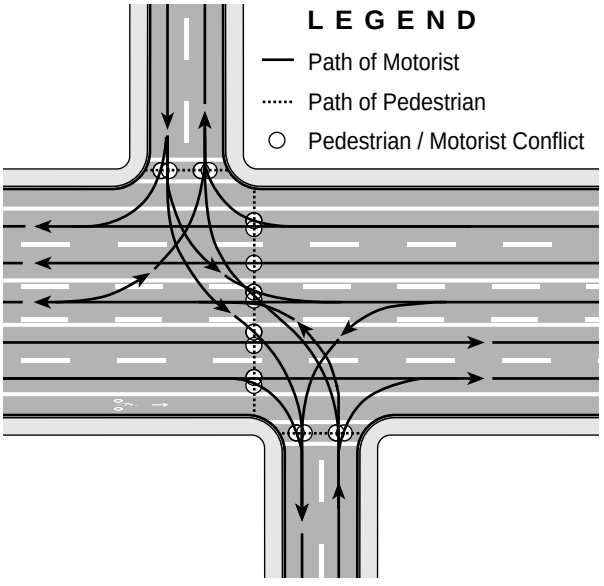


Figure 70: Accesses create additional conflicts for crossing pedestrians

Pedestrians will cross where it's most convenient

C.1.h. Maintenance

The effectiveness of a design will be lost if maintenance is excessively difficult or expensive. Forethought must be given to the practicality of future maintenance. Facilities will be effective over time only if they are in good condition. Examples of design features to be avoided include:

- Blind corners that can accumulate debris;
- Restricted areas that cannot accommodate sweepers or other power equipment; and
- Remote areas requiring hand maintenance, such as sweeping.

C.2. SOLUTIONS

No one solution is applicable in all situations as the issues will usually overlap on any given section of road. In most cases, a combination of measures will be needed to improve pedestrian crossing opportunities and safety.

C.2.a. Raised Medians

These benefit pedestrians on two-way, multilane streets, as they allow pedestrians to cross only one direction of traffic at a time: it takes much longer to cross four lanes of traffic than two. Where raised medians are used for access management, they should be constructed so they provide a pedestrian refuge.

Where it is not possible to provide a continuous raised median, island refuges can be created between intersections and other accesses.

Curb extensions

These should be located across from high pedestrian generators such as schools, park entrances, libraries, parking lots, etc.

In most instances, the width of the raised median is the width of the center turn-lane, minus the necessary shy distance on each side. Ideally, raised medians should be constructed with a smooth, traversable surface, such as brick pavers. If a median is landscaped, the plants should be low enough so they do not obstruct visibility, and spaced far enough apart to allow passage by pedestrians.

C.2.b. Curb Extensions

Also known as "bulbs, neckdowns, flares or chokers," curb extensions reduce the pedestrian crossing distance and improve the visibility of pedestrians by motorists. Curb extensions should be considered at all intersections where on-street parking is allowed. The crossing distance savings are greatest when used on streets with diagonal parking. On arterials and collectors, space should be provided for existing or planned bike lanes.

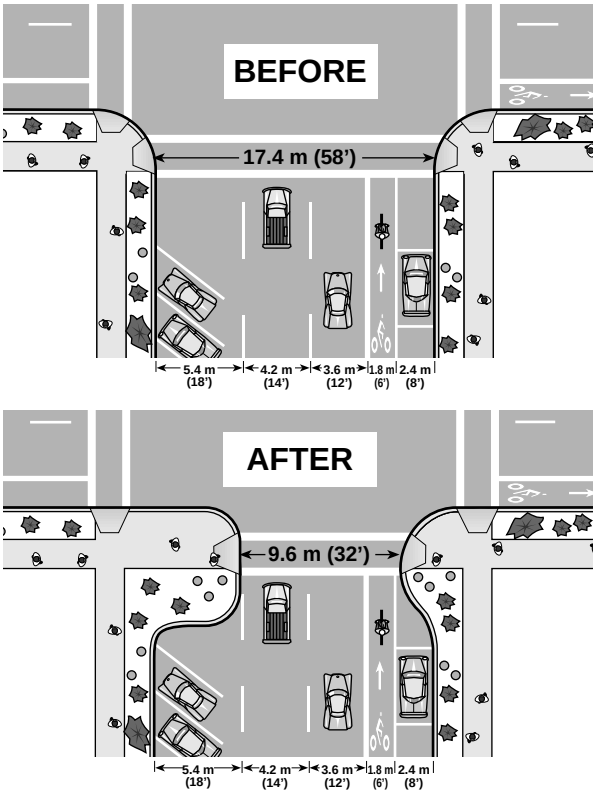


Figure 71: Curb extensions reduce crossing distance

Zebra crosswalks are highly visible

Mid-block crossing curb extensions may be considered where there are pedestrian generators on both sides of the road. However, entrances to buildings should be placed close to intersections, existing signals or crosswalks, where possible. Mid-block crossings are established by the appropriate road authority.

C.2.c. Illumination

Many crossing sites are not well lit. Providing illumination or improving existing lighting can increase nighttime safety at many locations, especially at mid-block crossings, which are often not expected by motorists.

Reducing pedestrian crossing distance improves signal timing if the pedestrian phase controls the signal. The speed normally used for calculating pedestrian crossing time is 1.2 m (4 ft)/sec., or less where many older pedestrians are expected. The time saved is substantial when two corners can be treated with curb extensions.

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

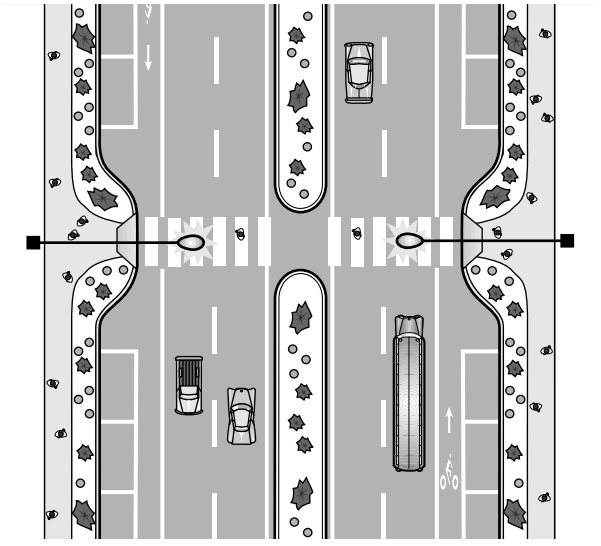


Figure 72: Mid-block curb extension with median and illumination

C.2.d. Crosswalks

Marked crosswalks are generally located at all open legs of signalized intersections. They may also be considered at other locations. Combined with curb extensions, illumination and signage, marked crosswalks can improve the visibility of pedestrian crossings. Crosswalks send the message to motorists that they are encroaching on a pedestrian area, rather than the reverse, which is often the common assumption.

There is considerable debate concerning the usefulness and safety of crosswalks (see section C.1.f). If a crosswalk is not working, some possible problems include:

- Enforcement – more rigorous enforcement of traffic laws is needed for motorists to understand that it is their duty to yield to pedestrians in a crosswalk, marked or unmarked;
- Location – marked crosswalks must be placed in locations where they are visible and where obstructions such as parked cars and signs do not affect sight lines;
- Traffic movement – many turning vehicles at nearby intersections or driveways can compromise the crosswalk;
- Users – Some people need extra help crossing a street and crosswalks alone may not be sufficient; for example, young children lack judgement and may need the positive control given by signals.

A traffic study will determine if a marked crosswalk will enhance pedestrian safety. This is usually in locations that are likely to receive high use, based on adjacent land use.

Crosswalks should be 3 m (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 (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.

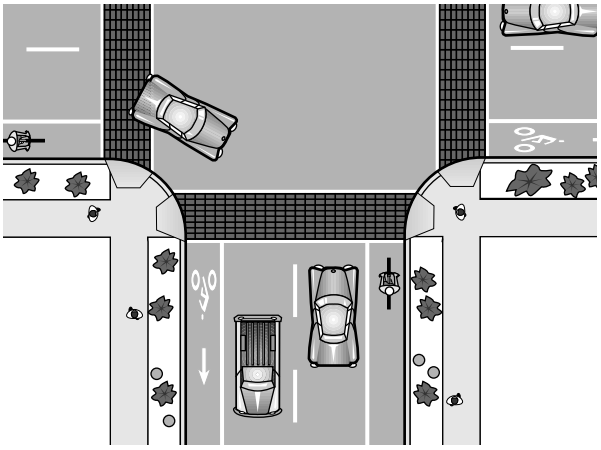


Figure 73: Colored & textured crosswalk

C.2.e. Islands & Refuges

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 1.2 m (4 ft) wide, preferably 2.4 m (8 ft) or more.

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.

Median allows pedestrian to cross one direction of traffic at a time

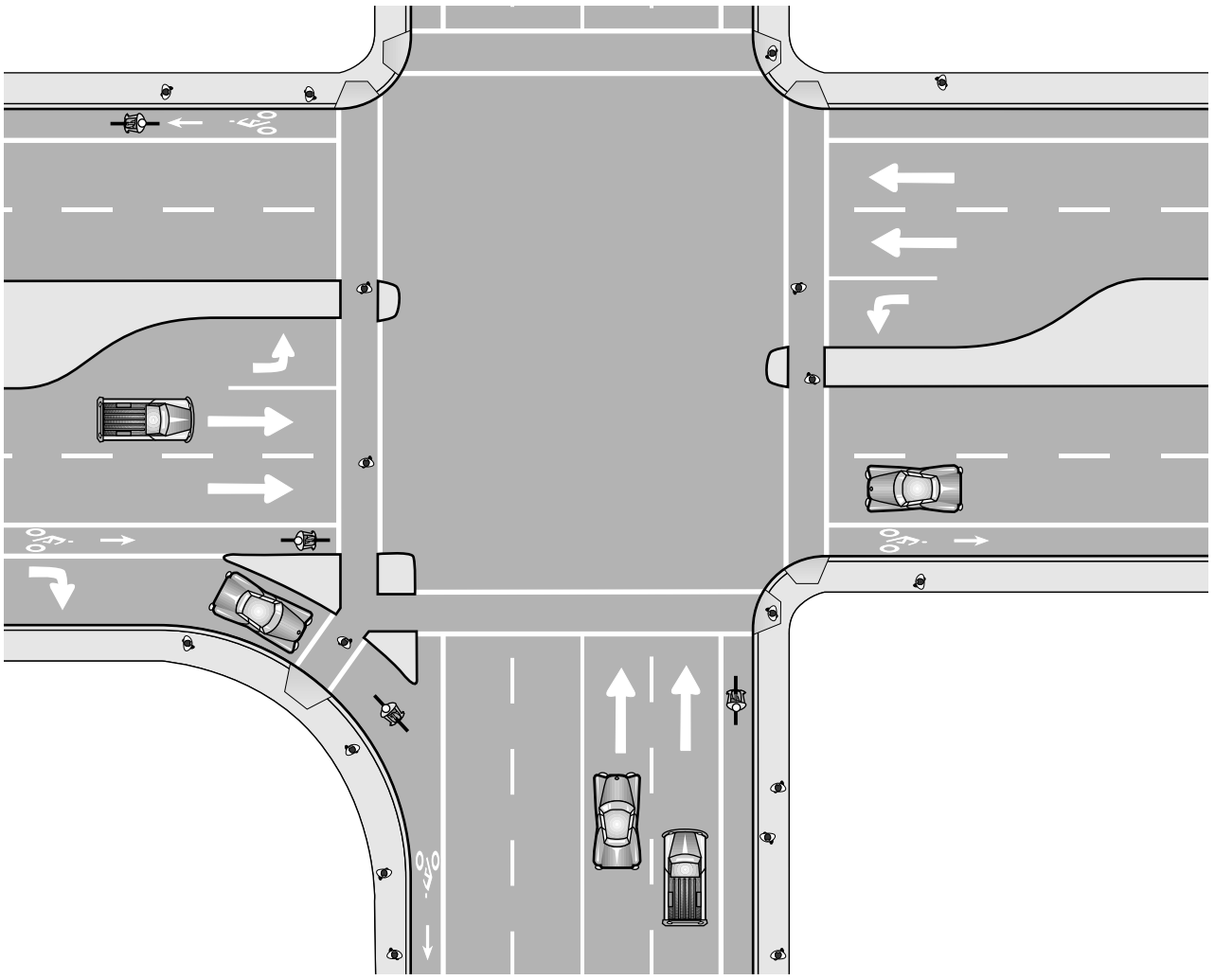


Figure 74: Raised islands at intersections

C.2.f. Pedestrian Signals

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 (a light that is rarely activated may be ignored when in use). Refer to the MUTCD for pedestrian signal warrants.

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.

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

Pedestrian island provides refuge

C.2.g. 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.

Pedestrian crossing signs

D. OTHER INNOVATIVE DESIGNS

These concepts are presented as information, to help ODOT cities and counties to come up with new solutions to street-crossing problems.

D.1. RAISED CROSSWALKS

Raised crosswalks, especially if textured and colored, are more visible. They also act as speed humps and may be used in areas where excessive speeds are a problem. See page 160 for a discussion on the design and applicability of speed humps.

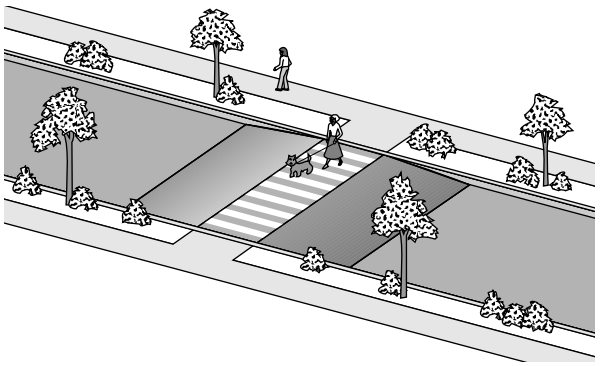


Figure 75: Raised crosswalk acts as speed hump on local street

D.2. 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.

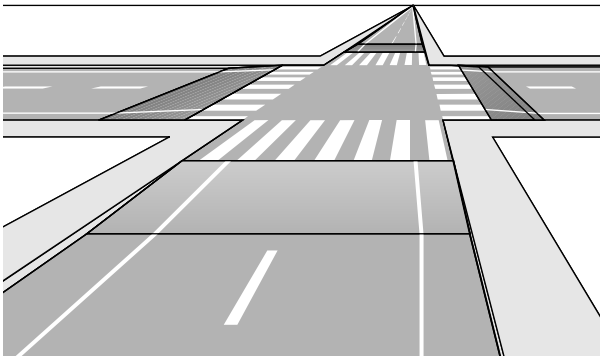


Figure 76: Raised intersection

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.

Note: these treatments are more appropriate on roads other than high-speed thoroughfares.

Raised crosswalk

II.6. MULTI-USE PATHS

INTRODUCTION

Though originally conceived to provide a facility for bicyclists separated from motor-vehicle traffic, paths often see greater use by pedestrians, joggers and skaters, sometimes even equestrians. The planning and design of multi-use paths must therefore take into account the various skills, experience and characteristics of these different users.

A. WHERE PATHS ARE APPROPRIATE

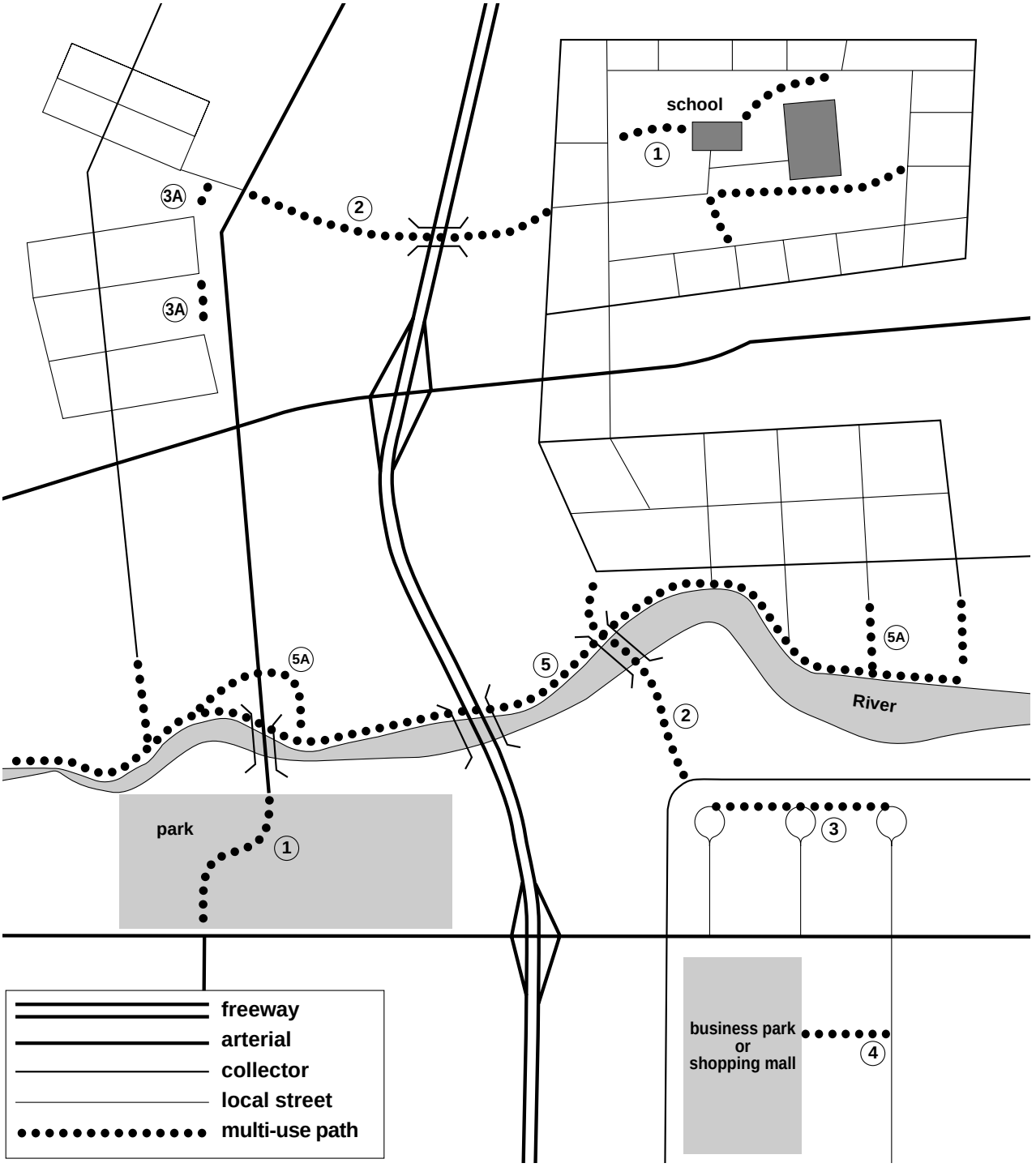
Well-planned and designed multi-use paths can provide good pedestrian and bicycle mobility. They can have their own alignment along streams and greenways, or may be components of a community trail system.

Paths can serve both commuter and recreational cyclists. Many inexperienced cyclists fear motor vehicle traffic and will not ride on streets until they gain experience and confidence. A separated path provides a learning ground for potential bicycle commuters and can attract experienced cyclists who prefer an aesthetic ride.

The key components to successful paths include:

- **Continuous separation from traffic,** by locating paths along a river or a greenbelt such as a rail-to-trail conversion, with few street or driveway crossings (paths directly adjacent to roadways are not recommended, as they tend to have many conflict points);
- **Scenic qualities,** offering an aesthetic experience that attracts cyclists and pedestrians;
- **Connection to land-uses,** such as shopping malls, downtown, schools and other community destinations;
- **Well-designed street crossings,** with measures such as bike and pedestrian activated signals, median refuges and warning signs for both motor vehicles and path users;
- **Shorter trip lengths** than the road network, with connections between dead-end streets or cul-de-sacs, or as short-cuts through open spaces;
- **Visibility:** proximity to housing and businesses increases safety. Despite fears of some property owners, paths have not attracted crime into adjacent neighborhoods;
- **Good design,** by providing adequate width and sight distance, and avoiding problems such as poor drainage, blind corners and steep slopes; and
- **Proper maintenance,** with regular sweeping and repairs. The separation from motor vehicle traffic can reduce some maintenance requirements, such as sweeping the debris that accumulates on roads.

Path set in pleasant surroundings



(1) As a short cut through public land, such as a park, or as a direct access to a school, etc.
(2) To bridge obstacles such as freeways, rivers etc.
(3) To connect up cul-de-sacs and dead-end streets, or as shortcuts (3A).
(4) To connect up residential areas to business areas.
(5) Along a river or other natural corridor, with links to street system (5A).

Figure 77: Examples of multi-use paths in urban setting

B. IMPORTANT CONSIDERATIONS

B.1. CROSSINGS

The number of at-grade crossings with streets or driveways should be limited. Poorly designed crossings put pedestrians and cyclists in a position where motor vehicle drivers do not expect them at street crossings.

B.2. ACCESS

Limiting crossings must be balanced with providing access. If a path is to serve bicyclists and pedestrians well, there should be frequent and convenient access to the local road network. Access points that are spaced too far apart will require users to travel out of direction to enter or exit the path. The path should terminate where it is easily accessible to and from the street system, e.g. at a controlled intersection or at the end of a dead-end street. Directional signs direct users to and from the path.

B.3. SECURITY

Multi-use paths in secluded areas should be designed with personal security in mind. Illumination and clear sight distances improve visibility. Location markers, mileage posts and directional signing help users know where they are. Frequent accesses improve response time by emergency vehicles.

B.4. MAINTENANCE

Multi-use paths require special trips for inspection, sweeping and repairs. They must be built to a standard high enough that allows heavy maintenance equipment to use the path without deterioration.

B.5. ON-STREET FACILITIES

As bicyclists gain experience and realize some of the advantages of riding on the road, many stop riding on paths placed adjacent to roadways. This can be confusing to motorists, who may expect bicyclists to use the path. The presence of a nearby path should not be used as a reason to not provide adequate shoulders, bike lanes or sidewalks on the roadway.

B.6. STANDARDS

Paths intended for multiple use by commuters and recreationists should be built to a standard that accommodates the various users with minimal conflicts. Designing to a low standard to save money can lead to problems if the path is popular. If usage is expected to be low, the need for a path should be reconsidered.

Lack of conflicts with motor vehicles attracts cyclists to this path

C. PATHS NEXT TO ROADWAYS

C.1. CONCERNS

Multi-use paths should not be placed next to roadways; half of the bicycle traffic will ride against the normal flow of motor vehicle traffic, which is contrary to the rules of the road, with the following consequences for bicyclists:

- When the path ends, bicyclists riding against traffic tend to continue to travel on the wrong side of the street, as do bicyclists getting to a path. Wrong-way travel by bicyclists is a major cause of bicycle/automobile crashes and should be discouraged.
- At intersections, motorists crossing the path often do not notice bicyclists coming from certain directions, especially where sight distances are poor.
- Bicyclists on the path are required to stop or yield at cross-streets and driveways.
- Stopped motor vehicle traffic on a cross-street or driveway may block the path.
- Because of the closeness of motor vehicle traffic to opposing bicycle traffic, barriers are often necessary to separate motor vehicles and bicyclists. These barriers are obstructions, complicate maintenance of the facility and waste available right-of-way.

C.2. GUIDELINES

Separated paths along roadways should be evaluated using the following guidelines:

- Bicycle and pedestrian use is anticipated to be high;
- The adjacent roadway is a heavily-traveled, high-speed thoroughfare where on-road bikeways and sidewalks may be unsafe;
- The path will generally be separated from motor vehicle traffic, with few roadway or driveway crossings.
- There are no reasonable alternatives for bikeways and sidewalks on nearby parallel streets;
- There is a commitment to provide path continuity throughout the corridor;
- The path can be terminated at each end onto streets with good bicycle and pedestrian facilities, or onto another safe, well-designed path;
- There is adequate access to local cross-streets and other facilities along the route.
- Any needed grade-separation structures do not add substantial out-of-direction travel; and
- The total cost of providing the proposed path is proportionate to the need. This evaluation should consider the costs of:
    1. Grading, paving, drainage, fences, retaining walls, sound walls, signs and other necessary design features;
    2. Structures needed to eliminate at-grade crossings; and
    3. Additional maintenance, including the need for specialized maintenance equipment.

Notes: In many cases, the best choice is to improve the roadway system to accommodate cyclists and pedestrians, which may require connecting up local streets or improving nearby, parallel streets.

Path adjacent to roadway creates conflicts at intersections

D. STANDARDS

D.1. WIDTH & CLEARANCES

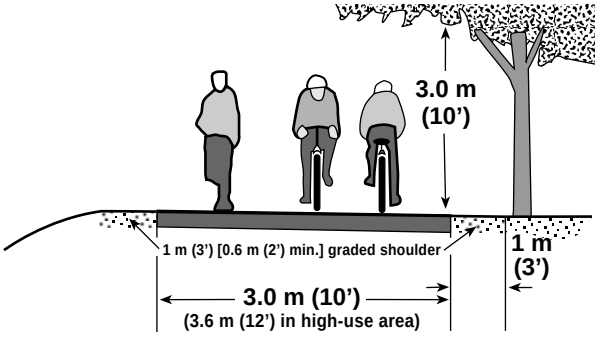


Figure 78: Multi-use path standards

D.1.a. Width

3 m (10 ft) is the standard width for a two-way multi-use path; they should be 3.6 m (12 ft) wide in areas with high mixed-use. Faster-moving bicyclists require greater width than pedestrians; optimum width should be based on the relative use by these two modes. High use by skaters may also require greater width.

The minimum width is 2.4 m (8 ft). However, 2.4 m wide multi-use paths are not recommended in most situations because they may become over-crowded. They should only be constructed as short connectors, or where long-term usage is expected to be low, and with proper horizontal and vertical alignment to assure good sight distances.

Although one-way paths may be intended for one direction of bicycle travel, they will often be used as two-way facilities, especially by pedestrians. Caution must be used in selecting this type of facility. If needed, they should be 1.8 m (6 ft) wide (min. 1.5 m [5 ft]) and designed and signed to assure one-way operation by bicyclists.

D.1.b. Lateral Clearance

A 1 m (3 ft) or greater (min. 0.6 m [2 ft]) "shy" or clear distance on both sides of a multi-use path is necessary for safe operation. If there is a railing, soundwall, retaining wall or other vertical face adjacent to the path, this area should be paved to the face of the vertical barrier. Where there is a fill- or cut-slope, this area should be unpaved and graded to the same slope as the path to allow recovery by errant bicyclists.

D.1.c. Overhead Clearance

The standard clearance to overhead obstructions is 3 m (10 ft), min. 2.4 m (8 ft).

D.1.d. Separation from roadway

Where a path is parallel and adjacent to a roadway, there should be a 1.5 m (5 ft) or greater width separating the path from the edge of roadway, or a physical barrier of sufficient height should be installed (see D.6, Railings, Fences and Barriers).

D.2. TYPICAL PAVEMENT SECTIONS

The use of concrete surfacing for paths is best for long-term use. Concrete provides a smooth ride when placed with a slip-form paver. The surface must be cross-broomed. The crack-control joints should be saw-cut, not troweled. Concrete paths cost more to build than asphalt paths, but long-term maintenance costs are lower, since they do not become as brittle, cracked and rough with age, or deformed by roots and weeds as does asphalt.

Multi-use paths should be designed with sufficient surfacing structural depth for the subgrade soil type to support maintenance and emergency vehicles. If the path must be constructed over a very poor subgrade (wet and/or poor material), treatment of the subgrade with lime, cement or geotextile fabric should be considered.

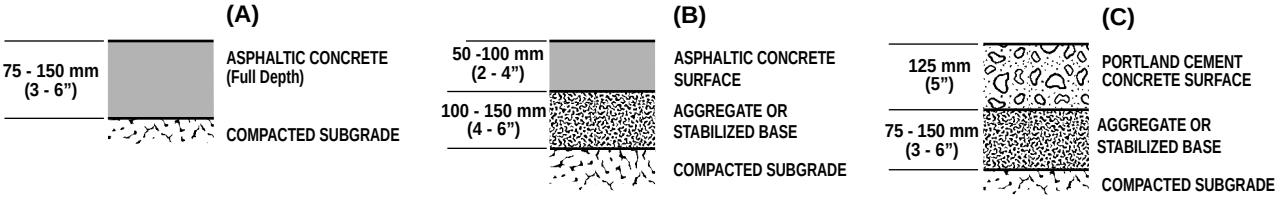


Figure 79: Multi-use path pavement structure

D.3. GRADES & CROSS-SLOPE

AASHTO recommends a maximum grade of 5% for bicycle use, with steeper grades allowable for up to 150 m (500 ft.), provided there is good horizontal alignment and sight distance. Extra width is also recommended. Engineering judgment and analysis of the controlling factors should be used to determine what distance is acceptable for steep grades.

If use by pedestrians is expected, ADA requirements must be met: the grade of separated pathways should not exceed 5%, to accommodate wheelchair users. See page 97 for an explanation of the ADA grade requirements.

Based on AASHTO recommendations and ADA requirements, 5% should be considered the maximum grade allowable for multi-use paths.

The standard cross-slope grade is 2%, to meet ADA requirements and to provide drainage. Curves should be banked with the low side on the inside of the curve to help bicyclists maintain their balance.

D.4. 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 multi-lane roadways as a refuge:

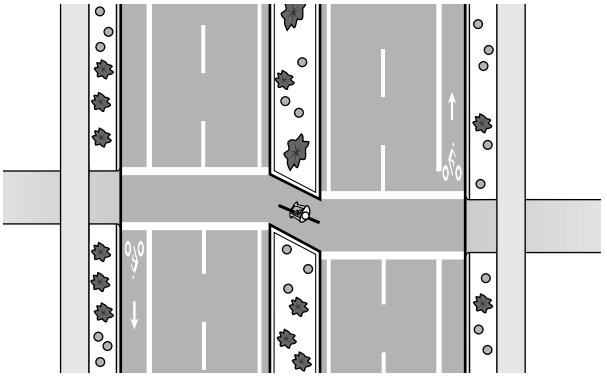


Figure 80: At-grade crossing of a thoroughfare with median island

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

Urban path intersection with cross-street

curve the path slightly, so that it is not parallel to the adjacent roadway:

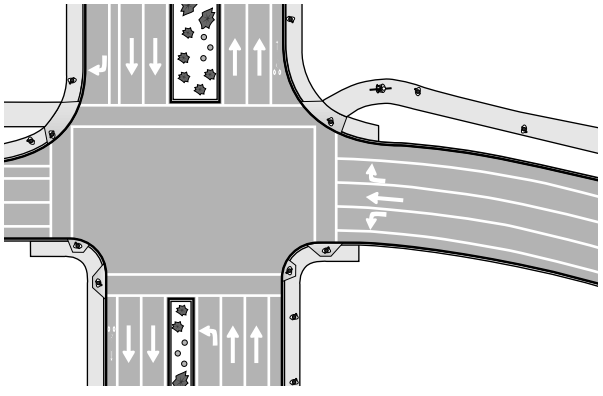


Figure 81: Path curves to improve visibility at signalized intersection

D.5. STRUCTURES

The width of multi-use path structures is the same as the approach paved path, plus a 0.6 m (2 ft) shy distance on both sides. For example, a 3 m (10 ft) wide path requires a 4.2 m (14 ft) wide structure.

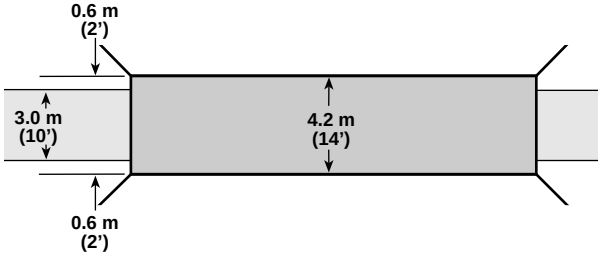


Figure 82: Multi-use path bridge

The standard overhead clearance of under-crossings is 3 m (10 ft); a 2.4 m (8 ft) min. may be allowable with good horizontal and vertical clearance, 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.

There are advantages and disadvantages to both overcrossings and undercrossings:

D.5.a. Under-crossings

ADVANTAGES: They provide an opportunity to reduce approach grades, as the required 3 m (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 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 drainage if the sag point is lower than the surrounding terrain.

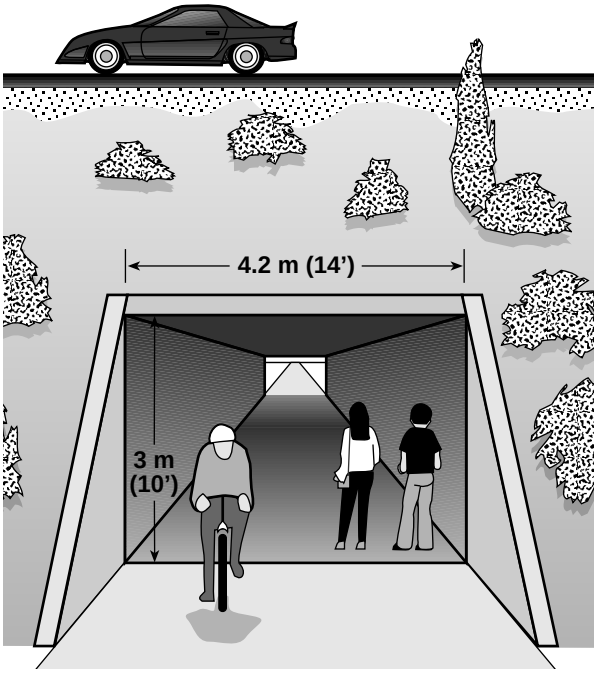


Figure 83: Undercrossing dimensions

D.5.b. Over-crossings

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

DISADVANTAGES: They require longer approaches to achieve the standard 5 m (17 ft) of clearance over most roadways. With an additional structural depth of 1 m (3 ft), the total rise will be 6 m (20 ft). At 5%, this requires a 120 m (400 ft) approach ramp at each end, for a total of 240 m (800 ft). This can be lessened if the road is built in a cut section.

Note: 7m (23 ft) clearance is required over railroad tracks.

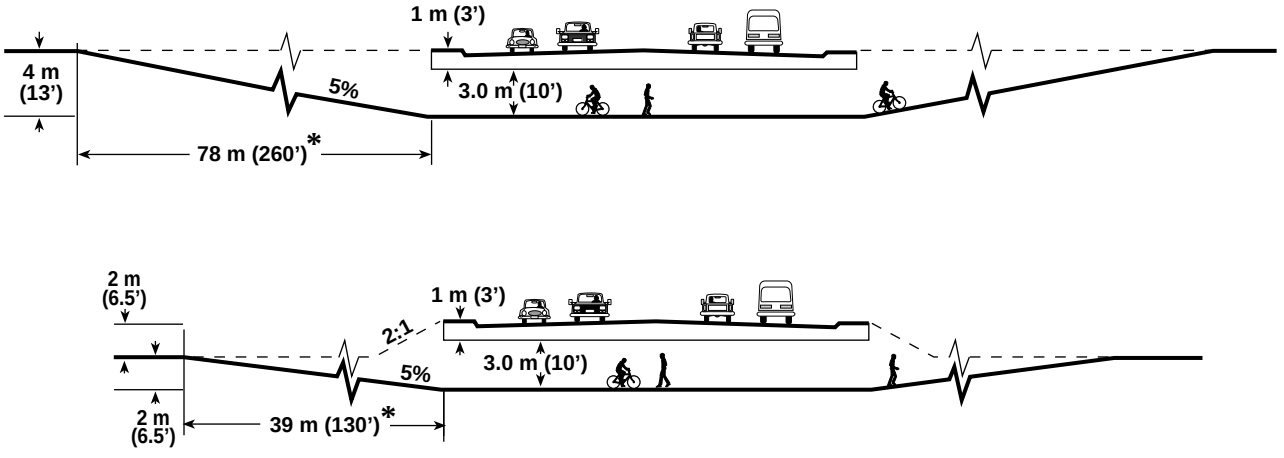


Figure 84: Undercrossing configurations

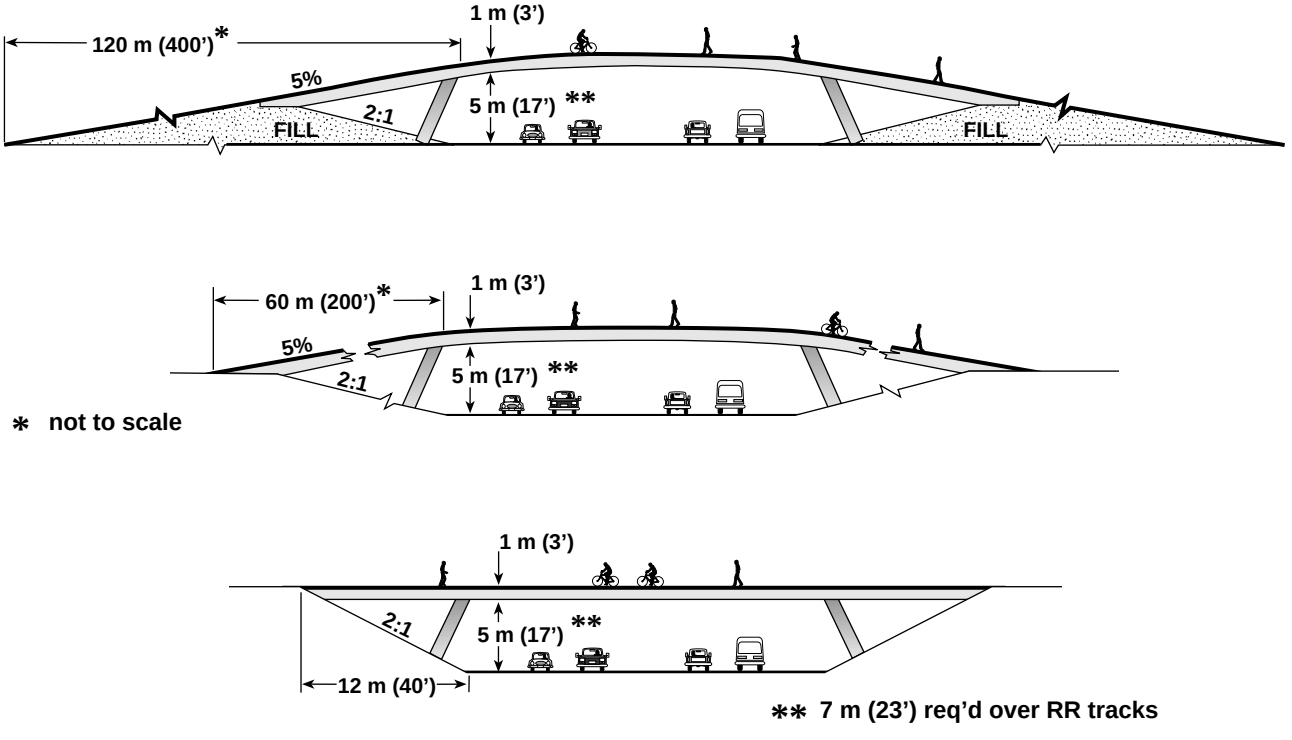


Figure 85: Overcrossing configurations

Structure with railing and illumination

The fence should be high enough to prevent a cyclist from toppling over – AASHTO recommends 1.4m (54"). Openings in the railing must not exceed 150 mm (6") in width.

Where a cyclist's handlebar may come into contact with a fence or barrier, a smooth, wide rub-rail may be installed at a height of 1 m (3 ft).

Where concrete barriers are used, adding tube railing or chain link fencing may be necessary to achieve the required height.

D.6. RAILINGS, FENCES & BARRIERS

Fences or railings along paths may be needed to prevent access to high-speed highways, or to provide protection along steep side slopes and waterways. **Fences, railings or barriers can become obstructions and should only be used where they are needed for safety reasons; for example, in an area where a pedestrian or a bicyclist could fall into a river, a high-speed roadway or a canyon.** They should be placed as far away from the path as possible. Duplication of fences should be avoided, such as fences on the right-of-way and fences to keep pedestrians off freeways.

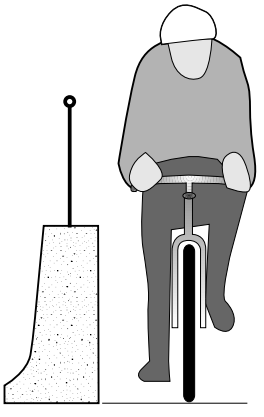


Figure 87: Adding railing to a barrier

Care must be taken to avoid a "cattle chute" effect by placing a high chain-link fence on each side of a path.

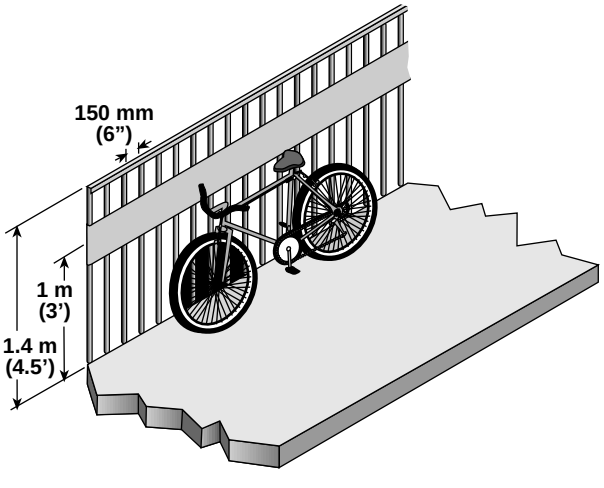


Figure 86: Railing with "rub-rail"

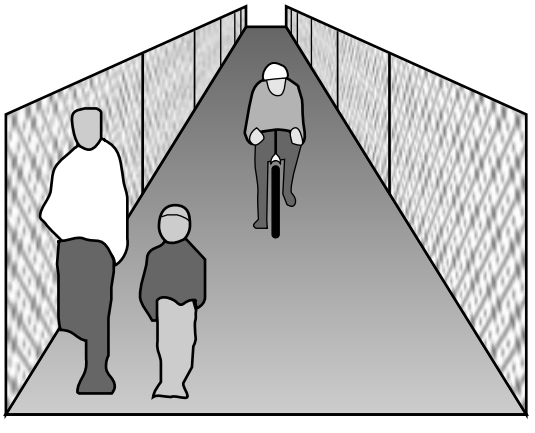


Figure 88 : "Cattle-chute" effect

D.7. PREVENTING MOTOR-VEHICLE ACCESS

D.7.a. Geometric Design

One method branches the path into two narrower one-way paths just before it reaches the roadway, making it difficult for a motor vehicle to gain access to the path:

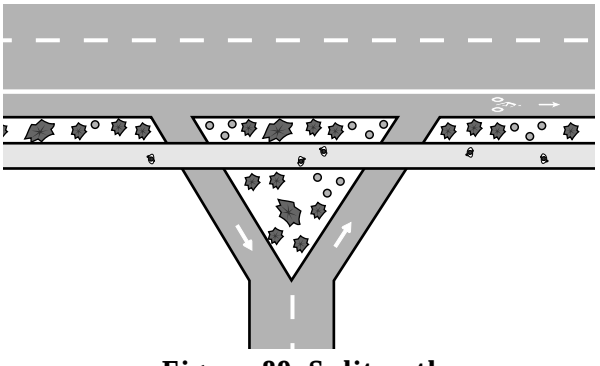


Figure 89: Split path discourages motor-vehicle access

D.7.b. Short Curb Radii

Short curb radii (1.5 m [5 ft]) make it difficult for motorists to enter a path from the roadway.

D.7.c. Bollards

Barrier posts ("bollards") may be used to limit vehicle traffic on paths. However, they are often hard to see and cyclists may not expect them. When used, they must be spaced wide enough (min. 1.5 m [5 ft]) for easy passage by cyclists and bicycle trailers as well as wheelchair users. A single bollard is preferred, as two may channelize bicyclists to the middle opening, creating conflicts. They should not be placed right at the intersection. They should be painted with bright, light colors for visibility.

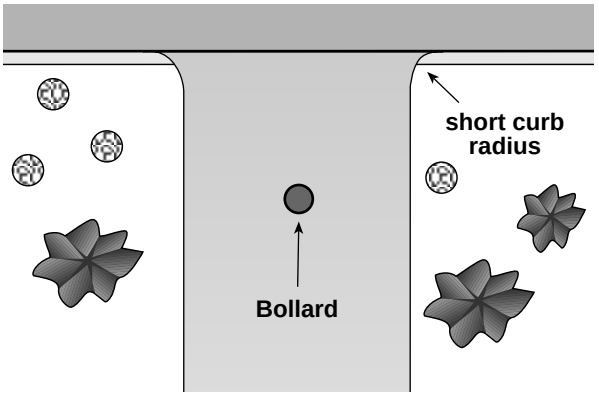


Figure 90: Short curb radius and bollard at the entrance to a path

D.7.d. Signing

Standard signing is often sufficient to inform motorists. Refer to page 153 for signing recommendations.

D.8. CURB CUTS

Curb cuts for bicycle access to multi-use paths should be built so they match the road grade without a lip. The width of the curb cut is the full width of the path when the approaching path is perpendicular to the curb and a minimum of 2.4 m (8 ft) wide when the approaching path is parallel and adjacent to the curb. Greater widths may be needed on downhill grades.

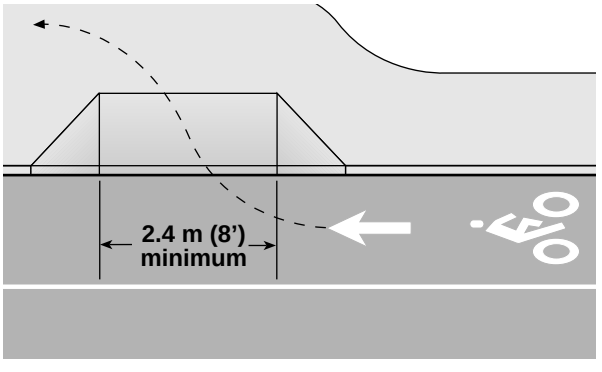


Figure 91: Curb cuts for paths

Wide pedestrian and bicycle bridge

Encroaching vegetation and poor sight distance create an undesirable situation

D.9. DRAINAGE

Multi-use paths must be constructed with adequate drainage to avoid washouts and flooding, and to prevent silt from intruding onto the path.

D.10. VEGETATION

All vegetation, including roots, must be removed in the preparation of the subgrade. Special care is needed to control new growth, such as the use of soil sterilant or lime treatment of the subgrade. Plants that can cause other problems should be controlled, such as plants with thorns that can puncture bicycle tires.

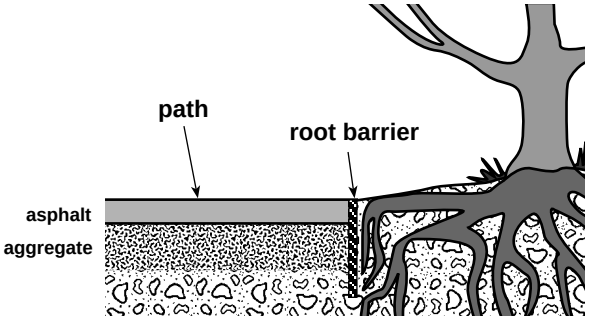


Figure 92: Path adjacent to trees

Paths built in wooded areas present special problems. The roots of shrubs and trees can pierce through the surface and cause it to bubble up and break apart. Preventive methods include removal of vegetation, realignment of the path away from trees, and placement of root barriers along the edge of the path. An effective barrier is created with a 300 mm (12") deep metal shield; greater depth is required for some trees such as cottonwoods.

D.11. PATHS WITH HEAVY USE

If a path must handle a high number of users, it should be wider than standard (3.6 m or more). A separate soft-surface jogger or equestrian path may be constructed with bark mulch alongside the paved path.

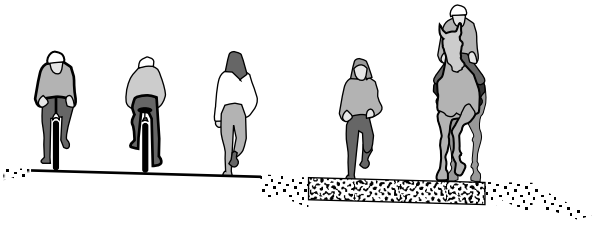


Figure 93: Multi-use path with additional jogger/equestrian way

D.12. STAIRWAYS

Where a connection is needed to a destination or another path at a different elevation, a stairway can be used where the terrain is too steep for a path. A grooved concrete trough should be provided so bicyclists can easily push their bicycles up or down.

Note: Stairways are usually provided as a shortcut and do not meet ADA requirements; the destination should also be accessible along a flatter route, even if this route is longer and more circuitous.

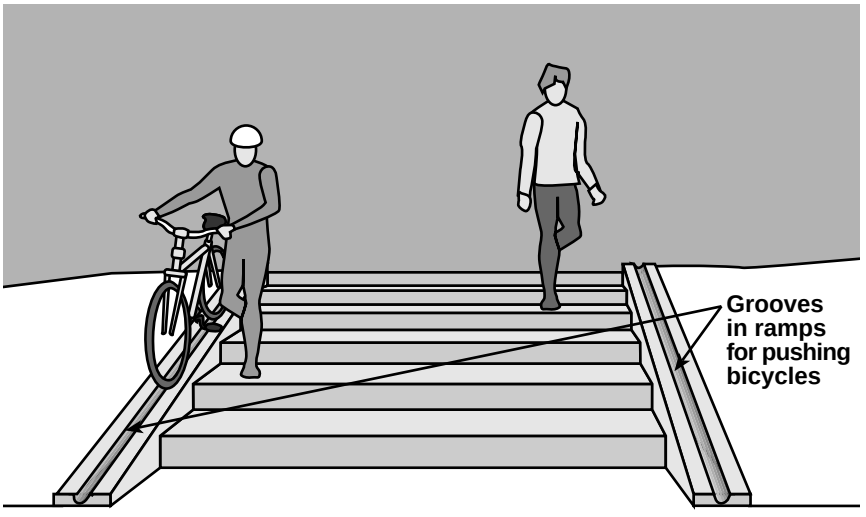


Figure 94: Stairway provides easy access for bicycles and pedestrians

Groove in stairway provides bicycle access to underground passage

Stairway provides access from arterial to local street

II.7. INTERSECTIONS

INTRODUCTION

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.

A. BASIC PRINCIPLES

A.1. FOR BOTH BICYCLISTS & PEDESTRIANS

- Unusual conflicts should be avoided.
- 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.

A.2. FOR BICYCLISTS

- Good design creates a path for bicyclists that is direct, logical and close to the path of motor vehicle traffic; only in rare cases should they proceed through intersections as pedestrians.
- Bicyclists should be visible and their movements should be predictable.
- Bike lanes should be striped to a marked crosswalk or a point where turning vehicles would normally cross them. The lanes should resume at the other side of the intersection.

A.3. FOR PEDESTRIANS

- 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.

Large island offers protection for pedestrians at this intersection

B. PEDESTRIAN CROSSINGS

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. The effective radius takes into account parking and bike lanes:

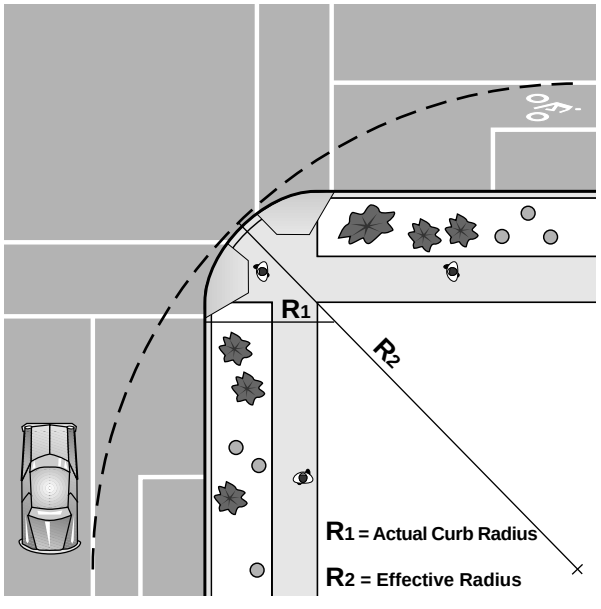


Figure 95 : Effective radius with bike lanes and parking

Even very large intersections can be treated for pedestrian crossings

- Using a short radius (1.5 m [5 ft]) on one-way streets, where no turn movements are allowed at a corner, the radius can be very short:

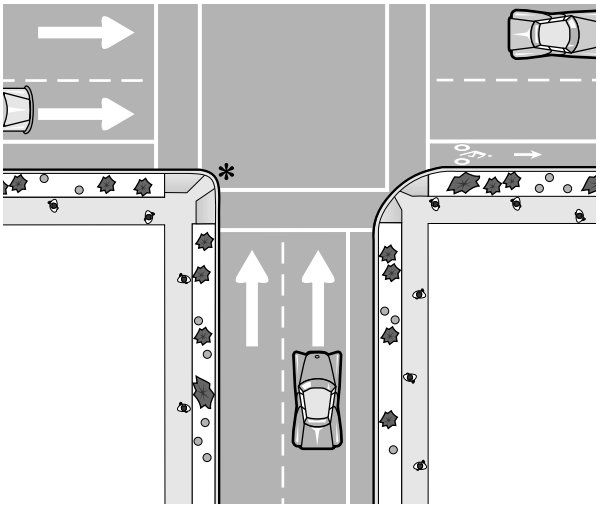


Figure 96: *Corner with no possible turn movements on a one-way street

- Using curb extensions, as they make pedestrians more visible to motorists. At signalized intersections, they improve signal timing by reducing the time needed for the pedestrian phase. See Figure 71, page 108, for an illustration of curb extensions.
- Using islands to interrupt extremely long crosswalks. See Figure 74, page 111 for an illustration of islands; and
- Lining up curb cuts with the crosswalk.

Closing crosswalk doesn't prevent pedestrians from crossing

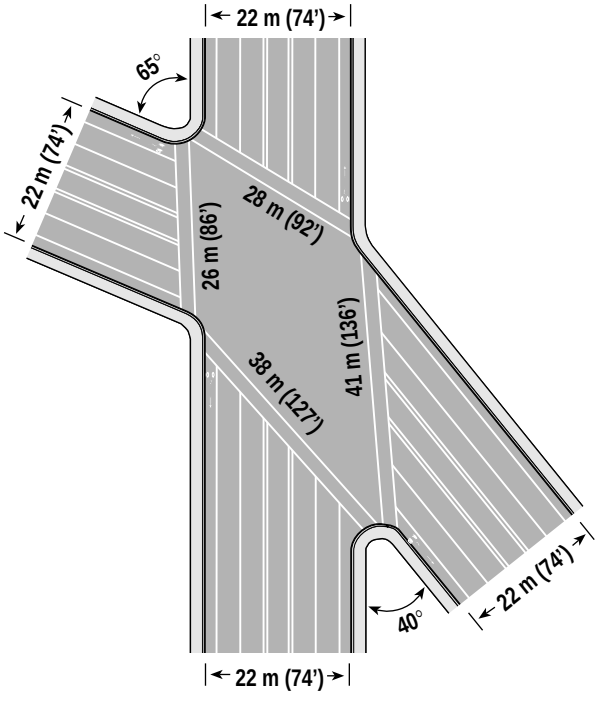


Figure 97: Skewed intersection increases crosswalk distances

- Sight distance should be improved by removal of obstacles;
- Pedestrian refuges should be provided if the crossing distance is excessive; and
- Bike lanes may be striped with dashes, or colored, if needed to guide bicyclists through a long undefined area.

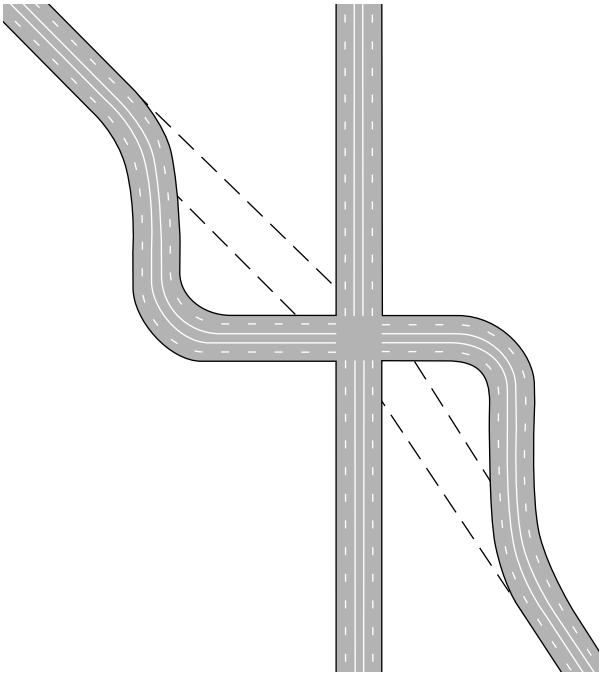


Figure 98: Skewed intersection reconfigured to a right angle

C. SKEWED INTERSECTIONS

Skewed intersections are generally undesirable for all roadway users and introduce these complications for bicyclists and pedestrians:

- Bicyclists and pedestrians approaching from an acute angle on the right are not very visible to motorists;
- The crossing distance for pedestrians is increased, which lengthens the pedestrian phase at a signalized intersection; and
- The path a bicyclist must follow may not be evident.

To alleviate these concerns, several options should be considered:

- Every reasonable effort should be made to design the intersection closer to a right angle;

Right-angle intersection with median island is easiest for pedestrians to cross

D. MULTIPLE INTERSECTIONS

Multiple intersections are generally undesirable for all roadway users and introduce these complications for bicyclists and pedestrians:

- Multiple conflict points are created as motor vehicles arrive from several directions;
- The visibility of cyclists and pedestrians is poor as they are not seen due to many approaching vehicles;
- The unpredictability of motorists, cyclists and pedestrians is increased;
- Pedestrians and bicyclists must cross more lanes of traffic;
- The total crossing distance is great; and
- At least one leg will be skewed.

To alleviate these concerns, several options should be considered:

- Every reasonable effort should be made to design the intersection so that only two roads cross at a given point. This is accomplished by removing one or more legs from the major intersection and creating a minor intersection further downstream;
- One or more of the approach roads can be closed to motor vehicle traffic;
- Pedestrian refuges should be created if the crossing distance is excessive;

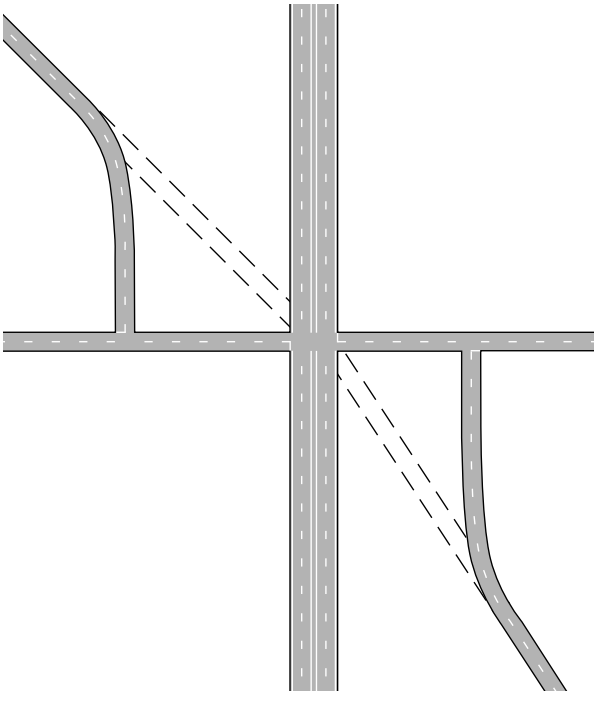


Figure 99: Multiple intersection reconfigured to right angles

- Bike lanes may be striped with dashes, or colored, if needed to guide bicyclists through a long undefined area; and
- Innovative designs such as roundabouts should be considered at complex intersections.

At this complex intersection in Switzerland, islands are provided for pedestrians

E. RIGHT-TURN LANES

E.1. STANDARD CONFIGURATION

Right-turn lanes should be used only where warranted by a traffic study, as they present these problems for cyclists and pedestrians:

- Right-turning cars and through bicyclists must cross paths;
- The additional lane width adds to the pedestrian crossing distance; and
- Right-turn moves are made easier for motorists, which may cause inattentive drivers to not notice pedestrians on the right.

The design shown below makes through bicyclists and right-turning motor vehicles cross prior to the intersection, with these advantages:

- This conflict occurs away from the intersection and other conflicts;
- The difference in travel speeds enables a motor vehicle driver to pass a bicyclist rather than ride side-by-side; and
- Bicyclists are encouraged to follow the rules of the road: through vehicles (including bicyclists) proceed to the left of right-turning vehicles.

For 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.

Where it is not possible to add a full-right turn lane, the bike lane should still be placed to the left of right-turning motor-vehicles. See figures 121 and 122, page 148 for examples of through bike lanes provided through striping only.

URBAN RIGHT–TURN CHANNELIZATION

1. To be used in urban areas, primarily at signalized intersections; and
2. Where a traffic investigation has determined the right turn lane to be warranted.

Bike lanes should be striped at intersection even when there is no approaching shoulder or bike lane.

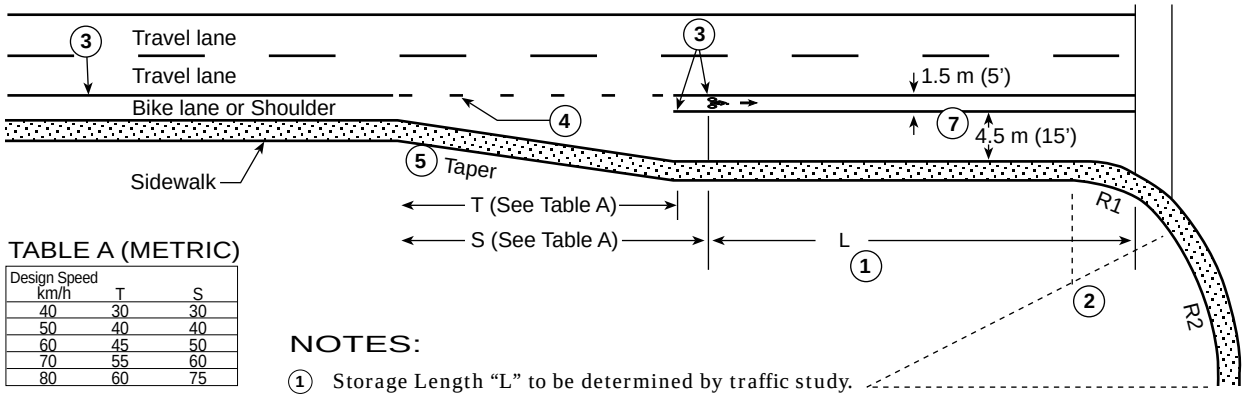


TABLE A (METRIC)

Design Speed km/h	T	S
40	30	30
50	40	40
60	45	50
70	55	60
80	60	75

TABLE A (ENGLISH)

Design Speed MPH	T	S
25	100	100
30	120	125
35	140	150
40	160	200
45	180	225
50	200	250

S = Stopping Sight Distance for a speed of: (0.7 x Highway Design Speed)
T = Horizontal Taper Distance

NOTES:

1. Storage Length "L" to be determined by traffic study.
2. Compound radii used to accomodate design vehicles, yet minimize pedestrian crossing distance. Radii are measured to the edge of travel lane.
3. Bike lane striping 200 mm (8") wide, solid white line.
4. Skip stripes 1 m (3') long x 200 mm (8") wide on 4.5 m (15') centers.
5. Taper Rate = [T/(6 m- Shldr. Width)] :1 (Metric)
   [T/(20' - Shldr. Width)] :1 (English)
6. See ODOT Standard Drawing 2-4.4 for placement of crosswalk.
7. Widths less than 4.5 m (15') may be used where warranted based on geometry, available right-of-way, design vehicles and other factors; 1.2 m (4') wide bike lane may also be used.

Figure 100: Standard right-turn lane configuration

E.2. EXCEPTIONS

E.2.a. Heavy Right Turns

If the major traffic movement at an intersection is to the right, and the straight through move leads to a minor side street, then the bike lane may be placed on the right and wrapped around the curve, assuming that the majority of cyclists will desire to turn right too. This often occurs where a highway is routed over local streets and the route is indirect.

E.2.b. Tee Intersections

At a Tee intersection, where the traffic split is approximately 50% turning right and 50% turning left, the bike lane should be dropped prior to the lane split to allow cyclists to position themselves in the correct lane; where traffic volumes are very high, a left- and right-turn bike lane should be considered.

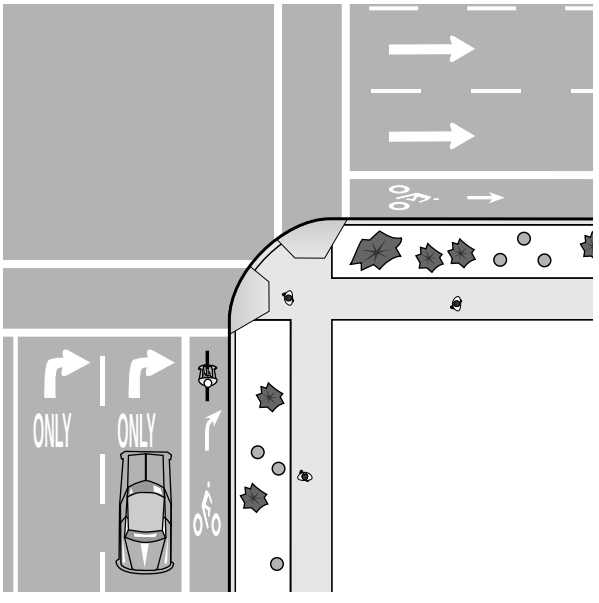
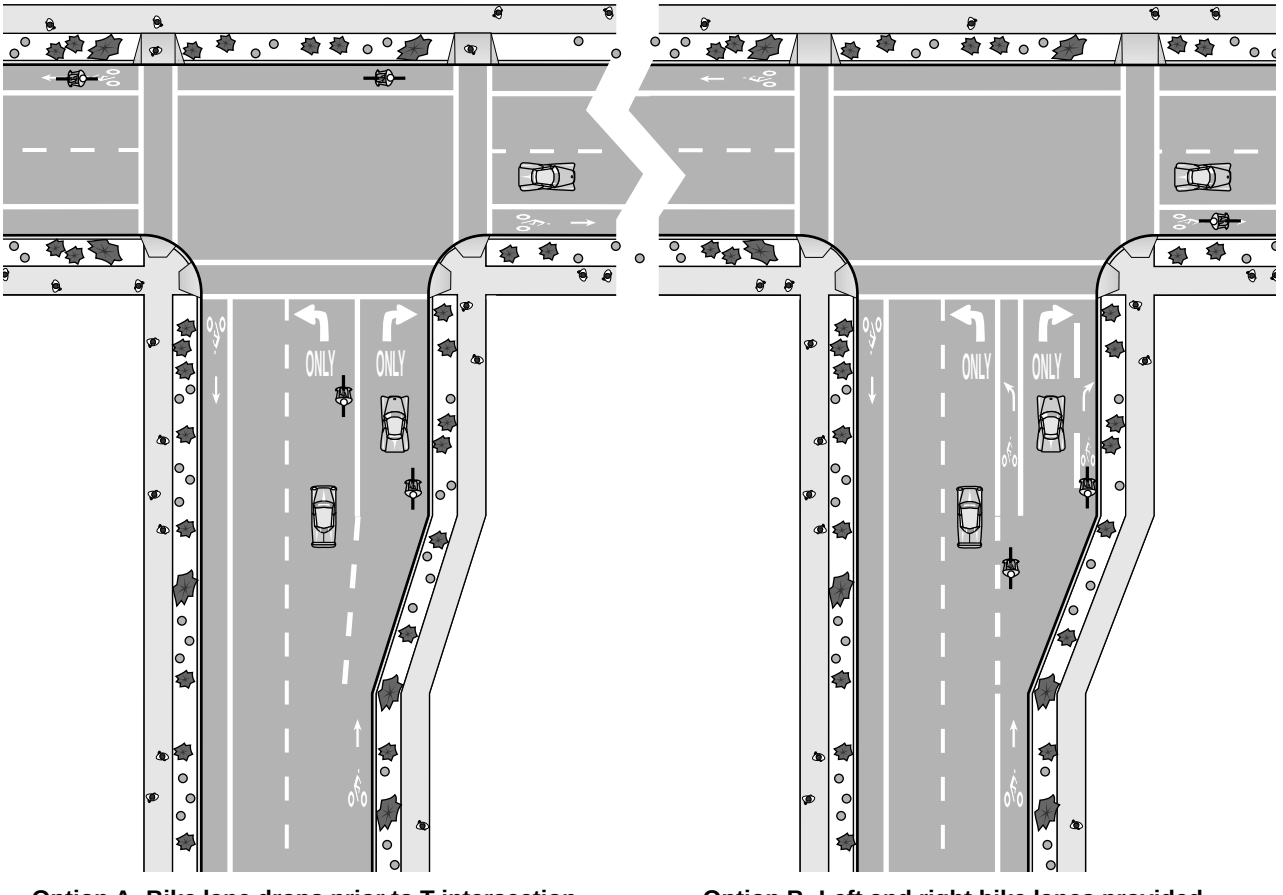


Figure 101: Bike lane follows major traffic flow to the right



Option A: Bike lane drops prior to T intersection

Option B: Left and right bike lanes provided

Figure 102: Bike lanes at T intersection

F. SIGNALS

Traffic signals are timed to accommodate smooth motor vehicle flows at a desired operational speed. In urban areas, this ranges from 25 to 70 km/h (15 to 45 MPH). These speeds are higher than typical bicycling and walking speeds (15 to 30 km/h [10 to 20 MPH] and 3 to 5 km/h [2 to 3 MPH] respectively).

Signal timing can create difficulties for bicyclists trying to maintain a constant speed to take advantage of their momentum. They may be able to get through two or three lights, then have to stop and wait, to start over again. This can tempt bicyclists to get a jump on a light or to run red lights out of frustration.

The situation is more frustrating to pedestrians, who often can only walk one or two blocks at a time, stopping at nearly every light.

Very little research has been done in this area. Where bicycle and pedestrian use is high, signal timing should take into account the convenience of bicyclists and pedestrians. For example, the traffic signals in downtown Portland are timed for speeds of 20-25 km/h (12-16 MPH), allowing bicyclists to ride with traffic.

On signals that function "on-call" (with loop detectors), there are several improvements that can be made to benefit cyclists:

1. Placing loop detectors in bike lanes on side street to trip the signal;
2. Placing loop detectors in bike lanes to prolong green phase when a bicyclist is passing through (the upcoming yellow phase may not allow enough time for a cyclist to cross a wide intersection);
3. Increasing the sensitivity of existing loop detectors in bike lanes, and painting stencils to indicate to cyclists the most sensitive area of the loop; and
4. Placing push-buttons close to the roadway where a bicyclist can reach them without dismounting.

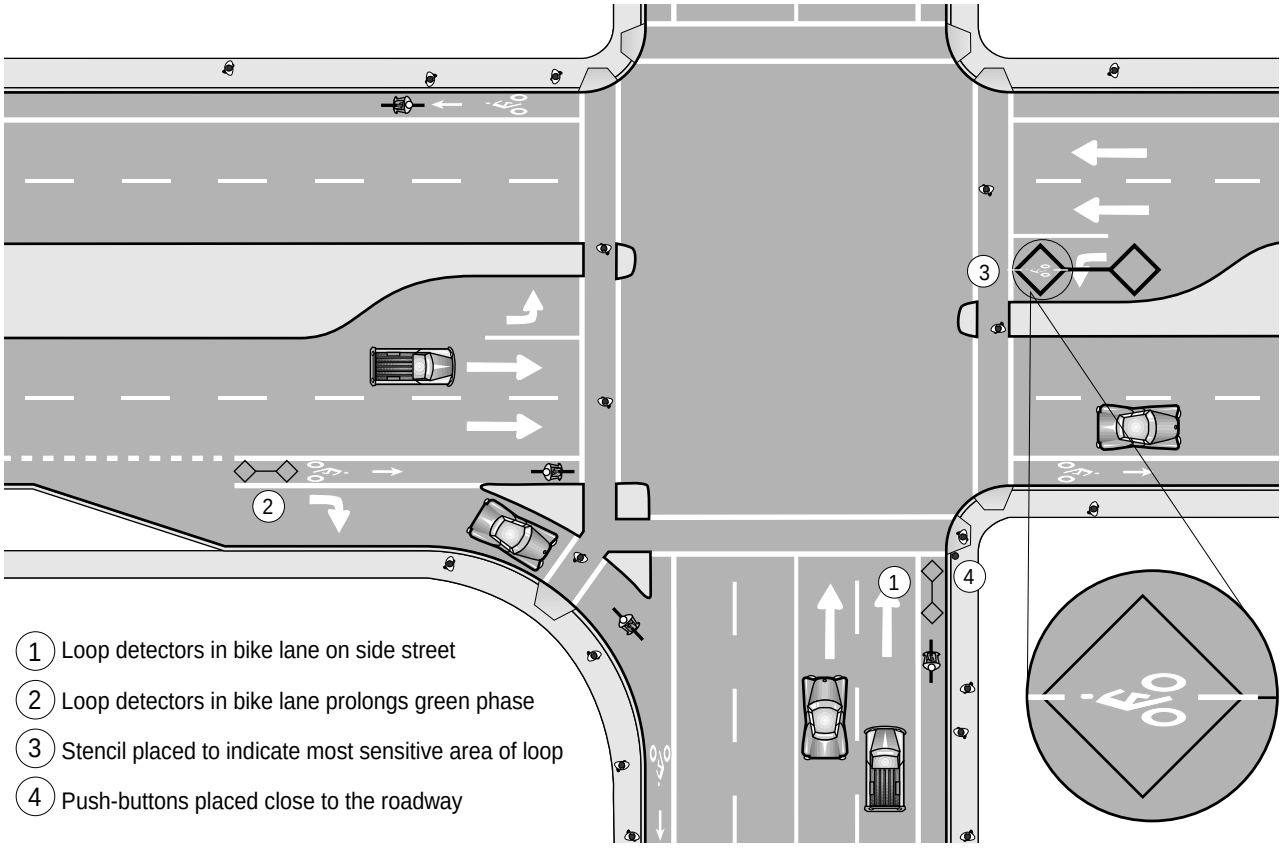


Figure 103: Signalized intersection sensitive to bicycles

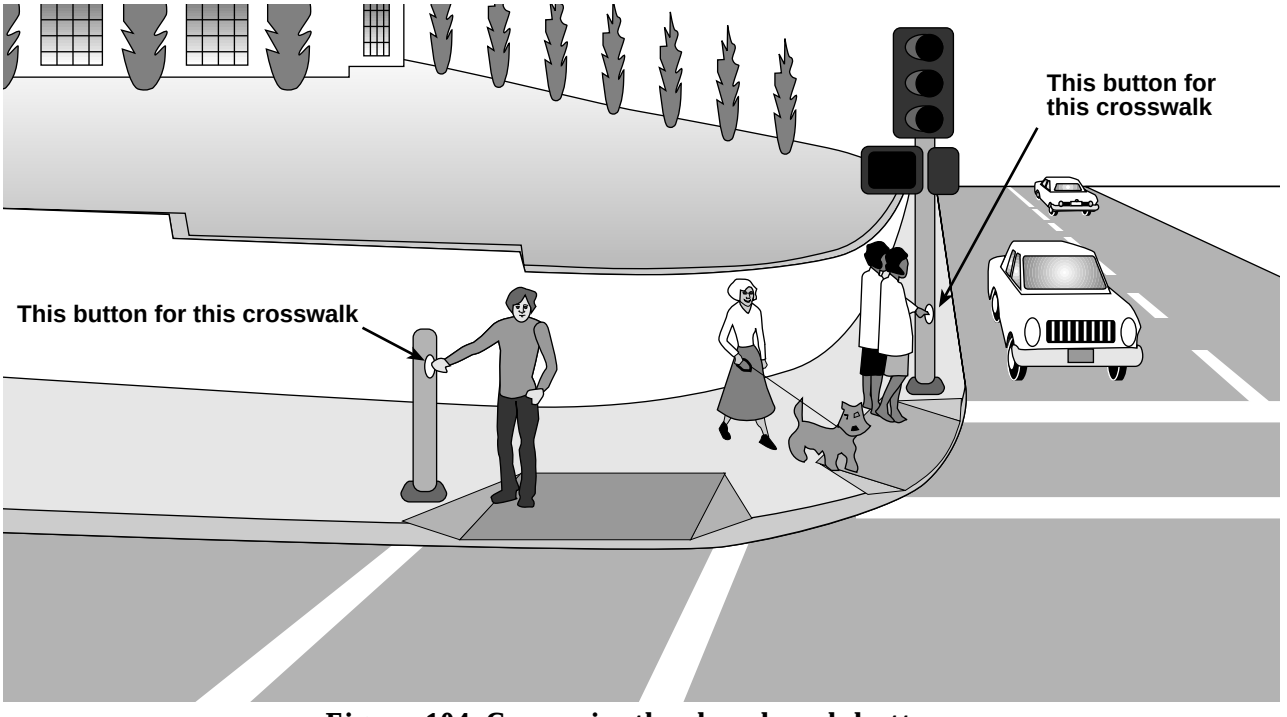


Figure 104: Conveniently-placed push-buttons

Push-buttons on poles and pedestal

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.

Motion detectors (both infrared and video) are being experimented with; these automatically change the signal phase when a pedestrian approaches.

Signalized pedestrian crossing

G. INTERCHANGES

INTRODUCTION

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

In rural areas, traffic volumes are usually lower, little pedestrian use is expected, and recreational and touring bicyclists are usually experienced enough to make their way through an interchange. Shoulder widths through interchanges should be wide enough for bicycle use.

However, in urban and suburban areas, pedestrians and bicyclists of all skill levels travel on the intersecting cross-streets. Well-designed interchanges provide safe and convenient passage for non-motorized traffic.

To alleviate conflicts, more non-interchange crossings of freeways should be provided, with these advantages for bicyclists and pedestrians:

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

G.1. BASIC PRINCIPLES

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

Signals and right-angle intersection make this freeway entrance crossable by pedestrians

It is important to consider both convenience and safety when providing for pedestrian and bicycle travel near interchanges. If facilities are not used because of perceived inconvenience, the issue of safety becomes moot. The expected path of pedestrians and bicyclists must be obvious and logical, with minimal out-of-direction travel and grade changes.

In most urban and suburban settings, the appropriate pedestrian facilities are sidewalks and the appropriate bicycle facilities are bike lanes. Sidewalks should be wide enough to facilitate two-way pedestrian travel; bike lanes must be placed on both sides of the roadway to allow bicyclists to ride with traffic.

G.2. STANDARDS

Refer to chapters II and III for bikeway and walkway standards. Higher standards should be considered under these special circumstances:

- When sidewalks are placed on only one side of the road, they should be 2.4 m (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 and bicyclists, they should be at least 3 m (10 ft) wide (this situation should be avoided wherever possible).

G.3. GUIDELINES

G.3.a. At-Grade Crossings

Interchanges with access ramps connecting to local streets at a right angle are easiest for pedestrians and bicyclists to negotiate; the intersection of the ramp and the street should follow established urban intersection design. The main advantages are:

- The distance that pedestrians and bicyclists must cross at the ramps is minimized;
- Signalized intersections stop traffic; and
- Visibility is enhanced.

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

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.

Interchanges that use a rural design create more difficult crossing movements for pedestrians and bicyclists, 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 and bicyclists 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 and bicyclists to cross ramps in locations with good visibility and where speeds are low.

G.3.b. Grade-Separated Crossings

Where it is not possible to accommodate pedestrians and bicyclists 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 and bicyclists ignore the facility and try to negotiate the interchange at grade with no sidewalks, bike lanes or crosswalks.

In some instances, a separated path can be provided on only one side of the interchange, 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); and
- Some bicyclists will be riding on a path facing traffic, creating difficulties when they must cross back to a bike lane or shoulder (clear and easy to follow directions must be given to guide bicyclists' movements that are inconsistent with standard bicycle operation).

Pedestrian crossing exit ramp

To ensure proper use by pedestrians and bicyclists, structures must be open, with good visibility - especially undercrossings.

G.3.c. Other Considerations

Special care must be given to accommodate all potential pedestrian and bicycle movements. Closing of a crosswalk should only be considered as a last resort.

Continuity of sidewalks and bike lanes must be provided to ensure linkage with existing facilities beyond the intersection.

If a path is used to carry bicycle and pedestrian traffic, opportunities to provide direct links to destination points should be sought, if they offer less travel distance than following the roadway alignment. This might be accomplished by providing paths with direct access to destinations.

Good visibility of pedestrians at ramp terminals on structures should be provided, by flaring guard rails at corners.

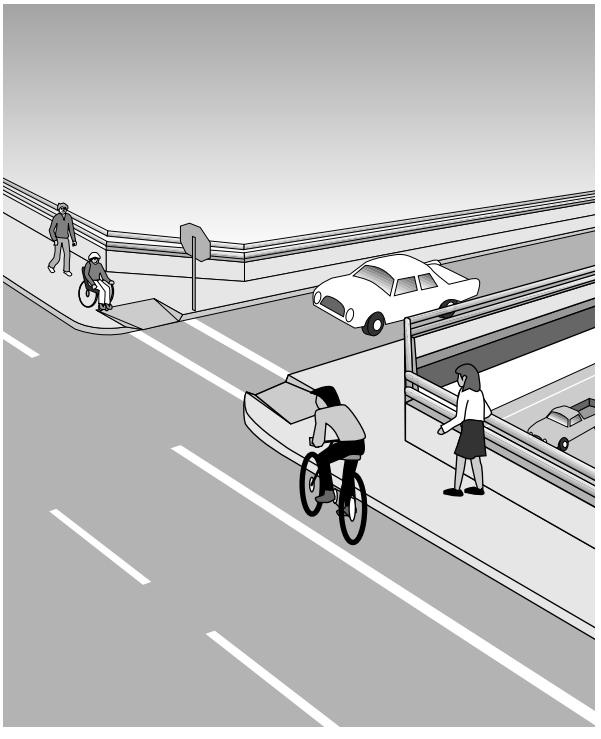


Figure 105: Ramp terminal with good pedestrian sight distance

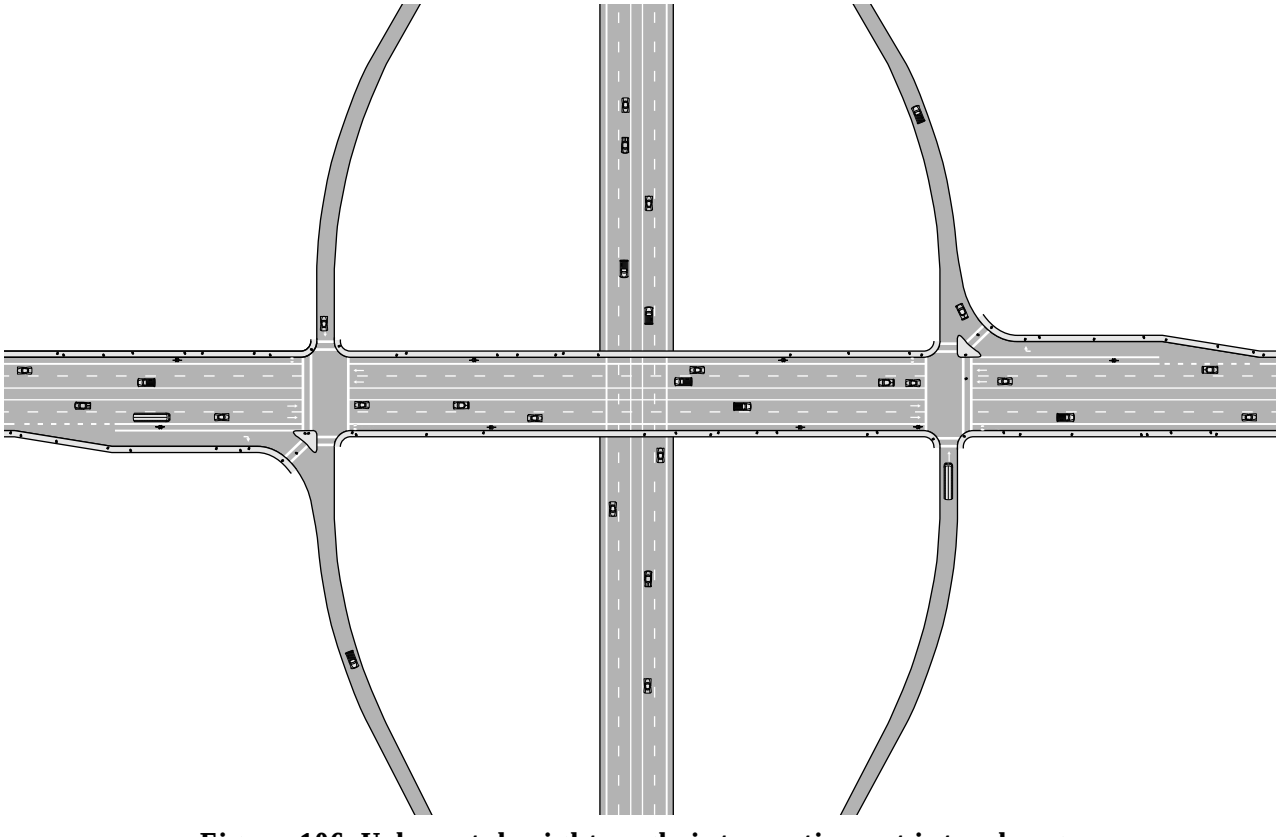


Figure 106: Urban-style right-angle intersections at interchange

H. OTHER INNOVATIVE DESIGNS

These concepts are presented as information, to help ODOT, cities and counties to come up with new solutions to common intersection problems.

H.1. MERGING & EXIT LANES

While bike lanes and 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.

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

H.1.a. Right-Lane Merge

It is difficult for cyclists and 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
- The speed differential between cyclists and motorists is high.

The following design guides cyclists and pedestrians in a manner that provides:

Bike lane striped across gore area

- 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 drivers' attention is not entirely focused on merging with traffic.

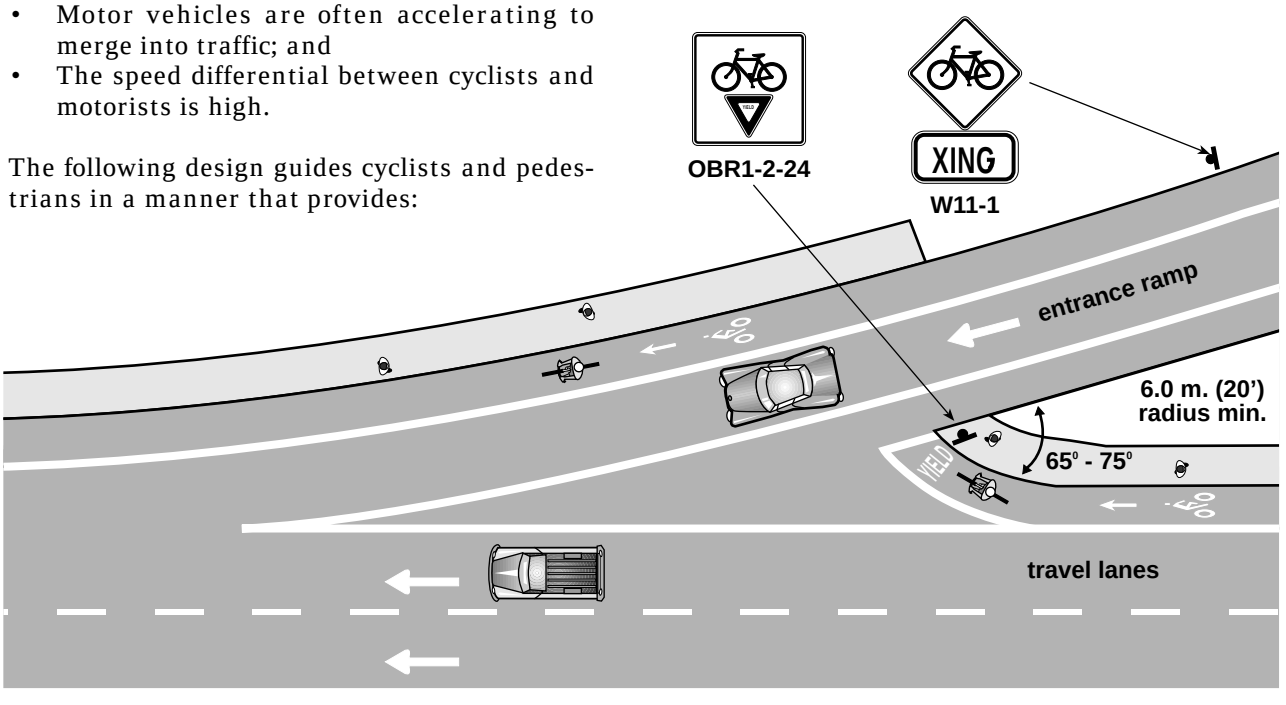


Figure 107: Right-lane merge - bike lane and sidewalk configuration (Urban design - not for use on limited access freeways)

H.1.b. 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 following 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.

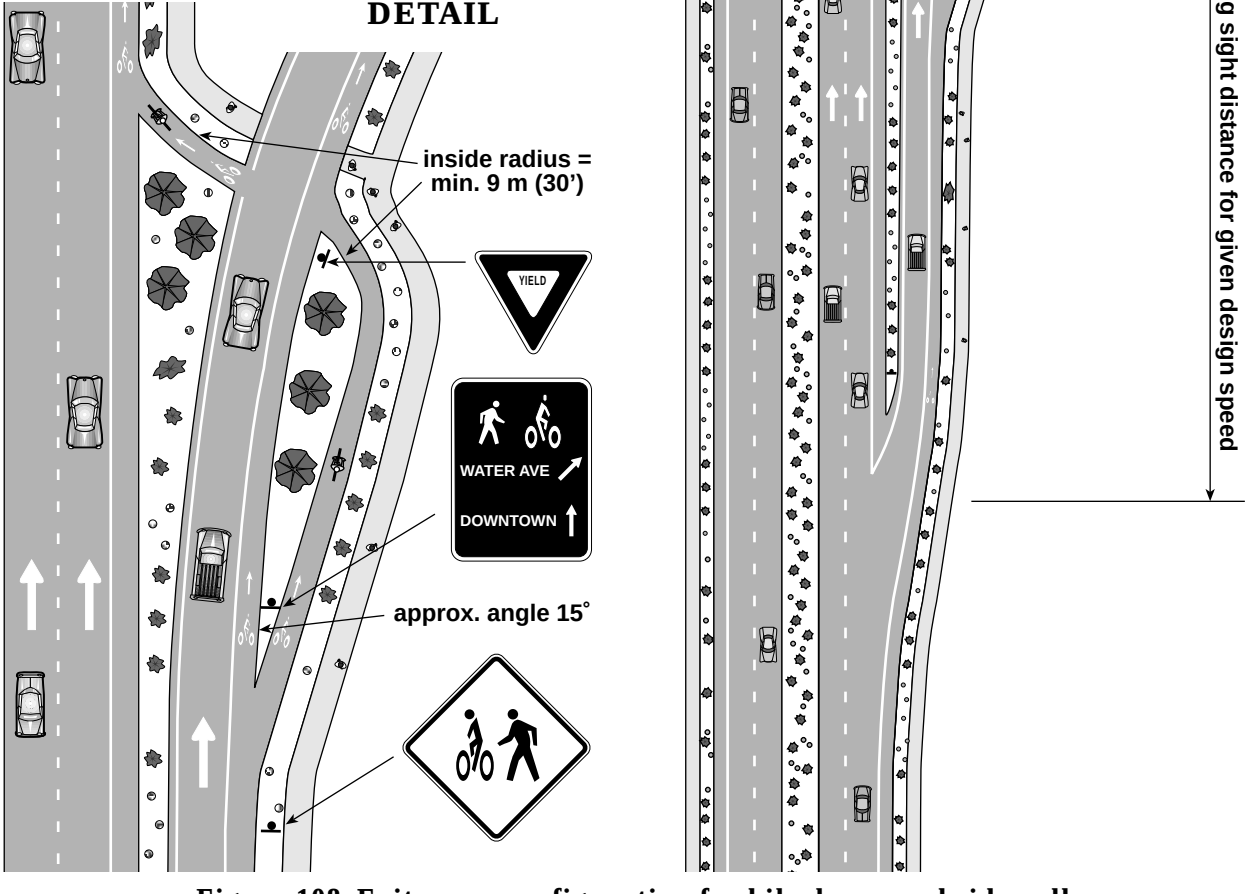


Figure 108: Exit ramp configuration for bike lanes and sidewalks (Urban design - not for use on limited access freeways)

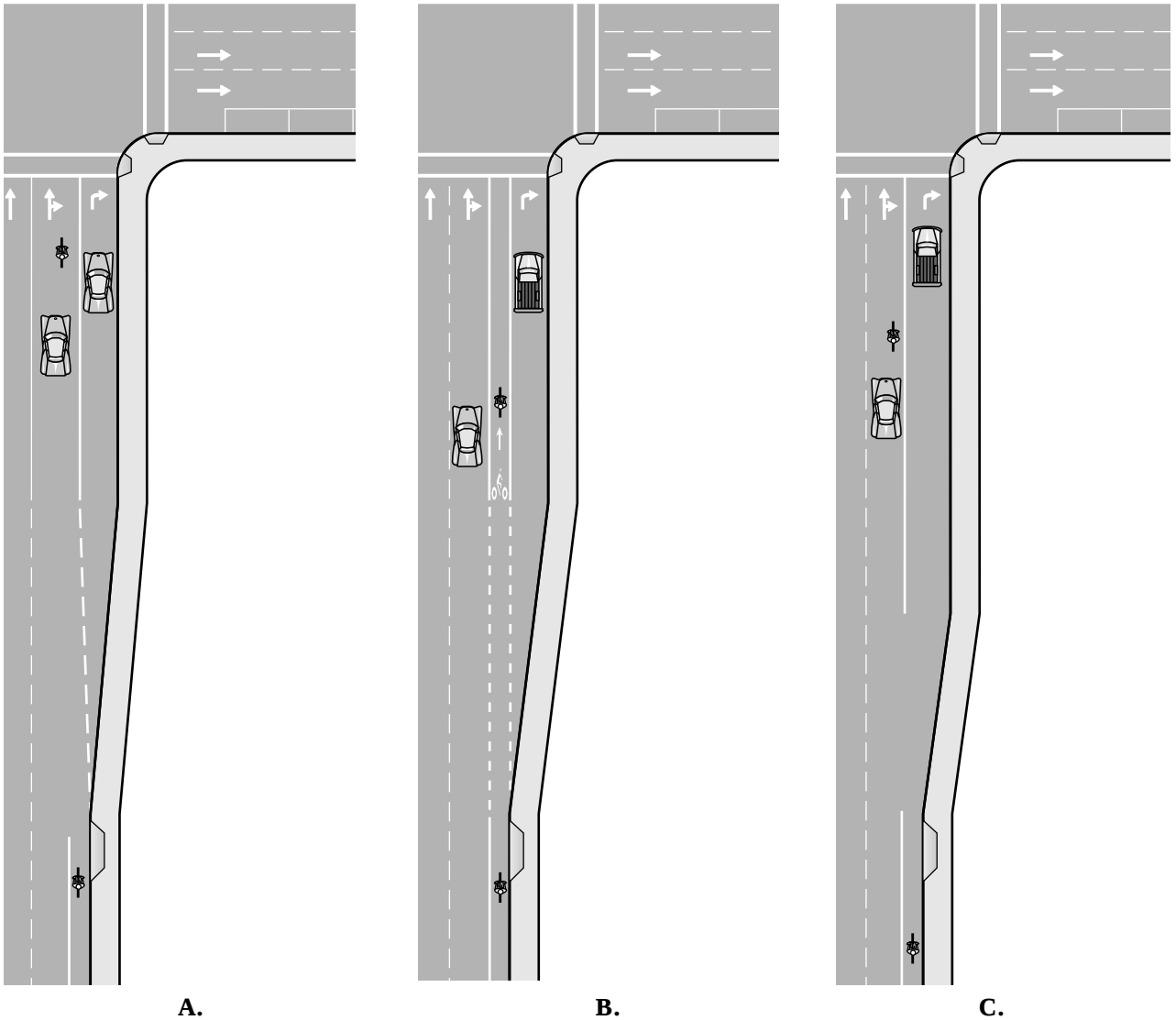
H.2. DUAL RIGHT-TURN LANES

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.

Bicyclists and motorists should be guided to areas where movements are more predictable, so bicyclists and motorists can tackle one conflict at a time, in a predictable manner. A curb cut provides bicyclists with an access to the sidewalk, for those who prefer to proceed as pedestrians.

- Design A encourages cyclists to share the optional through/right-turn lane with motorists.
- Design B guides cyclists up to the intersection in a dedicated bike lane.
- Design C allows cyclists to choose a path themselves (this design is the AASHTO recommendation - simply dropping the bike lane prior to the intersection).



A. **B.** **C.**

Figure 109: Bike lane through dual right-turn lanes

A fourth 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.

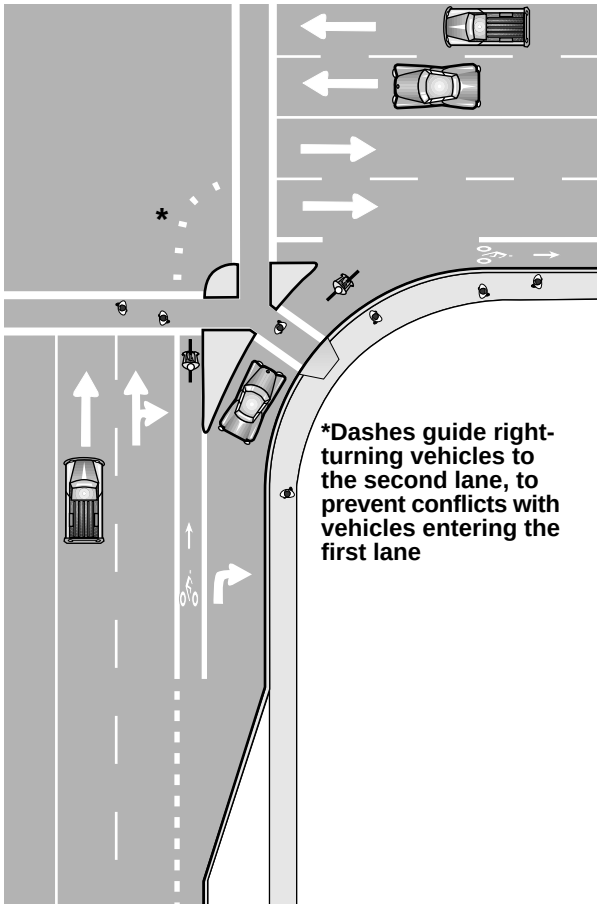


Figure 110: Bike lane through dual right-turn lanes with island

Engineering judgment should be used to determine which design is most appropriate for the situation.

H.3. RIGHT-TURN LANE WITHOUT ROOM FOR A BIKE LANE

On bike lane retrofit projects, where there is insufficient room to mark a minimum 1.2 m (4 ft) bike lane to the left of the right-turn lane, a right-turn lane may be marked and signed as a shared-use lane, to encourage through cyclists to occupy the left portion of the turn lane. This is most successful on slow-speed streets.

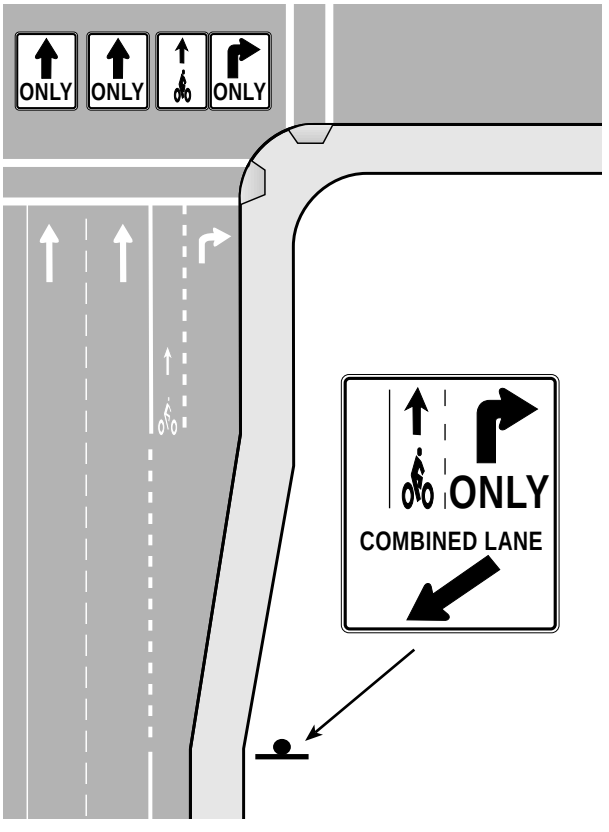


Figure 111: Joint use of a right-turn lane for through bicyclists.

Combined right-turn lane and through bike lane

Modern roundabout (Switzerland)

H.4. MODERN ROUNDABOUTS

A roundabout is a method of handling traffic at intersections commonly used in Europe, Australia and Japan. Roundabouts are now gaining acceptance in this country. Early attempts at roundabouts were often not successful for several reasons, mainly:

- The radius was too small (creating difficulties for trucks);
- The radius was too large (encouraging high speeds);
- The right of way was not clearly defined (causing confusion and collisions); or
- Pedestrians were allowed access to the middle of the roundabout.

Modern roundabout design has several distinctive features:

- A radius large enough to allow movement by trucks, but small enough to slow traffic speeds;
- A visual obstruction, through landscaping, that obscures the driver's view of the road ahead, to discourage users from entering the roundabout and proceeding at high speeds;
- The right of way clearly established: drivers entering the roundabout yield to drivers already in the roundabout; and
- No bicycle or pedestrian access to the center of the roundabout, which should not contain attractions such as fountains or statues.

One of the major advantages of roundabouts is the reduced need for travel lanes, as traffic is constantly moving (signals create stop-and-go conditions for motor vehicles - extra travel lanes are needed to handle capacity at intersections).

Other advantages include:

- Reduced crash rates;
- Reduced severity of injuries (due to slower speeds);
- Reduced costs (compared to traffic signals, which require electrical power); and
- Reduced liability by transportation agencies (there are no signals to fail).

Crosswalk at roundabout approach

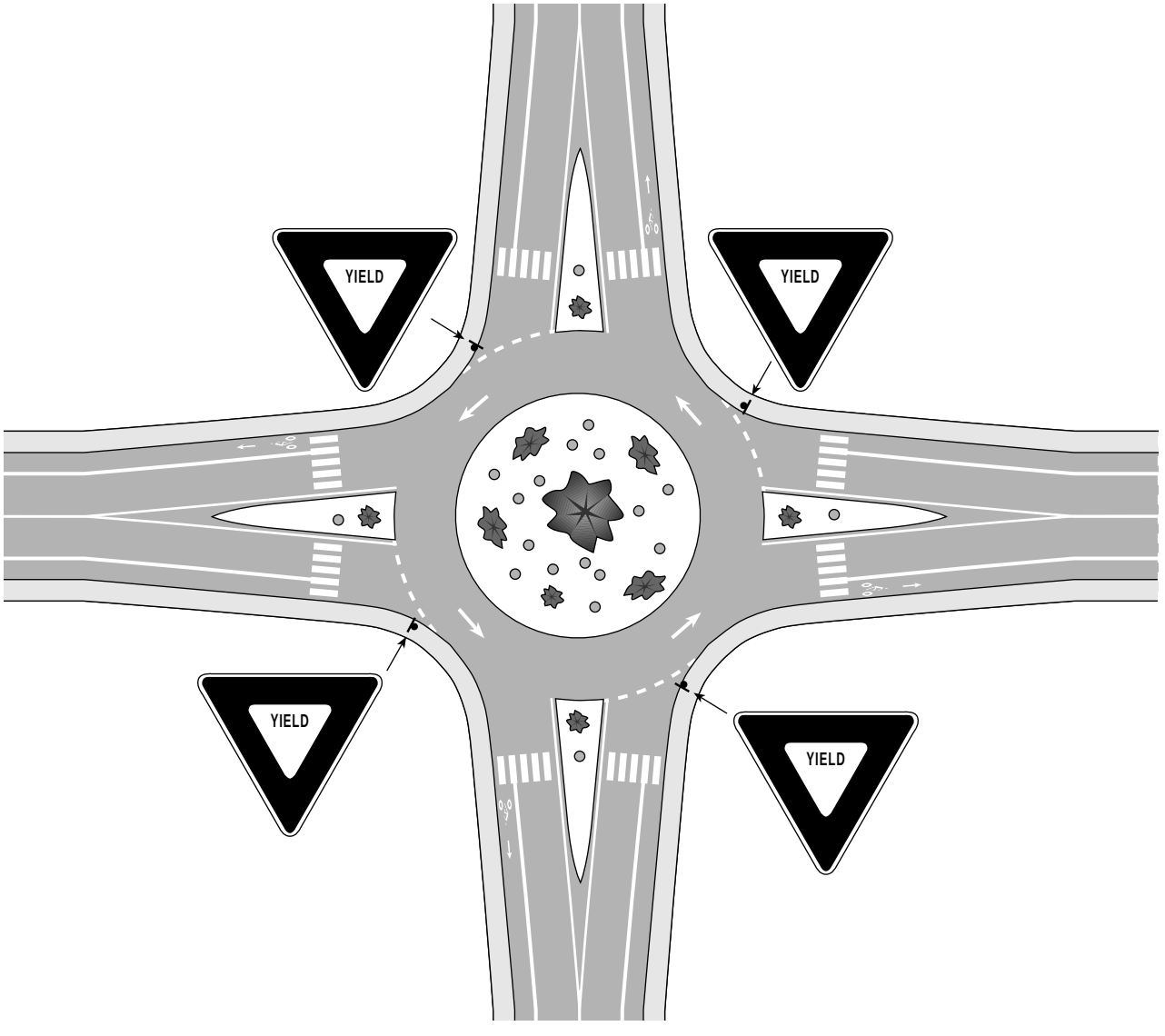


Figure 112: Modern urban roundabout

Most of the advantages and disadvantages of roundabouts affect motor vehicle flow, but there are advantages and disadvantages for bicyclists and pedestrians:

Advantages for pedestrians and bicyclists

- The reduced cost frees funds for other purposes, including bicycle and pedestrian facilities;
- The reduced need for travel lanes frees right-of-way for other purposes, including bicycle and pedestrian facilities;
- Traffic flows at a more even pace, making it easier for bicyclists and pedestrians to judge crossing movements;
- Pedestrians have to cross only one or two lanes of travel at a time, in clearly marked crosswalks;
- Bicyclists negotiate intersections at speeds closer to that of motor vehicles; and
- Mid-block crossing opportunities may be improved if the number of travel lanes can be reduced.

Disadvantages for pedestrians and bicyclists

- Traffic flowing more evenly may reduce pedestrian crossing opportunities as fewer gaps are created;
- Pedestrians are responsible for judging their crossing opportunities; there is no signal protection provided, though pedestrian signals can be added at special sites; and
- Bicyclists must share the road and occupy a travel lane; by riding too far to the right, they risk being cut off by vehicles leaving the roundabout in front of them.

For more design details not discussed here, please consult other publications such as Guide to Traffic Engineering Practices, Part 6: Roundabouts, published by Austroads.

A loop detector in the bike lane should supplement push-button

Stencil in left-turn lane marks "hot spot" of loop detector

II.8. SIGNING & MARKING

INTRODUCTION

Signing and marking of bikeways and walkways must be uniform and consistent for them to command the respect of the public and provide safety to users. Signing and marking must be warranted by use and need. All signing and markings of bikeways and walkways on the state highway system shall be in conformance with the recommendations of this section. To provide uniformity and continuity, cities and counties are encouraged to adopt these standards.

Well-designed roads make it clear to users how to proceed, and require very little signing. Conversely, an over-abundance of warning and regulatory signs may indicate a failure to have addressed problems. The attention of drivers, bicyclists and pedestrians should be on the road and other users, not on signs on the side of the road. Oversigning degrades the usefulness of signs, causes distractions, creates a cluttered effect, is ineffective and wastes resources.

Language Barriers: Many people don't read English. The message conveyed by signs should be easily understandable by all roadway users: symbols are preferable to text.

Sign Placement: Signs placed adjacent to roadways must conform to adopted standards for clearance and breakaway posts.

Directional signs on multi-use path

An abundance of commercial signs distracts from traffic signs

A. ON-ROAD BIKEWAYS

A.1. SHARED ROADWAYS & SHOULDER BIKEWAYS

A.1.a. Signing

In general, no signs are required for these two types of bikeways. Bicyclists should be expected on all urban local streets, which are mostly shared roadways. Bicyclists riding on shoulder bikeways are well-served with adequate width and a smooth pavement.

On narrow rural roads heavily used by cyclists, it may be helpful to install bike warning signs (W11-1) with the rider ON ROADWAY or ON BRIDGE ROADWAY, where there is insufficient shoulder width for a significant distance. This signing should be in advance of the roadway condition. If the roadway condition is continuous, an additional rider "NEXT XX MILES" may be used.

Figure 113: Sign W11-1 with riders

Directional signs are useful where it is recommended that bicyclists follow a routing that differs from the routing recommended for motorists. This may be for reasons of safety, convenience, or because bicyclists are banned from a section of roadway (the routing must have obvious advantages over other routes).

ODOT recommends **against** the use of BIKE ROUTE signs and arrows along city streets with no indication to cyclists as to where they are being directed. Cyclists will usually ignore these signs if they send them out of direction.

Figure 114: Sign OBD11-1; Destination sign

A.1.b. Marking

A normal 100 mm (4") wide fog line stripe is used on shoulder bikeways.

Warning sign on narrow roadway

Rural shoulder bikeway stripe

A.2. BIKE LANES

A.2.a. Bike Lane Designation

Bike lanes are officially designated to create an exclusive or preferential travel lane for bicyclists with the following markings:

- A 200 mm (8”) white stripe; and
- Bicycle symbol and directional arrow stencils on pavement.

Optional NO PARKING signs (R7-9 and R7-9a) may be installed if problems with parked cars occur; painting curbs yellow also indicates that parking is prohibited.

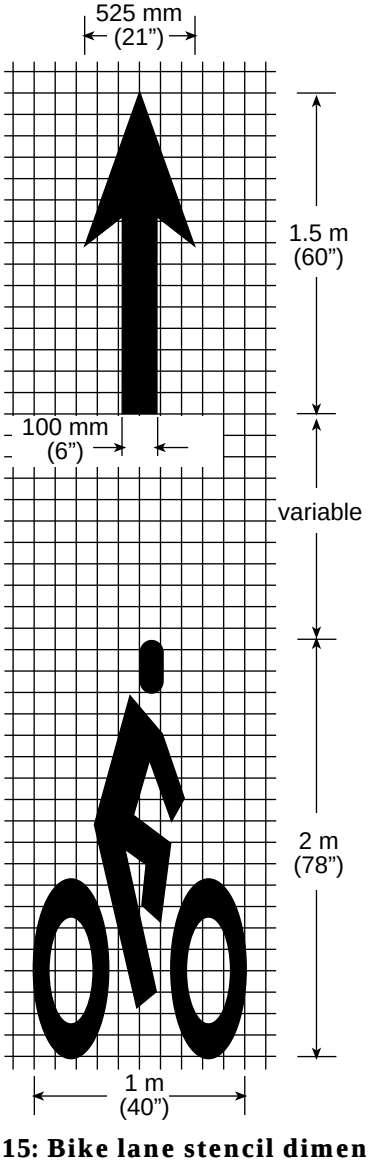


Figure 115: Bike lane stencil dimensions

Figure 116: Signs R7-9 and R7-9a

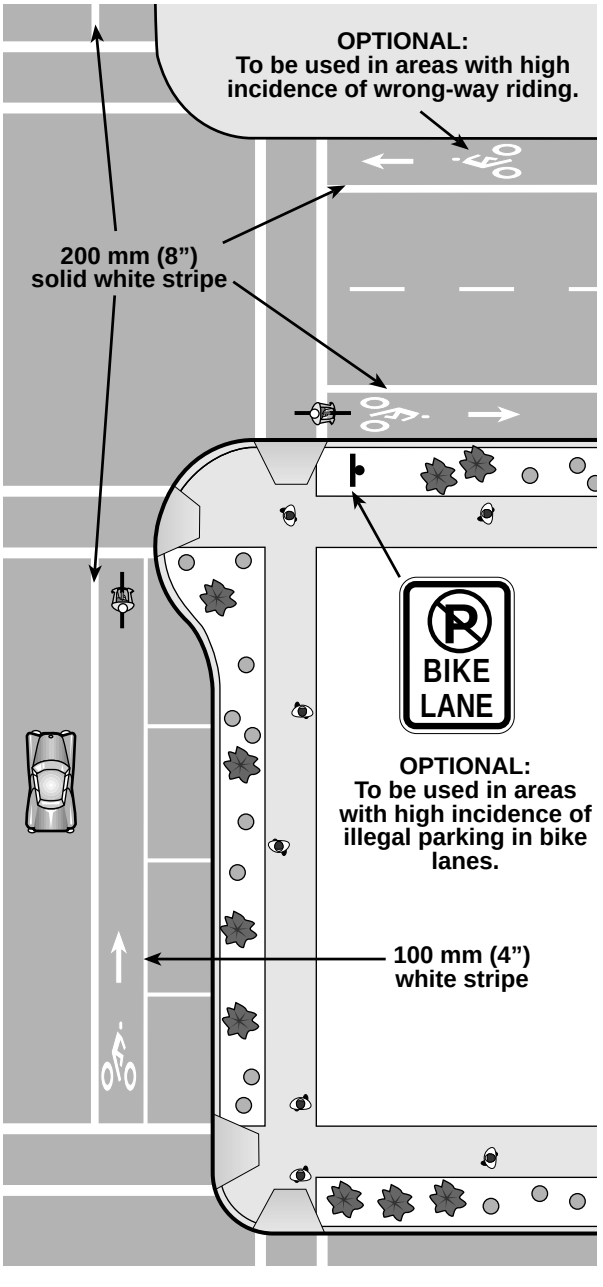


Figure 117: Bike lane designation

A.2.b. Stencil Placement

Stencils should be placed after most intersections; this alerts drivers and bicyclists entering the roadway of the exclusive nature of the bike lanes. Stencils should be placed after every intersection where a parking lane is placed between the bike lane and the curb.

Supplementary stencils may also be placed at the end of a block, to warn cyclists not to enter a bike lane on the wrong side of the road.

Additional stencils may be placed on long sections of roadway with no intersections. A rule of thumb for appropriate spacing is: multiply designated travel speed (in MPH) by 40. For example, in a 35 MPH speed zone, stencils may be placed approximately every 1400 feet. Metric formula: speed times 7; e.g., appropriate spacing in a 60 km/h zone is approximately 400 m.

Care must be taken to avoid placing stencils in an area where motor vehicles are expected to cross a bike lane - usually driveways and the area immediately after an intersection.

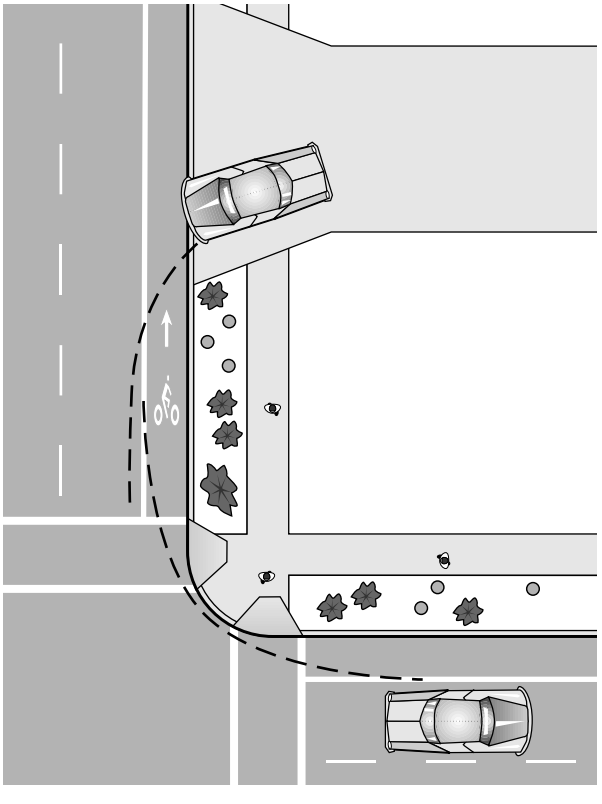


Figure 118: Bike lane stencil placed out of swept path of turning vehicles

A.2.c. Intersections

Bike lanes should be striped to a marked crosswalk or a point where turning vehicles would normally cross them. The lanes should resume at the other side of the intersection. Bike lanes are not normally striped through intersections; however, it may be appropriate to do so where extra guidance is needed; in this case, they may be striped with dashes, or colored, to guide bicyclists through a long undefined area.

Local jurisdictions may stripe bike lanes through all intersections.

A.2.d. Right Turn Lanes at Intersections

The through bike lane to the left of a right-turn lane must be striped with two 200 mm (8”) stripes and connected to the preceding bike lane with at least one dashed line on the left. This allows turning motorists to cross the bike lane. A stencil must be placed at the beginning of the through bike lane.

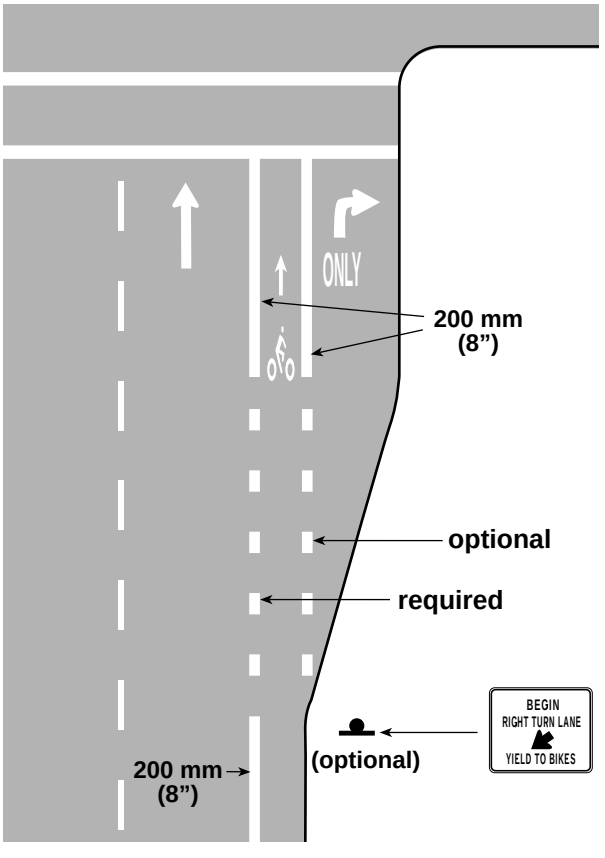


Figure 119: Bike lane marking at right-turn lane

Sign R4-4, BEGIN RIGHT TURN LANE, YIELD TO BIKES, may be placed at the beginning of the taper in areas where a through bike lane may not be expected (on high-speed urban roadways with a rural character, or on sections of roadway where bike lanes have been added where there weren't any previously).

Figure 120: Sign R4-4

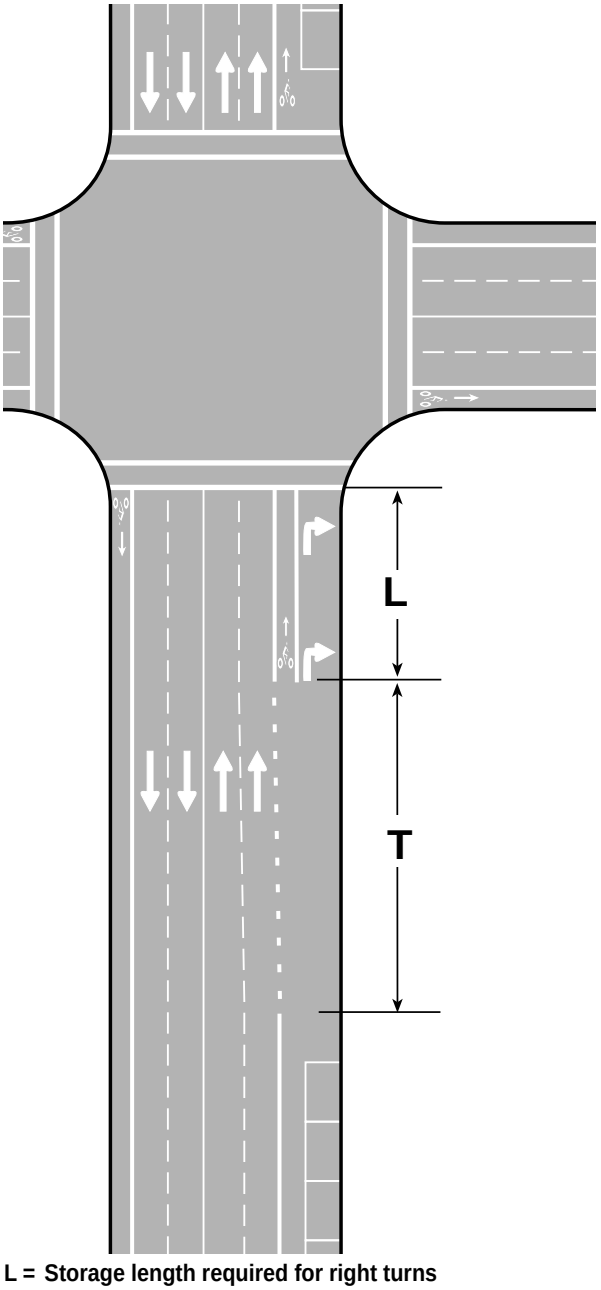
Bike lane stencil

Multiple bike lanes (Holland)

Through bike lane striped to left of right-turn lane

Not all intersections can be widened to provide a right-turn lane. A bike lane to the left of right turning cars should still be provided.

One common configuration occurs where a right-turn lane is developed by dropping parking:

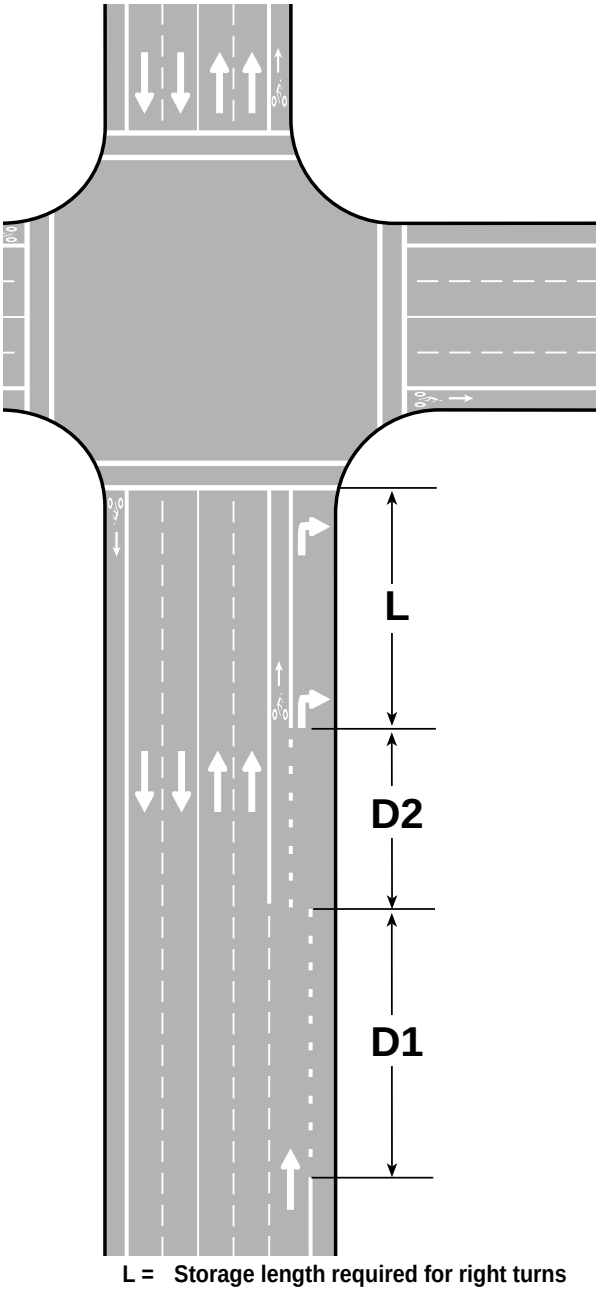


L = Storage length required for right turns
T = Taper length needed for motorists to merge right (to be calculated based on standard right-turn configuration)

Figure 121: Bike lane left of right-turn lane developed by dropping parking

Another configuration occurs where a lane drops and turns into a right-turn lane.

Note: This is a difficult movement for bicyclists as they must merge left and find a gap in the traffic stream:



L = Storage length required for right turns
D1, D2 = Distance needed for bicyclists to merge left (to be field-determined for each case)

Figure 122: Bike lane left of right-turn lane developed by dropping a travel lane

Bike lane to left of right-turn lane (parking dropped)

A.2.e. Outer Edge of Bike Lane

Where parking is allowed next to a bike lane, the parking area should be defined by parking space markings or a solid 100 mm (4") stripe.

Tick marks may be used to separate bike lane from parking

Reflectors and raised markings in bike lanes can deflect a bicycle wheel, causing the cyclist to lose control. If pavement markers are needed for motorists, they should be installed on the motorist's side of the stripe, and have a beveled front edge.

A.2.f. Bike Lane Ends

The bike lane ends symbol sign may be used where a bicycle lane is abruptly terminated and the rider must merge with the through lane of traffic. It may or may not have the BIKE LANE ENDS (OBW 1-10) rider placed under this sign. The BIKE LANE ENDS sign may be used as a rider under the bike lane ends symbol Sign No. OBW 1-9.

Figure 122b: Signs OBW1-9 and OBW1-10

A.3. SPECIAL USE SIGNS

A.3.a. Railroad Crossing

Where a shared roadway, shoulder bikeway, bike lane or multi-use path crosses a railway at an unfavorable crossing angle, or if the crossing surface is rough, warning sign OBW8-20 may be used:

Figure 123: Sign OBW8-20

A.3.b. Sidewalk Users

Where bicyclists are allowed to use sidewalks, and the sidewalks are too narrow for safe riding (usually on a bridge), sign OBR10-13 may be used to encourage cyclists to walk:

Figure 124: Sign OBR10-13

A.3.c. Bicycle Use of Push-Buttons

Where it is recommended that bicyclists use a push-button to cross an intersection (usually where a multi-use path crosses a roadway at a signalized intersection), the following signs should be used:

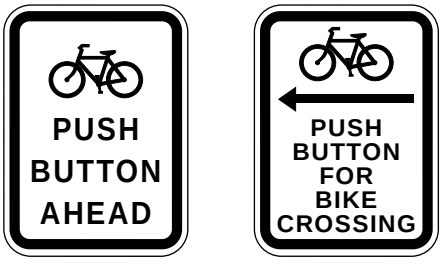


Figure 125: Signs OBR10-15 and OBR10-12

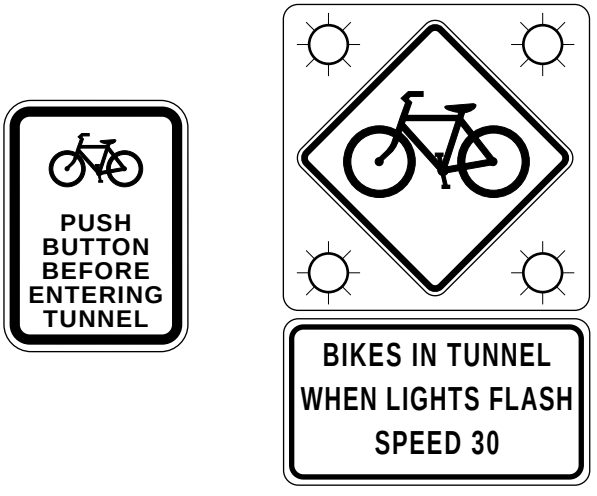


Figure 126: Signs OBR10-10 and OBW1-8

A.3.d. Tunnels

Where substantial bicycle traffic is expected in a narrow tunnel, the signs OBR10-10 and OBW1-8 may be used.

The push-button sign should be placed at a location that allows cyclists to proceed at a normal speed and enter the tunnel as lights begin to flash. The timing of the flashing lights should be based on normal bicycle travel speed, plus an extra margin for safety (though leaving the flashing lights on for too long may render them ineffective if motorists enter the tunnel and cyclists are no longer present).

"BIKES IN TUNNEL" sign on the Oregon Coast Highway

A.3.e. Touring Routes

Special signs may be created to guide cyclists along touring routes, such as the Oregon Coast Bike Route:

Figure 127: OBD11-3

These signs should be used sparingly, mainly at intersections to guide cyclists along the route.

Oregon Coast Bike Route signs guide touring cyclists down the coast

Bicycle races usually occupy an entire travel lane

A.3.f. Bicycle Races

A special sign to be used on the roadway for bicycle races in Oregon is OBW16-2:

Figure 128: OBW16-2

Sign OBW17-1 should be mounted on escort vehicles:

Figure 129: OBW17-1

For a complete description of measures to be taken for bicycle racing, please consult the "Guidelines for Administration of Bicycle Racing on Oregon Roads."

B. MULTI-USE PATHS

Paths should be signed with appropriate regulatory, warning and destination signs.

B.1. REGULATORY SIGNS

Regulatory signs inform users of traffic laws or regulations. They are erected at the point where the regulations apply. Common regulatory signs for bicyclists are:

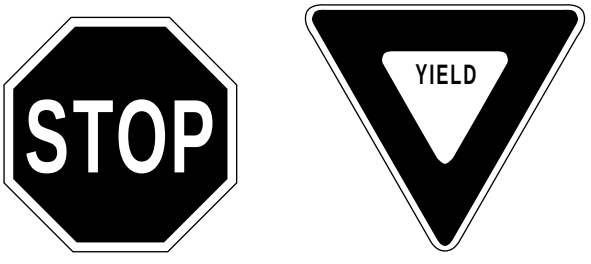


Figure 130: Signs R1-1 and R1-2

Note: signs R1-1 and R1-2 are reduced versions of standard motor vehicle signs, to be used where they are visible only to bicyclists (where a path crosses another path or where a path intersects a roadway at right angles):

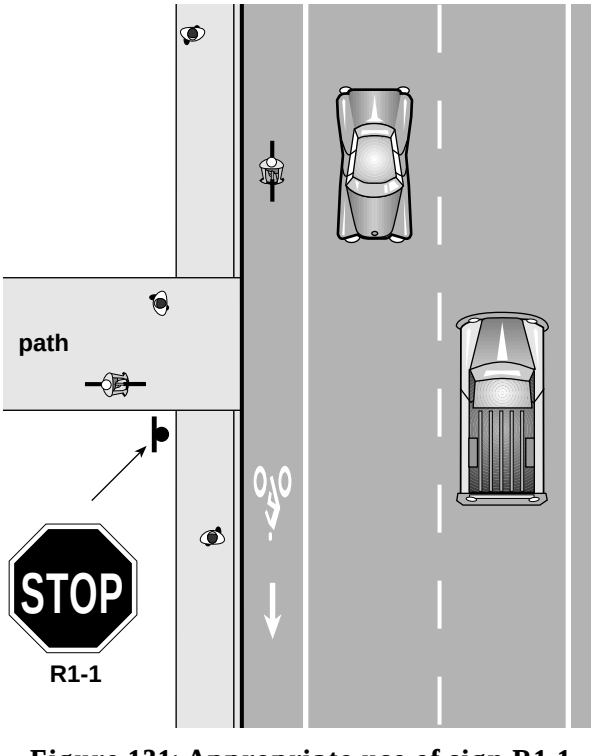


Figure 131: Appropriate use of sign R1-1

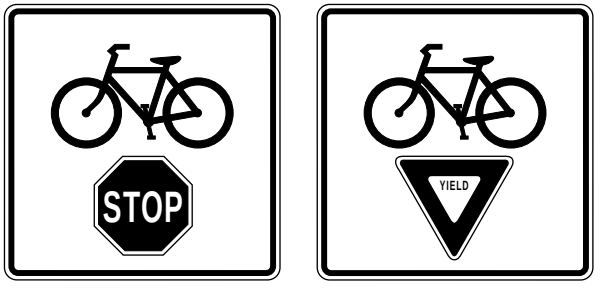


Figure 132: Signs OBR1-1 and OBR1-2

Signs OBR1-1 and OBR1-2 should be used where the signs are visible to motor vehicle traffic (where a path is parallel and close to a roadway):

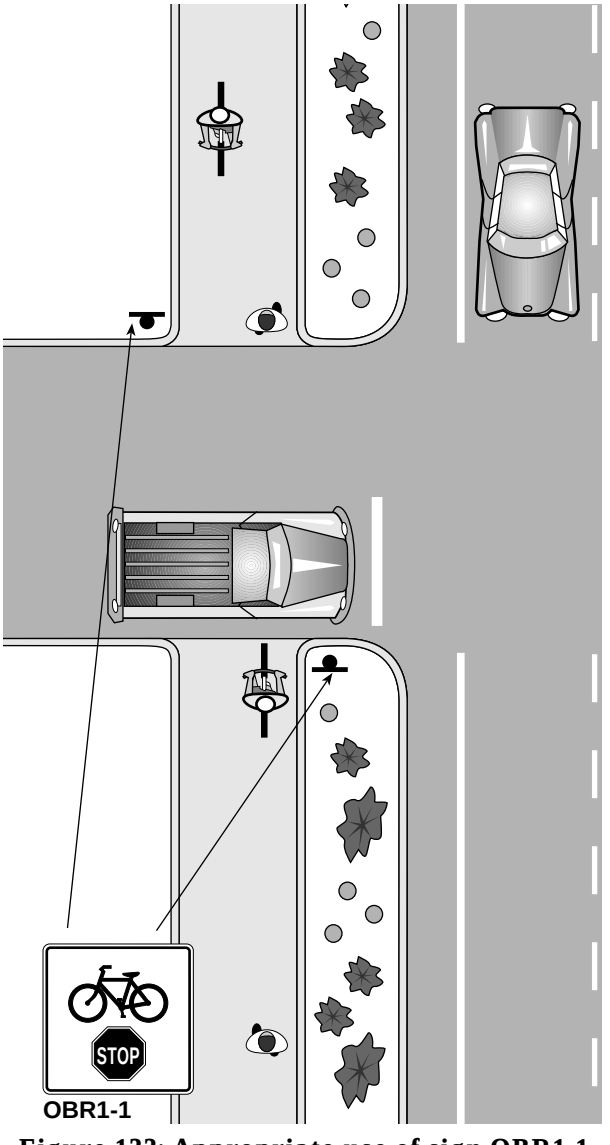


Figure 133: Appropriate use of sign OBR1-1

Sign OBR1-3 should be used at the beginning of multi-use paths and at important access points to warn cyclists of the presence of other users:

Figure 134: Sign OBR1-3

Signs R5-3 and OBR10-14 may be used at the beginning of a multi-use path if there are problems with motor vehicles using the path:

Figure 135: Signs R5-3 and OBR10-14

Where bicyclists using the path must cross a road at a signalized intersection (in a cross-walk) and proceed as pedestrians, sign OBR10-11 may be used:

Figure 136: Sign OBR10-11

B.2. WARNING SIGNS

Warning signs are used to inform path users of potentially hazardous conditions. They should be used in advance of the condition. Most are reduced versions (450 mm X 450 mm [18" X 18"]) of standard highway warning signs:

B.2.a. Curves

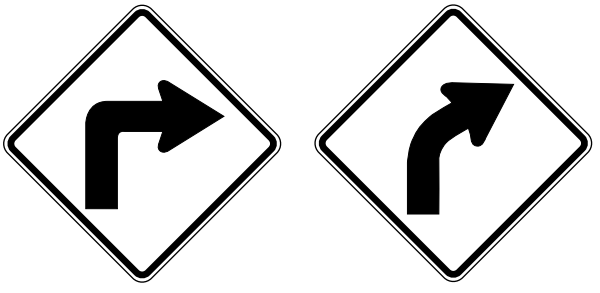


Figure 137: Signs W1-1 and W1-2

B.2.b. Intersections

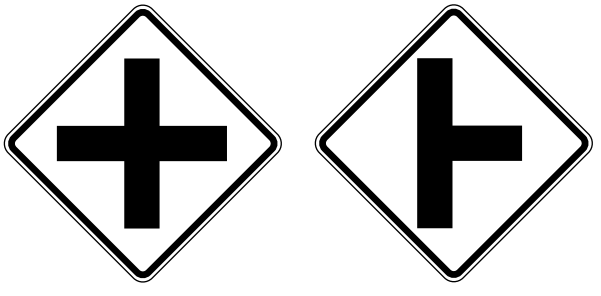


Figure 138: Signs W2-1 and W2-2

B.2.c. Hill

Figure 139: Sign W7-5

B.2.d. Height and Width Constraints

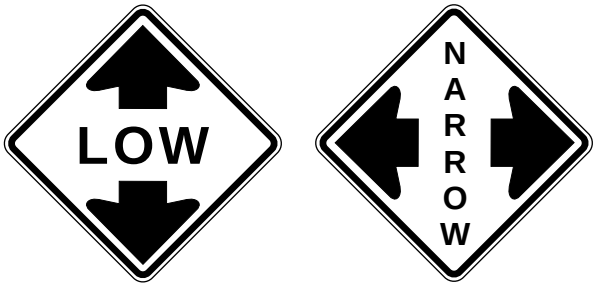


Figure 140: Signs OBW12-2 and OBW12-3

B.2.e. Railroad, STOP Ahead, etc.

Figure 141: Signs W10-1 and W3-1

B.2.f. Path Crossing Roadway

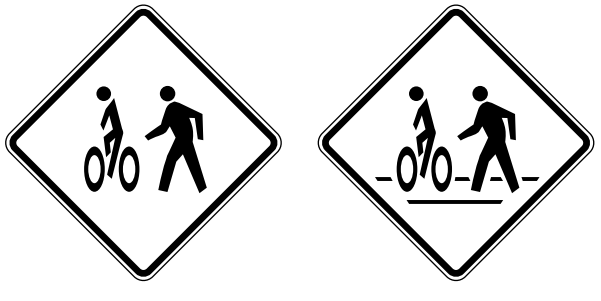


Figure 142: Signs OBW 8-22 and OBW 8-23

Signs OBW 8-22 and OBW 8-23 should be used where a multi-use path crosses a roadway in an unexpected location. This sign is not for use where bike lanes and shoulder bikeways cross streets at controlled intersections.

B.3. DIRECTIONAL, DESTINATION & STREET SIGNS

Where a path crosses a roadway or branches off into another path, directional and destination signs should be provided. It is also helpful to have street name signs at street crossings and access points. Signs directing users to the path are also helpful. These signs are more useful to users than "BIKE ROUTE" signs.

Figure 143: Directional and street signs

B.4. END OF PATH

Where a path ends, and bicyclists continue riding on the roadway, the following sign should be used to direct cyclists to the right side of the road to minimize wrong-way riding:

Figure 144: End of path signs

B.5. PLACEMENT OF SIGNS

Signs should have 1 m (3 ft) lateral clearance from the edge of the path (min 0.6 m [2 ft]). Because of cyclists' and pedestrians' lower line of sight, the bottom of signs should be about 1.5 m (5 ft) above the path. If a secondary sign is mounted below another sign, it should be a minimum of 1.2 m (4 ft) above the path. Signs placed over a path should have a minimum vertical clearance of 2.4 m (8 ft).

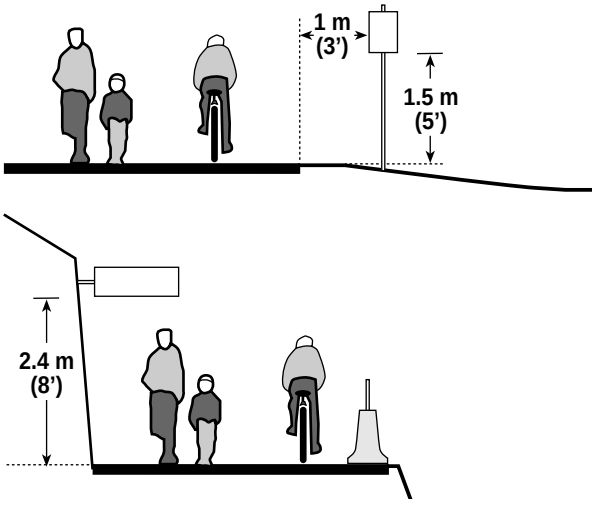


Figure 145: Sign clearances

B.6. RAILROAD CROSSINGS

Stencils and a sign should be placed prior to railroad crossings:

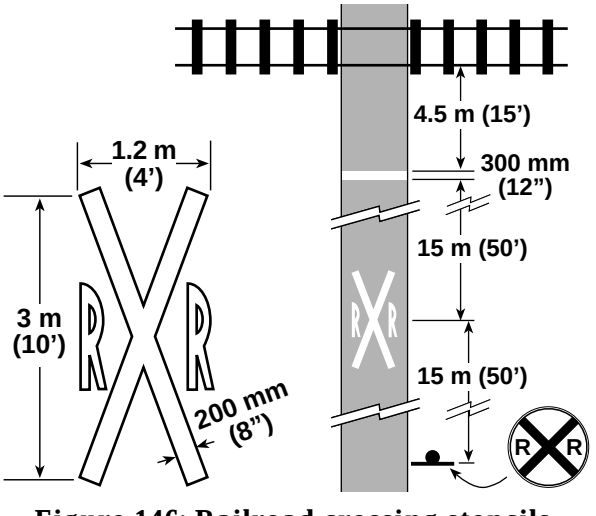


Figure 146: Railroad crossing stencils

B.7. STRIPING

On paths with high use, a broken yellow centerline stripe may be used to separate travel into two directions. Spacing may be either 1 m (3 ft) segments and 2.7 m (9 ft) gaps or 3 m (10 ft) segments and 9 m (30 ft) gaps. A solid centerline stripe should be used through curves and areas of poor sight distance.

Note: Attempts to separate pedestrians from cyclists with an additional painted lane have not proven successful and are not recommended.

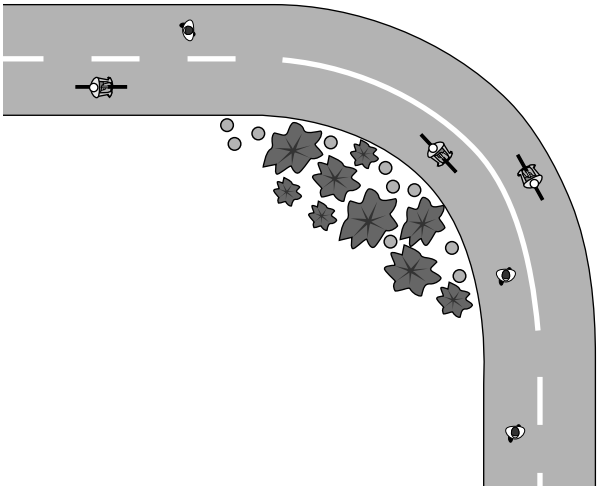


Figure 147: Path striping

Striping and arrows in blind curve

C. REVIEW OF EXISTING BIKEWAY SIGNING

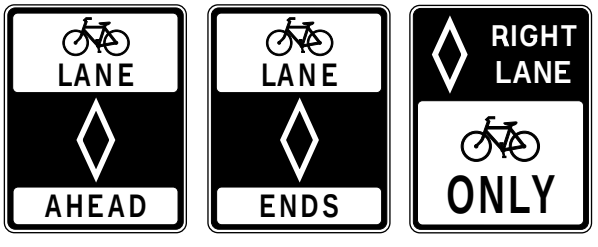
Many bikeways are signed and marked in a manner that is not consistent with current standards and practices. ODOT recommends periodic review of existing signs, to upgrade and standardize bikeway signing.

All existing signs and markings should be inventoried and recommendations made to the appropriate office. **In most cases, this results in a net decrease in the total number of signs.**

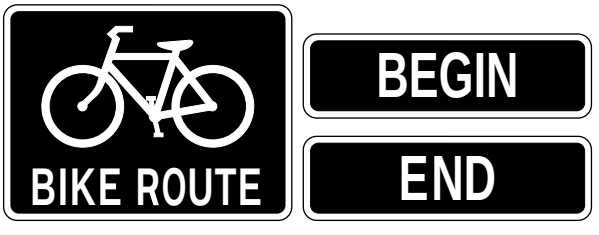
See Figure 148 for examples of signs and markings that ODOT recommends for removal.

Other signs that are not appropriate for the situation, as well as bike lane stencils on rural shoulder bikeways, should be removed.

These signs are confusing



BIKE LANE signs should be replaced with bike lane stencils, with optional NO PARKING signs where needed.



BIKE ROUTE signs, especially with BEGIN and END riders, should be removed, or replaced with direction signs (OBD11-1) for directional assistance.

BIKE XING signs are not needed for bike lanes or shoulder bikeways where they approach controlled intersections.

BIKE WARNING sign with ON SHOULDER rider is not needed where shoulder width is adequate for bicycling.

This warning sign is not needed as bicyclists can judge for themselves the width of a lane.

Figure 148: Obsolete signs

D. WALKWAYS

Walkways generally require little signing. Most regulatory and warning signs are directed at motor vehicle traffic when they approach a crossing. Very little has been done for directional signs for pedestrians.

D.1. REGULATORY SIGNS

The most important signs to increase pedestrians' safety in crosswalks at controlled intersections are STOP and YIELD signs.

Stop sign increases security of pedestrians at crosswalk

At signalized intersections with right-turn or left-turn lanes, signs OR17-5 or OR17-6 may be installed where conflicts with crossing pedestrians could occur:

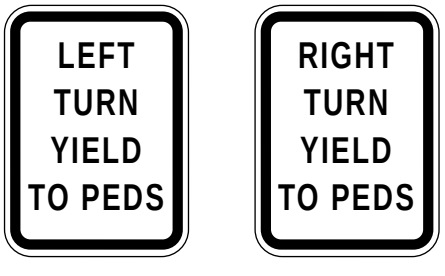


Figure 149: Signs OR17-5 and OR17-6

R10-2a is used to direct pedestrian traffic at intersections where it would be unsafe for pedestrians to cross at a location other than a marked crosswalk:

Figure 150: Sign R10-2a

R9-2a and R9-3 direct pedestrians to cross on green only or to use a push-button:

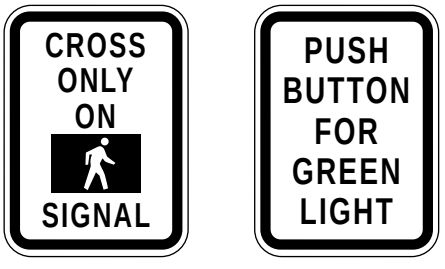


Figure 151: R9-2a and R9-3

D.2. WARNING SIGNS

Pedestrian Crossing signs (W11A-2 and W11-2) should be used at locations where a crossing is not normally encountered. This is usually at mid-block locations, where the adjacent land use is likely to generate a fairly high number of crossings.

Sign W11A-2, should be used in advance of crossings or areas of high pedestrian use. Sign W11-2 should only be used at a crosswalk.

Figure 152: W11A-2 and W11-2

Pedestrian crossing sign

D.3. DIRECTIONAL SIGNS

Most directional signs are installed for the benefit of motorists. They are large, mounted fairly high, indicating destinations relatively far away, and may not adequately serve pedestrians. Most walking trips are short, and the pedestrian's line of sight is fairly low.

No standards have been developed yet for pedestrian directional signs. Signs should be developed for urban areas to assist pedestrians new to the area, or for residents who may not realize that the best route on foot is shorter than what they are used to driving.

To avoid adding clutter to the existing street signs, it may be preferable to cluster signs together on one post, placed in strategic locations. Distances should be given in blocks, average walking time, or other measurements meaningful to pedestrians.

Overhead pedestrian crossing sign at mid-block crosswalk

Examples of key destinations to include are: libraries, schools, museums, entertainment centers, shopping districts, etc.

Signs should be unobtrusive, easy to read and aesthetic. This example is based on a model used in Switzerland:

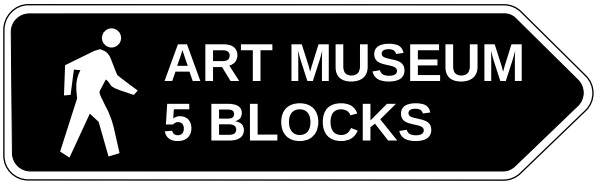


Figure 153: Pedestrian directional sign

Directional signs placed high are not visible to pedestrians

D.4. STREET SIGNS

Most street signs adequately serve pedestrians. However, there are situations where pedestrians cannot read signs mounted for automobile drivers:

- On one-way streets, signs should face both ways, as foot traffic will be approaching from both directions.
- Signs that are mounted high on mast arms over the roadway should be supplemented with conventional, smaller signs on the street corners.

II.9. TRAFFIC CALMING

INTRODUCTION

Citizens are often concerned about excessive traffic volumes and speeds on residential streets. Local streets are intended to serve the adjacent land use at slow speeds, yet they are often designed so that high speed travel is accommodated. Well-designed traffic calming devices effectively reduce traffic speeds and volumes while maintaining local access to neighborhoods.

Motorists often choose short-cuts through residential areas when the arterial or collector street system isn't functioning properly. Traffic calming should be viewed as an area-wide treatment, rather than a solution for only one or two problem streets, so that through traffic is not diverted onto other residential streets; this may require improving the arterial street system.

Public involvement is needed for residents, businesses, planners and engineers to understand the issues and agree with the proposed changes.

The benefits of traffic calming for bicycling and walking are:

- Reduced traffic speeds and volumes allow bicyclists to share the road with vehicles;
- Quieter streets and increased ease of crossing enhance the pedestrian environment;
- Lower traffic speeds increase safety (high speeds are responsible for many pedestrian fatalities); and
- Parents will be more likely to let their children walk or ride a bike in the neighborhood if the streets are made safer.

Some earlier attempts at traffic calming in this country have not proven effective for several reasons:

- The technique slowed cars down excessively, encouraging drivers to accelerate to higher speeds to make up for lost time, which increases noise and air pollution. For example, speed bumps are uncomfortable to cross at even very low speeds, and are unpopular with bicyclists.
- The technique was a misuse of traffic controls, breeding disrespect for their legitimate use; e.g. four-way stop signs are often ignored where there is no perceived danger.
- No further efforts were made beyond placing speed limit signs. Most drivers travel at a speed they feel comfortable with, which is usually a product of roadway design.

Effective traffic calming techniques rely on these general principles:

- The street design allows drivers to drive at, but no more than, the desired speed;
- The street design allows local access, while discouraging through traffic; and
- Traffic calming works best when roads are properly designed in the first place.

Traffic circles slow motor vehicles

Traffic calming can be viewed as a method to help reestablish the proper hierarchy for streets:

- Local streets should carry local traffic at slow-speeds, with bicyclists sharing the road and pedestrians crossing freely.
- Collector streets should carry traffic to and from local streets and arterials, at moderate speeds. Bicyclists should be able to share the road or ride on bike lanes. Pedestrians should be provided with buffered sidewalks and frequent crossing opportunities.
- Arterial streets should carry mostly through traffic. Bicyclists should be accommodated with bike lanes. Pedestrians should have buffered sidewalks and be offered reasonably-spaced crossing opportunities.

A. REDUCING TRAFFIC SPEEDS

Reducing traffic speeds can be accomplished through physical constraints on the roadway or by creating an "illusion of less space." Motorists typically drive at a speed they perceive as safe; this is usually related to the road design, especially available width.

A.1. PHYSICAL CONSTRAINTS

A.1.a. Narrow Streets or Travel Lanes

Narrow cross-sections can effectively reduce speeds, as most drivers adjust their speed to the available lane width. Narrow streets also reduce construction and maintenance costs.

A.1.b. Speed Humps (not speed bumps)

Well-designed speed humps allow vehicles to proceed over the hump at the intended speed with minimal discomfort, but will rock vehicles when driven at higher speeds. One common hump design has a reversing curve at each end, and a level area in the middle long enough to accommodate most wheelbases. Others are parabolic.

Speed humps are preferable to bumps for several reasons:

- They allow vehicles to travel at a constant speed, as opposed to the braking and accelerating associated with bumps; and
- They are easier for bicyclists to ride over.

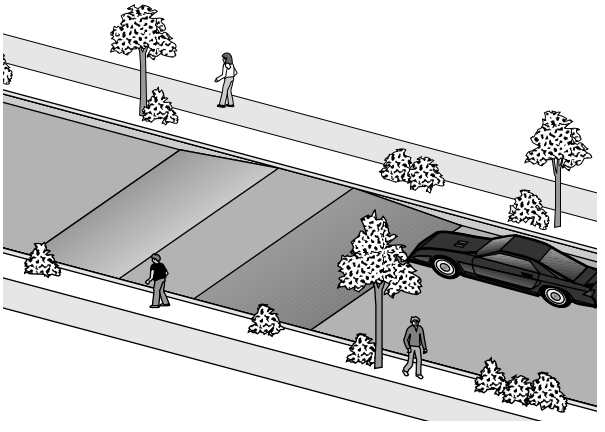


Figure 154: Speed hump

A.1.c. Chokers (curb extensions)

Chokers constrict the street width and reduce the pedestrian crossing distance (see Figure 71, page 108).

Street space rededicated to pedestrians (Holland)

Colored bike lanes

A.2. ILLUSION OF LESS SPACE

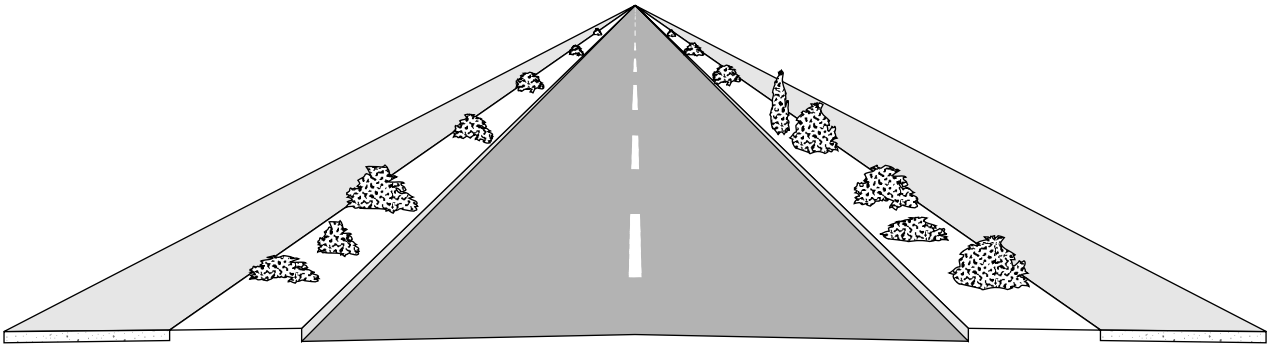
A.2.a. Creating Vertical Lines

By bringing buildings closer to the roadway edge, or by adding tall trees, the roadway appears narrower than it is.

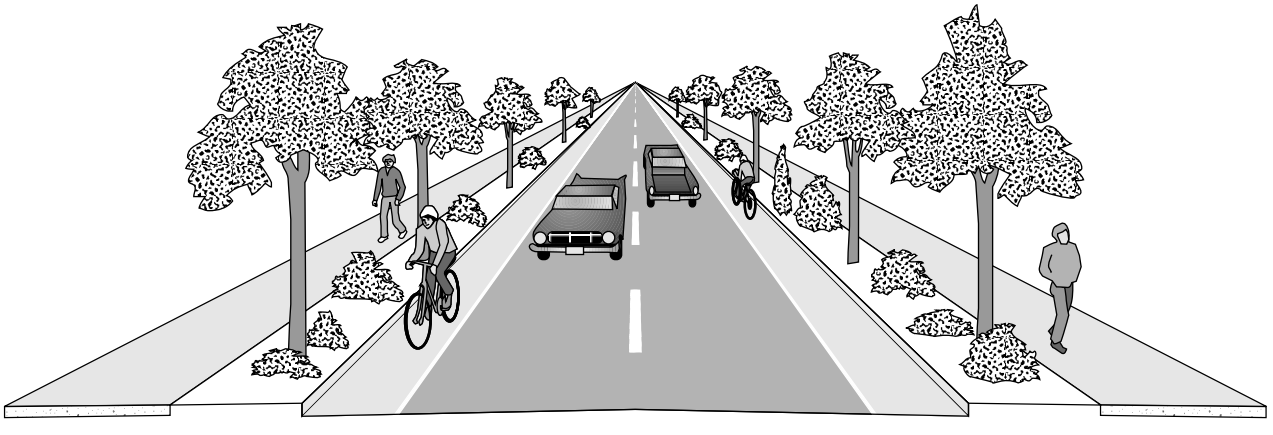
A.2.b. Coloring or Texturing Bike Lanes

Drivers see only the travel lanes as available road space, so the roadway appears narrower than it is. Painting the road surface is expensive; lower-cost methods include:

1. Slurry-sealing or chip-sealing the roadway and not the bike lanes;
2. Incorporating dyes into concrete or asphalt.



WITHOUT TREATMENTS



WITH TREATMENTS

Figure 155: Trees and colored bike lanes make a roadway appear narrower

Creating vertical lines and colored bike lanes can be used on higher speed arterials, as there is no change in the roadway width available to motor vehicles.

A.2.c. Chicanes

By alternating on-street parking, landscaping or other physical features from one side of the road to the other, the driver does not see an uninterrupted stretch of road. The roadway width remains adequate for two cars to pass.

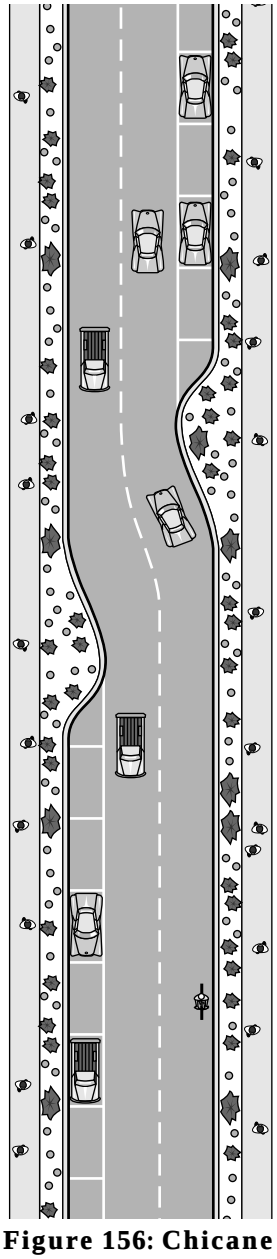


Figure 156: Chicane created through alternate parking

B. DISCOURAGING THROUGH TRAFFIC ON LOCAL STREETS

These techniques physically limit access to local streets for through traffic. This may require some out-of-direction travel for some trips. Techniques include:

B.1. ONE-WAY CHOKERS

Autos are allowed out of a street, but entrance occurs at side streets. Bicyclists and pedestrians are allowed to travel in both directions.

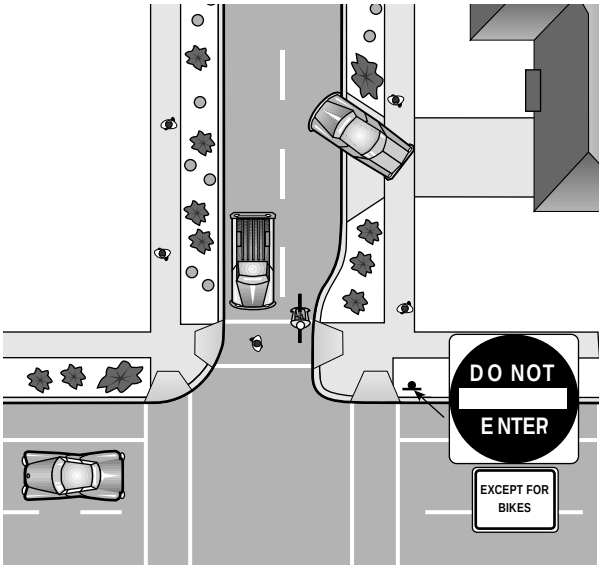


Figure 157: Choker at entrance of two-way local street

Choker on one-way street allows access for bicyclists

B.2. DIVERTERS AND CUL-DE-SACS

These prohibit all movements into a certain section of street.

Caution should be used when physically restricting access: this may contradict other transportation goals, such as an open grid system. Cul-de-sacs should allow through bicycle and pedestrian access. Refer to Figure 6, page 44, for an example of an open design that provides bicyclists and pedestrians easy access to and from cul-de-sacs.

C. LIVING STREETS (DUTCH "WONERF")

This idea originated in Holland, and takes traffic calming to its ultimate realization: streets are designed primarily for foot traffic, bicyclists and children playing - automobiles are treated as guests. This requires a legislative change, as this is a modification of existing right of way laws. The burden of responsibility for safety is on motorists: they are assumed to be at fault if they hit a pedestrian.

The street is designed with physical constraints that allow only local motor vehicle access (residents and visitors) at low speeds (under 15 km/h). Streets are designed with physical constraints that do not allow high speed. Signs are posted warning entering motorists of the street characteristics - the signs depict children playing and pedestrians.

A new treatment such as this requires public involvement, support from the residents, and a street system that functions well enough so that through traffic has access to a reasonable alternative route. As with all traffic calming measures, emergency vehicles must be able to access residences.

One major advantage is cost: streets are very narrow, which reduces the total paved surface area, and there is no need for curb and sidewalks.

A similar concept is already in use in Boulder Colorado - they are called "access lanes."

Other traffic-calming techniques and design details not discussed here may be found in other publications such as FHWA-PD-93-028, Case Study No. 19: "Traffic Calming, Auto-Restricted Zones and Other Traffic Management Techniques - Their Effects on Bicycling and Walking."

This street is reserved for pedestrians, bicyclists and transit

EFFECTS OF ON-STREET PARKING

	BICYCLISTS	PEDESTRIANS
FUNCTIONAL		
Additional buffer width	—	P
Aesthetics (glare, noise, heat)	N	N
Interferes with street furniture	—	N
Interferes with bike racks	N	N
Increases shy distance	N	P
Increases access to destinations	—	P
Incentive to orient businesses towards street	P	P
SAFETY/OPERATIONAL		
Interferes with bicycle traffic (esp. diagonal)	N	—
Traffic calming effect (slower speeds)	P	P
Obscures sight distance (both at intersections and mid-block crossing)	N	N
Complicates street maintenance	N	—
Encourages car use	N	N
Interferes with transit operation	N	N
Reduces need for driveways to access off-street parking	P	P
Provides good access to sidewalks for drivers/passengers	—	P
ECONOMIC/LIVABILITY		
Increases activity on street	P	P
Keeps CBD commercially viable	P	P
Reduces need for off-street parking	P	P
Additional demand on right-of-way	N	N
Political problems with removal	N	N

P = *Positive impact* N = *Negative impact* — = *No impact one way or the other*

Table 9: Effects of on-street parking

D. ON-STREET PARKING

While the primary purpose of a public right-of-way is to transport people and goods, on-street parking is often cited as an advantage for pedestrians, primarily as a buffer. Yet on-street parking also uses space that could be used for wider sidewalks or bike lanes. Table 9 lists some of the advantages and disadvantages for both pedestrians and bicyclists of on-street parking, to help guide planners, designers and elected officials in the difficult decision to remove or retain parking.

Bollards used to prevent parking on narrow Dutch street

II.10. BICYCLE MAPS

INTRODUCTION

Consistency in bicycle maps enables users to readily identify standard symbols and colors when they visit a new area. A system of unified codes and symbols is also useful to planners, designers and engineers.

There are four basic types of bicycle maps:

- Urban bicycle facility maps;
- County, state or regional bicycling guides;
- Bicycling tour guides; and
- City or county planning maps.

The first three types are used mainly by bicycle riders; the fourth is used by a wide variety of interested parties.

A. URBAN BICYCLE MAP

Used primarily by local utilitarian bicyclists, newcomers and visitors, this type of map is intended to help cyclists choose routes they feel comfortable cycling on, and to encourage first-time riders to try making certain trips by bicycle.

All streets should be shown. A simple color code indicates the presence and type of bicycle facilities. It also warns bicyclists of roads they should use with caution. The accompanying text should provide information on good riding skills, traffic laws and safety tips.

Other useful information includes enlargements of difficult intersections, steep hills, weather data, parking facilities, bike shops, important destinations and landmarks, etc. But too much detail creates a cluttered effect; simplicity makes it easier to find needed information.

CODE:

Blue.....Bike Lanes
Purple ....Multi-Use Paths
Red.....Caution Areas
Black.....Local streets (shared roadways)

B. BICYCLING GUIDE

The intended audience is recreational and touring riders interested in medium to long-distance trips. The major concerns when choosing a route are traffic volumes and roadway conditions. Color coding indicates traffic volume levels; a solid line indicates the presence of shoulders wide enough for bicycle travel.

The map should include state highways and county roads. The level of detail is less than on an urban map. Other information to include are distances, grades, weather data (especially prevailing wind directions), bike shops, markets and camping facilities. Text should be used for information on local history, landmarks, viewpoints, etc.

Description of loop tours is useful to riders planning day trips. Local cyclists should ride the loops in order to assess conditions. A written description of the route listing landmarks and turns is helpful.

Since bicycle trips often cross jurisdictional boundaries, counties are encouraged to coordinate regional maps, covering a natural geographical area within easy reach of several population centers.

CODE:

Traffic Volumes:
Green.....Low .....(<1000 ADT)
Yellow ....Moderate ...(1000-3000 ADT)
Orange ...High .....(>3000 ADT)
Red .....Caution areas, due to narrow roads, poor visibility or high truck volumes

Shoulders:
Black lines indicate shoulders 1.2 m (4 ft) or wider on both sides of the roadway

Grades:
1 Chevron .....2-4% grade
2 Chevrons.....4-6% grade
3 Chevrons.....Over 6% grade

C. BICYCLING TOUR GUIDE

The intended audience is bicyclists on an extended tour. The format can be fold-out maps, strip maps or brochures. Various agencies can cooperate to produce maps for long-distance bicycle tours that traverse several jurisdictions.

If a loop or one-way tour is best when cycled in one direction only, this should be emphasized in the text (for example, it is best to ride the Oregon Coast Bike Route from north to south, to take advantage of prevailing winds).

Points of interest are important, as are distances, grades, campgrounds, availability of water and details of difficult areas. A written description of the route listing landmarks and turns is useful, as well as an elevation profile.

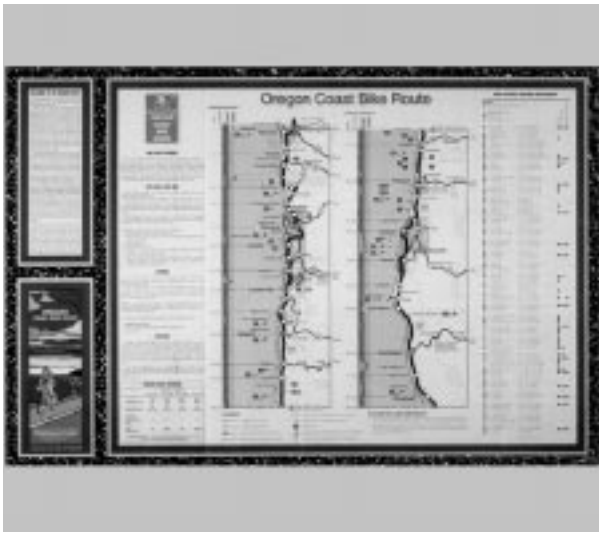
D. CITY & COUNTY BICYCLE & PEDESTRIAN PLAN MAP

The intended audience are planners, advisory committees, designers, engineers, elected officials and interested citizens. The maps document planned and existing facilities. They should be readily available to the public.

The following coding is convenient: open squares and circles and dashed lines can be filled in when projects are completed. The use of black and white makes these maps easy to photocopy, enlarge and FAX.

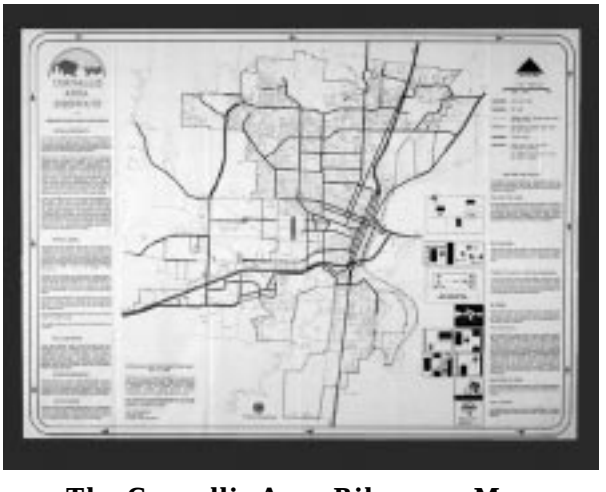
CODE:

Bike Lanes .....Squares
planned .....open
existing .....filled
Paths .....Circles
planned .....open
existing .....filled
Sidewalks .....Diamonds
planned .....open
existing .....filled
Shoulders .....Lines
planned .....dash
existing .....solid



The Oregon Coast Bike Route Map

Bicyclists in Oregon have several statewide and local maps available



The Corvallis Area Bikeways Map

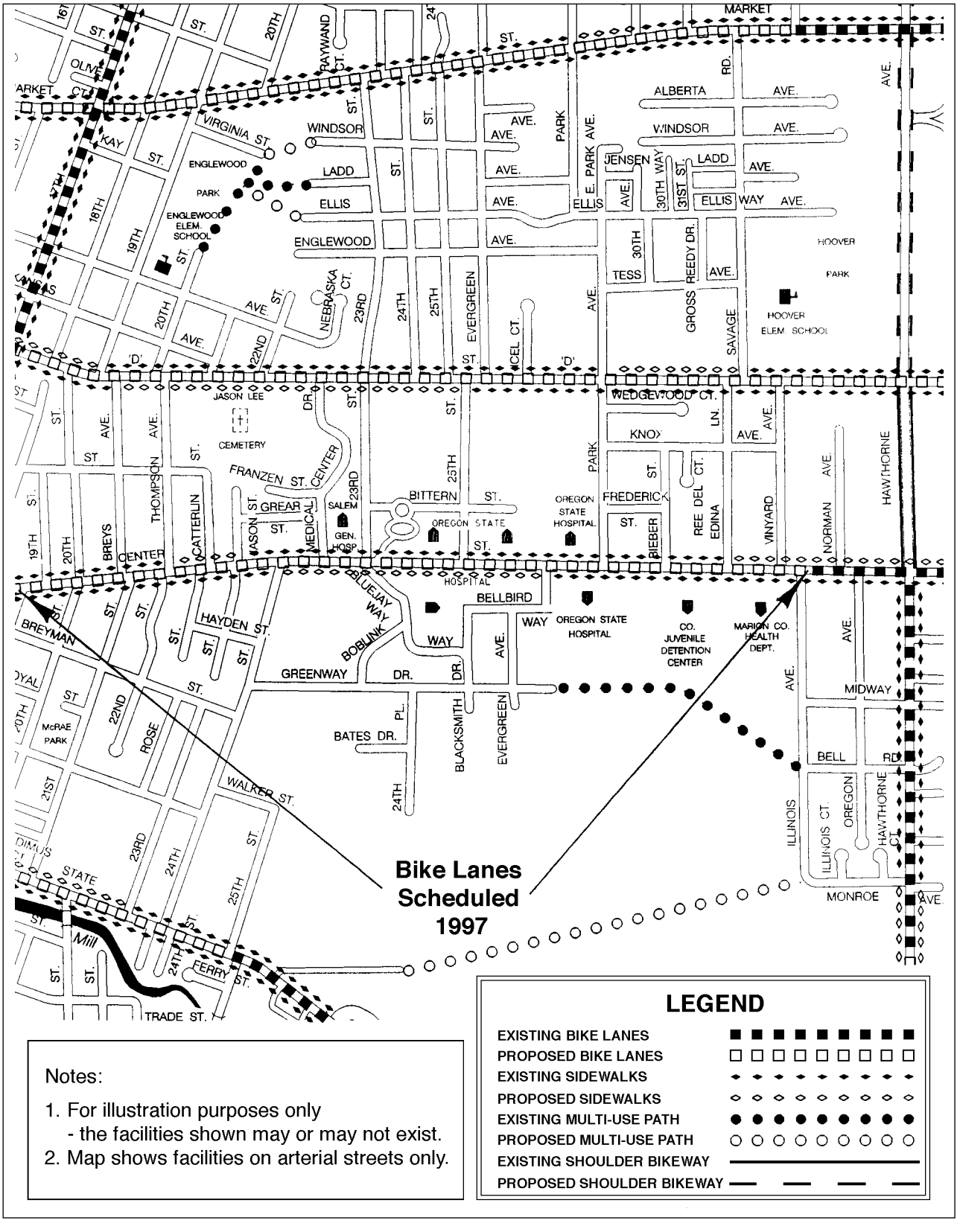


Figure 158: Bicycle and pedestrian facility planning map

E. OTHER USEFUL TIPS

Good maps are clear and simple, as too many symbols and details create confusion. Only needed information should be included:

- **For urban maps**, all city streets should be shown, as well as schools, public agencies and other common destinations. But not every street needs to be coded for bicycling purposes: most residential streets and minor collectors function well as shared roadways and should be left open on the map.
- **For bicycling guides**, too much topographical detail obscures the information that is really useful.
- **For tour guides**, inclusion of all roadways in the vicinity creates a confusing, web-like effect. Only the roads on the tour need to be included, along with roads that connect the route to other localities (for riders who wish to join or leave the route at intermediate points). Insets of urban areas are useful.

It is usually better to create a new map. If available graphics capabilities don't allow this, existing maps can be used by adding and deleting information.

Other important considerations are:

- Symbols and text should be oriented in a direction consistent with the way a map is going to be held (if possible, north at the top).
- Descriptive text should be placed as close as possible to the relevant map segment (especially important for tour guides).

F. OTHER SUGGESTIONS

The following suggestions have been made by cyclists and local jurisdictions since the first printing of this plan in 1995; therefore they are offered as suggestions only, rather than standards adopted by ODOT.

Urban Bicycle Map

Many cyclists wish to know the number of travel lanes, the traffic speeds and volumes on the streets they consider riding on. The simple blue color-coding of urban streets with bike lanes doesn't give this information. One method to present all of this data is to color code the roads for traffic volumes (similar to the bicycling guide), and using a symbol to indicate posted speeds and number of lanes. The presence of bike lanes can be indicated with a blue line on each side of the road; unmarked shoulders can be shown with black lines.

Given the heavier traffic and lower speeds inherent to urban areas, different traffic volume breaking points should be used. The following table has been suggested:

Green.....Low .....(<5000 ADT)
Yellow ....Medium.....(5000-15000 ADT)
Orange ...High .....(>15000 ADT)

The number of travel lanes and posted speeds can be indicated with a special symbol next to the road, for example:

35 MPH, 5 lanes 

One way streets should be indicated; a simple arrow in the direction of traffic is sufficient. →

Difficult intersections should have a red circle drawn around them. 

Gravel roads should be shown; gray shading rather than black is often used.

Chevrons should be used to indicate steep streets.

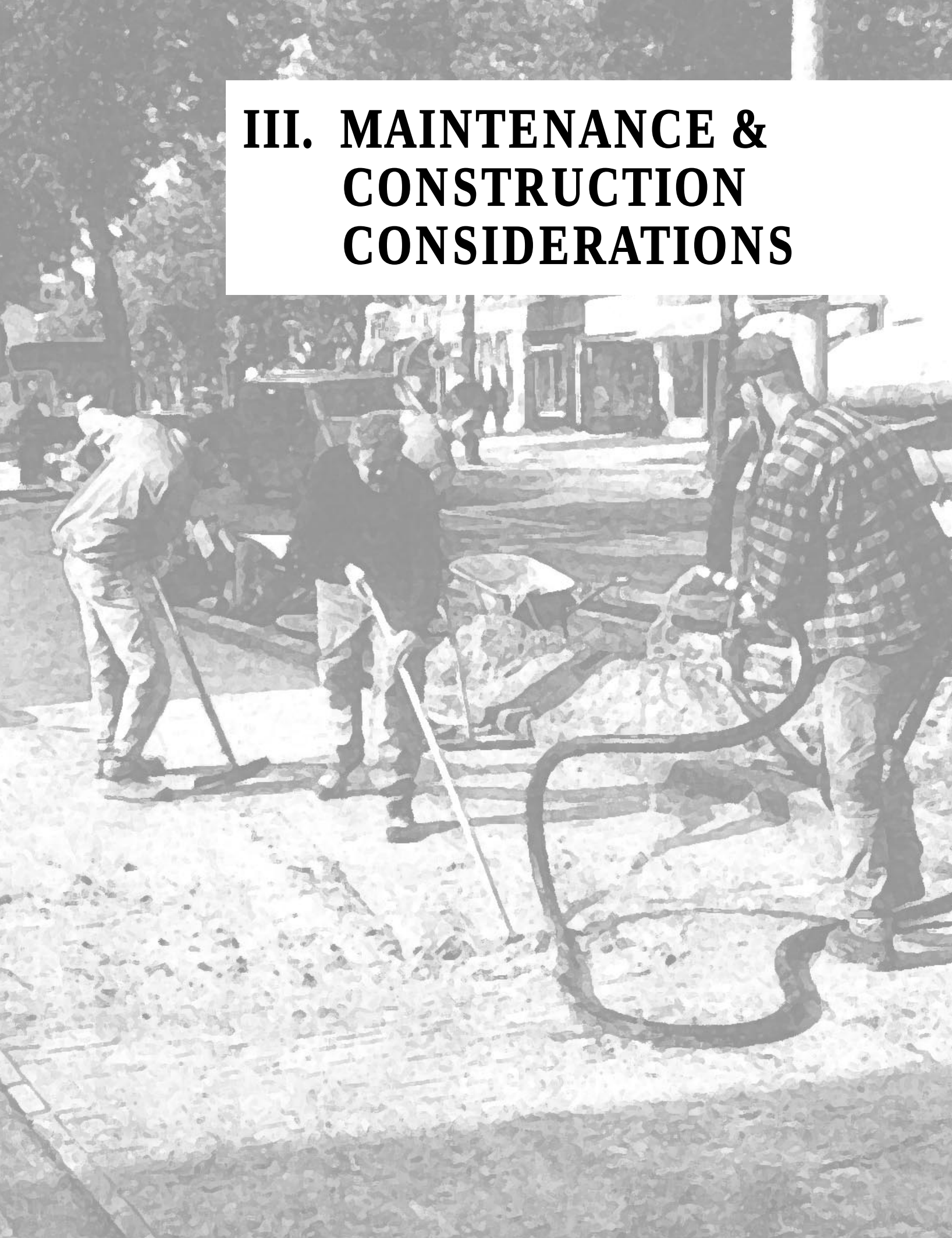
Bicycling Guide

Gravel roads should be shown; gray shading rather than black is often used.

Roads with moderate traffic volumes and paved shoulders less that 1.2 m (4 ft) wide can accommodate bicyclists quite well, if the paved area is 1 m (+/-) wide. These roads can be indicated with a dashed, rather than a solid black line.

Many local bicycle maps have been produced since the original printing of this plan. ODOT's Bicycle and Pedestrian Program can help interested parties select maps that are good examples to follow.

III. MAINTENANCE & CONSTRUCTION CONSIDERATIONS



III.1. BIKEWAY & WALKWAY MAINTENANCE

This section implements Strategy 2C:

STRATEGY 2C. *Adopt maintenance practices to preserve bikeways and walkways in a smooth, clean and safe condition.*

INTRODUCTION

Bikeways and walkways are subject to debris accumulation and surface deterioration, and require maintenance to function well. Maintenance protects the investment of public funds in bikeways and walkways, so they can continue to be used safely. Poorly maintained facilities become unusable and a legal liability, as cyclists and pedestrians who continue to use them may risk equipment damage and injury. Others will choose not to use the facilities at all.

Sweeping the outer edge of roadway improves conditions for bicyclists

A. USER CHARACTERISTICS & NEEDS

A.1. BICYCLISTS

Bicyclists ride on two narrow, high-pressure tires. What may be an adequate roadway surface for automobiles (with four wide, low-pressure tires) can be treacherous for cyclists. Small rocks, branches and other debris can deflect a wheel, minor ridges in the pavement can cause spills, and pot-holes can cause wheel rims to bend. Wet leaves are slippery and can cause cyclists to fall. Gravel blown off the travel lane by traffic accumulates in the area where bicyclists ride. Broken glass can easily puncture bicycle tires.

A.2. PEDESTRIANS

Pedestrians have little or no protection from the elements. While walking, a person typically looks ahead and around, without noticing cracks and bumps in the sidewalk. A smooth, level surface is critical for disabled, young and elderly pedestrians.

When street snow removal is stored on the sidewalk, conditions are degraded for pedestrians, especially where there is no buffer. Pedestrians depend on motorists respecting traffic signs and signals; these must be properly maintained for pedestrian safety.

B. RECOMMENDED MAINTENANCE PRACTICES

B.1. SWEEPING

Bicyclists often avoid shoulders and bike lanes filled with sanding materials, gravel, broken glass and other debris; they will ride in the roadway to avoid these hazards, causing conflicts with motorists. Debris from the roadway should not be swept onto sidewalks (pedestrians need a clean walking surface); nor should debris be swept from the sidewalk onto the roadway.

Debris accumulated on the shoulder forces cyclist into the roadway

A regularly scheduled inspection and maintenance program helps ensure that travelway litter is regularly picked up or swept. During extended icy conditions, it may not be cost-effective to frequently remove sanding materials; however, they should be swept after the winter season ends or after major storms in high-use areas.

Recommendations

- Establish a seasonal sweeping schedule;
- Sweep walkways and bikeways whenever there is an accumulation of debris on the facility;
- In curbed sections, sweepers should pick up debris; on open shoulders, debris can be swept onto gravel shoulders;
- Pave gravel driveway approaches to reduce loose gravel on paved roadway shoulders;
- Provide extra sweeping in the fall in areas where leaves or pine cones accumulate in bike lanes; and
- Require parties responsible for debris to either:
  (1) Prevent problem in the first place (e.g. by placing tarps over trucks loaded with gravel) or
  (2) Sweep up debris immediately (ORS 822.225 requires tow-vehicle operators to remove glass after crashes).

B.2. SURFACE REPAIRS

A smooth surface, free of cracks, potholes, bumps and other physical problems should be provided and maintained.

Recommendations

- Inspect bikeways and walkways regularly for surface irregularities;
- Respond to citizen complaints in a timely manner;
- Repair potentially hazardous conditions as soon as possible;
- Prevent the edge of a repair from running through a bike lane or shoulder;
- Perform preventative maintenance operations such as keeping drains in operating condition and cutting back intrusive tree roots; and
- Sweep a project area after repairs.

A rough surface can be treacherous for wheelchair users

B.3. PAVEMENT OVERLAYS

Pavement overlays are good opportunities to improve conditions for cyclists if done carefully: **a ridge should not be left in the area where cyclists ride** (this occurs where an overlay extends part-way into a shoulder bikeway or bike lane). Overlay projects offer opportunities to widen the roadway, or to restripe the roadway with bike lanes.

Recommendations

- Extend the overlay over the entire roadway surface to avoid leaving an abrupt edge;
- If this is not possible, and there is adequate shoulder or bike lane width, it may be appropriate to stop at the shoulder or bike lane stripe, provided no abrupt ridge remains;
- After overlays, raise inlet grates, manhole and valve covers to within 6 mm (1/4") of the pavement surface;
- In curbed sections, maintain a 180 mm (7") (min. 130 mm [5"]) curb exposure for pedestrian safety;
- Where the existing roadway surface is ground out, grind the entire surface to avoid an exaggerated crown and a steep slope at crosswalks, creating difficulties for the disabled;
- Pave gravel driveways and approaches 4.5 m (15 ft) from the edge of pavement to prevent gravel from spilling onto shoulders or bike lanes (see Figure 16, page 69); and
- Sweep the project area after overlay.

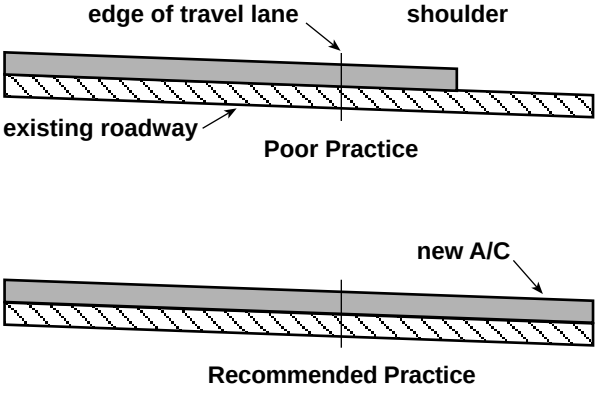


Figure 159: An overlay should extend over the entire roadway

This overlay project added smooth, paved shoulders

B.4. VEGETATION

Vegetation encroaching into bikeways or walkways is both a nuisance and a problem. Roots should be controlled to prevent break-up of the surface. Adequate clearances and sight-distances should be maintained at driveways and intersections: pedestrians and bicyclists must be visible to approaching motorists, rather than hidden by overgrown shrubs or low-hanging branches, which can also obscure signs.

Local ordinances should allow road authorities to control vegetation that originates from private property. Some jurisdictions require adjacent land owners to control vegetation, or else maintenance personnel perform the work and bill the property owner.

Recommendations

- Cut back vegetation to prevent encroachment; and
- Perform preventative operations such as cutting back intrusive tree roots.

Vegetation obscures visibility

B.5. SIGNS, STRIPES & LEGENDS

New bikeway and walkway signs and legends are highly visible, but, over time, signs may fall into disrepair and legends may become hard to see, especially at night. Signs and legends should be kept in a readable condition, including those directed at motorists: pedestrians and bicyclists rely on motorists observing the signs and legends that regulate their movements. Examples include STOP and RIGHT TURN YIELD TO PEDS signs, stop bars, fog lines, etc.

Thermo plastic stripes increase the visibility of bike lanes

Recommendations

- Inspect signs and legends regularly, including reflectivity at night;
- Replace defective signs as soon as possible; and
- Retrace legends, crosswalks and other pavement markings in the spring; in high-use areas, these may require another paint application in the fall.

B.6. DRAINAGE IMPROVEMENTS

New drainage facilities function well, but may sink and deteriorate over time. Catch basins may need to be adjusted or replaced to improve drainage. A bike-safe drainage grate at the proper height improves bicycle safety. Curbs used to divert storm water into catch basins should be designed so they do not create hazard for cyclists. At intersections, there should be no puddles in pedestrian crosswalks.

Poor drainage traps water in crosswalk

Recommendations

- Raise catch basin grates flush with pavement;
- Modify or replace deficient drainage grates with bicycle-safe grates;
- Repair or relocate faulty drains at intersections where water backs up onto the curb cut or into the crosswalk; and
- Remove existing drainage curbs that encroach into shoulders or bike lanes.

This catch basin should have been raised after pavement overlay

C. OTHER MAINTENANCE ACTIVITIES THAT AFFECT BICYCLING & WALKING

The following activities, when performed incorrectly, may degrade conditions for cyclists or pedestrians.

C.1. CHIP SEALING

Chip seals leave a rough surface for bicycling. Chip seals that cover the travelway and part of the shoulder area leave a ragged edge or ridge in the shoulder, causing problems for cyclists.

Recommendations

- Where shoulders or bike lanes are wide enough and in good repair, cover only the travel lanes with chip seal;
- If the shoulders or bike lanes must be chip sealed, cover the shoulder area with a well-rolled, *fine-textured* material: 3/8”-10 or finer for single pass, 1/4”-10 for second pass;
- Sweep the shoulder area following chip seal operations; and
- Ensure that inlet grates, manhole and valve covers are within 6 mm (1/4”) of the final surface.

Chip seal leaves adequate shoulder width

C.2. PATCHING ACTIVITIES

Loose asphalt often ends up on the shoulder, adhering to the surface and creating roughness.

Recommendation

- Sweep fresh loose materials off the road before they adhere to the pavement.

Patch extends only halfway into bike lane

C.3. BLADE PATCHING ACTIVITIES

Road graders can provide a smooth pavement patch; however, the last pass of the grader sometimes leaves a rough tire track in the middle of the shoulder.

Recommendations

- Equip road graders with smooth tires;
- Cover the entire shoulder width;
- Roll the shoulder area after the last pass of the grader; and
- Sweep fresh loose materials off the road before they adhere to the pavement.

Utility cut is flush with sidewalk

Weeds breaking up bike lane

C.4. UTILITY CUTS

Utility cuts can leave a rough surface for cyclists if not back-filled carefully. Sidewalk cuts should be finished as smooth as a new sidewalk.

Recommendations

- Wherever possible, place cut line in an area that will not interfere with bicycle travel;
- Back fill cuts in bikeways flush with the surface (humps will not get packed down by bicycle traffic);
- Ensure that cuts parallel to bicycle traffic don't leave a ridge or groove in the bicycle wheel track; and
- Back fill cuts in sidewalks with concrete, flush with the sidewalk grade.

C.5 RAISED PAVEMENT MARKERS

Raised pavement markers (RPM) present many problems for bicyclists. The MUTCD states that "Raised markers generally should not supplement right edge lines."

Recommendations

- Remove existing RPM's if not needed for motorist safety;
- If needed, install RPM's on the motorists' side of the stripe.

Raised pavement markings placed outside of the bike lane

Abandoned driveway should be retrofitted with sidewalk

C.6. ABANDONED APPROACHES

When accesses are abandoned in urban areas, there is no point in leaving a sidewalk dip or warp at these locations.

Recommendation

- Fill in legally abandoned accesses with level sidewalks.

C.7 SNOW REMOVAL

Snow stored on bike lanes or sidewalks impedes bicycling and walking in winter.

Recommendations

- On streets with bike lanes, remove all snow from street surface;
- Do not store snow on sidewalks.

Sidewalk ramp should be raised

D. MAINTENANCE PROGRAM

A walkway and bikeway maintenance program is necessary to ensure adequate maintenance of facilities. Sufficient funds should be budgeted to accomplish the necessary tasks. Neighboring jurisdictions should consider joint programs for greater efficiency and reduced cost.

The program should establish maintenance standards and a schedule for the regular inspections and maintenance activities recommended in the previous sections.

E. SPOT IMPROVEMENT PROGRAMS

Road users are often the first to experience deficiencies. Spot-improvement programs enable bicyclists and pedestrians to bring problems to the attention of authorities in a quick and efficient manner.

Postage-paid, pre-addressed postcards are made available to the public, to be sent in when they notice a needed improvement. Telephone numbers of staff contacts are included. Quick response from the city improves communications between the public and staff.

PORTLAND BICYCLE PROGRAM
FACILITY IMPROVEMENT REQUEST FORM

The bicycle facility improvement program is intended to enhance bicycle safety and encourage bicycling through **low-cost**, small scale improvements suggested by concerned bicyclists (e.g., pavement maintenance and sweeping, hazard removal, bike rack installation, and grating repair).

Location: _____
STREET

_____
CROSS STREET, ADDRESS, OR LANDMARK

Suggestion: _____

_____

_____

Requested by: _____
NAME

_____
STREET CITY ZIP

_____ _____
DAY PHONE DATE

DO NOT WRITE BELOW THIS LINE—FOR OFFICE USE ONLY

Referred to: _____

Investigation: _____
PDOT STAFF: LIST CONDITION BEFORE AND AFTER JOB IS COMPLETED

_____

_____

Signed _____ Date _____

Figure 160: Portland's *Facility Improvement Request Form*

III.2. OPERATING BIKEWAYS & WALKWAYS DURING CONSTRUCTION

INTRODUCTION

The construction of transportation projects can disrupt the public's mobility and access. Efforts should be made to maintain access for pedestrians and bicyclists, who are the most susceptible to disruptions because of their slower speeds and exposure to noise, dirt and fumes.

Temporary lane restrictions, detours and other traffic control measures should be designed to accommodate non-motorized travelers in areas where these modes are normally encountered.

It may not always be possible to ensure a desirable or comfortable route for pedestrians and bicyclists, but their access should not be denied. Some roadways and bridges are the only link between neighborhoods, and their severance cuts off residents dependent on walking or bicycling.

The following recommendations should be incorporated into project construction plans. Workers who routinely perform maintenance and construction operations should also be aware of these considerations.

A. RURAL HIGHWAY CONSTRUCTION

Construction operations on rural highways affect mostly touring and recreational cyclists; pedestrians are seldom encountered in rural settings.

On low-volume roads, or through short construction zones, standard traffic control practices are usually adequate. Bicyclists can ride through without impeding traffic. Their needs can be met by maintaining a paved surface and removing temporary signs, debris and other obstructions from the edge of the roadway after each day's work.

On high-volume roads or through long construction zones, enough paved roadway width should be provided for motor vehicles to safely pass bicyclists. Flaggers and pilot cars should take into account the cyclists' lower speed. When cyclists are coming through, radio messages can be relayed to other flaggers.

On highways with very high traffic volumes and speeds, and where construction will restrict available width for a long time, it may be advisable to provide a detour route for cyclists where possible. The detour should not be overly circuitous. Directional signs should guide cyclists along the route and back onto the highway.

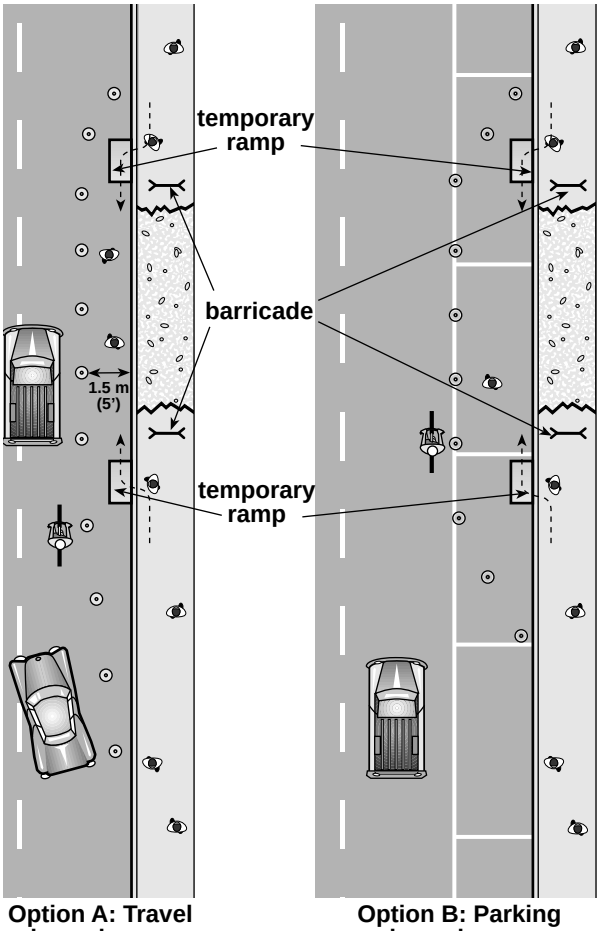
Rural highway construction project with sufficient shoulder width maintained

B. URBAN ROADWAY CONSTRUCTION

In urban areas, safe and convenient passage is needed during construction for both pedestrians and bicyclists.

Pedestrians have little tolerance for out-of-direction travel. Pedestrians may ignore signs that reroute them or prohibit their access if it is inconvenient; they might prefer to walk through the construction zone. It is preferable to create a passage that allows pedestrians to proceed as close to their normal route as possible.

Solutions such as closing a sidewalk or installing signs asking pedestrians to cross a busy street are undesirable. If a sidewalk must be closed, barricades and cones can be used to create a temporary passageway. This is most practical on streets with parking: the pedestrian passage replaces the parking area.



Option A: Travel lane closure

Option B: Parking lane closure

Cone taper not to scale. See MUTCD for standard taper lengths, and for standard right lane closure signs.

Figure 161: Creating passageways for pedestrians during construction

Construction operation leaves debris in bike lane

It may not be possible to maintain standard walkway widths during construction. However,

Construction signs placed out of bike lane and sidewalk

Sidewalk maintained and protected during construction

a passage wide enough to accommodate the disabled should be maintained with a surface capable of being negotiated in a wheelchair.

At intersections, it is preferable to keep all crosswalks open. At signalized intersections, temporary crosswalks should be painted if they are relocated. Temporary signals should include pedestrian phases.

Through bicycle movement must also be maintained. Bicyclists can share a lane over a short distance. On longer projects, and on busy roadways, a temporary bike lane or wide outside lane may be provided. Bicyclists should not be routed onto sidewalks or onto unpaved shoulders where possible.

Debris should be swept to maintain a reasonably clean riding surface in the outer 1.5 or 1.8 m (5 or 6 ft) of roadway. Bicyclists have a low tolerance for surface grade changes and excessive bumps should be avoided.

The placement of advance construction signs should obstruct neither the pedestrian's nor the bicyclist's path. Where this is not possible, placing signs half on the sidewalk and half on the roadway may be the best solution.

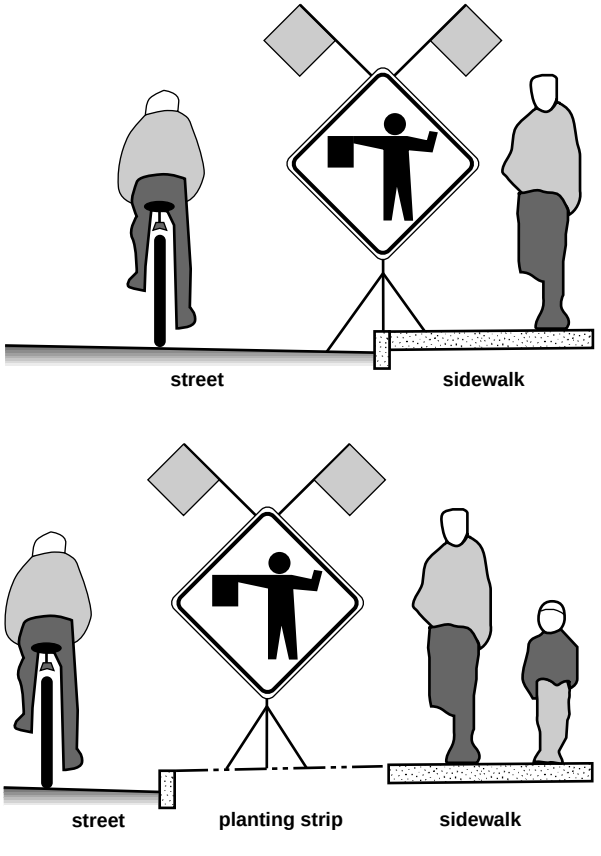


Figure 162: Construction sign placement

C. OTHER CONSIDERATIONS

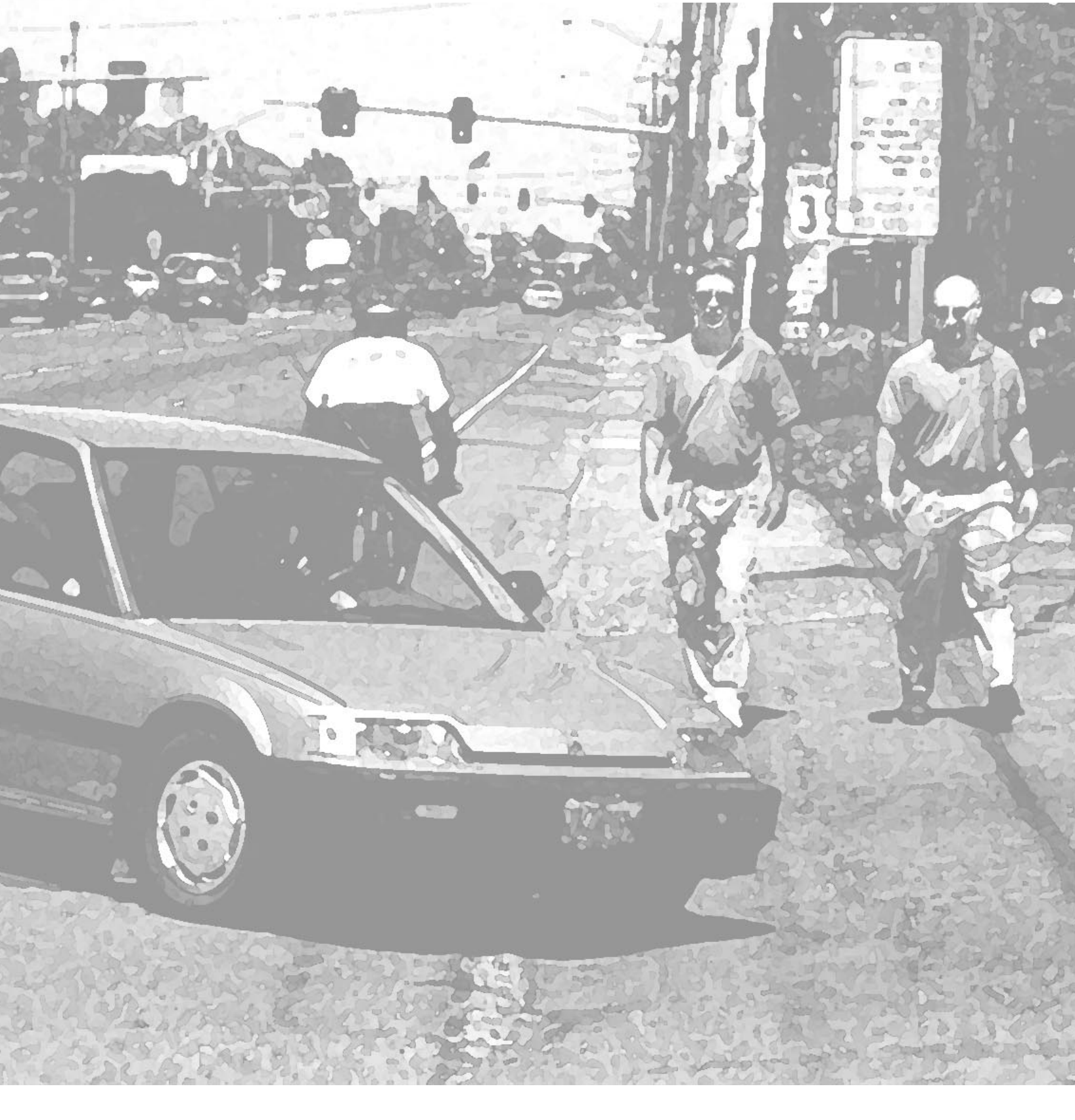
Communication with the public is important during construction. Notices in local newspapers and radio announcements can get messages regarding important changes out to users. Construction project managers should consult local groups such as bicycle or pedestrian advisory committees, PTA's, school districts, etc., to find out who will be affected by a disruption.

Bus stops must remain accessible to pedestrians.

Pavement grinding project left exaggerated lip at this curb cut

Pedestrians need access across freeway during construction

IV. SAFETY CONSIDERATIONS



This section implements Strategy 3A:

STRATEGY 3A: *Monitor and analyze bicyclist and pedestrian crash data to formulate ways to improve bicyclist and pedestrian safety.*

Engineering, education and enforcement are necessary components of bicycle and pedestrian safety. For bicyclists, equipment and riding skills are also important factors. In Oregon, the quality of engineering for bikeways is very good and facility-related bicycle crashes are few. As long as facilities are well-maintained, there should be few major problems in this area.

It is more difficult to assess pedestrian crashes related to facility design; the lack of facilities, especially safe crossings, may be a contributing factor in some crashes.

Education and enforcement need more attention. State highway funds cannot be expended for these activities, but federal safety funds are available for safety programs and activities.

TRANSPORTATION SAFETY AT ODOT

Bicycle and Pedestrian Program: The Program's main responsibilities are the planning, design and construction of safe, attractive and convenient facilities.

Bicycle and Pedestrian Safety Programs: The Programs' main responsibilities are education activities aimed at user behavior, as well as developing programs targeted at motorists to encourage them to "share the road" with all users.

Transportation Safety Action Plan (TSAP): ODOT's primary procedure for developing policy regarding safety is through the TSAP, which defines ODOT's role in developing programs aimed at increasing safety through education and promotional campaigns.

The TSAP establishes priorities for improving transportation safety in Oregon over a twenty-year period. It considers all transportation modes as well as education, engineering, enforcement and emergency medical services. The TSAP includes the following actions specifically related to bicycling and walking:

ACTION 66: *Increase emphasis on programs that will encourage pedestrian travel and improve pedestrian safety.*

ACTION 67: *In public education and enforcement efforts, recognize bicycles as an alternative mode of travel that are required to follow the same rules of the road as motorized vehicles.*

ACTION 68: *Increase emphasis on programs that will encourage bicycle travel and improve bicycle safety.*

IV.1. BICYCLE SAFETY

INTRODUCTION

Most bicycling crashes (65%-85%) **do not** involve collisions with motor vehicles; they usually involve falls or collisions with stationary objects, other cyclists and pedestrians.

Injury crashes caused by loss of control can be greatly reduced by:

- Improving riding skills;
- Ensuring that all equipment is functional (brakes, tire pressure and condition, etc.);
- Ensuring that bikeways are clear of obstructions, debris and rough surfaces.

Many bicycles/motor vehicle crashes are not reported. ODOT statistics represent reported crashes: approximately 800 injury crashes a year, including 10-15 fatalities (1%-2% of total).

To help develop programs aimed at bicyclists and motorists, one must understand what types of crashes are responsible for most injuries, and who is at fault. ODOT has been tracking bicycle/motor vehicle crashes for many years and bases many of its engineering solutions on analysis of these statistics.

The data for 1994 (see Table 10) are typical of data collected in other years.

Most crashes are due to bicyclists or motorists disobeying the rules of the road, often out of ignorance. Overall, the fault lies equally with motorists and bicyclists. Most crashes occur where two roadways or a roadway and a driveway intersect, and one user failed to yield the right of way to the other. The fault in these situations is slightly more often the motor vehicle driver's than the bicyclist's.

Wrong-Way Riding

The leading cause of crashes in which the bicyclist is at fault is wrong-way riding. This behavior is observed in about 15% of riders, and is responsible for 17% of crashes. It is often based on an unfounded fear of traffic, and a sense that looking at on-coming traffic will prevent crashes; the inability to cross a street also contributes to wrong-way riding.

The danger is that, at intersections, bicyclists riding against traffic are invisible to drivers entering, crossing or leaving the roadway, who are looking for traffic from a certain direction; wrong-way riders are not noticed.

BICYCLE/MOTOR VEHICLE CRASHES: 1994 STATEWIDE STATISTICS

- 45% occurred at intersections:
  - 27%: motorist failed to yield to bicyclist at a stop, signal or turn.
  - 19%: bicyclist failed to yield to motorist at a stop, signal or turn.
- 20% occurred at mid-block (driveway or alley):
  - 12%: motorist entered or left the road
  - 8%: bicyclist entered or left the road (mostly young riders)
- 17% resulted from wrong-way bicycle riding.
- 8% were caused by turning or swerving movements:
  - 5%: bicyclist turned or swerved
  - 3%: motorist turned or swerved
- 3% occurred when a cyclist was hit from behind by a motorist.

The other 7% were due to miscellaneous causes, e.g. motorist opening car doors into the path of a bicyclist (1%).

Table 10: Bicycle/motor vehicle crashes: 1994 statewide statistics

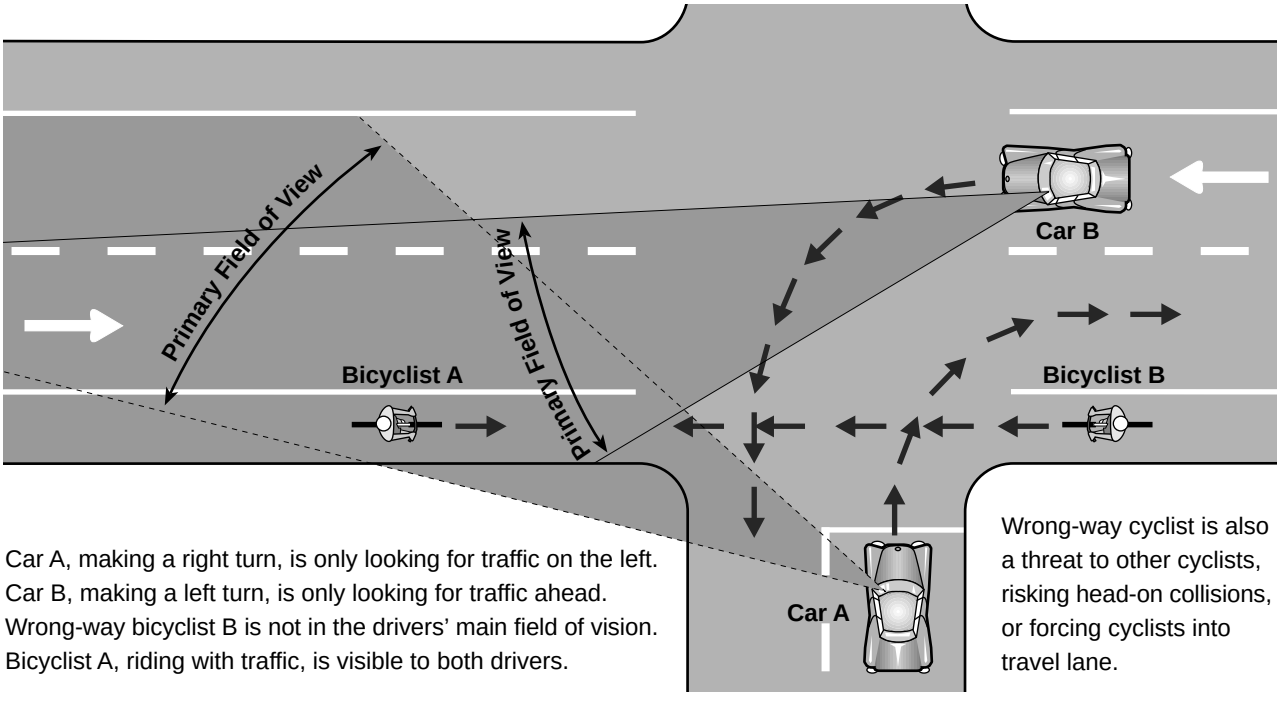


Figure 163: Hazards of wrong-way riding

Another hazard of wrong-way riding is the increase in closing speed:

- A wrong-way bicyclist going 20 km/h approaching a vehicle going 50 km/h will have a 70 km/h closing speed, greatly reducing reaction time.
- A vehicle going 50 km/h gaining on a cyclist going 20 km/h will have a 30 km/h closing speed, allowing more reaction time.

On one-way streets, the problem is compounded by the fact that signs and traffic signals are not visible to the wrong-way rider.

Wrong-way cyclist is not easily seen by right-turning motorist

A. ENGINEERING SOLUTIONS TO COMMON PROBLEMS

Even though most bicycle/motor vehicle crashes are caused by improper behavior, many improvements can be made to roads to reduce the potential for crashes. Well-designed facilities encourage proper behavior, decreasing the likelihood of crashes.

Transportation agencies should provide bicycle facilities that encourage all users to obey the rules of the road.

When surveying bicycle usage, the Bicycle and Pedestrian Program records several behaviors. There appears to be a correlation between good facilities, high use and proper behavior:

- Cities with good bikeway networks have the highest number of riders, and behavior is the best: wrong-way riding is minimal and fewer ride on the sidewalk (helmet use is above the statewide average).
- Cities with fewer facilities experience lower ridership numbers and poorer rider behavior: more ride against traffic or on the sidewalks (helmet use is lower than the statewide average).

Bike lane stencil with arrow

A.1. WRONG-WAY RIDING

Riding against traffic can be discouraged by:

- Including a directional arrow on bike lane markings;
- Placing bike lanes on both sides of a two-way street or placing bike lanes on both legs of a one-way couplet;
- Replacing existing two-way bike lanes with one-way bike lanes on each side of the road;
- Providing equal width shoulders on each side of the road;
- Providing more crossing opportunities on wide streets; and
- Avoiding two-way multi-use paths that begin or end at mid-block.

A.2. CYCLIST DISREGARDS STOP SIGN

It is natural for bicyclists to want to ride without breaking their momentum. Good planning places bikeways on streets where there aren't excessive stops, by:

- Providing bike lanes on arterials, which have the right-of-way at most intersections;
- Avoiding directing cyclists to local streets with many stops, which encourages bicyclists to disregard stop signs that slow them down (see Figure 7, page 50);
- Avoiding placing unnecessary four-way stop signs on local streets; and
- Creating Bicycle Boulevards.

A.3. CYCLIST ENTERS THE ROAD FROM DRIVEWAY OR ALLEY

This behavior is common in young riders, who have not yet fully-developed perception skills. Some simple steps that can help improve motorists' awareness of children are:

- Improving sight distance, by restricting on-street parking and by removing excessive vegetation and other obstructions;
- Designing residential streets to discourage excessive motor vehicle speeds.

A.4. MOTORIST ENTERS THE ROAD FROM DRIVEWAY OR ALLEY

This is a constant source of conflicts for cyclists riding on busy streets with many accesses. Engineering solutions include:

- Reducing the number of accesses by elimination or consolidation; and
- Improving sight distance, by restricting on-street parking and by removing excess vegetation and other obstructions.

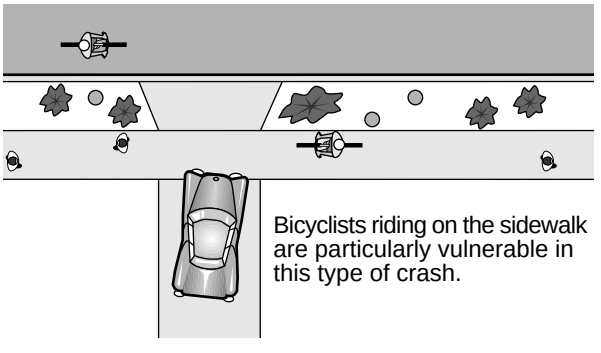


Figure 164: Conflicts at driveway

A.5. MOTORIST DISREGARDS SIGN OR SIGNAL

Motorists often commit this infraction because they didn't see a bicyclist. The best engineering solutions to improve cyclists' visibility include:

- Designing on-road bikeways that place bicyclists in the flow of traffic; and
- Improving sight distance, by restricting on-street parking and by removing excess vegetation and other obstructions.

B. EDUCATION SOLUTIONS

Education of both motorists and bicyclists can curtail unintentional infractions as well as promote other safe riding and driving practices.

For bicyclists to safely coexist with motorists, they need to understand the vehicle code and develop good cycling skills. Education provides these skills and knowledge. Comprehensive bicycle safety education programs are designed for each age group with emphasis on errors commonly committed by that group. On-bike training is an important element of such a program. Education also stresses the value of helmets and other protective measures.

At present, only a few Oregon communities have a comprehensive bicycle safety education program. Others have only some of the basic elements. More funds, expert personnel, and persons or agencies directly responsible for bicycle safety education are needed to improve programs. In some communities, volunteer service groups or police departments do some education, but they typically need better support materials. Often, only elementary school age children are selected as the target group.

In 1987 the Legislature passed Senate Bill 514 (ORS 802.325), requiring the former Traffic Safety Commission to establish a bicycle safety program. ODOT is continuing this program to help educate young and adult cyclists, motorists, parents, and law enforcement personnel.

There are hundreds of volunteers in dozens of communities trained in on-bicycle education programs such as the *Smart Cycling I & II* curriculum, as well as the staging of bicycle safety events. Thousands of students have taken this training. ODOT publishes two safety brochures: *Say, you're not from this Planet, Are You?* and the *Oregon Bicyclist's Manual.*

DMV includes information on bicyclists and pedestrians in its publications aimed at motor vehicle drivers. At least one question regarding bicyclists or pedestrians is included on every written driver's license test.

Bicycle safety education materials, services, and information may be obtained from:

BICYCLE SAFETY COORDINATOR
Mill Creek Office Park
555 13th Street NE
Salem, OR 97310
Tel: (503) 986-4196

Children learn traffic safety through "Safety Town" program

C. ENFORCEMENT SOLUTIONS

Law enforcement is a necessary component of bicycle safety. Stricter enforcement can limit both intentional and unintentional infractions. As with any law, lack of enforcement leads to a general disregard of the law. Local police officers should be willing to enforce the motor vehicle code with bicyclists and motorists. There are practical problems in citing bicyclists, since they often lack positive identification, such as a driver's license.

Frequent contact between local bicycle advisory committees, traffic safety groups and the police can highlight the need for enforcement and identify problem areas. Significant violation problems that have been identified by the bicycling community include:

- Motorists not yielding to bicyclists;
- Motorists not giving bicyclists enough room on the roadway;
- Bicyclists running traffic signals;
- Bicyclists riding on sidewalks;
- Bicyclist riding the wrong way; and
- Bicyclists riding at night without lights.

Motorists and cyclists must learn to coexist on narrow roads

Bicycle-mounted police can often more easily apprehend offenders. Community education and support of enforcement efforts builds respect between bicyclists and motorists.

D. EQUIPMENT SOLUTIONS

There are several bicycle features which contribute to riders' ability to control their movements:

- **SIZE:** a bicycle must be properly fitted. If it is too small or too big, the rider will have trouble reacting properly when stopping, turning or accelerating. The wrong size bicycle is also uncomfortable, leading to fatigue.
- **BRAKES:** by law, brakes must be sufficiently powerful to enable a rider to bring a bicycle to a skid on dry pavement. Brake levers must be readily accessible.
- **TIRES:** must be in good condition and inflated to their recommended pressure.
- **FENDERS:** prevent lights and reflectors from getting dirty in wet weather.
- **LUGGAGE RACKS AND PANNIERS:** bicyclists should never attempt to carry loads in their arms while riding.
- **LIGHTS:** by law, when riding after dark, the bicycle or the rider must be equipped with a white light visible at least 500 feet to the front and a red light or reflector visible at least 600 feet to the rear. A rear light is more effective than a reflector. The front white reflectors sold with bicycles do not provide visibility to a motorist entering from a side street (see Figure 165, page 190).

Well-equipped cyclist, with lights, fenders, luggage rack and helmet

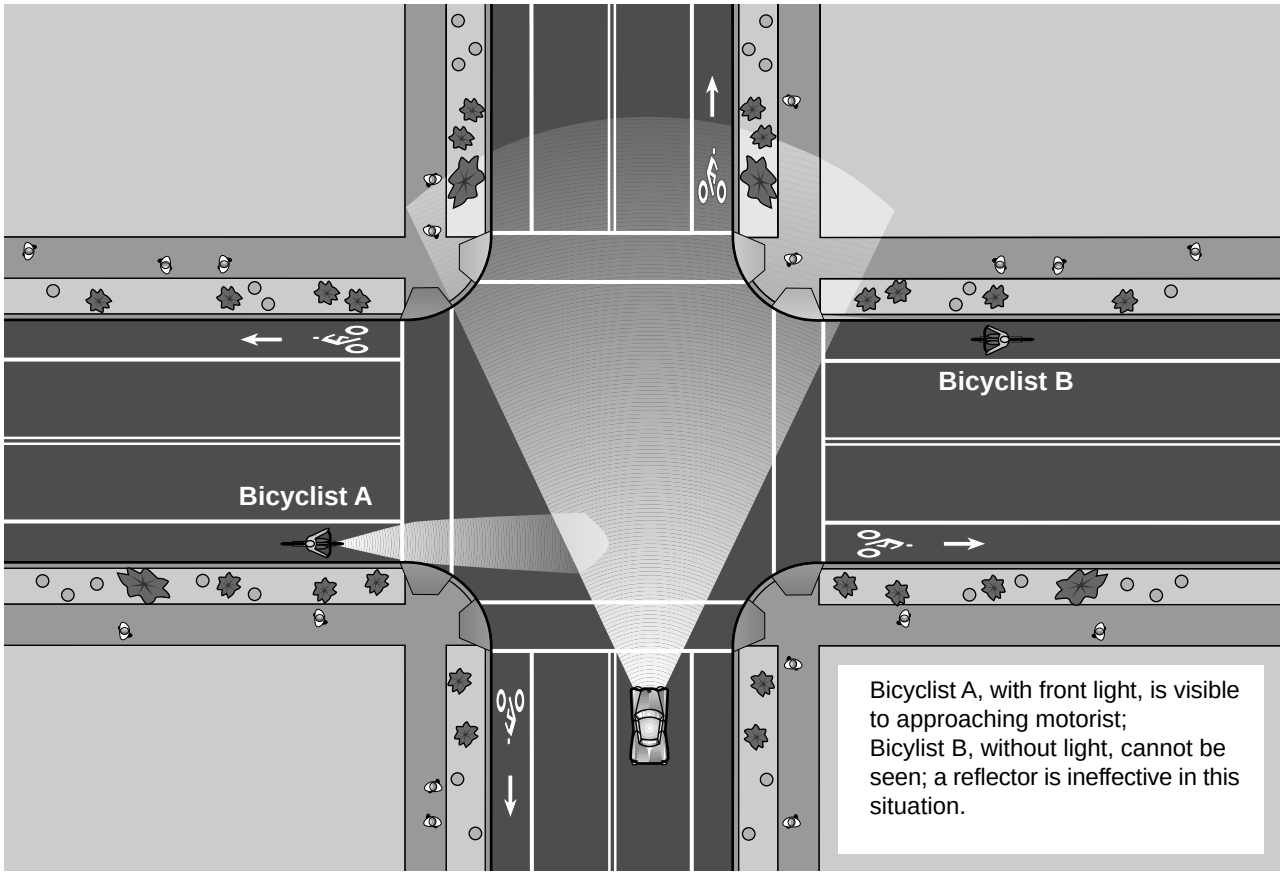


Figure 165: Effectiveness of bike lights at intersections

E. RIDING SKILLS

Since most bicycle crashes do not involve motor vehicles, poor riding skills must be responsible for many injury crashes. By ensuring that one has a good sense of balance, by looking ahead and to the sides, by avoiding distractions such as personal stereos, and by ensuring that one's bike is in good working order, falls and collisions with fixed objects can be largely avoided.

Many crashes with motor vehicles could be avoided if riders learned to control their bicycles better, including riding in a straight line and turning or stopping faster to avoid collisions.

F. HELMETS

Wearing a helmet does not reduce the chances of a crash, but can reduce the severity of injuries or the possibility of a fatality. A properly worn bicycle helmet can reduce the severity of head injuries by up to 80%. Many communities are promoting awareness campaigns aimed at increasing helmet use, especially among children.

Proper fit is an important aspect of responsible helmet use. ODOT produces a brochure on this subject, "Get Head Smart." It is available from the Bicycle Safety Coordinator.

In 1993, the State of Oregon passed a mandatory helmet law for riders and passengers under the age of sixteen (Senate Bill 1088), which went into effect on July 1, 1994.

1994 ODOT statistics indicate that approximately 36% of riders in urban setting wore a helmet (24% of youth and 40% of adults). Helmet use is higher than the state average in cities with well-developed bikeway systems; use is highest on the Coast Highway, where virtually all of the touring riders wear helmets.

IV.2. PEDESTRIAN SAFETY

INTRODUCTION

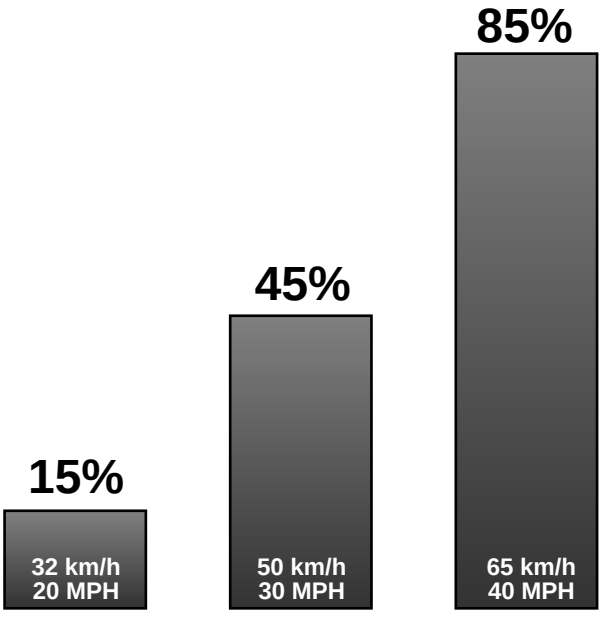
Compared to bicycle crashes, virtually all reported pedestrian crashes are the result of a collision with a motor vehicle. This is mostly due to our perceptions: when a person trips and falls while walking, the resulting injury is rarely reported as a pedestrian crash.

Most pedestrian crashes are the result of an attempt to cross a roadway; fewer occur as pedestrians walk along a roadway.

Effective pedestrian safety programs should target behaviors that cause the majority of crashes. Analysis of pedestrian/motor vehicle crashes can help establish engineering, education and enforcement solutions.

One important factor in all pedestrian crashes is speed. A recent study conducted in Great Britain (Killing Speed and Saving Lives) demonstrates a dramatic correlation between motor vehicle speeds and fatality rates.

Reducing traffic speeds not only reduces the severity of pedestrian crashes, but may reduce their occurrence, as slower speeds decrease braking distances and reaction time. All engineering, education and enforcement programs should include reducing speeds as an important step. This does not necessarily mean reducing existing speed limits, as much as ensuring that the current limits are observed.



Pedestrians' chances of death if hit by a motor vehicle
SOURCE: *Killing Speed and Saving Lives*, UK Department of Transportation

Figure 166: The relationship between speed and the pedestrian fatality rate

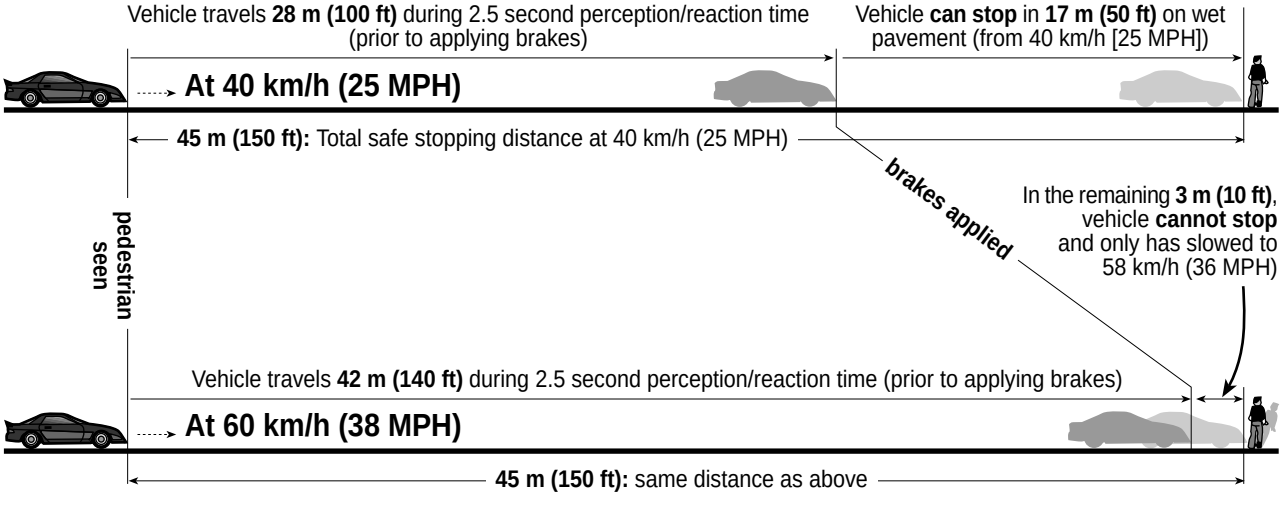


Figure 167: Relationship between safe stopping distance and travel speed

Refuge helps pedestrians cross street

LONG-TERM TRENDS

The number and severity of pedestrian crashes could rise in the future due to an unintentional consequence of cars being built with more safety features: as drivers and passengers are better protected within their vehicles, and further isolated from the outside world (with quiet interiors and improved sound systems), the unprotected pedestrian will not be noticed or perceived as a threat. This could lead to pedestrians being invisible to or ignored by motorists. Pedestrian fatalities have been on the rise the last few years.

The statewide data collected by ODOT (see Table 11) reveal the nature of crashes between pedestrians and motor vehicles.

Most safety efforts should be aimed at crossing movements; greater education of motorists is necessary to make them aware of the rights of pedestrians.

Pedestrians should be secure when using crosswalks

PEDESTRIAN/MOTOR VEHICLE CRASHES

- There are approximately 700-800 pedestrian injury crashes reported each year.
- Of these, approximately 60-80 are fatal (10%)
- 80% of the crashes occur in urban areas.
- 80% occur as a pedestrian crosses a street:
  - Of the crossing accidents, 50% occur at mid-block locations.
  - Of the crossings that occur at intersections, about half are at signalized intersections, and half are at non-signalized intersections.
  - In 90% of the intersection crashes, the pedestrian was in a crosswalk.
  - At signalized intersections, in 65% of the crashes, the pedestrian was crossing with the signal.
- The moves of motor vehicles in intersection crashes were:
  - Motor vehicle going straight: 50%
  - Motor vehicle turning: 50% (63% turning left, 37% turning right)

Table 11: Pedestrian/motor vehicle crashes

A. ENGINEERING SOLUTIONS

Even though most pedestrian/motor vehicle crashes are caused by improper behavior, many improvements can be made to roads to reduce the potential for crashes. If facilities are well-designed and pedestrians and motorists use them correctly, the likelihood of crashes will decrease.

The most important step that transportation agencies can take is to design pedestrian facilities that enable motorists to clearly see pedestrians along the roadway and those preparing to cross the roadway. Pedestrians must be given opportunities to cross roadways with minimal conflicts with motor vehicles.

Most of the proposed engineering solutions are covered in greater detail in the chapters on walkway and intersection design (II.4 to II.7).

A.1. PEDESTRIAN WALKING ALONG THE ROADWAY

- The addition of sidewalks in urban areas and wider shoulders in rural areas are the preferred treatments.
- Sidewalks separated from traffic with planter strips increase pedestrian safety.

Lack of sidewalk forces pedestrian onto roadway

A.2. PEDESTRIAN CROSSING AT INTERSECTION

- Shortening the total distance to be crossed shortens the exposure time; techniques include curb extensions, median islands and islands at complicated turn movements.
- Placement of signs reminding motorists of their duty to yield to pedestrians when they turn left or right can help improve awareness of the pedestrian's right of way.
- Illumination can improve visibility of pedestrians under nighttime conditions.
- Improved marking of crosswalks enhance their visibility.

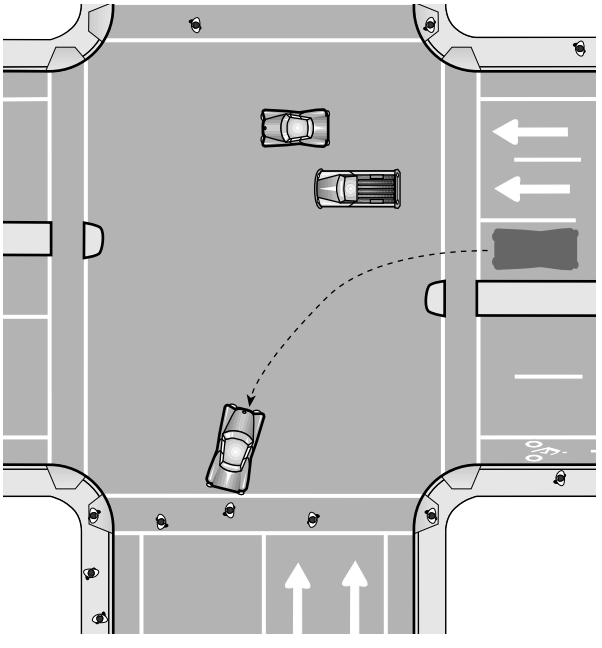


Figure 168: Left-turning vehicle and pedestrian conflict

Left-turning conflicts

A.3. PEDESTRIAN CROSSING OUTSIDE AN INTERSECTION

- On wide, multiple lane roads, a center median improves crossing opportunities: a pedestrian only has to concentrate on traffic coming from one direction at a time, as the median provides a refuge.
- Mid-block curb extensions can reduce crossing distance and improve the visibility of pedestrians waiting to cross.
- Illumination improves the visibility of pedestrians under nighttime conditions.
- Improved marking of crosswalks enhances their visibility.

A.4. MOTORIST SPEEDING

Though this is usually considered an enforcement issue, there are many roadway design features that influence the speed at which motorists drive - motorists will usually travel at speeds that seem appropriate for the roadway.

The traffic calming measures can be used on local streets and minor collectors. On arterials and major collectors, there are features that can be incorporated that discourage excessive speeds: trees along the road, narrower lanes, landscaping, bike lanes, etc. (See page 159)

B. EDUCATION SOLUTIONS

Many of the pedestrian crashes are due to the ignorance of the rules pertaining to the right-of-way. A recent study conducted by the AAA revealed that close to 50% of Americans do not know some of the basic laws as they apply to pedestrians. More information should be made available to motorists so they know that pedestrians have the right-of-way at crosswalks, *both marked and unmarked.*

The consequences of excessive travel speeds must be made known to the motorists; many do not understand that traveling above the speed limit in residential areas can result in a fatal pedestrian crash.

Pedestrians must know how to safely cross streets. It should never be assumed that a signal guarantees safety; one should always look before crossing. The meaning of "WALK/DON'T WALK" signals is not clearly understood by all (the white WALK phase of a signal is time during which pedestrians may begin to enter the crosswalk; the flashing red DON'T WALK phase indicates that pedestrians in the crosswalk may safely proceed across the street, but pedestrians approaching the intersection should wait).

Though there are many situations in which the pedestrian is technically at fault (e.g. mid-block dart out), more emphasis needs to be placed on the driver's responsibility, since he or she is the one moving in a high-speed, heavy vehicle.

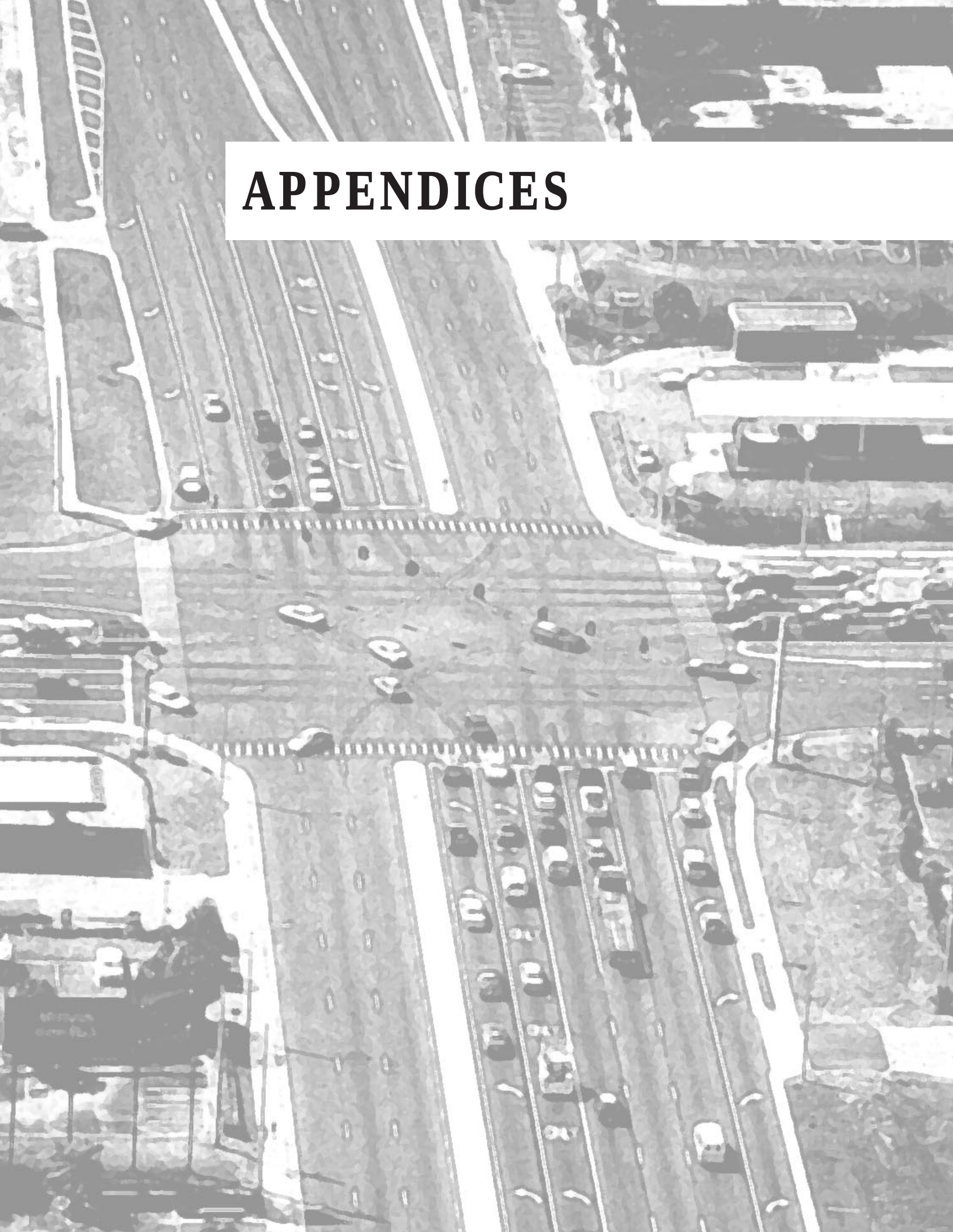
C. ENFORCEMENT SOLUTIONS

Along with education, increased enforcement can have the greatest effect on pedestrian safety. The lack of consequences to motorists who run lights and stop signs or fail to yield at crosswalks is mostly due to the insufficient numbers of law enforcement officers dedicated to traffic enforcement.

Increased education efforts aimed at law enforcement officers can help them understand the severity of pedestrian infractions. An effective program in Seattle combined increased citation of motorists at crosswalks with extensive media coverage. The result was a dramatic decrease in the number of pedestrian crashes following these efforts.

Attitudes towards the relative severity of pedestrian crashes need to change among prosecutors and judges. Motorists often get off fairly lightly following crashes that result in pedestrian injuries or deaths. The pedestrian is often assumed to be partially at fault for simply "being in the road."

The consequences of failing to yield to pedestrians need to be more severe and better publicized for motorists to change behavior.



APPENDICES

APPENDIX A: GLOSSARY OF TERMS & ABBREVIATIONS USED IN THIS PLAN

AASHTO: American Association of State Highway and Transportation Officials.

ACCESS MANAGEMENT: The principles, laws and techniques used to control access to a highway.

ADA: The Americans with Disabilities Act; civil rights legislation passed in 1990, effective July 1992.

ADT: Average Daily Traffic. The measurement of the average number of vehicles passing a certain point each day on a highway, road or street.

ARTERIAL (STREET): A street designated to carry traffic, mostly uninterrupted, through an urban area, or to different neighborhoods within an urban area.

BICYCLE: A vehicle having two tandem wheels, a minimum of 14" (35 cm) in diameter, propelled solely by human power, upon which any person or persons may ride. A three-wheeled adult tricycle is considered a bicycle.

BICYCLE FACILITY: Any facility provided for the benefit of bicycle travel, including bikeways and parking facilities as well as all other roadways not specifically designated for bicycle use.

BIKE LANE: A portion of a roadway which has been designated by striping and pavement markings for the preferential or exclusive use of bicyclists.

BIKEWAY: A bikeway is created when a road has the appropriate design treatment for bicyclists, based on motor vehicle traffic volumes and speeds: shared roadway, shoulder bikeway, bike lane or bicycle boulevard. Another type of facility is separated from the roadway: multi-use path.

CBD: Central Business District - A traditional downtown area usually characterized by established businesses fronting the street, sidewalks, slow traffic speeds, on-street parking and a compact grid street system.

CLEARANCE, LATERAL: The width required for safe passage as measured in a horizontal plane.

CLEARANCE, VERTICAL: The height required for safe passage as measured in a vertical plane.

COG: Council of Governments

COLLECTOR (STREET): A street designated to carry traffic between local streets and arterials, or from local street to local street.

CROSS SECTION, or TYPICAL CROSS-SECTION or TYPICAL: Diagrammatic presentation of a highway profile at right angles to the centerline at a given location.

CROSSWALK: Portion of a roadway designated for pedestrian crossing, marked or unmarked. Unmarked crosswalks are the natural extension of the shoulder, curb line or sidewalk.

DLCD: Department of Land Conservation and Development.

FRONTAGE ROAD: A road designated and designed to serve local traffic parallel and adjacent to a highway or arterial street.

GRADE: A measure of the steepness of a roadway, bikeway or walkway, expressed in a ratio of vertical rise per horizontal distance, usually in percent; e.g. a 5% grade equals 5 m of rise over a 100 m horizontal distance.

GRADE SEPARATION: The vertical separation of conflicting travelways with a structure.

HIGHWAY: A general term denoting a public way for purposes of travel, including the entire area within the right-of-way.

ISTEA: The Intermodal Surface Transportation Efficiency Act.

JAY-WALKING: Crossing a street illegally; includes walking against a traffic control device, or stepping out in front of a moving vehicle so as to present an immediate danger, whether in a crosswalk or not, or crossing at an intersection outside of a crosswalk.

LCDC: Land Conservation and Development Commission.

LEGEND: Words, phrases or numbers appearing on all or part of a traffic control device; also the symbols that appear on maps.

LOCAL STREET: A street designated to provide access to and from residences or businesses.

MOTOR VEHICLE: A vehicle that is self-propelled or designed for self-propulsion.

MPO - Metropolitan Planning Organization: An agency that combines the governing bodies of neighboring cities whose combined population exceeds 50,000.

MULTI-USE PATH: A path physically separated from motor vehicle traffic by an open space or barrier and either within a highway right-of-way or within an independent right-of-way, used by bicyclists, pedestrians, joggers, skaters and other non-motorized travelers.

MUTCD: The "Manual on Uniform Traffic Control Devices," approved by the Federal Highway Administration as a national standard for placement and selection of all traffic control devices on or adjacent to all highways open to public travel.

OAR: Oregon Administrative Rule - A rule written by an affected government agency, intended to clarify the intent of an ORS.

OBPAC: Oregon Bicycle and Pedestrian Advisory Committee; an eight-member, Governor appointed committee, which advises ODOT on the regulation of bicycle and pedestrian traffic and the establishment of bikeways and walkways.

ODOT: Oregon Department of Transportation.

ORS - Oregon Revised Statute: The laws that govern the state of Oregon, as proposed by the legislature and signed by the Governor.

OTC- Oregon Transportation Commission: a five-member, Governor-appointed commission, whose primary duty is to develop and maintain a state transportation policy and a comprehensive, long-term plan for a multimodal transportation system.

OTP: Oregon Transportation Plan.

PAVEMENT MARKINGS: Painted or applied lines or legends placed on a roadway surface for regulating, guiding or warning traffic.

PEDESTRIAN: A person on foot, in a wheelchair or walking a bicycle.

PEDESTRIAN FACILITY: A facility provided for the benefit of pedestrian travel, including walkways, crosswalks, signs, signals, illumination and benches.

RIGHT-OF-WAY: A general term denoting publicly-owned land, property, or interest therein, usually in a strip, acquired for or devoted to transportation purposes.

RIGHT OF WAY: The right of one vehicle or pedestrian to proceed in a lawful manner in preference to another vehicle or pedestrian.

ROADWAY: The paved portion of the highway.

RULES OF THE ROAD: The portion of a motor vehicle law that contains regulations governing the operation of vehicular and pedestrian traffic.

SHARED ROADWAY: A type of bikeway where bicyclists and motor vehicles share a travel lane.

SHOULDER: The portion of a highway that is contiguous to the travel lanes provided for pedestrians, bicyclists, emergency use by vehicles and for lateral support of base and surface courses.

SHOULDER BIKEWAY: A type of bikeway where bicyclists travel on a paved shoulder.

SHY DISTANCE: The distance between the edge of a travelway and a fixed object.

SIDEWALK: A walkway separated from the roadway with a curb, constructed of a durable, hard and smooth surface, designed for preferential or exclusive use by pedestrians.

SIGHT DISTANCE: The distance a person can see along an unobstructed line of sight.

SKEW ANGLE: The angle formed between a roadway, bikeway or walkway and an intersecting roadway, bikeway, walkway or railway, measured away from the perpendicular.

STRUCTURE: A bridge, retaining wall or tunnel.

TPR: Transportation Planning Rule 12 (OAR 660-12).

TRAFFIC CONTROL DEVICES: Signs, signals or other fixtures, whether permanent or temporary, placed on or adjacent to a travelway by authority of a public body having jurisdiction to regulate, warn or guide traffic.

TRAFFIC VOLUME: The given number of vehicles that pass a given point for a given amount of time (hour, day, year). See ADT.

TSP: Transportation System Plan: the overall plan for all transportation modes for a given area (usually city, county or MPO).

UGB: Urban Growth Boundary: the area surrounding an incorporated city in which the city may legally expand its city limits.

URBAN AREA: The area immediately surrounding an incorporated city or rural community that is urban in character, regardless of size.

VEHICLE: Any device in, upon or by which any person or property is or may be transported or drawn upon a highway, including vehicles that are self-propelled or powered by any means.

WALKWAY: A transportation facility built for use by pedestrians, including persons in wheelchairs. Walkways include sidewalks, paths and paved shoulders.

WIDE OUTSIDE LANE: A wider than normal curbside travel lane that is provided for ease of bicycle operation where there is insufficient room for a bike lane or shoulder bikeway.

APPENDIX B: OTHER DOCUMENTS RELATED TO BICYCLING AND WALKING

For information on **bicycle racing** in Oregon, please obtain the *"Guidelines for Administration of Bicycle Racing on Oregon Roads"* from:

Bicycle/Pedestrian Program
Room 210, Transportation Building
Salem, OR 97310-1354

National standards for bikeway and walkway design are contained in several documents:

AASHTO (American Association of State Highway and Transportation Officials) publishes the "Policy on Geometric Design of Highways and Streets" and the "Guide for the Development of Bicycle Facilities." These can be obtained from:

AASHTO
444 North Capitol Street, NW, Suite 225
Washington, DC 20001

Design standards for highways are contained in the "Highway Design Manual," available from the ODOT Library by calling (503) 986-3280.

Information on **signing and pavement markings** is contained in the *"Manual on Uniform Traffic Control Devices"* (MUTCD). It is available from:

Federal Highway Administration
400 Seventh Street, SW
Washington, DC 20590

ODOT has adopted signs for use in Oregon; these are published in the *"Sign Policies and Guidelines for the State Highway System"* available from:

Traffic Management Section
Transportation Building
Salem, OR 97310-1354

The most current information regarding **ADA standards** is contained in the Federal Register, Volume 59, No. 117, dated Monday, June 20, 1994.

Designs for **interfacing transit with pedestrians** have been developed by Tri-Met in their "Planning and Design for Transit Handbook," available from:

Tri-Met Technical Services Division
710 NE Holladay Street
Portland, OR 97232

The Oregon Department of Transportation publishes **surveys and reports** such as the "Bicycle/Motor Vehicle Crash Report" and the "Bicycle and Pedestrian Counts." These are available from the Bicycle/Pedestrian Program.

Other groups and agencies also publish **research data**, including, for example, "The Pedestrian Environment," published by 1000 Friends of Oregon.

The Oregon Chapter of the American Planning Association publishes *"Recommendations for Pedestrian, Bicycle and Transit Friendly Development Ordinances"*, available from the Bicycle and Pedestrian Program

The Bicycle Federation of America runs the National Bicycle and Pedestrian Clearing House, which tracks all currently available documents. They can be reached at (800) 760-6272.

Research data and other background information are available from FHWA, including the "Planning, Design and Maintenance of Pedestrian Facilities" and the "Synthesis of Safety Research - Pedestrians." Other information is contained in the 24 Case Study Reports of the "National Bicycling and Walking Study:"

1. Reasons Why Bicycling and Walking are and are Not Being Used More Extensively as Travel Modes, FHWA-PD-93-041
2. The Training Needs of Transportation Professionals Regards the Pedestrian and Bicyclist, FHWA-PD-93-038
3. What Needs to be Done to Promote Bicycling and Walking, FHWA-PD-93-039
4. Measures to Overcome Impediments to Bicycling and Walking, FHWA-PD-93-031

5. An Analysis of Current Funding Mechanisms for Bicycle and Pedestrian Programs at the Federal, State and Local Levels, FHWA-PD-93-008
6. Analysis of Successful Grass-roots Movements Relating to Pedestrians and Bicyclists and a Guide on How to Initiate a Successful Program, FHWA-PD-93-024
7. Transportation Potential and Other Benefits of Off-Road Bicycle and Pedestrian Facilities, FHWA-PD-92-040
8. Organizing Citizen Support and Acquiring Funding for Bicycle and Pedestrian Trails, FHWA-PD-93-007
9. Linking Bicycle/Pedestrian Facilities with Transit, FHWA-PD-93-012
10. Trading Off Among the Needs of Motor Vehicle Users, Pedestrians, and Bicyclists, FHWA-PD-94-012
11. Balancing Engineering, Education, Law Enforcement, and Encouragement, FHWA-PD-93-009
12. Incorporating Consideration of Bicyclists and Pedestrians into Education Programs, FHWA-PD-92-036
13. A Syntheses of Existing Bicyclist and Pedestrian Related: Laws and Enforcement Programs, FHWA-PD-93-009
14. Benefits of Bicycling and Walking to Health, FHWA-PD-93-025
15. The Environmental Benefits of Bicycling and Walking, FHWA-PD-93-015
16. A Study of Bicycle and Pedestrian Programs in European Countries, FHWA-PD-92-037
17. Bicycle and Pedestrian Policies and Programs in Asia, Australia, and New Zealand, FHWA-PD-93-016
18. Analyses of Successful Provincial, State, and Local Bicycle and Pedestrian Programs in Canada and the United States, FHWA-PD-93-010
19. Traffic Calming, Auto Restricted Zones, and Other Traffic Management Techniques: Their Effect on Bicyclists and Pedestrians, FHWA-PD-93-028
20. The Effects of Environmental Design on the Amount and Type of Bicycling and Walking, FHWA-PD-93-037
21. Incorporating Bicycle and Pedestrian Considerations Into State and Local Transportation Planning, Design, and Operations, FHWA-PD-93-017
22. The Role of State Bicycle/Pedestrian Coordinators, FHWA-PD-93-019
23. The Role of Local Bicycle/Pedestrian Coordinators, FHWA-PD-93-014
24. Current Planning Guidelines and Design Standards Being Used by State and Local Agencies in the Design of Pedestrian/Bicycle Facilities, FHWA-PD-93-006

APPENDIX C:
ODOT INTERPRETATION OF ORS 366.514

Notes:

- The bill is divided into Sections (1)-(5).
- *The original language of the bill is written in italics,* with ODOT's interpretation following in regular print.
- The terminology of the original bill is outdated: "*footpaths and bicycle trails*" should read "*walkways and bikeways.*"

(1) Out of the funds received by the department or by any county or city from the State Highway Fund reasonable amounts shall be expended as necessary to provide footpaths and bicycle trails, including curb cuts or ramps as part of the project.

The law requires that *reasonable amounts* of State Highway Funds be expended by the Department of Transportation, counties and cities to provide walkways and bikeways. *Reasonable amounts* are related to the need for bikeways and walkways; if there is a need, the governing jurisdiction shall expend a reasonable amount to construct the needed facilities.

When the bill was introduced in 1971, most road projects were funded through the highway fund. While the law itself refers to the highway fund, several drafters of the original bill have indicated that the intent was not to limit this requirement to the highway fund only, but rather to make this fund available for the construction of walkways and bikeways, to benefit all users of the highway.

Footpaths and bicycle trails, including curb cuts or ramps as part of the project, shall be provided wherever a highway, road or street is being constructed, reconstructed or relocated.

The law requires the Department of Transportation, counties and cities to provide walkways and bikeways on all roadway construction, reconstruction or relocation projects. The funding source or amount are not the determining factors; what is important is that pedestrian and bicycle facilities be provided as part of road improvements.

"Construction, reconstruction and relocation" refers to all projects where a roadway is built or upgraded. Walkways and bikeways don't necessarily have to be provided on projects such as signal or signing improvements, landscaping and other incidental work. Preservation overlays are also excluded if the only intent of the project is to preserve the riding surface in usable condition, without any widening or realignment. Projects where the entire depth of the roadway bed is replaced are usually considered reconstruction projects.

Funds received from the State Highway Fund may also be expended to maintain footpaths and trails and to provide footpaths and trails along other highways, roads and streets and in parks and recreation areas.

The law also allows highway funds to be used for maintenance and to provide walkways and bikeways independently of road construction. The Department, a city or a county may use its highway funds for projects whose primary purpose is to provide improvements for pedestrians and bicyclists.

The 1980 Constitutional Amendment (Article IX, section 3a) now prohibits the expenditure of highway funds in parks and recreation areas. A subsequent Oregon Supreme Court opinion, **Rogers v. Lane County**, supports continued use of highway funds to construct and maintain walkways and bikeways within the highway right-of-way, but allows such use only when they are within the highway right-of-way.

(2) Footpaths and trails are not required to be established under subsection (1) of this section:
(a) Where the establishment of such paths and trails would be contrary to public safety;
(b) If the cost of establishing such paths and trails would be excessively disproportionate to the need or probable use: or
(c) Where sparsity of population, other available ways or other factors indicate an absence of any need for such paths and trails.

The law provides for reasonable exemptions. The determination that one or more exemption is met should be well-documented. The decision should allow opportunities for public review and input by interested parties. Exemptions (b) and (c) refer back to the need. The burden is on the governing jurisdiction to show the lack of need to provide facilities; the need is legislatively presumed but can be rebutted.

... *contrary to public safety:* this exemption applies where the safety of any group of highway users would be jeopardized by the inclusion of walkways or bikeways. In most instances, the addition of walkways and bikeways improves safety, both for motorists and non-motorized users, but there may be instances where the inclusion of a walkway or bikeway decreases safety, for example, sidewalks on a limited access freeway would be considered unsafe.

... *cost is excessively disproportionate to need or probable use:* this exemption applies if it can be shown that there is insufficient need *or probable use* to justify the cost. Probable use must extend to cover the anticipated life of the project, which can be twenty years or longer for roadway projects, fifty years or longer for bridge projects. It is not sufficient to claim that there is little or no current pedestrian or bicycle use. This is often due to the lack of appropriate facilities. The law does not provide guidelines for determining when costs are excessively disproportionate.

... *sparsity of population ... indicates an absence of any need:* This exemption most commonly applies to rural roads or highways where walkways and bikeways would get very little use.

... *other available ways ... indicate an absence of any need:* For this exemption to apply, it must be shown that the "other available ways" serve bicyclists and pedestrians as well as or better than would a facility provided on the road, street or highway in question. The "other available ways" must provide equal or greater access and mobility than the road, street or highway in question. An example sufficient to indicate other available ways would be providing sidewalks and bike lanes on a parallel or adjacent street rather than along a freeway. An example not sufficient would be choosing not to provide bike lanes and sidewalks on an arterial street and encouraging use of local side streets that do not include bicycle and pedestrian facilities nor offer the equivalent direct route or access as the arterial street.

... *other factors ... indicate an absence of any need:* This exemption allows consideration of other factors that are particular to a project. A common example is the acceptability of cyclists sharing the roadway with automobiles on low volume, low traffic local streets. Again, the absence of any need must be found.

(3) The amount expended by the department or by a city or county as required or permitted by this section shall never in any one fiscal year be less than one percent of the total amount of the funds received from the highway fund. However:

(a) This subsection does not apply to a city in any year in which the one percent equals $250 or less, or to a county in any year in which the one percent equals $1500 or less.

(b) A city or county in lieu of expending the funds each year may credit the funds to a financial reserve or special fund in accordance with ORS 280.100, to be held for not more than 10 years, and to be expended for the purposes required or permitted by this section.

(c) For purposes of computing amounts expended during a fiscal year under this subsection, the department, a city or county may record the money as expended:

(A) On the date actual construction of the facility is commenced if the facility is constructed by the city, county or department itself; or

(B) On the date a contract for the construction of the facilities is entered with a private contractor or with any other governmental body.

The law requires that in any given fiscal year, the amounts expended to provide walkways and bikeways must be a minimum of 1% of the state highway fund received by the Department, a city or county. The law does not establish a special fund ("bicycle fund"), nor does it limit the expenditures to 1%: section (1) requires that "reasonable amounts" be expended. 1% is only a minimum.

Cities and counties are not required to spend a minimum of 1% each year; they may credit this amount to a reserve fund and expend these amounts within a period not to exceed ten years.

The 1% minimum requirement is independent from the requirement to provide bikeways and walkways as part of road construction. A jurisdiction spending more than 1% of its funds on walkways and bikeways must still provide bikeways and walkways as part of all new construction projects, unless determined not to be otherwise required pursuant to section (2).

The 1% minimum requirement does not apply to cities receiving less than $25,000 a year, or to counties receiving less than $150,000 a year from the fund. However, bikeways and walkways must be provided wherever roads are constructed, as required in Section 1, subject to the exemptions in Section 2.

(4) For the purposes of this chapter, the establishment of paths, trails and curb cuts or ramps and the expenditure of funds as authorized by this section are for highway, road and street purposes.

This section is the legislature's statement of intent that these uses would qualify under the Constitution as highway uses. This is reinforced in the 1980 constitutional amendment (Article IX, section 3a) and by **Rogers v. Lane County**.

The department shall, when requested, provide technical assistance and advice to cities and counties in carrying out the purpose of this section. The division shall recommend construction standards for footpaths and bicycle trails. Curb cuts or ramps shall comply with the requirements of ORS 447.310. The division shall, in the manner prescribed for marking highways under ORS 810.200, provide a uniform system of signing footpaths and bicycle trails which shall apply to paths and trails under the jurisdiction of the department and cities and counties.

One of the purposes of this Bicycle/Pedestrian Plan is to implement this section. ODOT develops standards and designs for bikeways and walkways. ODOT staff is available to assist cities and counties with technical problems, as well as with planning and policy issues.

The department and cities and counties may restrict the use of footpaths and bicycle trails under their respective jurisdictions to pedestrians and non-motorized vehicles.

Motor vehicles are generally excluded from using bike lanes, sidewalks and multi-use paths.

(5) As used in this section, "bicycle trail" means a publicly owned and maintained lane or way designated and signed for use as a bicycle route.

A "*bicycle trail*" is currently defined as a "bikeway."

The Oregon Court of Appeals upheld the intent of this statute in **Bicycle Transportation Alliance v. City of Portland** (9309-05777; CA A82770). The judge's summary was: "Read as a whole, ORS 366.514 requires that when an agency receives state highway funds and constructs, reconstructs or relocates highways, roads or streets, it must expend a reasonable amount of those funds, as necessary, on bicycle and pedestrian facilities. The statue also requires the agency to spend no less than one percent per fiscal year on such facilities, unless relieved of that obligation by one of the exceptions in subsection (2)."

APPENDIX D: OREGON TRANSPORTATION PLAN:
SELECTED GOALS, POLICIES & ACTIONS RELATING TO BICYCLING & WALKING

THE GOALS OF THE OREGON TRANSPORTATION PLAN

The purpose of the Oregon Transportation Plan is to guide the development of a safe, convenient and efficient transportation system which promotes economic prosperity and livability for all Oregonians.

GOAL 1 - CHARACTERISTICS OF THE SYSTEM: To enhance Oregon's quality of life and comparative economic advantage by the provision of a transportation system with the following characteristics:

- **Balance**
- **Efficiency**
- **Accessibility**
- **Environmental Responsibility**
- **Connectivity among Places**
- **Connectivity among Modes and Carriers**
- **Safety**
- **Financial Stability**

POLICY 1A - Balance: It is the policy of the State of Oregon to provide a balanced transportation system. A balanced transportation system is one that provides transportation options at appropriate minimum service standards, reduces reliance on the single occupant automobile where other modes or choices can be made available, particularly in urban areas, and takes advantage of the inherent efficiencies of each mode.

ACTION 1A.1: Design systems and facilities that accommodate multiple modes within corridors, where appropriate, and encourage their integrated use in order to provide users with cost-effective choices of travel and shipping within corridors.

POLICY 1B - Efficiency: It is the policy of the State of Oregon to assure provision of an efficient transportation system. The system is efficient when (1) it is fast and economic for the user; (2) users face prices that reflect the full costs of their transportation choices; and (3) transportation investment decisions maximize the net full benefits of the system. (Full benefits and costs include social and environmental impacts, as well as the benefits of mobility to users, and construction, operations and maintenance costs.)

ACTION 1B.3: Use demand management techniques to reduce vehicle miles traveled in single occupant automobiles, especially during peak hours of highway use. These measures include the use of *alternative modes* such as transit, *bicycling* and *walking*, ridesharing, vanpooling, telecommuting and projects that promote efficient urban design.

ACTION 1B.4: Preserve corridors for future transportation development. Consider obtaining, developing and using those abandoned rail rights-of-way that are in the public interest for transportation system improvements. Consider using abandoned rail corridors for *bicycle* and *walking* trails and for utility and communication corridors as interim uses.

POLICY 1C - Accessibility: It is the policy of the State of Oregon to promote a transportation system that is reliable and accessible to all potential users, including the transportation disadvantaged, measured by availability of modal choices, ease of use, relative cost, proximity to service and frequency of service.

ACTION 1C.1: Cooperatively define acceptable levels of accessibility through the establishment of standards in transportation system plans for minimum levels of service and system design for passengers and freight for all modes.

ACTION 1C.2: Encourage multimodal accessibility to employment, shopping and other commerce, medical care, housing and leisure, including adequate public transit access for the transportation disadvantaged.

ACTION 1C.3: Implement the accessible transportation requirements established by the Americans with Disabilities Act of 1990.

ACTION 1C.4: Develop public transit, *bicycle* and *pedestrian* systems in urban and rural areas.

ACTION 1C.5: Assure that the services of private and public transportation providers are coordinated. Integrate public and special purpose transportation services.

POLICY 1D - Environmental Responsibility: It is the policy of the State of Oregon to provide a transportation system that is environmentally responsible and encourages conservation of natural resources.

ACTION 1D.1: Minimize transportation-related energy consumption through improved vehicle efficiencies, use of clean burning motor fuels, and increased use of fuel efficient modes which may include railroads, transit, carpools, vanpools, *bicycles* and *walking*.

ACTION 1D.4: Cooperate with the Oregon Department of Environmental Quality in carrying out the transportation-related requirements of the federal and state clean air standards consistent with the long-term air quality goals of the Oregon Benchmarks.

POLICY 1E - Connectivity among Places: It is the policy of the State of Oregon to identify and develop a statewide transportation system of corridors and facilities that ensures appropriate access to all areas of the state, nation and the world.

ACTION 1E.1: Identify a multimodal network of facilities to meet requirements for the movement of people, goods and services throughout Oregon and develop a plan to implement that system.

ACTION 1E.3: Develop and promote service in statewide transportation corridors by the most appropriate *mode* including intercity bus, truck, rail, airplane, passenger vehicle and *bicycle*.

ACTION 1E.4: Complete the Access Oregon Highways Program.

POLICY 1F - Connectivity among Modes and Carriers: It is the policy of the State of Oregon to provide a transportation system with connectivity among modes within and between urban areas, with ease of transfer among modes and between local and state transportation systems.

ACTION 1F.1: Require local and regional transportation plans to identify (a) major transportation terminals and facilities and (b) routes and modes connecting passenger and freight facilities with major highways and intermodal facilities.

ACTION 1F.2: Encourage development of a system of open access passenger facilities throughout the state to expedite transfers between modes, routes and carriers.

POLICY 1G - Safety: It is the policy of the State of Oregon to improve continually the safety of all facets of statewide transportation for system users including operators, passengers, *pedestrians*, recipients of goods and services, and property owners.

ACTION 1G.1: Develop a Transportation Safety Action Plan addressing air, land and water transportation to reduce fatal, injury and property damage accidents among system users.

ACTION 1G.2: Improve the enforcement of transportation safety laws and regulations intended to reduce injury and property damage. Emphasize enforcement of laws and regulations involving excessive speed, alcohol and other drug use, use of safety belts, and use of helmets for motorcycle drivers and passengers.

ACTION 1G.3: Develop and deliver a comprehensive safety awareness, education and training program for all system users.

ACTION 1G.4: Improve the safety in design, construction and maintenance of new and existing systems and facilities for the users and benefactors including the use of techniques to reduce conflicts between modes using the same facility or corridor. Target resources to dangerous routes and locations in cooperation with local and other state agencies.

ACTION 1G.7: Develop and implement a comprehensive and coordinated transportation records and accident reporting program to manage and evaluate transportation safety.

ACTION 1G.9: Build, operate and regulate the transportation system so that users feel safe and secure as they travel.

POLICY 1H - Financial Stability: It is the policy of the State of Oregon to ensure a transportation system with financial stability. Funding programs should not bias transportation decision making.

ACTION 1H.1: Provide balanced funding for transportation facilities and services and seek legislative and voter approval where necessary.

ACTION 1H.3: Give priority to funding those transportation needs identified in state, regional and local transportation system plans.

GOAL 2: LIVABILITY: To develop a multimodal transportation system that provides access to the entire state, supports acknowledged comprehensive land use plans, is sensitive to regional differences, and supports livability in urban and rural areas.

POLICY 2A - Land Use: It shall be the policy of the State of Oregon to develop transportation plans and policies that implement Oregon's Statewide Planning Goals, as adopted by the Land Conservation and Development Commission.

ACTION 2A.1: Support local land use planning with system plans that implement this policy, with the objective of providing the needed level of mobility while minimizing automobile miles traveled and number of automobile trips taken per capita.

ACTION 2A.3: Coordinate state transportation planning with local and regional land use plans as described in the certified ODOT/LCDC State Agency Coordination Agreement.

ACTION 2A.4: Provide technical assistance to local and regional governments in the implementation of Oregon Administrative Rule 660-12 that sets forth the requirements for transportation planning within the state.

POLICY 2B - Urban Accessibility: It is the policy of the State of Oregon to define minimum levels of service and assure balanced, multimodal accessibility to existing and new development within urban areas to achieve the state goal of compact, highly livable urban areas.

ACTION 2B.1: Cooperate with local governments and metropolitan planning organizations to develop integrated transportation plans for urban areas that meet the needs for urban mobility, and intercity, interstate and international travel within and near each urban area.

ACTION 2B.2: Give preference to projects and assistance grants that support compact or infill development or mixed use projects.

ACTION 2B.3: Increase the availability and use of transit, *walking*, *bicycling* and ridesharing. Promote the design and development of infrastructure and land use patterns which encourage alternatives to the single occupant automobile.

POLICY 2C - Relationship of Interurban and Urban Mobility: It is the policy of the State of Oregon to provide interurban mobility through and near urban areas in a manner which minimizes adverse effects on land use and urban travel patterns.

ACTION 2C.2: Promote *alternative modes* and preservation and improvement of parallel arterials so that local trips have alternatives to the use of intercity routes.

POLICY 2D - Facilities for *Pedestrians* and *Bicyclists*: It is the policy of the State of Oregon to promote safe, comfortable travel for *pedestrians* and *bicyclists* along travel corridors and within existing communities and new developments.

ACTION 2D.1: Make *walkways*, *pedestrian* shelters and *bikeways* an integral part of the circulation pattern within and between communities to enhance safe interactions between motor vehicles and *pedestrians* and *bicyclists*, using techniques such as:

- Renovating arterials and major collectors with *bike lanes* and *walkways* and

designing intersections to encourage *bicycling* and *walking* for commuting and local travel.
- Developing all transit centers near residential areas to be safely and expeditiously accessible to *pedestrians* and *bicyclists*.

POLICY 2E - Minimum Levels of Service: It is the policy of the State of Oregon to define and assure minimum levels of service to connect all areas of the state.

ACTION 2E.1: Define appropriate minimum levels of service for all modes and for all potential users.

POLICY 2F - Rural Mobility: It is the policy of the State of Oregon to facilitate the movement of goods and services and to improve access in rural areas.

ACTION 2F.1: Improve rural highways, minimizing the interaction of passenger vehicles, *bicycles*, recreational vehicles and freight vehicles by providing passing lanes and paved shoulders, wherever practical.

ACTION 2F.2: Implement a statewide system of *bikeways* using current rights-of-way and creating new paths along rail beds, open spaces, and other public and private lands held by cooperating landowners.

ACTION 2F.3: Encourage modal alternatives to the automobile and truck where feasible in rural areas.

POLICY 2H - Aesthetic Values: It is the policy of the State of Oregon to protect and enhance the aesthetic value of transportation corridors in order to support economic development and preserve quality of life.

ACTION 2H.1: Include aesthetic considerations in the design, maintenance and improvement of corridors and rights-of-way for all modes.

GOAL 3 - ECONOMIC DEVELOPMENT: To promote the expansion and diversity of Oregon's economy through the efficient and effective movement of goods, services and passengers in a safe, energy efficient and environmentally sound manner.

POLICY 3E - Tourism: It is the policy of the State of Oregon to develop a transportation system that supports intrastate, interstate and international tourism and improves access to recreational destinations.

ACTION 3E.1: Develop a tourism transportation action plan to identify facilities and services to serve tourism and incorporate in state and local transportation plans.

ACTION 3E.2: Identify certain transportation corridors as scenic routes and consider scenic values in corridor planning, improvements and maintenance.

GOAL 4 - IMPLEMENTATION POLICIES: To implement the Transportation Plan by creating a stable but flexible financing system, by using good management practices, by supporting transportation research and technology, and by working cooperatively with federal, regional and local governments, Indian tribal governments, the private sector and citizens.

POLICY 4A - Adequate Funding: It is the policy of the State of Oregon to develop and maintain a transportation finance structure that provides adequate resources for demonstrated and proven transportation needs. This funding package should incorporate federal, state, local and private funding and should provide adequate funding for all transportation modes and jurisdictions.

POLICY 4B - Efficient and Effective Improvements: It is the policy of the State of Oregon to develop and maintain a transportation finance structure that promotes funding by the state and local governments of the most appropriate improvements in a given situation and promotes the most efficient and effective operation of the Oregon transportation system.

POLICY 4D - Flexibility: It is the policy of the State of Oregon to change the structure of the transportation finance system to provide more flexibility in funding, investment and program options.

POLICY 4E - Achievement of State Goals: It is the policy of the State of Oregon to

plan and manage the transportation finance structure to contribute to the accomplishment of the state's environmental, land use and economic goals and objectives.

POLICY 4F - Equity: It is the policy of the State of Oregon to develop a transportation finance system which consciously attempts to provide equity among competing users, payers, beneficiaries, providers of the transportation system and regions of the state.

POLICY 4G - Management Practices: It is the policy of the State of Oregon to manage effectively existing transportation infrastructure and services before adding new facilities.

ACTION 4G.3: Use demand management and other transportation systems operation techniques that reduce peak period single occupant automobile travel, that spread traffic volumes away from the peak period, and that improve traffic flow. Such techniques include HOV (high occupancy vehicle) lanes with express transit service, carpools, parking management programs, peak period pricing, ramp metering, motorist information systems, route diversion strategies, incident management, and enhancement of *alternative modes* of transportation including *bicycling* and *walking*.

POLICY 4H - Research and Technology Transfer: It is the policy of the State of Oregon to promote the development of innovative management practices, technologies and regulatory techniques and safety measures that will further implementation of the Oregon Transportation Plan and lead to new approaches to meeting mobility needs.

ACTION 4H.2: Broaden the Oregon Department of Transportation's research responsibilities to include research for all modes.

ACTION 4H.3: Prepare and implement a transportation research agenda for the State of Oregon which includes analysis of the relative costs of implementation measures put forth in this plan.

ACTION 4H.5: Establish a demonstration program to encourage alternatives to the use of the automobile.

POLICY 4I - State Responsibilities: It is the policy of the State of Oregon that the Oregon Department of Transportation shall define a transportation system of statewide significance that:

- **Accommodates international, interstate and intercity movements of goods and passengers that move into and through urban and rural areas;**
- **Accommodates connections between different parts of the system, including intermodal transfers of goods and passengers on the system;**
- **Provides a minimum level of mobility within the state, including access to the system;**
- **Recognizes that maintaining an acceptable level of transportation mobility in Oregon's four metropolitan planning organization (MPO) regions is a matter of special statewide concern.**

ACTION 4I.1: Establish criteria in the Oregon Transportation Plan and modal plans to guide the development of MPO and other regional transportation plans.

ACTION 4I.2: Adopt MPO and other regional plans when they meet established criteria.

ACTION 4I.3: Carry out Oregon Department of Transportation responsibilities for transportation planning and development as described in the Land Conservation and Development Commission's Transportation Planning Administrative Rule (OAR 660-12).

State transportation project plans shall be compatible with acknowledged local comprehensive plans.

POLICY 4J - MPO and Other Regional Responsibilities: It is the policy of the State of Oregon that:

- **MPO's and counties outside of MPO's shall define a transportation system of regional significance adequate to meet identified needs for the safe move-**

ment of people and goods between and through communities and to regional destinations within their jurisdictions; and
- **Regional transportation plans shall be consistent with the adopted elements of the state transportation system plan.**

ACTION 4J.1: Regional transportation plans shall establish criteria for applicable local government transportation plans. MPO's and counties shall:

- Ensure local plans conform to state and regional system plans; and
- Assure consistency and appropriate linkages of local plans with regional plans to meet local needs.

ACTION 4J.2: MPO's and counties shall carry out their responsibilities for transportation planning and development as described in the LCDC Transportation Rule (OAR 660-12).

POLICY 4K - Local Government Responsibilities: It is the policy of the State of Oregon that:

- Local governments shall define a transportation system of local significance adequate to meet identified needs for the movement of people and goods to local destinations within their jurisdictions; and
- Local government transportation plans shall be consistent with regional transportation plans and adopted elements of the state transportation system plan.

ACTION 4K.1: Cities and counties shall adopt regional and local transportation plans as part of their comprehensive plans.

ACTION 4K.2: Local governments shall carry out their responsibilities for transportation planning and development as described in the LCDC Transportation Rule (OAR 660-12).

POLICY 4N - Public Participation: It is the policy of the State of Oregon to develop programs that ensure the opportunity for citizens, businesses, local governments and state agencies to be involved in all phases of transportation planning processes.

ACTION 4N.1: When preparing and adopting a transportation plan, transportation plan element, modal plan, facility plan or transportation improvement program, conduct and publicize a program for citizen, business, local government and state agency involvement that clearly defines the procedures by which these groups will be involved.

ACTION 4N.2: Make information about proposed transportation policies, plans and programs available to the public in an understandable form.

POLICY 4O - Public Information and Education: It is the policy of the State of Oregon to provide a program of public information and education for the implementation of the Oregon Transportation Plan.

ACTION 4O.1: Implement a public information strategy for the Transportation Plan, including educational and informational programs on :

- Land use choices and development pattern issues, targeting architects, planners, developers and financiers;
- Transportation choices and the ways to use them;
- Transportation-related maintenance requirements and benefits;
- Economic and environmental benefits and costs of transportation alternatives, targeting school children;
- *Bicycle* use and safety, targeting both vehicle drivers and *bicyclists*;
- *Pedestrian* safety issues, targeting the under 25 and over 65 age groups in their roles both as vehicle drivers and *pedestrians*.

ACTION 4O.2: Through the Safety Action Plan and other means, expand public awareness of travel safety to reduce transportation-related accidents. Provide information on the primary causes of accidents including drug and alcohol abuse, driver error and vehicle maintenance neglect, and their results in deaths, injuries and economic loss.

APPENDIX E:
PROJECTS IDENTIFIED IN THE 1996-1998 STIP

The following projects on ODOT highways are identified in the construction section of the STIP. ISTEA Enhancement and other local grant projects on city and county facilities requiring local match are not included.

1. BIKEWAY & WALKWAY PROJECTS

Region	Highway	Project Limits	Project Description	Length
1	OR-99W	SW Hamilton-SW Miles (Portland)	Construct Bikeway & Sidewalks	1.55
1	OR 99W	SW Front-SW Hamilton (Portland}	Construct Bikeway & Sidewalks	0.34
1	Hall Blvd	SPRR X'ing-SW Greenburg Rd (Tigard)	Construct Bikeway & Sidewalks	0.73
1	Hall Blvd	Lwr Boones Fry-Tualatin (Tualatin)	Construct Bikeway & Sidewalks	0.79
1	OR-99W	Pacific Highway W-SW Mcdonald (Tigard)	Construct Bikeway	1.10
1	OR-43	Mcvey Ave-Burnham Rd (Lake Oswego)	Construct Shoulder Bikeway	0.39
2	OR-126	Pacific Hwy-Glenwood (Eugene)	Construct Multi-use Path & Bike Lanes	0.50
4	I-84	Port Access-River Front Park (The Dalles)	Construct Multi-use Path	0.60

2. RURAL HIGHWAY PROJECTS THAT WILL INCLUDE SHOULDER WIDENING

Region	Highway	Project Limits	Project Description	Length
1	I-5	Stafford Inchge	Reconstruct Interchange	1.28
1	OR-210	Scholls @ Beef Bend Road	Realign & Add Left Turn	0.70
1	OR-211	MP 26.5-Clear Creek Canyon	Realign Three Curves	0.50
2	OR-22	Joseph St Intchge-Stayton NCL	Four Lane Widening	8.08
2	OR-22	Whitewater Creek Bridge	Replace Structure on New Alignment	0.20
2	OR-22	Wallace Bridge-Perrydale Road	Surface Preservation	11.70
2	OR-34	N Fork Alsea River Bridge	Replace Structure	0.14
3	OR-38	Elk Creek-Brush Creek Road (Tunnel)	Realign Road, Construct Bridges & Tunnel	2.20
3	OR-42	\Chrome Plant-Cedar Point Road	Widen Section To 4-Lanes W/8' Shoulders	2.30
2	US-20	Eddyville-Cline Hill	Reconstruct Hwy on new Alignment	4.65
2	OR-58	Kitson Ridge Rd-MP 47.0	Construct Passing Lanes	3.50
2	OR-58	Salt Cr. Falls Camp-Klamath Cty Line	Construct Passing Lanes	5.42
2	US-30	Fernhill-John Day River Bridge	Reconstruct to Current Standards	2.95
2	US-101	Big Creek Bridge	Replace Structure	0.04
2	OR-58	Black Canyon-WCL Oakridge	Overlay; Widen Shoulders & Bridge	7.13
2	OR-99W	Crowley Rd-Salem/Willamina Hwy	Surface Preservation	3.50
2	OR-18	Longfiber Road-A. R. Ford Road	Surface Preservation	8.73
2	US-101	Hobsonville Point Rd-Wilson River Br	Surface Preservation	6.71
2	OR-126	Greenwood Drive-Vida	Widen Shoulders, Overlay Road	3.30
2	US-101	Lake Lytle Outlet	Replace Structure	0.20
2	US-20	Burkhart Creek Bridge	Replace Structure	0.20
3	US-101	Haynes Inlet Slough Bridge	Replace Structure, Add Climbing Lane	0.68
3	OR-238	Applegate River Bridge	Replace Structure	0.16
3	US-101	Brush Creek Bridge	Replace Structure	0.20
3	OR-42	Manning Gulch Slough-Greenacres	Realign Road, Install New Structure	1.20
3	US-101	Smith River Br Stage 1	Replace Bridges on New Alignment	1.29
3	OR-62	Dutton Road-Linn Road	Widen Highway to 3 & 4 Lanes	2.80
3	US-199	Grants Pass-Applegate River	Widen Shoulders and Overlay	6.57
3	OR-42	Olalla Creek Bridge-Hoover Hill Road	Widen Structure & Add Passing Lane	1.83

3	US-101	OR Coast Hwy @ Coquille/Bandon Hwy	Construct A New Connection	0.38
3	OR-38	Paradise Creek Bridge	Widen Structure	0.06
3	OR-38	Weatherly Creek Bridge	Replace Structure on New Alignment	0.40
3	OR-62	Linn Road-Jct. Hwy 234	Overlay Roadway	3.57
3	OR-199	Applegate River-Chandler Creek	Overlay Roadway	18.64
4	OR-140	Paradise Creek Rd-Klamath County Line	Widen, Realign Highway, & Overlay	4.00
4	US-97	Crooked River Gorge Bridge	Construct New 4 Lane Bridge	1.00
4	US-197	Wapinitia Jct.-Maupin	Realign & Widen Roadway	0.51
4	US-97	Madras-Crooked River	Widen Shoulders and Overlay	12.00
4	US-26	Warm Springs River Bridge	Replace Structure and Widen Roadway	0.90
4	US-97	Deschutes Market Road Overcrossing	Construct Overcrossing	0.55
5	US-20	Hines Section	Widen and Overlay Roadway	1.85
5	US-395	Cooper Creek-Ukiah/Hilgard Hwy	Widen and Reconstruct Roadway	7.07
5	US 20	US-20 @ JCT. US 395	Raise Roadway, Reconstruct Intersection	0.65
5	US-26	Fields Creek Road-Mt. Vernon	Construct 4' Shoulders on each Side	4.70
5	US-26	Picture Gorge-Dayville	Widen & Realign Roadway	7.00
5	OR-82	Enterprise Wallowa Lake	Upgrade Surfacing and Roadway Width	5.62
5	OR-37	S Fork Cold Springs (Grange Hall)	Realign & Widen Roadway	0.78

3. URBAN HIGHWAY PROJECTS WITH PEDESTRIAN & BICYCLE IMPROVEMENTS

Region	Highway	Project Limits	Project Description	Length
1	I-5	Wilsonville Interchange (Unit 1)	Reconstruct Interchange	N/A
1	I-5	Hwy 217/Kruse Way (Unit 1)	Reconstruct Ramps/Lanes	N/A
1	US-30	Columbia City NCL-Warren (St Helens)	Widen Highway, Add Curbs & Sidewalks	6.50
1	US-30	NE Columbia Blvd @ I-205	Widen Highway and Restripe	0.10
1	US-30	NE 102nd-NE 121st	Remove Parking and Restripe	1.00
1	OR-10	172nd Ave Murray Blvd (Wash. Co.)	Widen To 5 Lanes	1.17
1	US-26	Sylvan Inchg-Highlands Inchg (Wash. Co.)	Replace Structures	1.03
1	I-205	E Ptld Fwy @ Sunnybrook (Clack Co.)	Construct Split Diamond Interchange	2.66
1	OR-8	SW 117th Ave-SW 110th Ave (Beaverton)	Relocate Signal, Raise Median And Widen	0.40
1	US-26	Camelot Intch-Sylvan Intch (Portland)	Replace Structure, Realign Local Streets	1.57
1	OR-8	TV Hwy @ Esplanade Ctr (Hillsboro)	Widen Hwy., Move Bus Stop	0.10
1	OR-8	Shute Park-21st Avenue (Hillsboro)	Widen Hwy	0.67
1	OR-99W	Ped. overcrossing-SW 60th	Overlay and Restripe	5.80
2	OR-99W	Edmunston St-Salmon R Hwy (McMinnvl)	Widen and Realign Highway	0.89
2	0R-99W	Brutscher St.-Everest St. (Newberg)	Surface Preservation Overlay	1.02
2	OR-126	W 11th St-Garfield St (Eugene) Unit 1	4-Lane New Construction	1.63
2	OR-99W	Everest St-Main St (Newberg)	Construct Left Turn Lane & Add'l SB Lane	1.15
2	OR-99	Walnut Street- Mill Street (Eugene)	Access Road & Street Improvements	1.46
2	OR-99E	Pacific Blvd-9th Ave Couplet (Albany)	Construct 3 Lane Couplet	0.94
2	OR-126	West 11th Ave-NCL (Eugene)	Construct Interchange @ Barger	3.20
2	US-101	Wilson R Br-Dougherty Slough (Tillamook)	Widen To 4 Lanes	0.88
3	US-199	6th St/7th St Couplet (Grants Pass)	Reconstruct 6th & 7th Streets	2.70
3	OR-238	Highway 238-Jackson Street(Medford)	Extend McAndrews Rd	1.20
3	OR-138	Elkton/Sutherlin Hwy @ I-5 (Sutherlin)	Construct Sidewalk & Shoulder Barrier	0.31
3	I-5	North Medford Interchange (Medford)	Reconstruct Interchange	N/A
4	US-97	Bend Parkway, Unit 2 (Bend)	Construct New Roadway	7.00
4		Hilyard Ave-Laverne Ave (Klamath Falls)	Widen Roadway And Install Signal	0.55
4	OR-140	S Klamath Falls Hwy @ Washburn Way	Construct Interchange	1.08
5	US-30	East Idaho Avenue (Ontario)	Signal, Paving	1.15
5		Halfway Section	Reconstruct City Street	0.50
5	OR-74	Heppner Section	Reconstruct City Street	0.50
5	I-84	North Ontario Interchange	Raise & Widen Structure	N/A

APPENDIX F: ADMINISTRATIVE ORGANIZATION

To fulfill the various requirements to provide bikeways and walkways, ODOT has established various processes within the organization.

OREGON DEPARTMENT OF TRANSPORTATION (ODOT)

The need to provide well-designed bikeways and walkways is established throughout the Department. ODOT also cooperates with cities and counties in the development of their walkway and bikeway systems. Much of this task is assigned to the Bicycle and Pedestrian Program, and much of the work is carried out at other levels within the Department.

OREGON TRANSPORTATION COMMISSION (OTC)

Before implementation, all major transportation policies, programs and projects must be approved by the Commission, which is appointed by the governor and has the authority to set policy and approve expenditure of funds for the Department. ODOT staff recommends policies or programs to the Commission for their approval. If approved, they are returned to the Department for implementation.

OREGON BICYCLE & PEDESTRIAN ADVISORY COMMITTEE (OBPAC)

OBPAC's primary function is to advise ODOT in regulating bicycle and pedestrian traffic and establishing bikeways and walkways. The OBPAC reviews public and Department policy, forwards proposals and makes recommendations to the Department for further consideration. The Committee meets quarterly in various locations around the state, to listen to the views and concerns of interested citizens, local officials and ODOT Region staff.

TRANSPORTATION DEVELOPMENT BRANCH (TDB)

The Transportation Development Branch is responsible for the long-range planning of Oregon's state transportation system. One of its responsibilities is implementing the Oregon Transportation Plan. The Bicycle and Pedestrian Program cooperates closely to ensure that policies and plans reflect the need to provide for bicyclists and pedestrians.

STATEWIDE TRANSPORTATION IMPROVEMENT PROGRAM (STIP)

After a need has been identified, a project on a state highway can be forwarded for approval by the OTC and construction only if it is included in the STIP. This document is revised every two years and is open for public review and comment. Projects with strong local support that implement the stated goals of local, regional and statewide plans have the best chances of being advanced through the STIP process.

TECHNICAL SERVICES BRANCH

The Technical Services Branch of ODOT is responsible for transportation design and engineering. All construction plans for roadway projects, including bikeways and walkways, are reviewed for compliance with established standards. All new design proposals must be approved by the Technical Services Branch.

BICYCLE & PEDESTRIAN PROGRAM

The Bicycle and Pedestrian Program has many areas of responsibility:

Policies and Programs:

- Formulating policies;
- Implementing programs;
- Identifying and prioritizing bikeway and walkway projects; and
- Advocating for the increased use of *non-motorized modes of transportation*.

Technical Assistance:

- Providing technical assistance within the Department and to local officials regarding bikeway and walkway design, construction, and maintenance;
- Recommending design standards for bikeways and walkways;

- Reviewing construction plans to ensure that bicycle and pedestrian needs are met; and
- Reviewing local Transportation Systems Plans for bicycle and pedestrian compatibility.

Information:
- Developing products such as bicycling maps and accident reports;
- Giving presentations and organizing conferences to local government staff and the general public; and
- Coordinating the Bicycle and Pedestrian Advisory Committee activities.

ODOT REGIONS

The five ODOT Regions bear most of the responsibility for developing transportation projects. The Region offices act as liaison to local jurisdictions. Region, city, county and MPO staff cooperate to ensure that transportation systems are well-planned and coordinated. The Bicycle and Pedestrian Program cooperates with Region staff in developing projects and ensuring that bicycle and pedestrian needs are met on all construction projects. Actual construction of roadway projects, including bikeways and walkways, is overseen by Region staff.

Citizens who wish to have bikeway or walkway improvements made on a state highway should contact their Region Manager's office

ODOT DISTRICTS

The Regions are divided into Districts. The District Managers are responsible for the maintenance of state highways. Their tasks also include issuing access permits and performing minor betterments. District Managers play an important role in improving conditions for bicyclists and pedestrians. Some projects are initiated at the district level.

Citizens who have concerns about bikeway or walkway maintenance on a state highway, or suggestions for minor improvements, should contact their District Manager's office.

LOCAL BICYCLE & PEDESTRIAN PROGRAMS

Most cities and counties are aware of the requirements to provide bicycle and pedestrian facilities. These tasks are usually carried out by transportation planning and engineering staff. Many of the larger cities and counties of Oregon have full or part-time staff devoted to bicycle and pedestrian issues. Eugene has a full-time bicycle coordinator; Portland has both a bicycle program and a pedestrian program.

LOCAL ADVISORY COMMITTEES

Many cities and counties have local bicycle or pedestrian citizen advisory committees, who forward their recommendations to local staff and elected officials. In general, cities and counties with advisory committees are more responsive to the needs of bicyclists and pedestrians. Both state and federal legislation mandate participation by the public in planning of transportation systems. Advisory committees are a very effective way of meeting these requirements.

ADVOCACY GROUPS

There are several independent advocacy groups in Oregon that play a role in lobbying elected officials, educating the general public and raising awareness on transportation issues. These tasks support the work of transportation staff, whose primary responsibility is to meet the transportation needs of the public. In general, there is good cooperation between bicycle and pedestrian programs and advocacy groups.

The Oregon Bicycle and Pedestrian Advisory Committee

APPENDIX G: SELECTION CRITERIA FOR BICYCLE & PEDESTRIAN PROJECTS

This guide is designed to assist applicants and reviewers in screening proposed bicycle and pedestrian projects, prior to committing the time and expense required to prepare a full project request. The Yes/No questions bring to light important factors to consider. If some considerations are not met by the proposed project, the applicant should consider seeking technical assistance, to see what can be modified or improved. Applicants may contact the Oregon Bicycle/Pedestrian Program for help (Tel. (503) 986-3555).

ODOT will use these criteria in evaluating and rating projects.

If a question can not be answered with a YES, please provide an explanation.

1) Is this the APPROPRIATE FACILITY for the corridor served?

Inadequate facilities discourage users and overdesign wastes money and resources. Refer to the Oregon Bicycle and Pedestrian Plan for a full description of appropriate facilities. These factors should be considered in determining the appropriateness of a facility:

____ A. Is there a bicycle and/or pedestrian transportation problem? Will the proposed solution solve or alleviate the problem?

____ B. Is the proposed solution the appropriate treatment for the problem? Refer to the Oregon Bicycle/Pedestrian Plan for appropriate treatments.

____ C. Will the facility be part of an existing bikeway or walkway network? Good projects link, complete or extend systems. However, a project that is the first element of a planned bikeway or walkway system is also valued. Avoid isolated projects with no clearly defined origin or destination.

____ D. Is the existing road a deterrent to bicycling or walking? Roads with narrow lanes and high levels of traffic, or that are difficult to cross, receive priority treatment. Other factors include high truck volumes, poor sight distance, dangerous intersections or other obstacles to direct travel by bicyclists and walkers.

____ E. 1. Does the project upgrade a major roadway? Arterial and major collector streets generally receive highest priority.

or:

2. Does the project bridge an obstacle, provide a more direct route (reducing significant out-of-direction travel) or provide access to important destinations such as schools?

____ F. Is the potential daily usage high? Is a population center served? Factors to consider include proximity to residential areas, schools, parks, shopping centers, business and industrial districts.

____ G. Does the project meet current design standards? Refer to the Oregon Bicycle and Pedestrian Plan for current design standards.

____ H. Will the project primarily enhance transportation? Are there clear origin and destination points along the corridor served? Oregon's statewide goal is to facilitate non-motorized transportation; recreational riders and walkers also benefit from improved facilities. Bikeways and walkways that provide for commuter/utility use will be given priority.

____ I. Does the project consider the needs of both bicyclists and pedestrians? In most cases, bicyclists and pedestrians require separate facilities. If the project provides for only one mode, the design should not preclude use by the other mode, now or in the future, where appropriate.

____ J. Does the project help meet the needs of the transportation disadvantaged - the young, the elderly, low-income and the disabled?

____ K. (Optional) Does the project provide connectivity to other modes? Facilities that provide bicycle and pedestrian access to bus stops, train stations and park-and-ride sites enhance intermodal transportation.

____ L. (Optional) Are there other site-specific considerations which make this project appropriate?

____ 2) Are the project costs realistic and reasonable?

Some projects provide more benefit than others for the same cost. Realistic cost estimates are needed to determine feasibility. Reasonable costs are consistent with other projects of a similar nature. Costs should be considered in relation to the actual improvement of an entire corridor; i.e., an expensive structure to bridge a freeway may provide only a short facility, but may enhance usage of entire system. A reconnaissance design analysis can help determine a cost estimate.

3) Does project satisfy the following requirements:

____ A. LCDC's Transportation Planning Rule 12,

____ B. The Oregon Transportation Plan, and

____ C. Provisions of an existing, adopted local plan.

____ 4) (Where applicable): Is funding available for a local match?

Many grants require a local match. A funding source needs to be identified, so project construction is not delayed if the project is approved.

____ 5) (Where applicable): Does the responsible agency agree to maintain the facility?

Many projects, especially separated paths, will require special maintenance to preserve the usefulness of the facility. An agreement or other arrangements may be required to ensure that the bikeway or walkway will be maintained in good condition.

APPENDIX H:
BIKEWAY/WALKWAY PROJECT RATING SHEET

Applicant: _____ **Region:** _____
Roadway: _____ **Length:** _____
Section: _____
Cost: _____ **Cost/mile:** _____

Is it the appropriate type of bicycle/pedestrian treatment for the corridor served?
See the Oregon Bicycle and Pedestrian Plan for details.

Does the project satisfy the requirements of: (a) LCDC's Transportation Planning Rule 12, (b) the Oregon Bicycle/Pedestrian Plan, and (c) a recently adopted local plan?

A "No" answer to any of the above questions should disqualify a project from further consideration.

RATING CRITERIA: (circle relevant factors)	**POINTS**
1. Will it be an important part of a bikeway or walkway system? *Points: most direct route which links or completes a system: or essential core route which serves many users = 8; extends existing facility = 6; begins a planned system = 4; isolated project with no linkage = 2.*	8
2. What is the classification of the roadway being treated? *Points: arterial = 6; major collector = 4; minor collector = 3; local = 2*	6
3. Who will the main users be? *Points: 2 each for commuter/utility; school children; disabled; recreation/touring*	8
4. What is the potential daily usage (relative to projects of a similar nature)? *Points: very high = 6; high = 5; average = 4; fairly low = 3; low = 2; very low = 1;*	6
5. Current conditions: is the existing roadway a deterrent to bicycling or walking? *Points: (add each factor cumulatively: high = 2, moderate = 1, low = 0)* *Bikeways and walkways along roadway: ADT___; narrow___; curves___; other safety factors___ (trucks, etc._____).* *Intersection treatments: ADT___; speed___; width___; accesses, other threats___ (i.e. skew, sight distance, etc._____)*	8
6. Are ODOT adopted standards used? *Points: highest = 8; intermediate = 6; minimum = 4; below standard = 0*	8
7. Are the costs reasonable compared to projects of a similar nature? *Points: under 80% of usual costs = 6; within 20% either way of usual costs = 5; 20%-50% over usual costs = 4; 50%-100% over usual costs = 2; more than 100% over usual costs=1.*	6
BONUS POINTS: *Does the project provide for both bicyclists and pedestrians?* — *Points = 5* *Does the project reduce out-of-direction travel? (Mostly applicable to paths)* — *Points = 3* *Does the project provide a connection to another mode? (transit, car pool)* — *Points = 3*	
TOTAL POINTS POSSIBLE = 50 (w/o bonus points) **TOTAL POINTS:**	

COMMENTS, OTHER CONSIDERATIONS: (any other outstanding features of the project)

EXPLANATION OF THE 9 RATING CRITERIA

(Preliminary) Is it the appropriate type of bicycle/ pedestrian treatment for the corridor served?

Inadequate facilities discourage users and overdesign wastes money and resources. Examples of appropriate facilities include: shoulder bikeways on rural roadways; bike lanes and sidewalks on urban arterials & major collectors; multi-use path to serve as connection or to bridge obstacles; intersection treatments (islands, curb extensions) for pedestrians.

(Preliminary) Does the project satisfy the requirements of LCDC's Transportation Planning Rule 12, the Oregon Bicycle/Pedestrian Plan and a recently adopted local plan?

Both the TPR and the Bicycle/Pedestrian Plan stress the importance of providing access, connectivity and the appropriate type of facility. Older local plans sometimes do not address these concerns, or may have out-dated bike route designation and design.

1. Will it be an important part of a bikeway or walkway system?

Connectivity is important, but a community starting a bikeway or walkway system with its first project should be encouraged. Avoid isolated projects that lead nowhere.

2. What is the classification of the roadway being upgraded?

When providing a network of bikeways or walkways, main roads should be addressed first.

3. Who will the main users be?

One important goal is to offer transportation choices. The primary users should be cyclists and pedestrians using the facility to reach a destination. School children should get special consideration. Well-designed facilities also attract recreational users.

4. What is the potential daily usage?

This is often difficult to determine. Factors include proximity to generators such as schools, parks, shopping centers, places of employment and residential areas. The ratings are not absolute, but should be compared to other facilities in the area.

5. Current conditions: is the existing roadway a deterrent to bicycling or walking?

Not every obstacle to bicycling or walking is identified, only the most common ones. "High, moderate and low" ratings should be viewed from the user's perspective. There may be other situations that can act as obstacles.

6. Are full standards used?

Good design encourages responsible use and increases safety.

7. Are the costs reasonable compared to projects of a similar nature?

This reflects the need to ensure that project costs are in line with standard practices. Cost should not be an overriding factor, but all else being equal, some projects will provide more "bang for the buck." Some projects might appear very expensive for the length constructed, but can provide a missing link in a longer corridor, bridge an obstacle or remove a deterrent to walking and bicycling.

BONUS POINTS: Does the project provide for both bicyclists and pedestrians? Does the project reduce out-of-direction travel? Does the project provide a connection to another mode?

Both bicyclists and pedestrians need access to roads and streets. Projects in urban areas should provide mobility for both modes, and connect to other modes, especially transit, where available. One of the main advantages of paths is that they can reduce out-of-direction travel.

APPENDIX I: STATUTES PERTAINING TO BICYCLES & PEDESTRIANS

NOTES:

(1) Some statutes that only reference bicycle and pedestrian concerns have been abridged - missing sections are indicated with (...);
(2) The words *bicycle, bicyclist, pedestrian, footpath, sidewalk* and *crosswalk* are italicized for easy reference
(3) References to "department" mean the Oregon Department of Transportation, unless otherwise noted;
(4) This listing may not be comprehensive; other statutes may pertain to bicycle and pedestrian matters without direct mention;
(5) Statutes pertaining to the establishment of pedestrian malls (ORS 376.705-376.825) are not included;
(6) The statutes are grouped into 11 categories:

1. DEFINITIONS

Note: the following are official legal definitions; they may differ from definitions used in design manuals, which are principally for engineering purposes.

801.150 *"Bicycle."* "*Bicycle*" means a vehicle that:
(1) Is designed to be operated on the ground on wheels;
(2) Has a seat or saddle for use of the rider;
(3) Is designed to travel with not more than three wheels in contact with the ground;
(4) Is propelled exclusively by human power; and
(5) Has every wheel more than 14 inches in diameter or two tandem wheels either of which is more than 14 inches in diameter.

801.155 *"Bicycle* lane." "*Bicycle* lane" means that part of the highway, adjacent to the roadway, designated by official signs or markings for use by persons riding *bicycles* except as otherwise specifically provided by law.

801.160 *"Bicycle* path." "*Bicycle* path" means a public way, not part of a highway, that is designated by official signs or markings for use by persons riding *bicycles* except as otherwise specifically provided by law.

801.220 *"Crosswalk."* "*Crosswalk*" means any portion of a roadway at an intersection or elsewhere that is distinctly indicated for *pedestrian* crossing by lines or other markings on the surface of the roadway that conform in design to the standards established for *crosswalks* under ORS 810.200. Whenever marked *crosswalks* have been indicated, such *crosswalks* and no other shall be deemed lawful across such roadway at that intersection. Where no marked *crosswalk* exists, a *crosswalk* is that portion of the roadway described in the following:
(1) Where *sidewalk*s, shoulders or a combination thereof exists, a *crosswalk* is the portion of a roadway at an intersection, not more than 20 feet in width as measured from the prolongation of the lateral line of the roadway toward the prolongation of the adjacent property line, that is included within:
(a) The connections of the lateral lines of the *sidewalk*s, shoulders or a combination

thereof on opposite sides of the street or highway measured from the curbs or, in the absence of curbs, from the edges of the traveled roadway; or

(b) The prolongation of the lateral lines of a *sidewalk*, shoulder or both, to the *sidewalk* or shoulder on the opposite side of the street, if the prolongation would meet such *sidewalk* or shoulder.

(2) If there is neither *sidewalk* nor shoulder, a *crosswalk* is the portion of the roadway at an intersection, measuring not less than six feet in width, that would be included within the prolongation of the lateral lines of the *sidewalk*, shoulder or both on the opposite side of the street or highway if there were a *sidewalk*.

801.258 "**Electric assisted bicycle.**" "Electric assisted bicycle" means a vehicle that meets all of the following requirements:

(1) Is designed to be operated on the ground on wheels.

(2) Has a seat or saddle for use of the rider.

(3) Is designed to travel with not more than three wheels in contact with the ground.

(4) Has both fully operative pedals for human propulsion and an electric motor.

(5) Is equipped with an electric motor that:

(a) Has a power output of not more than 1,000 watts; and

(b) Is incapable of propelling the vehicle at a speed of greater than 20 miles per hour on level ground.

801.305 "Highway." "Highway" means every public way, road, street, thoroughfare and place, including bridges, viaducts and other structures within the boundaries this state, open, used or intended for use of the general public for vehicles or vehicular traffic as a matter of right.

801.345 "**Moped.**" "Moped" means a vehicle, including any bicycle equipped with a power source, other than an electric assisted bicycle as defined in ORS 801.258, that complies with all of the following:

(1) It is designed to be operated on the ground upon wheels.

(2) It has a seat or saddle for use of the rider.

(3) It is designed to travel with not more than three wheels in contact with the ground.

(4) It is equipped with an independent power source that:

(a) Is capable of propelling the vehicle, unassisted, at a speed of not more than 30 miles per hour on a level road surface; and

(b) If the power source is a combustion engine, has a piston or rotor displacement of 3.05 cubic inches or less or 50 cubic centimeters or less regardless of the number of chambers in the power source.

(5) It is equipped with a power drive system that functions directly or automatically only and does not require clutching or shifting by the operator after the system is engaged.

801.385 "*Pedestrian.*" "*Pedestrian*" means any person afoot or confined in a wheelchair.

801.440 "Right of way" "Right of way" means the right of one vehicle or *pedestrian* to proceed in a lawful manner in preference to another vehicle or *pedestrian* approaching under such circumstances of direction, speed and proximity as to give rise to danger of collision unless one grants precedence to the other.

801.480 "Shoulder." "Shoulder" means the portion of a highway, whether paved or unpaved, contiguous to the roadway that is primarily for use by *pedestrians*, for the accommodation of stopped vehicles, for emergency use and for lateral support of base and surface courses.

801.485 "*Sidewalk.*" "*Sidewalk*" means the area determined as follows:

(1) On the side of a highway which has a shoulder, a *sidewalk* is that portion of the highway between the outside lateral line of the shoulder and the adjacent property line capable of being used by a *pedestrian*.

(2) On the side of a highway which has no shoulder, a *sidewalk* is that portion of the highway between the lateral line of the roadway and the adjacent property line capable of being used by a *pedestrian*.

801.590 "Vehicle." "Vehicle" means any device in, upon or by which any person or property is or may be transported or drawn upon a public highway and includes vehicles that are propelled or powered by any means.

2. THE PROVISION OF BICYCLE & PEDESTRIAN FACILITIES BY PUBLIC AGENCIES

223.880 Public roads included in *sidewalk* improvement district; assessment on property benefited. Any incorporated city, in addition to powers granted by law or charter, may include in any *sidewalk* improvement district within the city all county roads or state highways or any part thereof which are located within the improvement district. It may cause to be built on the county roads or state highways or portions thereof within the improvement district, *sidewalks* for *pedestrian* travel, and may assess the cost thereof upon the property benefited thereby, in the manner provided by charter or law.

276.095 Use of buildings by state and public. (Abridged) With respect to operating, maintaining, altering and otherwise managing or acquiring space to meet the office needs of state government and to accomplish the purposes of ORS 276.094, the Director of the Oregon Department of Administrative Services may: (...)
(2) Provide and maintain space, facilities and activities to the extent practicable that encourage public access to and stimulate public *pedestrian* traffic around, into and through state buildings, permitting cooperative improvements to and uses of the area between the building and the street, thereby complementing and supplementing commercial, cultural, educational and recreational resources in the neighborhood of state buildings

332.405 Transportation; board and room; *pedestrian* facilities. (Abridged) (1) The district school board shall provide transportation for pupils or combinations of pupils and other persons to and from school-related activities where required by law or when considered advisable by the board. (...) (4) The district school board may expend district funds to improve or provide for *pedestrian* facilities off district property if the board finds that the expenditure reduces transportation costs of the district and enhances the safety of pupils going to and from schools of the district.

352.360 Traffic control on properties under state board; enforcement; fees; use. (Abridged) (...) (4) All fees and charges for parking privileges and violations are hereby continuously appropriated to the State Board of Higher Education to be used to defray the costs of constructing *bicycle* racks and *bicycle* lanes and of traffic control, enforcement of traffic and parking regulations, and maintenance and operation of parking facilities and for the purpose of acquiring and constructing additional parking facilities for vehicles at the various institutions, department or activities under the control of the board, and may also be credited to the Higher Education Bond Sinking Fund provided for in ORS 351.460. Parking fees shall be established at levels no greater than those required to finance the construction, operation and maintenance of parking facilities on the same campus of the institution of the state institution of higher education on which the parking is provided. Notwithstanding ORS 351.072, parking fees or changes in fees shall be adopted by rule of the state board subject to the procedure for rules adopted in ORS 183.310 to 183.550.

366.460 Construction of *sidewalks* within highway right of way. The department may construct and maintain within the right of way of any state highway or section thereof *sidewalks, footpaths, bicycle* paths or trails for horseback riding or to facilitate the driving of livestock. Before the construction of any of such facilities the department must find and declare that the construction thereof is necessary in the public interest and will contribute to the safety of *pedestrians*, the motoring public or persons using the highway. Such facilities shall be constructed to permit reasonable ingress and egress to abutting property lawfully entitled to such rights.

366.514 Use of highway fund for *footpaths* and *bicycle* trails. (1) Out of the funds received by the department or by any county or city from the State Highway Fund reasonable amounts shall be expended as necessary to provide *footpaths* and *bicycle* trails, including curb cuts or ramps as part of the project. *Footpaths* and *bicycle* trails, including curb cuts or ramps as part of the project, shall be provided wherever a highway, road or street is being constructed, reconstructed or relocated. Funds received from the State Highway Fund may also be expended to maintain *footpaths*

and trails and to provide *footpaths* and trails along other highways, roads and streets and in parks and recreation areas.

(2) *Footpaths* and trails are not required to be established under subsection (1) of this section:

(a) Where the establishment of such paths and trails would be contrary to public safety;

(b) If the cost of establishing such paths and trails would be excessively disproportionate to the need or probable use; or

(c) Where sparsity of population, other available ways or other factors indicate an absence of any need for such paths and trails.

(3) The amount expended by the department or by a city or county as required or permitted by this section shall never in any one fiscal year be less than one percent of the total amount of the funds received from the highway fund. However:

(a) This subsection does not apply to a city in any year in which the one percent equals $250 or less, or to a county in any year in which the one percent equals $1,500 or less.

(b) A city or county in lieu of expending the funds each year may credit the funds to a financial reserve or special fund in accordance with ORS 280.100, to be held for not more than 10 years, and to be expended for the purposes required or permitted by this section.

(c) For purposes of computing amounts expended during a fiscal year under this subsection, the department, a city or county may record the money as expended:

(A) On the date actual construction of the facility is commenced if the facility is constructed by the city, county or department itself; or

(B) On the date a contract for the construction of the facilities is entered with a private contractor or with any other governmental body.

(4) For the purposes of this chapter, the establishment of paths, trails and curb cuts or ramps and the expenditure of funds as authorized by this section are for highway, road and street purposes. The department shall, when requested, provide technical assistance and advice to cities and counties in carrying out the purpose of this section. The department shall recommend construction standards for *footpaths* and *bicycle* trails. Curb cuts or ramps shall comply with the requirements of ORS 447.310 and rules adopted under ORS 447.231. The department shall, in the manner prescribed for marking highways under ORS 810.200, provide a uniform system of signing *footpaths* and *bicycle* trails which shall apply to paths and trails under the jurisdiction of the department and cities and counties. The department and cities and counties may restrict the use of *footpaths* and *bicycle* trails under their respective jurisdictions to *pedestrians* and nonmotorized vehicles, except that motorized wheelchairs shall be allowed to use *footpaths* and *bicycle* trails.

(5) As used in this section, "*bicycle* trail" means a publicly owned and maintained lane or way designated and signed for use as a *bicycle* route.

366.552 Historic road program for Historic Columbia River Highway; *footpaths* and *bicycle* trails; acquisition of property; cooperation with other agencies. (1) The Department of Transportation and the State Parks and Recreation Department shall prepare and manage a historic road program, in consultation with the Historic Columbia River Highway Advisory Committee and other affected entities, consistent with the purposes of the Columbia River Gorge National Scenic Area Act of 1986 and the public policy of this state declared in ORS 366.551.

(2) The departments shall inform the advisory committee of those activities of the departments which may affect the continuity, historic integrity and scenic qualities of the Historic Columbia River Highway.

(3) The departments shall undertake efforts to rehabilitate, restore, maintain and preserve all intact and usable segments of the Historic Columbia River Highway and associated state parks. The Department of Transportation may expend funds dedicated for *footpaths* and *bicycle* trails under ORS 366.514 to construct *footpaths* and *bicycle* trails on those portions of the Historic Columbia River Highway that are parts of the state highway system or that are county roads or city streets and the State Parks and Recreation Department may incorporate those segments into the Oregon recreation trails system under the provisions of ORS 390.950 to 390.989 and 390.990 (4).

(4) The departments may acquire real property, or any right or interest therein,

deemed necessary for the preservation of historic, scenic or recreation qualities of the Historic Columbia River Highway, for the connection of intact and usable segments, or for the development and maintenance of parks along or in close proximity to the highway. The departments shall encourage the acquisition of lands, or interests in lands, by donation, agreement, exchange or purchase.
(5) The departments shall assist and cooperate with other agencies and political subdivisions of the state, state agencies, the Federal Government, special purpose districts, railroads, public and private organizations and individuals to the extent necessary to carry out the provisions of ORS 366.550 to 366.553. The departments may enter into such contracts as are necessary to carry out these provisions.

376.605 Construction of trails and bridle paths to Pacific shore. (1) The Department of Transportation may establish, lay out, construct and improve public *pedestrian* trails and bridle paths not exceeding 30 feet in width, connecting legally established streets, roads and public parks with the shore of the Pacific Ocean.
(2) For the purpose set forth in subsection (1) of this section, the department may acquire real property or any interest therein by purchase, donation, agreement or exercise of the power of eminent domain. The provisions of ORS chapter 35 are applicable to proceedings of the department authorized by this subsection.

381.088 Tolls and franchise fees. The Department of Transportation may impose and collect tolls and franchise fees for the use of said bridge by all vehicles, *pedestrians*, public utilities and telecommunications utilities, including power, light, telephone and telegraph wires, and water, gas and oil pipes.

390.010 Policy of state toward outdoor recreation resources. The Legislative Assembly recognizes and declares:
(1) It is desirable that all Oregonians of present and future generations and visitors who are lawfully present within the boundaries of this state be assured adequate outdoor recreation resources. It is desirable that all levels of government and private interests take prompt and coordinated action to the extent practicable without diminishing or affecting their respective powers and functions to conserve, develop, and utilize such resources for the benefit and enjoyment of all the people.
(2) The economy and well-being of the people are in large part dependent upon proper utilization of the state's outdoor recreation resources for the physical, spiritual, cultural, scientific and other benefits which such resources afford.
(3) It is in the public interest to increase outdoor recreation opportunities commensurate with the growth in need through necessary and appropriate actions, including, but not limited to, the following:
(...) (h) Provision of trails for horseback riding, hiking, *bicycling* and motorized trail vehicle riding. (...)
(5) It shall be the policy of the State of Oregon to supply those outdoor recreation areas, facilities and opportunities which are clearly the responsibility of the state in meeting growing needs; and to encourage all agencies of government, voluntary and commercial organizations, citizen recreation groups and others to work cooperatively and in a coordinated manner to assist in meeting total recreation needs through exercise of their appropriate responsibilities.

390.962 Criteria for establishing trails; location; statutes authorizing trails for motorized vehicles unaffected. (1) Upon finding that such trails will meet the criteria established in ORS 390.950 to 390.989 and 390.990 (4) and such supplementary criteria as the department may prescribe, the department is encouraged and empowered to establish and designate Oregon recreation trails:
(a) Over lands owned by the State of Oregon, by the Federal Government or by any county, municipality or other local governmental body, with the consent of the state agency, federal agency, county, municipality or other local governmental body having jurisdiction over the lands involved; or
(b) Over lands owned by private persons, in the manner and subject to the limitations provided in ORS 390.950 to 390.989 and 390.990 (4).
(2) In establishing such trails, the department shall give special recognition to the need for the establishment of recreation trails in or near, or reasonably accessible to, urban areas. Upon the establishment of any such trail, the

department shall designate the primary kind of trail it is to be, based upon the mode or modes of travel to be permitted on such trail, including one or more of the following:
(a) *Footpath*.
(b) Horseback riding trail.
(c) *Bicycle* path.
(3) Nothing in ORS 390.950 to 390.989 and 390.990 (4) affects any other statute authorizing trails for motorized vehicles which is not inconsistent with ORS 390.950 to 390.989 and 390.990 (4).

447.310 Standards for curbing. (1) The standard for construction of curbs on each side of any city street, county road or state highway, or any connecting street, road or highway for which curbs and sidewalks have been prescribed by the governing body of the city or county or Department of Transportation having jurisdiction thereover, shall require not less than two curb cuts or ramps per lineal block to be located on or near the crosswalks at intersections. Each curb cut or ramp shall be at least 48 inches wide, where possible, and a minimum of 36 inches wide where a 48-inch width will not fit, at a slope not to exceed one-inch rise per 12-inch run. If a slope of 1:12 will not fit, a slope between 1:10 and 1:12 is allowed for a maximum rise of six inches and a slope between 1:8 and 1:10 is allowed for a maximum rise of three inches. In no case shall the slope exceed 1:8.
(2) Standards set for curb cuts and ramps under subsection (1) of this section shall apply whenever a curb or sidewalk is constructed or replaced at any point in a block which gives reasonable access to a crosswalk.

801.030 Exemptions from amendments to vehicle code. This section describes exemptions from specific changes to the vehicle code. The exemptions allow some practice or right to continue after the change is made. The exemptions are as follows:
(1) Nothing contained in ORS 810.150 shall require the redesign, modification or replacement of street drains installed prior to September 13, 1975.
(2) Sections 2 to 169 of chapter 451, Oregon Laws 1975, shall not apply to or govern the construction of or punishment for any vehicle code offense committed before June 27, 1975, or the construction and application of any defense to a prosecution for such an offense and do not impair or render ineffectual any court or administrative proceedings or procedural matters which occurred before June 27, 1975.

810.150 Drain construction; compliance with *bicycle* safety requirements; guidelines. (1) Street drains, sewer drains, storm drains and other similar openings in a roadbed over which traffic must pass that are in any portion of a public way, highway, road, street, *footpath* or *bicycle* trail that is available for use by *bicycle* traffic shall be designed and installed, including any modification of existing drains, with grates or covers so that *bicycle* traffic may pass over the drains safely and without obstruction or interference.
(2) The department shall adopt construction guidelines for the design of public ways in accordance with this section. Limitations on the applicability of the guidelines are established under ORS 801.030.

3. THE PROVISION OF *BICYCLE* & *PEDESTRIAN* FACILITIES BY OTHERS

374.307 Removal or repair of installation constructed without permission. (1) If any person, firm or corporation builds or constructs on the right of way of any state highway or county road any approach road or any other facility, thing or appurtenance without first obtaining the written permission required by ORS 374.305, the Department of Transportation or the county governing body shall, after the expiration of 30 days following the transmittal of a written notice to such person, firm or corporation, at the expense of such person, firm or corporation, remove all such installations from the right of way or reconstruct, repair or maintain any such installation in accordance with or as required by the rules and regulations. This expense may be recovered from such person, firm or corporation by the state or county in any court of competent jurisdiction.
(2) Notwithstanding subsection (1) of this section, if the Department of Transportation, county governing body or designated agent of the department or governing body, whichever is applicable, determines that a traffic or *pedestrian* hazard is created by the construc-

tion which causes imminent danger of personal injury, it may:
(a) Order the construction removed, repaired or maintained to eliminate the hazard, within 24 hours after delivery of written notice to the person, firm or corporation which caused the construction, and to the owner of the property on which the construction occurred.
(b) If the hazard is not removed within the time set under paragraph (a) of this subsection, remove the hazard and recover the expenses of any removal, repair or maintenance from any such person, firm or corporation in any court of competent jurisdiction.

374.320 Removal or repair of installation on right of way at expense of applicant. (1) Upon failure of the applicant to construct or maintain the particular approach road, facility, thing or appurtenance in accordance with the rules and regulations and the conditions of the permit, the Department of Transportation or the county governing body shall, after the expiration of 30 days following the transmittal of a written notice to the applicant, at applicant's expense, remove all such installations from the right of way or reconstruct, repair or maintain any such installation in accordance with or as required by such rules and regulations and the conditions of such permit. This expense may be recovered from the applicant by the state or county in any court of competent jurisdiction.
(2) Notwithstanding subsection (1) of this section, if the Department of Transportation, county governing body or designated agent of the department or governing body, whichever is applicable, determines that a traffic or *pedestrian* hazard is created by the noncompliance which causes imminent danger of personal injury, it may:
(a) Order the construction removed, repaired or maintained to eliminate the hazard, within 24 hours after delivery of written notice to the applicant, and to the owner of the property on which the noncompliance occurred.
(b) If the hazard is not removed within the time set under paragraph (a) of this subsection, remove the hazard and recover the expenses of any removal, repair or maintenance from the applicant in any court of competent jurisdiction.

4. THE REGULATION OF *BICYCLE* & *PEDESTRIAN* TRAFFIC

810.020 Regulating use of throughway. (1) Each road authority may prohibit or restrict the use of a throughway in its jurisdiction by any of the following:
(a) Parades.
(b) *Bicycles* or other nonmotorized traffic.
(c) Motorcycles or mopeds.
(2) Regulation under this section becomes effective when appropriate signs giving notice of the regulation are erected upon a throughway and the approaches to the throughway.
(3) Penalties for violation of restrictions or prohibitions imposed under this section are provided under ORS 811.445.
(4) The commission shall act as road authority under this section in lieu of the department.

810.080 *Pedestrian* traffic. (1) Road authorities may regulate the movement of *pedestrians* upon highways within their jurisdictions by doing any of the following:
(a) Establishing marked *crosswalks* and designating them by appropriate marking.
(b) Closing a marked or unmarked *crosswalk* and prohibiting *pedestrians* from crossing a roadway where a *crosswalk* has been closed by placing and maintaining signs giving notice of closure.
(c) Prohibiting *pedestrians* from crossing a highway at any place other than within a marked or unmarked *crosswalk*.
(2) This section neither grants authority to nor limits the authority of the department.

810.090 *Bicycle* racing. *Bicycle* racing is permitted on any highway in this state upon the approval of, and under conditions imposed by, the road authority for the highway on which the race is held.

810.230 Unlawful sign display; exceptions; penalty. (Abridged) (1) A person commits the offense of unlawful sign display if the person does any of the following: (a) Without authority under ORS 810.200 or 810.210, places, maintains or displays upon or in view of any highway any sign, signal, marking or device that: (...) (B) Attempts to direct the movement

of animal, *pedestrian*, vehicle or any other traffic; (...) (3) Every prohibited sign, signal, marking or device is hereby declared to be a public nuisance and the authority with jurisdiction over the highway, without notice, may remove it or cause it to be moved. (4) The offense described in this section, unlawful sign display, is a Class C traffic infraction.

5. THE DUTIES OF *PEDESTRIANS*

814.010 Appropriate responses to traffic control devices. This section establishes appropriate *pedestrian* responses to specific traffic control devices for purposes of ORS 814.020. Authority to place traffic control devices is established under ORS 810.210. Except when acting under the direction of a police officer, a *pedestrian* is in violation of ORS 814.020 if the *pedestrian* makes a response to a traffic control device that is not permitted under the following: (1) A *pedestrian* facing a traffic control device with a green light may proceed across the roadway within any marked or unmarked *crosswalk* unless prohibited from doing so by other traffic control devices.

(2 A *pedestrian* facing a traffic control device with a green arrow signal light may proceed across the roadway within any marked or unmarked *crosswalk* unless prohibited from doing so by other traffic control devices.

(3) A *pedestrian* facing a traffic control device with a steady yellow light shall not enter the roadway unless otherwise directed by a *pedestrian* control signal.

(4) A *pedestrian* facing a traffic control device with a steady red light shall not enter the roadway unless otherwise directed by a *pedestrian* control signal.

(5) If a traffic control device is erected and maintained at a place other than an intersection, the provisions of this section are applicable.

(6) When a *pedestrian* control signal showing the words "Walk" and "Wait" or "Don't Walk" or any other *pedestrian* symbol approved by the Oregon Transportation Commission under ORS 810.200 and 810.210 for the purpose of controlling *pedestrian* crossing is in place, the signal indicates and applies as follows:

(a) If a *pedestrian* is facing a "Walk" signal or other symbol approved under ORS 810.200 and 810.210 indicating that the *pedestrian* may proceed, the *pedestrian* may proceed across the roadway in the direction of the signal.

(b) A *pedestrian* shall not start to cross the roadway in the direction of a signal showing a "Wait" or "Don't Walk" or any other symbol approved under ORS 810.200 and 810.210 indicating that the *pedestrian* may not proceed. A *pedestrian* who has started crossing a roadway on a signal showing "Walk" or any other approved symbol to proceed shall proceed with dispatch to a *sidewalk* or safety island while a signal is showing "Wait" or "Don't Walk" or any other approved symbol indicating not to proceed.

814.020 Failure to obey traffic control device; penalty. (1) A *pedestrian* commits the offense of *pedestrian* failure to obey traffic control devices if the *pedestrian* does any of the following:

(a) Fails to obey any traffic control device specifically applicable to the *pedestrian*.

(b) Fails to obey any specific traffic control device described in ORS 814.010 in the manner required by that section.

(2) A *pedestrian* is not subject to the requirements of this section if the *pedestrian* complies with directions of a police officer.

(3) The offense described in this section, *pedestrian* failure to obey traffic control devices, is a Class C traffic infraction.

814.030 Failure to obey bridge or railroad signal; penalty. (1) A *pedestrian* commits the offense of *pedestrian* failure to obey bridge or railroad signal if the *pedestrian* does any of the following:

(a) Enters or remains upon a bridge or approach to a bridge beyond the bridge signal, gate or barricade after a bridge operation signal has been given.

(b) Passes through, around, over or under any crossing gate or barrier at a bridge or railroad grade crossing while the gate or barrier is closed or being opened or closed.

(2) The offense described in this section, *pedestrian* failure to obey bridge or railroad signal, is a Class C traffic infraction.

814.040 Failure to yield to vehicle; penalty. (1) A *pedestrian* commits the offense of *pedestrian* failure to yield to a

vehicle if the *pedestrian* does any of the following:
(a) Suddenly leaves a curb or other place of safety and moves into the path of a vehicle that is so close as to constitute an immediate hazard.
(b) Fails to yield the right of way to a vehicle upon a roadway when the *pedestrian* is crossing the roadway at any point other than within a marked *crosswalk* or an unmarked *crosswalk* at an intersection.
(c) Except as otherwise provided under the vehicle code, fails to yield the right of way to all vehicles upon the roadway.
(2) The offense described in this section, *pedestrian* failure to yield to a vehicle, is a Class C traffic infraction.

814.050 Failure to yield to ambulance or emergency vehicle; penalty. (1) A *pedestrian* commits the offense of *pedestrian* failure to yield to an ambulance or emergency vehicle if the *pedestrian* does not yield the right of way to:
(a) An ambulance used in an emergency situation; or
(b) An emergency vehicle or an ambulance upon the approach of the vehicle using a visual signal or audible signal or both according to requirements under ORS 820.300, 820.310 or 820.320.
(2) This section does not relieve the driver of an ambulance or emergency vehicle from the duty to:
(a) Drive with due regard for the safety of all persons using the highway; and
(b) Exercise due care to avoid colliding with any *pedestrian*.
(3) The offense described in this section, *pedestrian* failure to yield to an ambulance or emergency vehicle, is a Class C traffic infraction.

814.060 Failure to use *pedestrian* tunnel or overhead crossing; penalty. (1) A *pedestrian* commits the offense of failure to use *pedestrian* tunnel or overhead crossing if the *pedestrian* crosses a roadway other than by means of a *pedestrian* tunnel or overhead *pedestrian* crossing when a tunnel or overhead crossing serves the place where the *pedestrian* is crossing the roadway.
(2) The offense described in this section, failure to use *pedestrian* tunnel or overhead crossing, is a Class D traffic infraction.

814.070 Improper position upon or improperly proceeding along highway; penalty. (1) A *pedestrian* commits the offense of *pedestrian* with improper position upon or improperly proceeding along a highway if the *pedestrian* does any of the following:
(a) Takes a position upon or proceeds along and upon the roadway where there is an adjacent usable *sidewalk* or shoulder.
(b) Does not take a position upon or proceed along and upon the shoulder, as far as practicable from the roadway edge, on a highway that has an adjacent shoulder area on one or both sides.
(c) Except in the case of the divided highway, does not take a position upon or proceed along and upon the left shoulder and as far as practicable from the roadway edge on a two-way highway that has no *sidewalk* and that does have an adjacent shoulder area. This paragraph does not apply to:
  (A) A hitchhiker who takes a position upon or proceeds along and upon the right shoulder so long as the hitchhiker does so facing the vehicles using the adjacent lane of the roadway; or
  (B) A member of a group that has adopted that section of highway under the provisions of ORS 366.158 and who is obeying the rules of the Department of Transportation for picking up litter on either side of the roadway.
(d) Does not take a position upon or proceed along and upon the right highway shoulder, as far as practicable from the roadway edge, on a divided highway that has no *sidewalk* and does have a shoulder area. This paragraph does not apply to a member of a group that has adopted that section of highway under the provisions of ORS 366.158 and who is obeying the rules of the Department of Transportation for picking up litter on either side of the roadway.
(e) Fails to take a position upon or proceed along and upon a highway that has neither *sidewalk* nor shoulder available, as near as practicable to an outside edge of the roadway, and, if the roadway is a two-way roadway, only on the left side of it.
(2) This section is subject to the provisions of ORS 814.100.
(3) The offense described in this section, *pedestrian* with improper position upon or improperly proceeding along a highway, is a Class C traffic infraction.

6. THE DUTIES OF *BICYCLISTS*

811.395 Appropriate signals for stopping, turning, changing lanes and decelerating. This section establishes appropriate signals, for purposes of the vehicle code, for use when signals are required while stopping, turning, changing lanes or suddenly decelerating a vehicle. This section does not authorize the use of only hand and arm signals when the use of signal lights is required under ORS 811.405. Vehicle lighting equipment described in this section is vehicle lighting equipment for which standards are established under ORS 816.100 and 816.120. Appropriate signals are as follows:

(1) To indicate a left turn either of the following:

(a) Hand and arm extended horizontally from the left side of the vehicle.

(b) Activation of front and rear turn signal lights on the left side of the vehicle.

(2) To indicate a right turn either of the following:

(a) Hand and arm extended upward from the left side of the vehicle. A person who is operating a *bicycle* is not in violation of this paragraph if the person signals a right turn by extending the person's right hand and arm horizontally.

(b) Activation of front and rear turn signal lights on the right side of the vehicle.

(3) To indicate a stop or a decrease in speed either of the following:

(a) Hand and arm extended downward from the left side of the vehicle; or

(b) Activation of brake lights on the vehicle.

(4) Change of lane by activation of both front and rear turn signal lights on the side of the vehicle toward which the change of lane is made.

814.400 Application of vehicle laws to *bicycles*. (1) Every person riding a *bicycle* upon a public way is subject to the provisions applicable to and has the same rights and duties as the driver of any other vehicle concerning operating on highways, vehicle equipment and abandoned vehicles, except:

(a) Those provisions which by their very nature can have no application.

(b) When otherwise specifically provided under the vehicle code.

(2) Subject to the provisions of subsection (1) of this section:

(a) A *bicycle* is a vehicle for purposes of the vehicle code; and

(b) When the term "vehicle" is used the term shall be deemed to be applicable to *bicycles*.

(3) The provisions of the vehicle code relating to the operation of *bicycles* do not relieve a *bicyclist* or motorist from the duty to exercise due care.

814.410 Unsafe operation of *bicycle* on *sidewalk*; penalty. (1) A person commits the offense of unsafe operation of a *bicycle* on a *sidewalk* if the person does any of the following:

(a) Operates the *bicycle* so as to suddenly leave a curb or other place of safety and move into the path of a vehicle that is so close as to constitute an immediate hazard.

(b) Operates a *bicycle* upon a *sidewalk* and does not give an audible warning before overtaking and passing a *pedestrian* and does not yield the right of way to all *pedestrians* on the *sidewalk*.

(c) Operates a *bicycle* on a *sidewalk* in a careless manner that endangers or would be likely to endanger any person or property.

(d) Operates the *bicycle* at a speed greater than an ordinary walk when approaching or entering a *crosswalk*, approaching or crossing a driveway or crossing a curb cut or *pedestrian* ramp and a motor vehicle is approaching the *crosswalk*, driveway, curb cut or *pedestrian* ramp. This paragraph does not require reduced speeds for *bicycles* either:

(A) At places on *sidewalks* or other *pedestrian* ways other than places where the path for *pedestrians* or *bicycle* traffic approaches or crosses that for motor vehicle traffic; or

(B) When motor vehicles are not present.

(2) Except as otherwise specifically provided by law, a *bicyclist* on a *sidewalk* or in a *crosswalk* has the same rights and duties as a *pedestrian* on a *sidewalk* or in a *crosswalk*.

(3) The offense described in this section, unsafe operation of a *bicycle* on a *sidewalk*, is a Class D traffic infraction.

814.420 Failure to use *bicycle* lane or path; exceptions; penalty. (1) Except as provided in subsection (2) of this section, a person commits the offense of failure to use a *bicycle* lane or path if the person operates a *bicycle* on any portion of a roadway that is not a *bicycle*

lane or *bicycle* path when a *bicycle* lane or *bicycle* path is adjacent to or near the roadway.
(2) A person is not required to comply with this section unless the state or local authority with jurisdiction over the roadway finds, after public hearing, that the *bicycle* lane or *bicycle* path is suitable for safe *bicycle* use at reasonable rates of speed.
(3) The offense described in this section, failure to use a *bicycle* lane or path, is a Class D traffic infraction.

814.430 Improper use of lanes; exceptions; penalty. (1) A person commits the offense of improper use of lanes by a *bicycle* if the person is operating a *bicycle* on a roadway at less than the normal speed of traffic using the roadway at that time and place under the existing conditions and the person does not ride as close as practicable to the right curb or edge of the roadway.
(2) A person is not in violation of the offense under this section if the person is not operating a *bicycle* as close as practicable to the right curb or edge of the roadway under any of the following circumstances:
(a) When overtaking and passing another *bicycle* or vehicle that is proceeding in the same direction.
(b) When preparing to execute a left turn.
(c) When reasonably necessary to avoid hazardous conditions including, but not limited to, fixed or moving objects, parked or moving vehicles, *bicycles*, *pedestrians*, animals, surface hazards or other conditions that make continued operation along the right curb or edge unsafe or to avoid unsafe operation in a lane on the roadway that is too narrow for a *bicycle* and vehicle to travel safely side by side. Nothing in this paragraph excuses the operator of a *bicycle* from the requirements under ORS 811.425 or from the penalties for failure to comply with those requirements.
(d) When operating within a city as near as practicable to the left curb or edge of a roadway that is designated to allow traffic to move in only one direction along the roadway. A *bicycle* that is operated under this paragraph is subject to the same requirements and exceptions when operating along the left curb or edge as are applicable when a *bicycle* is operating along the right curb or edge of the roadway.
(e) When operating a *bicycle* along side not more than one other *bicycle* as long as the *bicycles* are both being operated within a single lane and in a manner that does not impede the normal and reasonable movement of traffic.
(f) When operating on a *bicycle* lane or *bicycle* path.
(3) The offense described in this section, improper use of lanes by a *bicycle*, is a Class D traffic infraction.

814.440 Failure to signal turn; exceptions; penalty. (1) A person commits the offense of failure to signal for a *bicycle* turn if the person does any of the following:
(a) Stops a *bicycle* the person is operating without giving the appropriate hand and arm signal continuously for at least 100 feet before executing the stop.
(b) Executes a turn on a *bicycle* the person is operating without giving the appropriate hand and arm signal for the turn for at least 100 feet before executing the turn.
(c) Executes a turn on a *bicycle* the person is operating after having been stopped without giving, while stopped, the appropriate hand and arm signal for the turn.
(2) A person is not in violation of the offense under this section if the person is operating a *bicycle* and does not give the appropriate signal continuously for a stop or turn because circumstances require that both hands be used to safely control or operate the *bicycle*.
(3) The appropriate hand and arm signals for indicating turns and stops under this section are those provided for other vehicles under ORS 811.395 and 811.400.
(4) The offense described under this section, failure to signal for a *bicycle* turn, is a Class D traffic infraction.

814.450 Unlawful load on *bicycle*; penalty. (1) A person commits the offense of having an unlawful load on a *bicycle* if the person is operating a *bicycle* and the person carries a package, bundle or article which prevents the person from keeping at least one hand upon the handlebar and having full control at all times.
(2) The offense described in this section, unlawful load on a *bicycle*, is a Class D traffic infraction.

814.460 Unlawful passengers on *bicycle*; penalty. (1) A person commits the offense of

unlawful passengers on a *bicycle* if the person operates a *bicycle* and carries more persons on the *bicycle* than the number for which it is designed or safely equipped.
(2) The offense described in this section, unlawful passengers on a *bicycle*, is a Class D traffic infraction.

814.470 Failure to use *bicycle* seat; penalty. (1) A person commits the offense of failure to use a *bicycle* seat if the person is operating a *bicycle* and the person rides other than upon or astride a permanent and regular seat attached to the *bicycle*.
(2) The offense described in this section, failure to use *bicycle* seat, is a Class D traffic infraction.

814.480 Nonmotorized vehicle clinging to another vehicle; penalty. (1) A person commits the offense of nonmotorized vehicle clinging to another vehicle if the person is riding upon or operating a *bicycle*, coaster, roller skates, sled or toy vehicle and the person clings to another vehicle upon a roadway or attaches that which the person is riding or operating to any other vehicle upon a roadway.
(2) The offense described in this section, nonmotorized vehicle clinging to another vehicle, is a Class D traffic infraction.

814.484 Meaning of *"bicycle,"* "operating or riding on a highway." (1) For purposes of ORS 814.485, 814.486, 815.052 and 815.281, "*bicycle*" has the meaning given in ORS 801.150 except that.
(a) It also includes vehicles that meet the criteria specified in ORS 801.150 (1) to (4) but that have wheels less than 14 inches in diameter.
(b) It does not include tricycles designed to be ridden by children.
(2) For purposes of the offenses defined in ORS 814.485, 814.486 and 815.281 (2), a person shall not be considered to be operating or riding on a *bicycle* on a highway or on premises open to the public if the person is operating or riding on a three-wheeled nonmotorized vehicle on a beach while it is closed to motor vehicle traffic.

814.485 Failure to wear protective headgear; penalty. (1) A person commits the offense of failure of a *bicycle* operator or rider to wear protective headgear if the person is under 16 years of age, operates or rides on a *bicycle* on a highway or on premises open to the public and is not wearing protective headgear of a type approved under ORS 815.052.
(2) Exemptions from this section are as provided in ORS 814.487.
(3) The offense described in this section, failure of a *bicycle* operator or rider to wear protective headgear, is a traffic infraction punishable by a maximum fine of $25.

814.486 Endangering *bicycle* operator or passenger; penalty. (1) A person commits the offense of endangering a *bicycle* operator or passenger if:
(a) The person is operating a *bicycle* on a highway or on premises open to the public and the person carries another person on the *bicycle* who is under 16 years of age and is not wearing protective headgear of a type approved under ORS 815.052; or
(b) The person is the parent, legal guardian or person with legal responsibility for the safety and welfare of a child under 16 years of age and the child operates or rides on a *bicycle* on a highway or on premises open to the public without wearing protective headgear of a type approved under ORS 815.052.
(2) Exemptions from this section are as provided in ORS 814.487.
(3) The offense described in this section, endangering a *bicycle* operator or passenger, is a traffic infraction punishable by a maximum fine of $25.

814.487 Exemptions from protective headgear requirements. A person is exempt from the requirements under ORS 814.485 and 814.486 to wear protective headgear, if wearing the headgear would violate a religious belief or practice of the person.

814.488 Citations; exemption from requirement to pay fine. (1) If a child in violation of ORS 814.485 is 11 years of age or younger, any citation issued shall be issued to the parent, legal guardian or person with legal responsibility for the safety and welfare of the child for violation of ORS 814.486, rather than to the child for violation of ORS 814.485.
(2) If a child in violation of ORS 814.485 is at least 12 years of age and is under 16 years of age, a citation may be issued to the child for

violation of ORS 814.485 or to the parent, legal guardian or person with legal responsibility for the safety and welfare of the child for violation of ORS 814.486, but not to both.
(3) The first time a person is convicted of an offense described in ORS 814.485 or 814.486, the person shall not be required to pay a fine if the person proves to the satisfaction of the court that the person has protective headgear of a type approved under ORS 815.052.

814.489 Use of evidence of lack of protective headgear on *bicyclist*. Evidence of violation of ORS 814.485 or 814.486 and evidence of lack of protective headgear shall not be admissible, applicable or effective to reduce the amount of damages or to constitute a defense to an action for damages brought by or on behalf of an injured *bicyclist* or *bicycle* passenger or the survivors of a deceased *bicyclist* or passenger if the *bicyclist* or passenger was injured or killed as a result in whole or in part of the fault of another.

815.052 Standards for bicycle headgear. The Department of Transportation shall adopt and enforce rules establishing minimum standards and specifications for safe protective headgear to be worn by people operating *bicycles* and by passengers on *bicycles*. The rules shall conform, insofar as practicable, to safety standards and specifications for such headgear issued by the American National Standards Institute, Snell or the United States Department of Transportation.

815.280 Violation of *bicycle* equipment requirements; requirements; penalty. (1) A person commits the offense of violation of *bicycle* equipment requirements if the person does any of the following:
(a) Operates on any highway a *bicycle* in violation of the requirements of this section.
(b) Is the parent or guardian of a minor child or ward and authorizes or knowingly permits the child or ward to operate a *bicycle* on any highway in violation of the requirements of this section.
(2) A *bicycle* is operated in violation of the requirements of this section if any of the following requirements are violated:
(a) A *bicycle* must be equipped with a brake that enables the operator to make the braked wheels skid on dry, level, clean pavement.
(b) A person shall not install or use any siren or whistle upon a *bicycle*.
(c) At the times described in the following, a *bicycle* or its rider must be equipped with lighting equipment that meets the described requirements:
  (A) The lighting equipment must be used during limited visibility conditions.
  (B) The lighting equipment must show a white light visible from a distance of at least 500 feet to the front of the *bicycle*.
  (C) The lighting equipment must have a red reflector or lighting device or material of such size or characteristic and so mounted as to be visible from all distances up to 600 feet to the rear when directly in front of lawful lower beams of headlights on a motor vehicle.
(3) Nothing contained in this section shall be construed to prohibit the use of additional parts and accessories on any *bicycle* not inconsistent with this section.
(4) The offense described in this section, violation of *bicycle* equipment requirements, is a Class D traffic infraction.

815.281 Selling unapproved bicycle headgear; renting bicycle without having approved headgear available; penalties. (1) A person commits the offense of selling unapproved *bicycle* equipment if the person sells or offers for sale any *bicycle* headgear that is not approved by the Department of Transportation under section 6 of this 1993 Act.
(2) A person commits the offense of unlawfully renting or leasing a *bicycle* to another if the person:
(a) Is in the business of renting or leasing *bicycles*; and
(b) Does not have *bicycle* headgear approved under section 6 of this 1993 Act available for rental for use by persons under 16 years of age.
(3) The offenses described in this section are Class D traffic infractions.

7. MOTORIZED WHEELCHAIRS

814.500 Rights and duties of person riding motorized wheelchair on *bicycle* lane or path. Every person riding a motorized wheelchair on a *bicycle* lane or path is subject to the provisions applicable to and has the same rights and duties as the driver of a *bicycle*

when operating on a *bicycle* lane or path, except:
(1) When those provisions which by their very nature can have no application.
(2) When otherwise specifically provided under the vehicle code.

8. DUTIES OF MOTORISTS TO *PEDESTRIANS* & *BICYCLISTS*

807.070 Examinations. (Abridged) The Department of Transportation shall administer an examination to establish qualification for each class of license and endorsement. The examination for each class of license or endorsement shall include all of the following as described: (...) (2) A test of the applicant's knowledge and understanding of the traffic laws of this state, safe driving practices and factors that cause accidents. The following all apply to the test under this subsection: (...) (c) The test under this subsection shall include, but is not limited to, the following subjects: (A) Rights of blind *pedestrians*. (...) Practices necessary for safe operation of a vehicle around *pedestrians* and *bicyclists*. (3) An actual demonstration of the applicant's ability to operate a motor vehicle without endangering the safety of persons or property.

811.005 Duty to exercise due care. None of the provisions of the vehicle code relieve a *pedestrian* from the duty to exercise due care or relieve a driver from the duty to exercise due care concerning *pedestrians*.

811.010 Failure to yield to *pedestrian* in *crosswalk*; penalty. (1) The driver of a vehicle commits the offense of failure to yield to a *pedestrian* in a *crosswalk* if:
(a) A *pedestrian* is crossing a roadway within a marked or unmarked *crosswalk* where there are no traffic control devices in place or in operation; and
(b) The driver does not stop before entering the *crosswalk* and yield the right of way to the *pedestrian* when the *pedestrian* is:
  (A) Approaching so closely to the half of the roadway along which the driver is proceeding so as to be in a position of danger by closely approaching or reaching the center of the roadway; or
  (B) On the half of the roadway on and along which the driver is proceeding.
(2) This section does not require a driver to stop and yield the right of way to a *pedestrian* under any of the following circumstances:
(a) Upon a roadway with a safety island, if the driver is proceeding along the half of the roadway on the far side of the safety island from the *pedestrian*; or
(b) Where a *pedestrian* tunnel or overhead crossing has been provided at or near a *crosswalk*.
(3) The offense described in this section, failure to yield to a *pedestrian* in a *crosswalk*, is a Class B traffic infraction.

811.015 Failure to obey traffic patrol member; penalty. (1) The driver of a vehicle commits the offense of failure to obey a traffic patrol member if:
(a) A traffic patrol member makes a cautionary sign or signal to indicate that students have entered or are about to enter the *crosswalk* under the traffic patrol member's direction; and
(b) The driver does not stop and yield the right of way to students who are in or entering the *crosswalk* from either direction on the street on which the driver is operating.
(2) Traffic patrol members described in this section are those provided under ORS 339.650 to 339.665.
(3) The offense described in this section, failure to obey a traffic patrol member, is a Class B traffic infraction.

811.020 Passing stopped vehicle at *crosswalk*; penalty. (1) The driver of a vehicle commits the offense of passing a stopped vehicle at a *crosswalk* if the driver:
(a) Approaches from the rear another vehicle that is stopped at a marked or an unmarked *crosswalk* at an intersection to permit a *pedestrian* to cross the roadway; and
(b) Overtakes and passes the stopped vehicle.
(2) The offense described in this section, passing a stopped vehicle at a *crosswalk*, is a Class B traffic infraction.

811.025 Failure to yield to *pedestrian* on *sidewalk*; penalty. (1) The driver of a vehicle commits the offense of failure to yield to a *pedestrian* on a *sidewalk* if the driver does not yield the right of way to any *pedestrian* on a *sidewalk*.

(2) The offense described in this section, failure to yield to a *pedestrian* on a *sidewalk*, is a Class C traffic infraction.

811.030 Driving through safety zone; penalty. (1) The driver of a vehicle commits the offense of driving through a safety zone if the driver at any time drives through or within any area or space officially set apart within a roadway for the exclusive use of *pedestrians* and which is protected or is so marked or indicated by adequate signs as to be plainly visible at all times while set apart as a safety zone.
(2) The offense described in this section, driving through a safety zone, is a Class C traffic infraction.

811.035 Failure to yield to blind *pedestrian*; penalty. (1) The driver of a vehicle commits the offense of failure to yield the right of way to a blind *pedestrian* if the driver violates any of the following:
(a) A driver approaching a blind or blind and deaf *pedestrian* carrying a white cane or accompanied by a dog guide, who is crossing or about to cross a roadway, shall yield the right of way to the blind or blind and deaf *pedestrian* and shall continue to yield the right of way to the blind or blind and deaf *pedestrian*.
(b) Where the movement of vehicular traffic is regulated by traffic control devices, a driver approaching a blind or blind and deaf *pedestrian* shall yield the right of way to the *pedestrian* and stop or remain stationary until the *pedestrian* has vacated the roadway if the blind or blind and deaf *pedestrian* has entered the roadway and is carrying a white cane or is accompanied by a dog guide. This paragraph applies notwithstanding any other provisions of the vehicle code relating to traffic control devices.
(2) This section is subject to the provisions and definitions relating to the rights of *pedestrians* who are blind or blind and deaf under ORS 814.110.
(3) The offense described in this section, failure to yield the right of way to a blind *pedestrian*, is a Class B traffic infraction.

811.040 Failure to yield to *pedestrian* proceeding under traffic control devices; penalty. (1) The driver of a vehicle commits the offense of failure to yield to a *pedestrian* proceeding under traffic control devices if the driver does not yield the right of way to a *pedestrian* who is:
(a) Proceeding under a *pedestrian* control signal under ORS 814.010.
(b) Lawfully within an intersection or *crosswalk* in accordance with any traffic control device in a manner that complies with ORS 814.010.
(2) The offense described in this section, failure to yield to a *pedestrian* proceeding under traffic control devices, is a Class B traffic infraction

811.045 Failure to yield to *pedestrian* when making turn at stop light; penalty. (1) A person commits the offense of failure to yield to a *pedestrian* when making a turn at a stop light if the person is driving a vehicle that is making a turn at a red light permitted under ORS 811.335 and the person does not yield the right of way to *pedestrians* lawfully within an adjacent *crosswalk*.
(2) The offense described in this section, failure to yield to a *pedestrian* when making a turn at a stop light, is a Class B traffic infraction.

811.050 Failure to yield to rider on *bicycle* lane. (1) A person commits the offense of failure of a motor vehicle operator to yield to a rider on a *bicycle* lane if the person is operating a motor vehicle and the person does not yield the right of way to a person operating a *bicycle*, moped or motorized wheelchair upon a *bicycle* lane.
(2) This section does not require persons operating mopeds to yield the right of way to *bicycles* if the mopeds are operated on *bicycle* lanes in the manner permitted under ORS 811.440.
(3) The offense described in this section, failure of a motor vehicle operator to yield to a rider on a *bicycle* lane, is a Class B traffic infraction.

811.055 Failure to yield to *bicyclist* on *sidewalk*. (1) The driver of a motor vehicle commits the offense of failure to yield the right of way to a *bicyclist* on a *sidewalk* if the driver does not yield the right of way to any *bicyclist* on a *sidewalk*.
(2) The driver of a motor vehicle is not in violation of this section when a *bicyclist* is operating in violation of ORS 814.410. Nothing in this subsection relieves the driver of a motor vehicle from the duty to exercise due care.
(3) The offense described in this section, failure to yield the right of way to a *bicyclist* on a *sidewalk*, is a Class C traffic infraction.

811.165 Failure to stop for passenger loading of public transit vehicle; penalty. (1) A person commits the offense of failure to stop for passenger loading of a public transit vehicle if the person is the driver of a vehicle overtaking a public transit vehicle described in this section that is stopped or about to stop for the purpose of receiving or discharging any passenger and the person does not:
(a) Stop the overtaking vehicle to the rear of the nearest running board or door of the public transit vehicle; and
(b) Keep the vehicle stationary until all passengers have boarded or alighted therefrom and reached a place of safety.
(2) The following described vehicles are the public transit vehicles that the requirements of this section are applicable to:
(a) Commercial buses.
(b) Trolleys.
(c) Streetcars, including every device traveling exclusively upon rails when upon or crossing a street, other than cars or trains propelled or moved by steam engine or by diesel engine.
(3) A person is not in violation of this section if the person passes a public transit vehicle:
(a) Upon the left of any public transit vehicle described in this section on a one-way street; or
(b) At a speed not greater than is reasonable and proper and with due caution for the safety of *pedestrians* when:
  (A) The public transit vehicle has stopped at the curb; or
  (B) Any area or space has been officially set apart within the roadway for the exclusive use of *pedestrians* and the area or space is so protected or marked or indicated by adequate signs as to be plainly visible at all times while set apart as a safety zone.
(4) The offense described in this section, failure to stop for passenger loading of public transit vehicle, is a Class C traffic infraction.

811.290 Obstructing cross traffic; penalty. (1) A person commits the offense of obstructing cross traffic if the person is operating a vehicle and the person enters an intersection or a marked *crosswalk* when there is not sufficient space on the other side of the intersection or *crosswalk* to accommodate the vehicle without obstructing the passage of other vehicles or *pedestrians*.
(2) The offense described in this section applies whether or not a traffic control device indicates to proceed.
(3) The offense described in this section, obstructing cross traffic, is a Class C traffic infraction.

811.360 When vehicle turn permitted at stop light; improper turn at stop light; penalty. (1) The driver of a vehicle, subject to this section, who is intending to turn at an intersection where there is a traffic control device showing a red light may do any of the following without violating ORS 811.260 and 811.265:
(a) Make a right turn into a two-way street.
(b) Make a right or left turn into a one way street in the direction of traffic upon the one-way street.
(2) A person commits the offense of improper turn at a stop light if the person does any of the following while making a turn described in this section:
(a) Fails to stop at the light as required.
(b) Fails to exercise care to avoid an accident.
(c) Disobeys the directions of a traffic control device or a police officer that prohibits the turn.
(d) Fails to yield the right of way to traffic lawfully within the intersection or approaching so close as to constitute an immediate hazard.
(3) A driver who is making a turn described in this section is also subject to the requirements under ORS 811.045 to yield to *pedestrians* while making the turn.
(4) The offense described in this section, improper turn at a stop light, is a Class B traffic infraction.

811.435 Operation of motor vehicle on *bicycle* trail; exemptions; penalty. (1) A person commits the offense of operation of a motor vehicle on a *bicycle* trail if the person operates a motor vehicle upon a *bicycle* lane or a *bicycle* path.
(2) Exemptions to this section are provided under ORS 811.440.
(3) This section is not applicable to mopeds. ORS 811.440 and 814.210 control the operation and use of mopeds on *bicycle* lanes and paths.
(4) The offense described in this section, operation of a motor vehicle on a *bicycle* trail, is a Class B traffic infraction.

811.440 When motor vehicles may operate on *bicycle* lane. This section

provides exemptions from the prohibitions under ORS 811.435 and 814.210 against operating motor vehicles on *bicycle* lanes and paths. The following vehicles are not subject to ORS 811.435 and 814.210 under the circumstances described: (1) A person may operate a moped on a *bicycle* lane that is immediately adjacent to the roadway only while the moped is being exclusively powered by human power.
(2) A person may operate a motor vehicle upon a *bicycle* lane when:
(a) Making a turn;
(b) Entering or leaving an alley, private road or driveway; or
(c) Required in the course of official duty.
(3) An implement of husbandry may momentarily cross into a *bicycle* lane to permit other vehicles to overtake and pass the implement of husbandry.
(4) A person may operate a motorized wheelchair on a *bicycle* lane or path.

811.475 Obstructing rail crossing; penalty. (1) A person commits the offense of obstructing a rail crossing if the person is operating a vehicle and the person drives onto any railroad grade crossing when there is not sufficient space on the other side of the railroad grade crossing to accommodate the vehicle the person is operating without obstructing the passage of other vehicles, *pedestrians* or railroad trains.
(2) The offense described in this section is applicable whether or not a traffic control device indicates to proceed.
(3) The offense described in this section, obstructing rail crossings, is a Class C traffic infraction.

811.490 Improper opening or leaving open of vehicle door; penalty. (1) A person commits the offense of improper opening or leaving open a vehicle door if the person does any of the following:
(a) Opens any door of a vehicle unless and until it is reasonably safe to do so and it can be done without interference with the movement of traffic, or with *pedestrians* and *bicycles* on *sidewalks* or shoulders.
(b) Leaves a door open on the side of a vehicle available to traffic, or to *pedestrians* or *bicycles* on *sidewalks* or shoulders for a period of time longer than necessary to load or unload passengers.
(2) The offense described in this section, improper opening or leaving open a vehicle door, is a Class D traffic infraction.

811.505 Failure to stop when emerging from alley, driveway or building; penalty. (1) A person commits the offense of failure to stop when emerging from alley, driveway or building if the person is operating a vehicle that is emerging from an alley, building, private road or driveway in a business or residence district and the person does not stop the vehicle as follows:
(a) If there is a *sidewalk* or *sidewalk* area, the person must stop the vehicle before driving onto the *sidewalk* or *sidewalk* area.
(b) If there is no *sidewalk* or *sidewalk* area, the person must stop at the point nearest the roadway to be entered where the driveway has a view of approaching traffic.
(2) The offense described in this section, failure to stop when emerging from alley, driveway or building, is a class B traffic infraction.

811.550 Places where stopping, standing and parking prohibited. (Abridged) This section establishes places where stopping, standing and parking a vehicle are prohibited for purposes of the penalties under ORS 811.555. Except as provided under an exemption in ORS 811.560, a person is in violation of ORS 811.555 if a person parks, stops or leaves standing a vehicle in any of the following places:
(1) Upon a roadway outside a business district or residence district, whether attended or unattended, when it is practicable to stop, park or leave the vehicle standing off the roadway. Exemptions under ORS 811.560 (1), (7) and (9) are applicable to this subsection.
(2) On a shoulder, whether attended or unattended, unless a clear and unobstructed width of the roadway opposite the standing vehicle is left for the passage of other vehicles and the standing vehicle is visible from a distance of 200 feet in each direction upon the roadway or the person, at least 200 feet in each direction upon the roadway, warns approaching motorists of the standing vehicle by use of flagpersons, flags, signs or other signals. Exemptions under ORS 811.560 (9) are applicable to this subsection.
(3) On the roadway side of a vehicle stopped or parked at the edge or curb of a highway.

Exemptions under ORS 811.560 (7) are applicable to this subsection.
(4) On a *sidewalk*. Exemptions under ORS 811.560 (4) to (7) are applicable to this subsection.
(5) Within an intersection. Exemptions under ORS 811.560 (4) to (7) are applicable to this subsection.
(6) On a *crosswalk*. Exemptions under ORS 811.560 (4) to (7) are applicable to this subsection.
(7) Between a safety zone and the adjacent curb or within 30 feet of points on the curb immediately opposite the ends of a safety zone, unless a different length is indicated by signs and markings. For purposes of this subsection the safety zone must be an area or space officially set apart within a roadway for the exclusive use of *pedestrians* and which is protected or is so marked or indicated by adequate signs as to be plainly visible at all times while set apart as a safety zone. Exemptions under ORS 811.560 (4) to (7) are applicable to this subsection.
(...) (17) Within 20 feet of a *crosswalk* at an intersection. Exemptions under ORS 811.560 (2) and (4) to (7) are applicable to this subsection.
(...) (23) On a *bicycle* lane. Exemptions under ORS 811.560 are applicable to this subsection.
(24) On a *bicycle* path. Exemptions under ORS 811.560 are applicable to this subsection.

814.210 Operation of moped on *sidewalk* or *bicycle* trail; penalty. (1) A person commits the offense of operation of a moped on a *sidewalk* or *bicycle* trail if the person operates a moped upon a *sidewalk*, a *bicycle* path or a *bicycle* lane.
(2) Exemptions to this section are provided under ORS 811.440.
(3) The offense described in this section, operation of a moped on a *sidewalk* or *bicycle* trail, is a Class D traffic infraction.

9. BICYCLISTS & PEDESTRIANS EXEMPT FROM CERTAIN REQUIREMENTS OF THE VEHICLE CODE

801.026 General exemptions; exceptions. (Abridged) (...) (6) Devices that are powered exclusively by human power are not subject to those provisions of the vehicle code that relate to vehicles. Notwithstanding this subsection, *bicycles* are generally subject to the vehicle code as provided under ORS 814.400.

803.030 Exemptions from title requirement. (Abridged) This section establishes exemptions from the requirements under ORS 803.025 to obtain title issued by this state. The exemptions are subject to ORS 803.040. The exemptions are in addition to any exemptions under ORS 801.026. Vehicles exempted by this section from the requirements to be titled by this state are not prohibited from being titled by this state if titling is permitted under ORS 803.035. The exemptions are partial or complete as provided in the following: (...) (7) *Bicycles* are exempt from the requirements for title.

803.305 Exemptions from general registration requirements. (Abridged) This section establishes exemptions from the requirements under ORS 803.300. The exemptions under this section are in addition to any exemptions under ORS 801.026. Vehicles exempted by this section from the requirements to be registered by this state are not prohibited from being registered by this state if registration is permitted under ORS 803.310. The following are exempt, either partially or completely as described, from the registration requirements under ORS 803.300: (...) (2) *Bicycles* are exempt from registration.

807.020 Exemptions from requirement to have Oregon license or permit. (Abridged) A person who is granted a driving privilege by this section may exercise the driving privilege described without violation of the requirements under ORS 807.010. A grant of driving privileges to operate a motor vehicle under this section is subject to suspension and revocation the same as other driving privileges granted under the vehicle code. This section is in addition to any exemptions from the vehicle code under ORS 801.026. The following persons are granted the described driving privileges: (...) (12) A person may operate a *bicycle* without any grant of driving privileges.

809.210 Suspension or restriction of driving privileges for failure to pay fine or obey court order; exceptions. (Abridged)

(1) A court may do any of the following if the defendant is convicted of any traffic offense and fails or refuses to pay a fine imposed by the judge or to comply with any condition upon which payment of the fine or any part of it was suspended: (a) Issue notice to the Department of Transportation to implement procedures under ORS 809.290. (b) Order a defendant's driving privileges restricted. (...) (5) A court shall not issue notice under this section to implement procedures under ORS 809.290 for failure to pay a fine relating to any parking offense, *pedestrian* offense or bicycling offense.

809.220 Failure to appear; suspension or other procedures. (Abridged) This section establishes procedures that are applicable if a person fails to comply with ORS 153.540. All of the following apply to this section: (1) If a defendant fails to comply with ORS 153.540, a court: (a) Shall issue notice to the Department of Transportation to suspend for failure to appear if the defendant has not complied with ORS 153.540 (1). If a court issues notice under this paragraph, the department shall suspend the driving privileges of the person as provided under ORS 809.280. (b) Shall issue notice to the department to implement procedures under ORS 809.290 if the defendant has not complied with ORS 153.540 (2). If a court issues notice under this paragraph, the department shall implement procedures under ORS 809.290. (...) (6) A court shall not notify the department under this section for failure to appear on any parking, *pedestrian* or *bicyclist* offense.

809.290 When person subject to suspension; duration. (Abridged) This section establishes circumstances that will make a person subject to suspension under ORS 809.410 (24) and what a person is required to do to make the person no longer subject to suspension. The following apply as described: (1) A person is subject to suspension under ORS 809.410 (24) if the Department of Transportation receives notice from a court to apply this section under ORS 809.220. A person who is subject under this subsection remains subject until the person presents the department with notice issued by the court showing that the person is no longer subject to this section or until five years have elapsed, whichever is earlier. This subsection shall not subject a person to ORS 809.410 (24) for any *pedestrian* offense, *bicycling* offense or parking offense. Upon receipt of notice from a court, the department shall send a letter by first class mail advising the person that the suspension will commence 60 days from the date of the letter unless the person presents the department with the notice required by this subsection. (...)

809.280 Procedures following court order or recommendation; length of suspension or revocation. (Abridged) (1) This section establishes the procedures the Department of Transportation shall follow when a court orders or recommends the suspension or revocation of driving privileges. This section also establishes the period of time the revocation or suspension will be effective. (...) (5) When a court notifies the department under ORS 809.220 to suspend for failure to appear, the department shall suspend the driving privileges of the person for an indefinite period. The department shall terminate the suspension upon notification by the court or upon the elapse of five years from the date of suspension. A suspension under this subsection shall be placed on the defendant's driving record. The department shall not suspend any driving privileges under this subsection for a person's failure to appear on a *pedestrian* or *bicyclist* offense.

811.405 Failure to signal with lights; exceptions; penalty. (1) A person commits the offense of failure to signal with lights when required if a person is operating a vehicle and does not use the vehicle lighting equipment described under ORS 811.395 to signal when turning, changing lanes, stopping or suddenly decelerating under any of the following circumstances:

(a) During limited visibility conditions.
(b) At any time the person is operating a vehicle or combination of vehicles in which the distance from the center of the top of the steering post to the left outside limit of the body, cab or load of the vehicle is greater than 24 inches.
(c) At any time the person is operating a vehicle or combination of vehicles in which the distance from the center of the top of the steering post to the rear limit of the body or load is greater than 14 feet.

(2) This section does not require the driver of a moped or *bicycle* that is not equipped with lighting equipment to use lighting equipment when required by this section. A driver of such moped or *bicycle* shall signal by means of appro-

priate hand and arm signals described under ORS 811.395 without violation of this section.
(3) The offense described in this section, failure to signal with lights when required, is a Class C traffic infraction.

811.495 Unlawful coasting on downgrade; exception; penalty. (1) A person commits the offense of unlawful coasting on a downgrade if the person is the driver of a vehicle on a downgrade and the person coasts with the gears or transmission of the motor vehicle in neutral or with the clutch disengaged.
(2) This section does not apply to the driver of a motorized *bicycle.*
(3) The offense described in this section, unlawful coasting on a downgrade, is a Class C traffic infraction.

811.525 Exemptions from requirements for use of lights. (Abridged) This section establishes exemptions from ORS 811.515 and 811.520. The exemptions under this section are in addition to any exemptions under ORS 801.026. The exemptions established under this section are partial or complete as described in the following: (...) (4) Lighting equipment on *bicycles* shall be lighted as required under ORS 815.280.

10. STATE COMMITTEES & PROGRAMS

366.112 *Bicycle* lane and path advisory committee; members, terms, duties and powers; meetings. (1) There is created in the Department of Transportation an advisory committee to be appointed by the Governor to advise the department regarding the regulation of *bicycle* traffic and the establishment of *bicycle* lanes and paths. The committee shall consist of eight members including an employee of a unit of local government employed in land use planning, a representative of a recognized environmental group, a person engaged in the business of selling or repairing *bicycles*, a member designated by the Oregon Recreation Trails Advisory Council, and at least one member under the age of 21 at the time of appointment. Members of the advisory committee shall be entitled to compensation and expenses as provided by ORS 292.495.
(2) The members shall be appointed to serve for terms of four years each. A vacancy on the committee shall be filled by appointment by the Governor for the unexpired term.
(3) The committee shall meet regularly four times a year, at times and places fixed by the chairman of the committee. The committee may meet at other times upon notice by the chairman or three members of the committee. The department shall provide office space and personnel to assist the committee as requested by the chairman, within the limits of available funds. The committee shall adopt rules to govern its proceedings and may select officers it considers necessary

Note: On June 14, 1995, the Oregon Transportation Commission recognized the committee as the Oregon Bicycle and Pedestrian Advisory Committee, to recognize their contributions to pedestrian issues

802.325 *Bicycle* safety program; contents; fees.(1) The Department of Transportation, in consultation with the Transportation Safety Committee, shall establish a *bicycle* safety program that complies with this section to the extent moneys are available for such program. The program established may include the following:
(a) *Bicycle* safety promotion and public education.
(b) Advice and assistance for *bicycle* safety programs operated by government or non-government organizations.
(c) Classroom instruction and actual riding instruction necessary to teach safe and proper operation of *bicycles*.
(d) *Bicycle* education and information that assist police agencies in the enforcement of *bicycle* laws.
(e) Other education or safety programs the department determines will help promote the safe operation of *bicycles*, promote safe and lawful riding habits and assist in accident prevention.
(f) The department may charge a fee for services provided under the program. Any fee charged by the department under this paragraph shall be established by rule and shall not be in an amount that will discourage persons from participating in safety programs offered by the department under this section.
(2) The department shall act as a liaison between government agencies and advisory committees and interested *bicyclist* groups.

(3) The department may accept donations and solicit grants to enable the department to carry out the functions of this section.

11. MISCELLANEOUS STATUTES

166.025 Disorderly conduct. (Abridged) (1) A person commits the crime of disorderly conduct if, with intent to cause public inconvenience, annoyance or alarm, or recklessly creating a risk thereof, the person: (...) (d) Obstructs vehicular or *pedestrian* traffic on a public way; (2) Disorderly conduct is a Class B misdemeanor.

814.100 Rights of driver and passengers of disabled vehicle on freeway. On a freeway on which *pedestrian* traffic is prohibited, the driver and passengers of a disabled vehicle stopped on the freeway may walk to the nearest exit, in either direction, on that side of the freeway upon which the vehicle is disabled, from which telephone or motor vehicle repair services are available.

814.110 Rights for blind or blind and deaf *pedestrians*. (1) This section establishes rights for *pedestrians* who are blind or blind and deaf. The rights established by this section are enforced by ORS 811.035 and 814.120. The following definitions apply to this section and to ORS 811.035 and 814.120:
(a) "Blind person" means a person who has 20/200 vision or less, or a visual field of 20 degrees or less.
(b) "Dog guide" means a dog that is wearing a dog guide harness and is trained to lead or guide a blind person.
(c) "White cane" means a cane or walking stick that is white in color or white with a red tip.
(2) This section and ORS 811.035 and 814.120 grant and enforce the following rights for *pedestrians* who are blind or blind and deaf:
(a) A blind or blind and deaf person may carry and use a white cane on the highways and other public places of this state for the purposes of identification and mobility.
(b) Any blind person who is deaf may use a white cane marked by a six-inch wide chartreuse colored strip at the tip end.
(3) A blind or blind and deaf *pedestrian* who is not carrying a white cane or not accompanied by a dog guide has all the rights and privileges granted by law to all *pedestrians*.

814.120 Unlawful use of white cane; penalty. (1) A person commits the offense of unlawful use of a white cane by a sighted person if the person uses or carries a white cane on the highways or any other public place of this state and the person is not blind or blind and deaf.
(2) This section is subject to the provisions and definitions relating to the rights of *pedestrians* who are blind or blind and deaf under ORS 814.110.
(3) The offense described in this section, unlawful use of a white cane by a sighted person, is a Class C traffic infraction.

12. SELECTED OREGON ADMINISTRATIVE RULES (OAR) THAT PERTAIN TO BICYCLISTS & PEDESTRIANS:

Prohibition of Non-Motorized Vehicles on Freeways

734-20-045 (1) Non-motorized vehicles are prohibited upon the following segments of freeways within the State of Oregon:
(a) Portland area:
(A) The Columbia River Highway No. 2 (Banfield/I-84) from its intersection with I-5, MP 0.00, to 122nd Avenue, MP 10.25, east bound, and to Sandy Boulevard, MP 15.14, west bound;
(B) The Sunset Highway No. 47 easterly of the Jefferson Street Interchange, MP 73.35;
(C) Interstate 5 (Hwy. No. 1) from the Beaverton-Tigard Highway Interchange, MP 292.20, to the Delta Park Interchange, MP 306.70;
(D) Interstate 205 (Hwy. No. 64) northerly of the Overcrossing of the Oswego Highway No. 3, MP 8.82;
(E) Interstate 405 (Hwy. No. 61) in its entirety; and
(F) Lower Columbia Highway No. 2W from its intersection with I-405, MPÊ0.00, to 23rd Street, MP 1.99.
(b) Medford area: Interstate 5 (Pacific Highway No. 1) from the Barnet Road

Interchange, MP 27.58, to the Crater Lake Highway Interchange, MP 30.29 (in Medford).

(2) The closure of the above sections to nonmotorized vehicles shall become effective following the erection of adequate signing.

Bicycle Lane Definition

734-20-055 A *bicycle* lane as defined by ORS 801.155 (6) shall be separated from the adjacent roadway by a single, solid eight-inch wide white stripe.

Design and Construction of Bikeways

734-20-060 (1) The Department of Transportation adopts by reference The American Association of State Highway and Transportation Officials, "Guide for the Development of Bicycle Facilities", (Guide), dated August, 1991, to establish bikeway design and construction standards, to establish guidelines for traffic control devices on bikeways including location and type of traffic warning signs and to recommend illumination standards, all in accordance with and pursuant to ORS 366.514, 184.616, 184.619, and 366.205.

(2) The following constitute supplements and exceptions to the August, 1991 Edition of the "Guide for the Development of Bicycle Facilities":

(a) Signing and Marking:

(A) All *bicycle* signing and markings on the State Highway System or installed on local city streets or county roads under state contract or agreement shall be in conformance with the current Department of Transportation "Sign Policy and Guidelines for the State Highway System" and the "Traffic Line Manual". Any signing or markings not included in these guidelines or manual, but which is deemed necessary and required for the *bicycle* facility shall conform to the Manual on Uniform Traffic Control Devices as adopted by the Oregon Transportation Commission;

(B) The standard width longitudinal painted solid line separating the motor vehicle travel way and a bike lane shall be a solid nominal eight-inch wide white stripe as required by OAR 734-20-055; and

(C) The desirable width for a one-way bike lane on the State Highway System or installed on local city streets or county roads under state contract or agreement is six feet. Where six feet is not practical to achieve because of physical or economic constraints, a minimum width of four feet may be designated as a bike lane.

(b) Definitions: For the purpose of this rule and the Guide, the definitions on pages two and three of the Guide shall control, rather than any conflicting statutory or rule definitions. Terms not defined in the Guide shall be given their ordinary every day interpretation, even if defined otherwise for use in specific chapters in the Oregon Revised Statutes.

Bicycle Racing

General Policy

734-20-155 It is the policy of the Oregon Transportation Commission to establish uniform statewide criteria for conducting *bicycle* racing on the state highway system. Pursuant to ORS 810.090, all persons or organizations desiring to conduct any form of *bicycle* racing on the state highway system shall comply with the regulations, conditions, and guidelines imposed by these administrative rules.

Definitions

734-20-160 "Bicycle Racing" means any competitive or timed-*bicycle* event. These rules apply to the following *bicycle* racing definitions:

(1) Biathlons/Triathlons and Other Competitions - Biathlons/Triathlons and other competitions which have a competitive or timed-*bicycle* component are included as a form of *bicycle* racing.

(2) Criteriums - Criteriums are massed-start, high-speed *bicycle* events in which riders race around a closed-circuit course to compete for order of finish. Criteriums are usually held on closed urban or suburban public streets and the circular course is normally one-half to one mile in length.

(3) Road Races - Road races are massed-start, point-to-point *bicycle* events in which riders compete for order of finish. They are usually held on suburban or rural courses which may be point-to-point, one large circuit, or repeated shorter circuits.

(4) Time Trials - Time trials are events in which each *bicycle* rider rides the same route and distance (usually on an out-and-back or circuit course) separately, with individual times being recorded to determine finish order. Normally, the riders are started at pre-set intervals.

Bicycle Racing Permits Required

734-20-165 All persons or organizations desiring to conduct any form of *bicycle* racing on the state highway system shall apply for a *bicycle* race permit from the appropriate Highway Division District Manager at least 60 days prior to the event. The District Manager may waive this 60-day requirement under special conditions. No *bicycle* race event may be held without an approved *bicycle* race permit.

Permit Conditions

734-20-170 (1) Approval of *bicycle* racing events shall be granted only under conditions which assure reasonable safety for all race participants, spectators and other highway users, and which prevent unreasonable interference with traffic flow which would seriously inconvenience other highway uses. Reasonable safety implies that the racers, spectators and other highway users have been accommodated in planning in such a manner as to minimize the possibility of placing one in conflict with the other.

(2) Requests for approval of *bicycle* race events must include a race description stating all information pertinent to an understanding of the event. The request must include a map showing the roadways on which the race will be held.

(3) If the race course involves other road authorities, approvals must also be obtained and coordinated with those road authorities.

(4) In the event the race course only crosses a state highway, the District Manager may waive the need for a state *bicycle* race permit, providing the race permit from the other road authority assures reasonable traffic control and safety at that highway crossing.

(5) Bicycle racing will normally not be allowed on the Interstate Highway system.

(6) The permittee shall provide indemnification for the State of Oregon.

(7) The permittee shall provide insurance coverage in an amount and to the extent required in the permit.

(8) Requests for *bicycle* race permits must comply with the current Highway Division "Guidelines for Administration of Bicycle Racing on Oregon Roads". A copy of the referenced guidelines may be obtained from any State Highway Division Maintenance office or from the Bicycle and Pedestrian Program, 210 Transportation Building, Salem, OR 97310.

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