American Association of State Highway and Transportation Officials

SECOND 2 EDITION

Guide for the Planning, Design, and Operation of Pedestrian Facilities



December 2021

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Chapter 1

Introduction

Walking is the oldest and most basic mode of travel and is a fundamental part of the United States transportation system. Walking includes pedestrians of all types, including pedestrians with disabilities and pedestrians using assistive mobility devices. The *Manual on Uniform Traffic Control Devices* (MUTCD) (FHWA, 2009) explicitly defines pedestrians as a mode of traffic. The American Association of State Highway and Transportation Officials' (AASHTO's) *A Policy on Geometric Design of Highways and Streets* (AASHTO, 2018a), known commonly as the AASHTO *Green Book*, encourages roadway designers to provide for pedestrians:

"Interactions of pedestrians with traffic are a major consideration in highway planning and design" (AASHTO, 2018a).

Cooperation among many different stakeholders is needed to reach desired levels of safety, operations, and comfort for pedestrians. Additionally, we need to change how we design streets and highways and how we manage future growth and reshape existing urban areas. In many parts of the country, communities have already begun to change land use planning and urban design practices to accommodate and encourage walking, bicycling, and transit use.

Safety is a key consideration in the planning, design, and operation of pedestrian facilities. Because pedestrians are the most vulnerable of all transportation facility users, particular attention to pedestrian safety is necessary. Designers generally strive to meet objective safety benefits by meeting nominal design standards or through a crash analysis; however, perceived safety should also be considered when planning and designing for pedestrians. Perceived safety is the perception of how safe a person *feels* on the transportation system and can have significant effects on how they use the facilities provided. Assessment of perceived safety for the same site will vary between observers. Perceived safety is analogous to "subjective" safety as defined by the AASHTO *Highway Safety Manual* (AASHTO, 2010).

Accessibility and usability are also key considerations for pedestrian facilities, which should accommodate pedestrians of all ages and abilities. Pedestrians should be provided safe and convenient travel opportunities between traffic generators, such as homes, workplaces, businesses, schools, houses of worship, post offices, libraries, parks, playgrounds, and other destinations. Pedestrians with disabilities using assistive mobility devices must be allowed to go anywhere other members of the public are allowed to go. Power-driven mobility devices may be prohibited where they cannot safely be used as long as alternative methods for persons with disabilities to access specific services are provided (DOJ, 2010).

1.1 Purpose

The purpose of this guide is to provide information on the planning, design, and operation of pedestrian facilities along streets and highways and on independent alignments. The MUTCD (FHWA, 2009) defines a pedestrian as "a person on foot, in a wheelchair, on skates, or on a skateboard." This is the definition that

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will be used in this guide as well. This guide focuses on pedestrian facilities in the public right-of-way and addresses concepts and recommendations for site design and parking area design. This guide also recognizes the profound effect that land use planning and site design have on pedestrian mobility and addresses these topics, as well.

The primary audience for this guide is transportation professionals at the state and local levels: planners, roadway designers, and transportation engineers. These individuals make the majority of the decisions affecting pedestrian facilities on a daily basis.

This guide is not intended to be a detailed design manual to supersede the need for the application of sound principles by knowledgeable transportation professionals, nor is it intended to eliminate the flexibility needed to encourage independent designs tailored to particular situations (FHWA, 2013b). Engineering judgment based upon knowledge of pedestrian facility planning, operations, and design is needed from highway agencies to select appropriate pedestrian facilities.

This guide provides three levels of design guidelines:

1. Where design values are clearly and authoritatively established as requirements either through legislation, such as the American with Disabilities Act (ADA) (U.S. Access Board, 1990), or through standards, such as the MUTCD, design guidelines are provided using words such as *required*, *must*, and *shall*.

2. Where there is a significant body of research to support design guidance on a particular issue or topic, specific design values and recommendations are provided as *guidance*, using words like *should*.

3. Where reliable research is not available to suggest a definitive guidance statement, design *recommendations* are based upon consensus and expert opinion.

There will be instances where it is appropriate for designs to vary from the guidance presented in this guide. In some cases, application of the guidance in this guide will be limited by constraints placed on the design by the environment, budgets, or policy decisions. Designers are encouraged to document the reasons for varying from the guidance presented in this guide in their design files.

1.2 Scope

Information in this guide is presented in four chapters:

Chapter 1, Introduction—This chapter presents the purpose and scope of the guide and its relationship to other documents.

Chapter 2, Planning for Pedestrians—This chapter includes a discussion of pedestrian activity in America, characteristics of pedestrians, transportation planning for pedestrians, and the relationship between land use and pedestrian activity.

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Chapter 3, Pedestrian Facility Design—This chapter addresses topics related to pedestrian facility design including the following:

- types of pedestrian facilities;
- the design of longitudinal features such as sidewalks, shoulders, and shared-use paths;
- design of pedestrian crossings; and
- design of intersections.

While the MUTCD serves as the national standard for all traffic control devices installed on any street, highway, or bikeway open to public travel, Chapter 3 includes some discussion of their application. Chapter 3 also includes information on transit, and Chapters 3 and 4 address temporary traffic control zones.

Chapter 4, Pedestrian Facility Operations, Maintenance, and Construction—This chapter addresses the maintenance of pedestrian facilities and ongoing operational concerns such as signal timing and coordination with transit. It also discusses the requirement for maintaining pedestrian access routes during maintenance and construction operations.

The scope of this guide includes planning, design, and operation of both existing and new pedestrian facilities. This guide is not intended to set forth strict standards except those that have been set authoritatively through legislation, but to present sound guidelines that provide for the needs of pedestrians and other roadway users. Where deviations from these standards or from an agency's guidelines are needed, the deviations should be based on an engineering study (and possibly public involvement). The rationale for not conforming to this guide or an agency's guidelines should be documented.

> Appropriate accommodation of pedestrian travel is a major consideration in roadway planning and design. Pedestrians are a part of every roadway environment, and attention should be paid to their presence in rural as well as urban areas. The urban pedestrian, being far more prevalent, more often influences roadway design features than the rural pedestrian does. Because of the demands of vehicular traffic in congested urban areas, it is often very difficult to make adequate provisions for pedestrians. Yet provisions should be made, because pedestrians are the lifeblood of our urban areas, especially in the downtown and other retail areas. In general, the most successful shopping areas are those that provide the most comfort and pleasure for pedestrians.…Pedestrian facilities include sidewalks, crosswalks, traffic control features, and curb cuts (depressed curbs and ramped sidewalks) and ramps for the older walkers and persons with mobility disabilities. Pedestrian facilities also include bus stops or other loading areas, sidewalks on grade separations, and the stairs, escalators, or elevators related to these facilities.
>
> *A Policy on Geometric Design of Highways and Streets*, Section 2.6 Pedestrians, Subsection 2.6.1 General Considerations (AASHTO, 2018a)

Designing pedestrian facilities involves balancing safety; mobility; preservation of scenic, aesthetic, historic, cultural, and environmental resources; and cost. These considerations should also be balanced within the constraints of design standards and guidelines. Good engineering judgment is needed to achieve this balance and provide pedestrian facilities that are welcoming, safe, and accessible.

1.3 Relationship to Other Documents

This guide is not intended to be all-inclusive with regard to pedestrian facility planning and design. The most recent editions of the following documents include pertinent information on pedestrian facility planning and design and should be used in conjunction with this guide. Additional documents are referenced throughout this guide.

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A Policy on Geometric Design of Highways and Streets (Green Book)

The current edition of AASHTO's *A Policy on Geometric Design of Highways and Streets* (AASHTO, 2018a), commonly known as the *Green Book*, was published in 2018. The *Green Book* (see Figure 1-1) provides direction to the engineering and planning community on appropriate design measures for roadways. The *Green Book* also provides general direction on pedestrian facility design elements such as sidewalk separation from the roadway, sidewalk widths, curbs, medians, and islands.

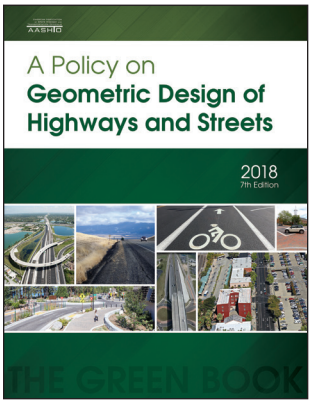


Figure 1-1. AASHTO's *A Policy on Geometric Design of Highways and Streets (Green Book)* (AASHTO, 2018a)

Manual on Uniform Traffic Control Devices

The Federal Highway Administration (FHWA), with assistance from the National Committee on Uniform Traffic Control Devices (NCUTCD), adopted the current edition of the *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD) (FHWA, 2009) (see Figure 1-2) in 2009. Pedestrian provisions in the MUTCD are located in all nine parts of the manual. In general, the manual provides standards for the use of traffic control devices, including the design of pedestrian signs and signals. It includes warrants for the application of traffic signals. The MUTCD is the national standard for all traffic control devices installed on streets, highways, bikeways, and private roads open to public travel. All of the states have adopted the MUTCD or a document in substantial compliance with the MUTCD as their standards for the implementation of traffic control devices.

The text of this guide makes occasional reference to signs. For signs included in the MUTCD, the MUTCD sign designation is shown after the sign name (e.g., stop sign [R1-1]).

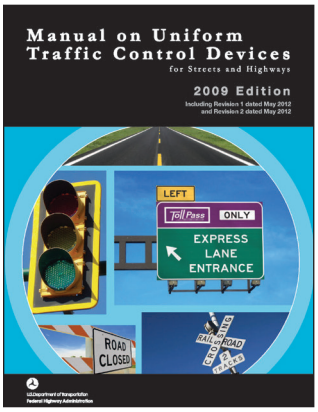


Figure 1-2. *Manual on Uniform Traffic Control Devices* (MUTCD) (FHWA, 2009)

Guide for the Development of Bicycle Facilities

The current edition of the AASHTO *Guide for the Development of Bicycle Facilities* (AASHTO, 2012), commonly known as the AASHTO *Bicycle Guide* (see Figure 1-3) was published in 2012. While the *Bicycle Guide*'s main focus is the provision of facilities for bicyclists, it also provides design guidelines for shared-use paths, which also accommodate pedestrians.

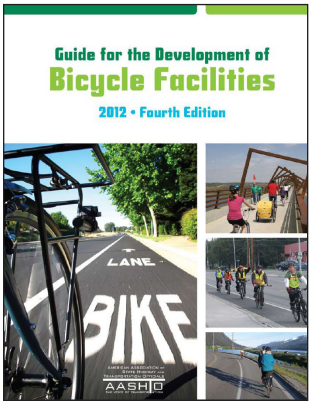


Figure 1-3. AASHTO's *Guide for the Development of Bicycle Facilities* (AASHTO *Bicycle Guide*) (AASHTO, 2012)

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LRFD Guide Specifications for the Design of Pedestrian Bridges

The guide specifications in the AASHTO *LRFD Guide Specifications for the Design of Pedestrian Bridges* (AASHTO, 2009) address the design and construction of typical pedestrian bridges that are designed for and intended to carry primarily pedestrians, bicyclists, equestrian riders, and light maintenance vehicles, but not designed and intended to carry typical highway traffic (see Figure 1-4). Pedestrian bridges with cable supports or atypical structural systems are not specifically addressed.

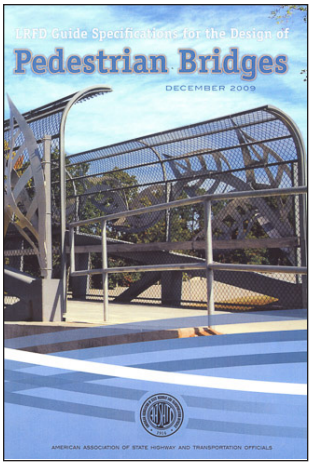


Figure 1-4. AASHTO's *LRFD Guide Specifications for the Design of Pedestrian Bridges* (AASHTO, 2009)

Highway Capacity Manual

The Transportation Research Board (TRB) published the most recent edition of the *Highway Capacity Manual* (HCM) (TRB, 2016) (see Figure 1-5) in 2016. The HCM provides direction on calculating the levels of service (LOS) for pedestrians on various widths of sidewalks and crosswalks based upon walking speed. It also outlines the effect of pedestrians on traffic delay at intersections. In addition, the HCM provides an alternative method for calculating the pedestrian LOS, which considers pedestrians' perceived levels of safety and comfort based on separation from the roadway, vehicle speeds and volumes, and intersection delay.

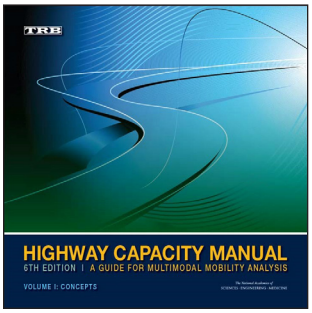


Figure 1-5. *Highway Capacity Manual* (HCM) (TRB, 2016)

Highway Safety Manual

The AASHTO *Highway Safety Manual* (HSM) (AASHTO, 2010) provides practitioners with current knowledge and methodologies to facilitate roadway design and operational decisions based on anticipated safety performance. The first edition of the HSM (see Figure 1-6) was published in 2010. The HSM provides tools to conduct quantitative safety analyses, allowing for safety to be evaluated alongside other transportation performance measures such as traffic operations, environmental impacts, and construction costs. Data related to pedestrians in the HSM are limited; however, AASHTO and TRB have identified pedestrian research as a priority area for future HSM editions. The HSM incorporates crash modification factors (CMFs) in its predictive methodology and provides estimates of reliable CMFs for a range of facility types. A CMF is an index of the expected change in crash frequency following a modification in design or traffic control. The Crash Modification Factors Clearinghouse includes a web-based database of CMFs and serves as an online repository of CMFs and can be used in conjunction with the HSM to help transportation engineers identify countermeasures for safety considerations. The HSM assists agencies in implementing Vision Zero and Toward Zero Deaths programs.

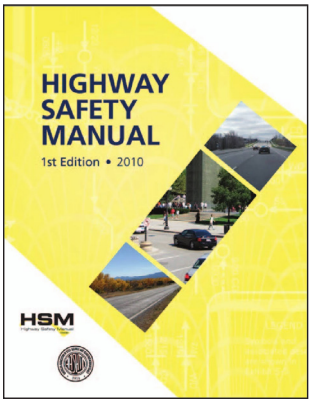


Figure 1-6. AASHTO's *Highway Safety Manual* (HSM) (AASHTO, 2010)

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Americans with Disabilities Act (ADA) Standards for Accessible Design

2010 Standards for Accessible Design (DOJ, 2010)

The Department of Justice (DOJ) published revised regulations for Titles II and III of the Americans with Disabilities Act of 1990 in the *Federal Register* on September 15, 2010. These regulations adopted revised, enforceable accessibility standards, called the "2010 ADA Standards for Accessible Design" (sometimes referred to as the "2010 Standards" or just the "Standards") (Figure 1-7). The 2010 Standards set minimum requirements—both scoping and technical—for newly designed and constructed or altered state and local government facilities, public accommodations, and commercial facilities to be accessible to and usable by individuals with disabilities. Under these ADA standards, where pedestrian facilities are provided, they must be accessible to and usable by pedestrians with disabilities. When an existing pedestrian facility is altered, the altered facility must be made accessible to and usable by pedestrians with disabilities to the maximum extent feasible and to the extent that it is not structurally impracticable to do so. Section 504 of the *Rehabilitation Act of 1973* (*Rehabilitation Act*, 1973), generally referred to as Section 504, includes similar requirements for public entities that receive Federal financial assistance.

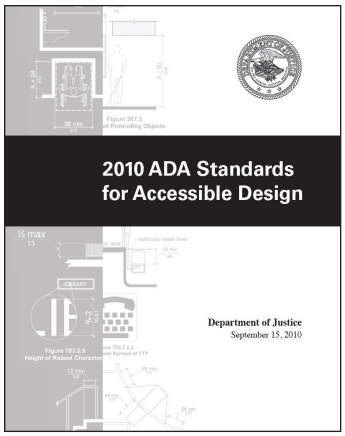


Figure 1-7. *2010 ADA Standards for Accessible Design* (DOJ, 2010)

2006 ADA Standards for Transportation Facilities (USDOT, 2006)

These ADA Standards issued by the U.S. Department of Transportation (USDOT or simply DOT) are referenced by DOT's 504 regulations at 49 CFR 27.3. Consequently, these standards apply to facilities used by state and local governments to provide designated public transportation services, including bus stops, bus stations, and rail stations. These standards are based on the Board's *ADA Accessibility Guidelines.*

The 2006 edition of these standards is consistent with the U.S. Access Board's updated ADA (and the Architectural Barriers Act [ABA]) guidelines, but includes a few additional requirements concerning:

- location of accessible routes,
- detectable warnings on curb ramps,
- bus boarding and alighting areas, and
- rail station platforms.

Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG) (U.S. Access Board, 2011)

The U.S. Access Board has proposed accessibility guidelines for the design, construction, and alteration of pedestrian facilities in the public right-of-way, which are often referred to by the acronym "PROWAG." The guidelines provide accessibility criteria for sidewalks, pedestrian street crossings, pedestrian signals, shared-use paths, and other facilities

> The Americans with Disabilities Act (ADA) recognizes and protects the civil rights of people with disabilities…The ADA covers a wide range of disability, from physical conditions affecting mobility, stamina, sight, hearing, and speech to conditions such as emotional illness and learning disorders...
>
> Under titles II and III of the ADA, the Board develops and maintains accessibility guidelines for buildings, facilities, and transit vehicles and provides technical assistance and training on these guidelines… The building guidelines cover places of public accommodation, commercial facilities, and State and local government facilities. The vehicle guidelines address buses, vans, a variety of rail vehicles, trams, and other modes of public transportation. Regulations issued by the Department of Justice (DOJ) and Department of Transportation (DOT) contain standards based on ADA Accessibility Guidelines (ADAAG) and also provide information on which buildings and facilities are subject to the standards. The regulations are to be used along with the design standards they contain or reference.
>
> (U.S. Access Board, 1990)

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for pedestrian circulation and use constructed or altered in the public right-of-way. The guidelines propose requiring that a pedestrian access route be provided within sidewalks and other pedestrian circulation paths located in the public right-of-way. A pedestrian access route is defined as a continuous and unobstructed path of travel provided for pedestrians with disabilities within or coinciding with a pedestrian circulation path. Compliance with the accessibility standards within PROWAG will be mandatory once the guidelines are adopted, with or without additions and modifications, as accessibility standards in regulations implementing the Americans with Disabilities Act, Section 504 of the Rehabilitation Act, and the Architectural Barriers Act. Since PROWAG has not yet been adopted as a regulation with which compliance is mandatory, proposed PROWAG requirements are treated in this guide as best practices or guidance that should be implemented.

While the PROWAG guidelines have not yet been adopted, public rights-of-way are still covered by ADA standards. Title II requires nondiscrimination in all programs, services, and activities of public entities. In the absence of a specific Federal standard, public entities may satisfy their obligation by complying with any applicable state or local law that establishes accessibility requirements for public rights-of-way equivalent to the level of access that would be achieved by complying with the *2010 ADA Standards* or *Uniform Federal Accessibility Standards* (UFAS).

> The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects.
>
> Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide—including health, safety, environmental, transportation, and quality of life—transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes.
>
> *USDOT Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations* (USDOT, 2010)

Numerous states and some local entities have adopted the proposed PROWAG as their accessibility standards for projects in the public right-of-way.

Uniform Vehicle Code

The *Uniform Vehicle Code* (UVC) (NCUTLO, 2000) was produced by the National Committee on Uniform Traffic Laws and Ordinances until 2000. The UVC was prepared as a suggested guide for state motor vehicle and traffic laws. The UVC reflected the need for uniformity in traffic regulation throughout the United States. Since its inception, the UVC was reviewed periodically and revised where warranted by new developments in state and Federal laws and by practical experience. While the UVC has not been officially updated since 2000 and is no longer being maintained, it is still a useful summary of typical state vehicle and traffic laws, and is referenced in Federal regulations. The National Committee on Uniform Traffic Control Devices has initiated efforts to review and possibly update sections of it more recently.

The UVC is referenced in this guide because it is referred to explicitly in Federal regulations. The exact text from the UVC is not used universally across the United States. However, most state vehicle codes are relatively consistent with the UVC. Consequently, the UVC is considered to represent typical vehicle codes when used as a reference in this guide.

Article V of the UVC is titled "Pedestrians' Rights and Duties," and contains the vast majority of information in the UVC related to pedestrians. In addition, Article II of the UVC contains a discussion of pedestrian control signals.

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Designing Walkable Urban Thoroughfares: A Context Sensitive Approach

This report from the Institute of Transportation Engineers (ITE) on *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach* (ITE, 2010) (see Figure 1-8) provides guidance for the design of walkable urban thoroughfares in places that currently support the mode of walking and where the community desires to provide a more walkable thoroughfare. The report focuses on applying the concepts and principles of context sensitive solutions in the planning and design of urban thoroughfares, commonly designated in the conventional functional classification system as arterials and collectors. The report was developed to improve mobility choices and community character through a commitment to creating and enhancing walkable communities.

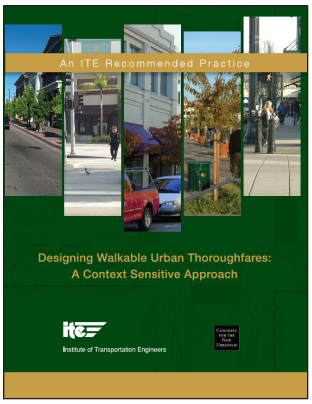


Figure 1-8. ITE's *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach* (ITE, 2010)

U.S. Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations

On March 11, 2010, the USDOT issued a policy statement entitled *U.S. Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations* (USDOT, 2010) to reflect the department's support for the development of fully integrated active transportation networks. The establishment of well-connected walking and bicycling networks is an important component for livable communities, and their design should be a part of Federal-aid project developments. Walking and bicycling foster safer, more livable, family-friendly communities; promote physical activity and health; and reduce vehicle emissions and fuel use. Legislation and regulations exist that require inclusion of bicycle and pedestrian policies and projects into transportation plans and project development. Accordingly, transportation agencies should plan, fund, and implement improvements to their walking and bicycling networks, including linkages to transit. In addition, DOT encourages transportation agencies to go beyond the minimum requirements, to proactively provide convenient, safe, and context-sensitive facilities that foster increased use by bicyclists and pedestrians of all ages and abilities and to utilize universal design characteristics when appropriate. Transportation programs and facilities should accommodate people of all ages and abilities, including people too young to drive, people who cannot drive, and people who choose not to drive.

> Bicycle and pedestrian ways shall be established in new construction and reconstruction projects in all urbanized areas unless one or more of three conditions are met:
>
> - bicyclists and pedestrians are prohibited by law from using the roadway. In this instance, a greater effort may be necessary to provide facilities for bicyclists and pedestrians elsewhere within the right-of-way or within the same transportation corridor.
> - the cost of establishing bikeways or walkways would be excessively disproportionate to the need or probable use. Excessively disproportionate is defined as exceeding twenty percent of the cost of the larger transportation project.
> - Where sparsity of population or other factors indicate an absence of need. For example, the *Portland Pedestrian Guide* requires "all construction of new public streets" to include sidewalk improvements on both sides, unless the street is a cul-de-sac with four or fewer dwellings or the street has severe topographic or natural resource constraints.
>
> USDOT *Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations* (USDOT, 2010)

1.4 State and Local Policies

States, metropolitan planning organizations (MPOs), and local jurisdictions have adopted policies and procedures to support pedestrian facilities design. The level of support ranges from standards mandating the inclusion of bicycle and pedestrian facilities to guidance documents that encourage the inclusion of pedestrian facilities.

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Complete Streets policies are one way that agencies can promote pedestrian facilities. When adopting a Complete Streets policy, states or communities direct their transportation professionals to make accommodation of all users common practice. The intent of these policies is to have every transportation project improve the street network for drivers, transit users, pedestrians, and bicyclists (NCSC, 2011). Actual policies vary with respect to states' or communities' desires, but all support pedestrian planning and design. Local and state Complete Streets policies should be reviewed and complied with when designing pedestrian facilities.

In addition to policies supporting pedestrian design, ADA Transition Plans help public agencies implement programs to upgrade pedestrian facilities that are inaccessible. The ADA required state and local governments to complete a self-evaluation of their facilities, programs, policies, and practices by January 26, 1995. The self-evaluation was to identify and correct policies and practices inconsistent with Title II's requirements. Self-evaluations were to consider all of an agency's programs, activities, and services, as well as the policies and practices an agency had put in place to implement its various programs and services. Remedial measures necessary to bring the programs, policies, and services into compliance with Title II were to be specified. These could include but were not limited to the following:

- relocation of programs to accessible facilities,
- offering programs in an alternative accessible manner,
- structural changes to provide program access,
- policy modifications to avoid discrimination, and
- auxiliary aids needed to provide effective communication.

Additionally, the ADA Transition Plans included components of public input and direct coordination with groups representing those with disabilities (DOJ, 2006).

A comprehensive Complete Streets policy:

- includes *a vision* for how and why the community wants to complete its streets.
- *specifies "all users"* to include pedestrians, bicyclists, and transit passengers of all ages and abilities, as well as trucks, buses, and automobiles.
- applies to both *new and retrofit projects*, including design, planning, maintenance, and operations, for the entire right-of-way.
- makes *specific exceptions* and sets a clear procedure that requires high-level approval of exceptions.
- encourages *street connectivity* and aims to create a comprehensive, integrated, connected network for all modes.
- is understood by all agencies to cover *all roads*.
- directs the use of the *latest and best design guidelines* while recognizing the need for flexibility in balancing user needs.
- directs that Complete Streets solutions will *complement the context* of the community.
- establishes *performance standards* with measurable outcomes.
- includes *specific next steps* for implementation of the policy.

National Complete Streets Coalition (NCSC, 2011)

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