

Seattle Pedestrian Master Plan

WORKING DRAFT

Pedestrian Issue Policy Review: Intersection Design

October 23, 2008

SvR/TDG

Introduction

Intersections are a critical element of the pedestrian environment. The layout of intersections affects visibility, accessibility, and pedestrian comfort traveling along and crossing streets in Seattle. Safe pedestrian crossing conditions are needed at signalized intersections, as well as at uncontrolled locations (crossings without a stop sign or traffic signal). Physical elements such as the width of the roads, curb radii, the presence of crosswalks, curb ramps, and pedestrian crossing islands impact a pedestrian's experience navigating intersections in Seattle. The volume and speed of motor vehicle traffic also impacts a person's experience crossing intersections on foot.

The geometric design of the intersection also impacts the pedestrian experience. The majority of streets in Seattle are arranged in a grid format that allows for compact intersections with right-angle crossings. This design provides the shortest crossing distance for the pedestrian, which minimizes their exposure to vehicular traffic. However, there are a number of important arterial roadways with wide intersections and many short connector streets that cut across the grid, creating skewed intersections. Skewed intersections that result in obtuse angles allow motorists to make right turns across the pedestrian travel way at higher speeds. At many locations around the city these intersections are uncontrolled along the arterial, which makes it difficult for a pedestrian to determine if a motorist is going to turn onto the local street or remain on the arterial. The resulting acute angle on the opposite side can limit sight distance between pedestrians and motorists.

Seattle's topography also impacts intersection design, motor vehicles may travel at higher speeds on downhill slopes or when accelerating to reach a crest of a hill. Hills also limit sight distances for both pedestrians and motorists.

Current Programs and Goals

Current Programs

Existing programs that impact intersections in Seattle are discussed below.

City of Seattle

- Department of Transportation
 - The *Sidewalk Development Program* coordinates the construction of new sidewalks at intersection and non-intersection locations throughout Seattle. The program administers the sidewalk prioritization policy, which prioritizes sidewalks in areas that have the most potential for people walking and that serve people for whom walking is a primary means of transportation. In many cases the prioritization process includes intersections in high pedestrian areas such as urban villages.
 - The *Traffic Signal Program* seeks to enable all traffic, including pedestrian traffic, on City streets to move as freely and smoothly as possible at all times. The signal operations team is made up of engineers who work with the existing network of streets, bridges, and highways to maintain and improve a

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functioning traffic system. Traffic signal design and timing has a significant impact on a pedestrian's experience crossing roadways at intersections.

- The *Safe Routes to School Program* aims to improve pedestrian and bicycle safety near schools through education, encouragement, enforcement, and engineering efforts. Intersection improvements are often undertaken as part of an effort to improve safety along designated school walking routes.
 - The *Pedestrian Program* seeks to improve pedestrian safety and to encourage more walking by creating an environment where pedestrians can walk safely and comfortably. The program implements infrastructure improvements to curb ramps, crosswalks, curb bulbs, crossing islands, and other treatments to improve the pedestrian experience crossing intersections.
 - The *Neighborhood Traffic Control Program* seeks to calm traffic on residential streets, thereby creating safer, more pleasant neighborhoods. The program is responsible for features such as traffic circles and curb bulbs, which improve intersections throughout Seattle as well as education programs aimed at changing behavior.
 - The *Urban Forestry and Arborist's Office* combines educational and regulatory efforts to maintain proper planting, pruning, and removal practices along City of Seattle streets. The planting and pruning of trees and landscaping around intersections can have an important impact on pedestrians, for example by affecting sight lines.
 - The *Parking Program* addresses all topics related to the City's management of on-street parking and curb space use. The regulation and enforcement of parking near intersections can impact pedestrians, for example by affecting sight lines and obstructing crosswalks.
 - *Sidewalk Repair Program*.
- Planning and Development Department
 - *Seattle City Planning* engages citizens in an ongoing dialogue about Seattle's future and plays a central role in guiding the long-term development of the built and natural environment. Many of DPD's initiatives, including the development of sub-area and urban design plans and work with the Seattle Planning Commission and the Seattle Design Commission, impact the vision for future development in the city.
 - DPD's permit-related work impacts intersections, for example through public notice and involvement for master use permits, design review, permit approval for construction, site development, and approval for signs and billboards.
 - DPD's compliance-related work also impacts intersections, for example responding to land use violations and addressing building code, site development, and other technical code violations.
 - The Parks and Recreation Department establishes a vision and guides decisions for the City's parks system, as well as providing education and encouragement efforts throughout the city. Many of these efforts focus on enhancing access to parks, which in some cases involves improving pedestrian conditions at intersections.

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- The Police Department establishes enforcement efforts throughout the city, including crosswalk violations and dangerous driver behavior, as well as parking enforcement near intersections.
- The Office of Sustainability and the Environment collaborate with City agencies, business groups, nonprofit organizations, and other partners to protect and enhance Seattle's environmental quality and livability. Certain intersection improvements such as landscaped curb extensions could contribute to the sustainability goals of the office and the city.
- Seattle Public Schools provides for academic achievement for every child in every school, seeking to raise academic standards, set clear and consistent expectations for students, and transform schools.

Regional

- The Puget Sound Regional Council works with Seattle government, business, and citizens to build a common vision for the region's future, expressed through three connected major activities: VISION 2040, the region's growth strategy, Destination 2030, the region's comprehensive long-range transportation plan; and Prosperity Partnership, which develops and advances the region's economic strategy. These documents provide the regional argument for infrastructure improvements, for example at intersections, to encourage travel mode splits, decreases in vehicle miles traveled, and other pedestrian-related goals.
- King County provides regional services to all residents of the county, including people who live in cities.
- Public Health Seattle King County seeks to protect and improve the health and well-being of all people in King County, as defined by per person healthy years lived. The organization employs strategies, policies, and interventions to reduce health disparities. Improvements at intersections can encourage and enable people in all neighborhoods to walk more, which can contribute to improved health outcomes.

Washington Department of Transportation

- The Washington Department of Transportation plans, designs, builds and maintains intersections on state roads in Seattle. It also provides design guidelines that impact intersections, for example in its Design Manual, Americans with Disabilities Act (ADA) design guidelines assistance with Standard Plans and specifications, Accessible Public Rights-of-Way Planning and Design for Alterations, and through its traffic design and urban design policies.
- The WDOT Pedestrian and Bicycle Program coordinates the statewide vision for pedestrian transportation and provides safety resources, funding, and educational opportunities to encourage walking throughout the State of Washington. It provides funding for pedestrian projects as well as pedestrian design information and other resources.

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- WDOT's Accessible Transit efforts include the coordination and provision of accessible transit services for those who can't access regular transit service.

Federal Government

- The Federal Highway Administration is charged with the broad responsibility of ensuring that America's roads and highways, and the intersections in between, continue to be the safest and most technologically up-to-date.
- The U.S. Government established the Americans with Disabilities Act (ADA) in 1990. Its implementing regulations, issued by the Department of Justice (DOJ) in 1991, require that all new and altered facilities, including sidewalks, street crossings, and related pedestrian facilities in the public right-of-way, be accessible to and usable by people with disabilities. Among other things, the Americans with Disabilities Act Accessibility Guidelines (ADAAG) provide the necessary guidance for the design and construction of pedestrian facilities at intersections.

Goals

Intersection-related goals that were identified in the planning process and that are outlined in the Comprehensive Plan and the Transportation Strategic Plan are highlighted below.

- Goals identified in the planning process
 - Reduce crossing distances by implementing road diets, curb extensions, and other design strategies.
 - Provide pedestrian crossing islands at some locations to reduce crossing distances and enable pedestrians to only have to cross one direction of traffic at a time.
 - Slow motor vehicle turning speeds at intersections.
 - Enhance motor vehicle and pedestrian sight lines at intersections.
 - Design curb radii to create sharper turns to slow traffic.
- Seattle Comprehensive Plan
 - T1: Design transportation infrastructure in urban villages to support land use goals for compact, accessible, walkable neighborhoods.
 - TG2: Manage the street system safely and efficiently for all modes and users and seek to balance limited street capacity among competing uses.
 - TG3: Promote safe and convenient bicycle and pedestrian access throughout the transportation system.
 - TG16: Create and enhance safe, accessible, attractive and convenient street and trail networks that are desirable for walking and bicycling.
 - CA-P8: Promote capital improvements that encourage "pedestrianism" among residents, employees, and shoppers. Use all area streets and sidewalks as avenues to walk to work, school, recreational facilities, shopping districts, and visit neighbors. Provide for pedestrian convenience and priority at signalized intersections using Transportation Strategic Plan strategies. Preserve residential area street ends and stairways for public access.

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- P/P-P20: Strive to enhance awkward intersections where streets come together at odd angles for use as unique urban plazas and strive to improve pedestrian safety along Madison and elsewhere.
- Transportation Strategic Plan
 - W1. Make Street Crossings Safer and Easier.
 - Reducing effective street crossing distance for pedestrians by providing curb extensions, raised pedestrian islands or reducing four-lane undivided road sections to two through lanes with left-turn pockets with sidewalks; Providing raised medians on multi-lane roads;
 - Installing traffic calming measures on neighborhood streets to slow vehicle speeds or reduce cut-through traffic;
 - Providing adequate nighttime lighting for pedestrians;
 - Redesigning intersections with crossing islands and tighter turn radii;
 - Using innovative signs, signals and markings.
 - W1.1. Install Marked Crosswalks at Signalized and Unsignalized Intersections Where Appropriate
 - W4. Use Traffic Signals and Their Associated Features to Improve Pedestrian Safety

Applicable/Related Regulations – Guidelines

Selected regulations and guidelines that impact intersections in Seattle are outlined below.

- Seattle Municipal Code
 - SMC 11.55.100: Obedience to no-turn signs. Whenever signs are erected indicating that no right or left or U turn is permitted, no person shall disobey the directions of any such signs; except, that at those intersections where there are authorized signs exempting transit coaches from the directions of a no-left-turn sign, the operators of taxicabs shall also be exempt from the directions of such sign; except that the above exception shall not apply to the intersection of Northeast 45th Street and University Way.
 - SMC 11.66.060: Blocking intersections and crosswalks. No person who is responsible for the operation of any railroad train or car shall stop the same within an intersection or on a crosswalk except to avoid accident or upon direction of a peace officer.
 - SMC 23.22.100: Design standards. D. Design Standards for Pedestrian Access and Circulation. Design of sidewalks and private sidewalk easements for pedestrian access and circulation shall meet the standards of the Right-of-Way Improvement Manual.
 - SMC 11.40.100: Prohibited crossing near signals. No pedestrian shall cross the roadway between adjacent intersections at which traffic-control signals are in operation, except in a marked crosswalk. (RCW 46.61.240 (3))
 - SMC 11.50.320: Stop intersections. A. Every driver of a vehicle approaching a stop sign shall stop at a marked stop line, or if none, before entering a marked crosswalk on the near side of the intersection or, if none, then at the point nearest the intersecting roadway where the driver has a view of

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- approaching traffic on the intersecting roadway, unless directed to proceed by a person duly authorized to regulate traffic.
- SMC 11.14.266: Intersection control area. "Intersection control area" means an intersection, together with such modifications of the adjacent roadway area as result from the arc of curb corners, and together with any marked or unmarked crosswalks adjacent to the intersection. (Statutory reference: RCW 46.04.240.)
 - SMC 11.16.340: Traffic Engineer -- Authority -- Traffic-control devices. D. Determine and order the marking of crosswalks at intersections or at such other places where the Traffic Engineer deems it appropriate for the identification of the crossing location; E. Determine and order the closure of certain crosswalks to pedestrians;
 - SMC 11.40.150: Prohibited use of crosswalks. No pedestrian shall cross a roadway in any crosswalk where a traffic or pedestrian-control sign prohibits such crossing. (RCW 46.61.240(5))
 - SMC 11.52.100: Speed limit -- School or playground crosswalks or school or playground zones. Subject to Section 11.52.020 A, and except in those instances where a lower maximum speed is provided by this subtitle, no person shall operate any vehicle at a speed in excess of twenty (20) miles per hour when passing any marked school or playground crosswalk or when within any marked school or playground zone when such marked crosswalk or zone is fully posted with school speed limit signs or playground speed limit signs. The speed zone at the crosswalk shall extend three hundred (300) feet in either direction from the marked crosswalk, and the school or playground zone may extend three hundred (300) feet from the border of the school or playground, but may include only area consistent with active school or playground use. (RCW 46.61.440)
 - SMC 11.14.650: Traffic-control devices. "Traffic-control devices" means all signs, signals, markings, curb markings, cross-hatchings, buttons and other devices officially placed or erected for the purpose of regulating, warning or guiding traffic. (RCW 46.04.611)
 - SMC 11.40.040: Right-of-way in crosswalk. When traffic-control signals are not in place or not in operation, the operator of an approaching vehicle shall stop to allow a pedestrian using an unmarked or marked crosswalk or a disabled person using a curb ramp as provided in Section 11.40.090 to cross the roadway when the pedestrian or disabled person is upon the half of the roadway upon which the vehicle is traveling, or when the pedestrian or disabled person is upon the opposite half of the roadway and moving toward the approaching vehicle. This section shall not apply to pedestrians crossing a roadway at a point where an accessible pedestrian tunnel or overhead pedestrian crossing has been provided.
 - SMC 11.50.070: Obstructing traffic at traffic-control signals. No driver shall enter an intersection or a marked crosswalk unless there is sufficient space on the other side of the intersection or crosswalk to accommodate the vehicle he is operating without obstructing the passage of other vehicles or pedestrians, notwithstanding any traffic-control signal indication to proceed. (UVC 11-1112-1971)

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- SMC 11.50.300: "Wait" pedestrian-control signal. Pedestrian-control signals having the "WAIT" legend in use shall mean the same as the "DON'T WALK" legend. (RCW 46.61.060(3))
 - SMC 11.14.315: Marked crosswalk. "Marked crosswalk" means any portion of a roadway distinctly indicated for pedestrian crossing by lines or other markings on the surface thereof. (RCW 46.04.290)
 - SMC 11.14.445: Pedestrian. "Pedestrian" means any person afoot or in a wheelchair, whether motorized or not. (RCW 46.04.400)
 - SMC 11.14.450: Pedestrian zone. "Pedestrian zone" means the area or space officially set apart within a roadway for the exclusive use of pedestrians and which is protected or is marked or indicated by painted marks, signs, buttons, standards, or otherwise, so as to be plainly discernible.
 - SMC 11.40.020: Subject to traffic regulations. Pedestrians shall be subject to traffic-control signals as provided in Chapter 11.50 and to the direction of officers discharging the duty of directing traffic. (RCW 46.61.230)
 - SMC 11.40.060: Prohibited crossing. No pedestrian shall suddenly leave a curb or other place of safety and move into the path of a vehicle which is so close that it is impossible for the driver to stop.
 - SMC 11.14.465: Physical barrier. "Physical barrier" means a continuous raised barrier, raised median island or curb installed in a roadway.
 - SMC 11.40.420: Pedestrian right-of-way. The City Council may by ordinance designate streets upon which pedestrians will be granted right-of-way over vehicles using that street.
 - SMC 11.40.220: Walking on sidewalk. Where there are sidewalks provided, no pedestrian shall move along and upon an adjacent roadway. Where sidewalks are provided but wheelchair access is not available, disabled persons may move along and upon an adjacent roadway until they reach an access point in the sidewalk.
- SDOT Director's Rules
 - Director's Rule 04-01: Installation Criteria and Procedures for Responding to Requests for Safety Improvements regarding: Marked Pedestrian Crosswalks; General Traffic Control Signals; Pedestrian Traffic Signals; Pedestrian Traffic Signals for the Disabled or Senior Citizens; and Pedestrian Traffic Signals to Accommodate School Crossings
 - The Seattle, Washington "Marked Pedestrian Crosswalks" Policy/Director's Rule #01-02
 - SDOT Director's Rule 2-07. Green Streets.
 - Design Guidelines and Review Process
 - SDOT Director's Rule 2-05. The Right-of-Way Improvements Manual, Chapters 3 and 4
 - Director's Rule 2004-02. Street and Sidewalk Pavement Opening and Restoration Rules
 - DPD Director's Rules
 - 38-82 Pedestrian Access Bridges
 - 11-2007 Green Streets: Design Guidelines and Review Process

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- 10-2006 Clarifying when administrative design review is required in order to save exceptional trees in low-rise, mid-rise, and commercial zones.
- 22-2005 Right of Way Improvements Manual, Chapters 3 & 4
- 14-2002 Transportation Management Programs
- Seattle Design Guidelines for Link Light Rail, Various Stations
- 7-94 Design Review Program
- 16-88 Applications to Place Tables and Chairs on Public Sidewalks
- Right-Of-Way Improvements Manual
 - A new curb ramp is required whenever more than 3 lineal feet of curb or 12 square feet of sidewalk was being added, repaired, or replaced at the pedestrian landing area.
 - Curb ramps: Two compliant curb ramps with tactile warning strips are required to be installed at each impacted corner and corresponding compliant companion ramps need to be retrofitted or constructed. Curb ramps and companion ramps are required whenever more than 3 lineal feet of curb or 12 square feet of sidewalk is being added, repaired, or replaced at the pedestrian landing area. If a street paving impacts legal crossing path or the landing modified, then curb ramps must either be retrofitted to comply with Standard Plan 422, or new ramps must be constructed that meet the current standard.
 - Curb ramp locations: Curb ramps are permitted only at legal crosswalk locations, at intersections, and at approved marked crosswalk locations. Legal crosswalks at intersections are defined by projections of the curb and back of sidewalk lines/right-of-way lines across the street or by a line 10 feet behind the face of the curb or roadway edge when there is no sidewalk. Curb ramps at any other location in the public right-of-way are subject to the approval of the Director of Seattle Department of Transportation.
 - Curb radius: In general, standard curb radius for street intersections are as follows: SDOT evaluates curb radii based on the type and volume of activity at the intersection. In all cases, with the exception of a location where a vehicle turn is illegal, SDOT will evaluate the curb radii based on a Single Unit (SU) vehicle with a 42 foot turning radius. An applicant may propose tighter curb radii, and will need to provide supporting documentation and have the request approved by the City Traffic Engineer. Refer to [Section 4.8.3 Design Intersection Considerations](#) for more information about curb radii.
 - Emergency vehicle signal priority: Signal priority for emergency vehicles will be included at all new signal installations, and is typically included for traffic signals that are being modified or updated.
 - Layout and grading of intersections: The layout and grading of an intersection must be accomplished so that water flows and the intersection is safe and accessible by pedestrians and safe for bicycle use.
 - Utility vault location in intersections: Do not place vaults, covers, castings or drainage grates within the crosswalk, curb ramp or landing area behind or in front of the ramp. In the event that no feasible alternative exists, SDOT will work with the applicant and Seattle City Light to determine the best possible location.
 - Curb ramp considerations: Curb ramps should be placed to align with the adjacent crosswalk. Issues to consider include location and placement of

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utility poles, hand holes, vaults, inlets, catch basins and signal controller equipment. Any curb ramp constructed prior to January 2003 which does not comply with current standards would at least need to be retrofitted according to the design criteria described above.

- Curb radii considerations: Curb radii should be designed based on the location and use of the intersection location and should balance the need to accommodate safe large vehicle movements with pedestrian safety: Tighter turn radii are appropriate at intersections that have high volumes of pedestrian and cyclist crossings to support adjacent land uses. These include [Main Streets](#) , [Mixed Use Streets](#), [Local Connector Streets](#), and at intersections in Urban Centers and Villages. Wider turn radii are typically required at intersections that experience frequent, high volumes of truck and transit vehicle turns. These include [Regional Connectors](#), [Major Truck Streets](#) and streets that are part of the [Transit classifications](#). In these locations, curb radii will be evaluated based on the following standard design vehicle: Single Unit (SU) with a 42' turning radius. If for some reason, SDOT would anticipate a larger vehicle used in a site, a radius evaluation based on this larger vehicle would be required. Examples of typical turning templates would include a SU, WB-40, WB-50, WB-60 and WB-62. In locations where there is on-street parking in the receiving lane, consideration of tighter curb radii may be appropriate and still allow for safe larger vehicle movements.
- Transit signal priority: Traffic signals may be timed to respond to certain conditions at intersections. Transit Signal Priority, transit signal queue jump and other related treatments may be desirable along [Regional Connector](#), [Commercial Connector](#) and [Industrial Access](#), [Main Street](#) and [Local Connector](#) street types, with high transit ridership.
- Pedestrian signal priority: Traffic signals at intersections along [Local Connector](#), [Mixed Use](#), [Main Street](#) and [Green Street](#) street types should consider enhancing pedestrian crossings including pedestrian walk phases on all legs of the intersection, countdown and/or audible signals where appropriate and elimination of pedestrian push buttons.
- Curb setbacks and pedestrian bulbs: Curb setbacks and pedestrian bulbs have been established to ensure the public's safety and allowing for street sweepers to negotiate curb line variations. The installation of a parking curb setback in conjunction with a development proposal requires the approval of both the SDOT and DPD Directors. The curb radii used for an 8 feet parking curb setback is 20 feet while the curb radii used for a 6 feet pedestrian bulb is 10 feet for the radius nearest to the travel lane and 20 feet for the radius closest to the right-of-way margin.
- Location of legal crosswalks: Legal crosswalks exist at every intersection, unless otherwise signed, regardless of whether they are marked or unmarked.
 - Standard construction of crosswalks: New marked crosswalks should be ladder-style crosswalks that are at least 10 feet wide and designed consistent with [Standard Plan No. 712](#). Marked crosswalks should keep as much as possible to the natural path of travel. Ideally they will align with existing sidewalks. Refer to [Section 4.8.2 Curb Ramps](#).
 - Visibility: Marked crosswalks must have a reflective surface that is visible in hours of darkness or during poor weather conditions.

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- Sight distance: No obstructions to pedestrian or driver visibility should be present within 30 feet of the legal crosswalk. These include parking, trees, and bus zones.
 - Orientation of building entrances to crosswalks: The manner, in which new developments associate with the street impacts pedestrians travel patterns. Entrances and access points to new facilities should orient as much as possible towards a legal crosswalk. This is especially true of facilities where frequent pedestrian travel across the street is expected. Entrances and access points that orient pedestrians towards a mid-block crossing can promote mid-block or illegal pedestrian crossings. This problem is difficult to remedy after construction is complete.
 - Variation from standard construction of crosswalks: Textured and/or colored concrete may be considered in certain crosswalk applications. The following design criteria apply:
 - Area of crosswalk: At least 10 feet wide.
 - Curb ramps: Two are required at either end of the crosswalk.
 - Smooth surface: To reduce vibrations experienced by wheelchair users on bumpy surfaces, six feet of the crosswalk area must have a fully vibration-free texture and a limit of ¼ inch or less rise, not more than every 30 inches.
 - Visibility: A thermoplastic parallel line on either side of a colored or textured crossing maintains visibility. Street lighting upgrades may be necessary.
 - Given the high cost of altering or relocating any crosswalk at which textured or colored concrete is used, approval for such treatments must be received from the SDOT Pedestrian Program before construction can begin.
- Standard Specifications and Standard Plans for Roads
 - Standard Plan 422a: Curb Ramp Details
 - Standard Plan 422b: Curb Ramp Details
 - Standard Plan 712: Typical Crosswalk and Stop Line Installations
 - Standard Specification 8-02 and 8-14
 - Standard Plan, #030
 - Standard Plans Section 100: Landscape Planting (includes standard plans for trees, shrub and ground cover, irrigation, tree protection, and grading)
 - Standard Plan 424: Tree Pit Detail
 - Standard Plans, Section 500 Signalization/Lighting
 - Standard Specifications, Section 8-30 Illumination and Electrical Systems
 - Standard Specifications, Section 9-31 Illumination and Electrical Materials
- Bridge and Municipal Construction Standards: The 2008 edition of the City of Seattle's Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction are available at http://www.seattle.gov/util/Engineering/Standard_Plans_&_Specs/index.asp. This document provides standard plans and specifications for physical infrastructure at intersections including curbs, sidewalks, driveways, and signals.

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- State of Washington Law: The complete list of State of Washington rules of the road is available at <http://apps.leg.wa.gov/RCW/default.aspx?cite=46.61>. A few notable elements are included below.
 - When a new ramp is installed on one side of the street, per [State Law \(RCW 35.68.075\)](#) City of Seattle compliant companion ramp shall be installed on the opposite side of the street.
- Americans with Disabilities Act Accessibility Guidelines (ADAAG): The guidelines are available at <http://www.access-board.gov/adaag/html/adaag.htm>. The guidelines provide standards and requirements for intersection elements such as curb ramps and detectable warnings.
- FHWA Washington Division: The FHWA Washington Division implements federal government standards such as the ASAAG discussed above, as well as [State Roadway Design Manuals](#), [State Standard Drawings](#), Pedestrians and Accessible Design, and other areas that impact intersection design.

Best Practices

- The Portland, Oregon Pedestrian Design Guide provides detailed crosswalk marking guidelines, intersection parking restrictions, and other design guidelines to improve intersections.
- The City of Chicago includes near and far side parking restrictions near intersections.
- Curb radius recommendations are included in the *ITE Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities* document.
- The 2009 MUTCD provides more guidance on locating push buttons in typical and constrained situations.
- *ITE's Alternative Treatments for At-Grade Pedestrian Crossings* provides detailed design standards for intersection design.
- The City of Boulder developed *Pedestrian Treatment Installation Guidelines* to provide additional information on how to apply the FHWA crosswalk study recommendations to specific treatments to improve pedestrian safety at uncontrolled crossings.
- The American Association of State Highway and Transportation Officials, Policy on the Geometric Design of Highways and Streets (AASHTO Green Book, 2004) provides the basis for roadway geometric design throughout the country.
- The *Americans with Disabilities Act Accessibility Guidelines (ADAAG)* is the current law governing the design of curb ramps (www.access-board.gov/adaag/html/adaag.htm).
- *Guidelines for Accessible Public Rights-of-Way* are currently in draft form and may be adopted by the US Access Board in the future. Further guidance on curb ramps is provided in *Part 2, Designing Sidewalks and Trails for Access: Best Practices Design Guide*. This document was published by the Federal Highway Administration (FHWA) in 2001 and devotes an entire chapter to the design of curb ramps (www.fhwa.dot.gov/environment/sidewalk2/).

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Gaps/Additions/Modifications

Design Standards

- There is a need to implement Neighborhood Street Fund and Neighborhood Matching Fund conceptual designs because much of the work has already been completed and has community support.
- For low-cost asphalt sidewalks without a curb, there is a need to resolve the issue of people driving or parking in the pedestrian zone.
- The existing process for prioritizing sidewalk and street improvements should be evaluated to determine if improvements or additions are needed. For example, this process may need to include the consideration of alternative uses of the street.
- Curb ramp design criteria related to crossing locations should be evaluated. Municipal standards currently require curb ramps to be located perpendicular to curb radii and this often results in a curb ramp that angles out into center of the intersection instead of into the crosswalk (see City of Seattle 2008 Standard Plans).

Pedestrian Crossings

- More pedestrian-related lighting at intersections is needed. This includes lighting for pedestrians on the side of the street and in the crosswalk.
- There are many intersections where there is a pedestrian call button and no curb ramp.
- There is a need for a process for prioritizing curb ramps, crosswalks and other intersection projects to make the most of limited funds.
- Curb ramps are not always located at predictable locations.
- Signal issues, such as signal timing, are not addressed in ROWIM.
- It was found that, at a number of locations, push buttons and pushbutton locations did not meet current ADA requirements.

Transit Stops and Stations

- Not all pedestrian facilities are incorporated in the implementation of crosswalk marking policy. For example, the presence of a pedestrian crossing island is not included in the analysis.
- Connectivity to transit is lacking in many locations.
- Transit stops are not always located in proximity to crosswalks and intersections.

Potential Recommendations for review

- Curb radii standards should be revised to create tighter turns where possible to slow traffic.
- Parking near a legal crossing in intersections should be evaluated. The design criteria in the Right of Way Improvements Manual calls for the standard lateral clearance from the nearest parking space to a stop sign to be 30 feet. Other locations provide a greater distance between parking and intersections. For example, the District of Columbia Design and Engineering Manual restricts parking to within 40 ft. of the intersection.

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- The process for replacing power lines or requiring underground placement should be examined with regards to the impact on the pedestrian environment. Of particular importance are the placement considerations and requirements for poles and vaults within the pedestrian travelway. Poles for street lights, fiber optic cables, and wireless facilities can potentially obstruct sidewalks, especially at corners. The placement of utility vaults in intersections should be carefully considered as vaults, covers, castings, or drainage grates within the crosswalk, curb ramp, or landing area can also be obstructions.
- Investigate lighting standards and details for type and quality at a corner and in the crosswalk.
- Existing or proposed transit stops with no formal pedestrian connectivity may need to receive priority rating for pedestrian improvements.
- For developments that are less than one block, the City could require fee in lieu of sidewalk construction to resolve drainage, grade, and connectivity issues; piecemeal installation can be expensive.
- Good examples of pedestrian friendly areas without sidewalks on both sides exist (e.g., Sea Streets). There should be standards for a variety of design options that incorporate these and other examples. Best practices from successful alternative designs should be made available and opportunities to “value engineer” alternative design should be explored.
- CIP projects represent a unique opportunity to reconfigure the ROW and could provide the chance to “think outside of the box.”
- There have been a number of alternative sidewalk/intersection designs that have either been installed or approved in conceptual form or exist as pilot projects that could be applied to other parts of the City if information regarding designs and permitting processes were made available.
- There is the potential to use a pilot program to start implementing additional options for various designs and material treatments.
- Seattle’s crosswalk guidelines for uncontrolled intersections should be evaluated.
- Updating pedestrian signals and installing pedestrian countdown signals at signalized intersections should be considered.
- Leading pedestrian intervals and right-turn-signals could be implemented to increase motorist yielding compliance and reduce conflicts between pedestrians and turning motorists.
- Signal timing at many locations should be evaluated to provide pedestrians with sufficient crossing time.
- In locations with high pedestrian activity, particularly around transit stations, a pedestrian phase should be provided during every cycle of the signal rather than requiring pedestrians to push a button. In these cases, the push button should be removed and signal timing modified to provide a walk phase during each cycle.
- Push buttons should be relocated to meet ADA requirements when it is determined to be necessary to have pedestrian actuation for a walk signal. In addition, a wider installation of accessible pedestrian signals with audible tones assist visually impaired people know when it is safe to cross the street.
- Acquiring easements may be necessary to allow adequate level area in back of curb ramps.