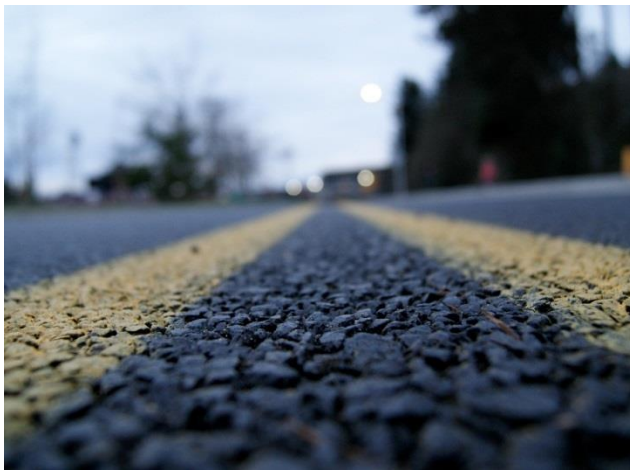


City of Tacoma Right-of-Way Design Manual



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Prepared by
City of Tacoma





CHAPTER 4

Street Design

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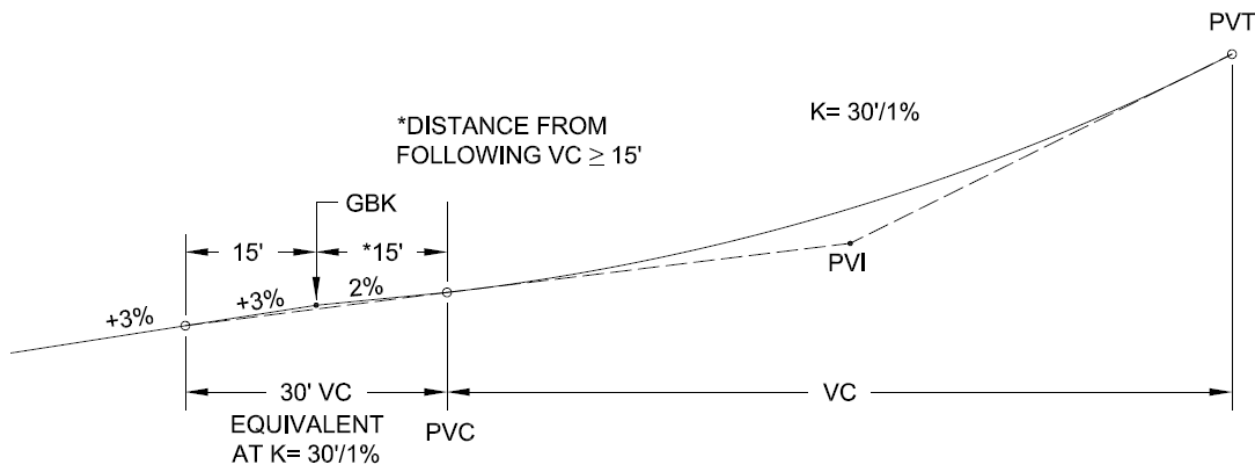
considered the area must also have adequate fixed source lighting (street lighting) already or as a part of the project (see CHAPTER 5). Where approved, the sag vertical curve may be reduced to an absolute minimum as determined by the “comfort criteria” in accordance with the AASHTO Policy.

3.8 Roadway Grade Breaks

The City allows for a 1 percent maximum grade break in place of a vertical curve (crest or sag). Grade breaks are not allowed at the point of vertical curvature or the point of vertical tangency of a vertical curve, in close proximity to a vertical curve, or in close proximity to another grade break. The minimum separation from grade break to a vertical curve or another grade break can be calculated by inserting a vertical curve in place of the grade break. For example (see also [Figure 4-3](#)):

- If designing a crest vertical curve with a 35 mph design speed the distance needed to make the grade or “K-value” is 29 based on the AASHTO Policy. For ease of calculation and supposing a better crest curve fits, use a K-value of 30. Then, for a 1 percent grade break the vertical curve equivalent would be 30 feet in length. Consider also that for a 30 foot vertical curve an equivalent 1 percent grade break would be centered in the horizontal direction, at 15 feet from the start of that vertical curve segment since vertical curves may not overlap each other. The minimum spacing between two 1 percent crest grade breaks is 30 feet. Likewise, a 1 percent crest grade break could not be located within 15 feet of the beginning or end of a vertical curve.

Figure 4-3: Minimum Distance for Grade Break Design in Example



Key:

- PVC = point of vertical curvature
- PVT = point of vertical tangency
- VC = vertical curve
- GBK = grade break
- K = distance to needed to meet grade

roundabouts, the sight distance principles in the AASHTO Policy may be supplemented by guidance provided in other design guidelines, such as FHWA and WSDOT publications.

SECTION 5 Street Section

5.1 Street Width

The City standard minimum residential street width is 28 feet which typically provides for parking on both sides. The City Engineer or designee may consider different widths based on site specific considerations, the specific street design, GSI/Low Impact Development designs, or existing improvements that may dictate the alignment of the curb. The design engineer shall consider the existing improvements, including trees and landscaping, public art, historic features, and other pertinent features in the area and may base the design of the street section accordingly.

5.2 Lane Widths

Table 4-1: Typical Channelization Combinations by Street Width¹

Street Width	Outside Lane	Inside Lane	Left-Turn Lane	Bike Lane ²	Parallel Parking Lane ³
56 feet	11 feet	11 feet	None	6 feet	None
56 feet	12 feet	11 feet	10 feet	None	None
56 feet	13 feet	None	None	5 feet, 2 foot parking buffer	8 feet (both sides)
56 feet	12 feet	None	10 feet	5 feet, 2 foot parking buffer	8 feet (one side)
56 feet	15 feet	None	10 feet	None	8 feet (both sides)
44 feet	11 feet	None	10 feet	6 feet	None
44 feet	11 feet	None	None	5 feet, 2 foot parking buffer	8 feet (one side)
44 feet	14 feet	None	None	None	8 feet (both sides)
40 feet	15 feet	None	10 feet	None	None
40 feet	14 feet	None	None	6 feet	None
40 feet	12 feet	None	None	None	8 feet (both sides)
32 feet	11 feet	None	None	5 feet	None
32 feet	12 feet	None	None	None	8 feet (one side)
30 feet	15 feet	None	None	None	Allowable
30 feet	11 feet	None	None	None	8 feet (one side)
28 feet	14 feet	None	None	None	Allowable

- 1 Other channelization solutions will be considered for review. Refer to Section 6 of this chapter for guidance on medians versus two-way left-turn lanes, parking, and bike lanes.
- 2 Additional bike facilities, including sharrows, buffered bike lanes, advisory bike lanes, bike passing lanes, contraflow bike lanes, and cycle tracks are described in the MoMaP and Bicycle Design Guidelines.
- 3 Angle parking may also be considered/permitted in some cases.

5.3 Cross Sections

Please note that the following tables and accompanying text in this subsection are based on the design of a full street section. Design of a half street section shall take into account the future permanent improvements and adjust the cross section accordingly.

The City standard street section consists of a typical crown section with the elevations of the right and left gutters being equal. Where existing conditions dictate a variance from

6.3 Access Location and Spacing

Minimum access spacing provides drivers with sufficient perception-reaction time to minimize the number of potential conflicts to address at once, which improves safety for both motorized and non-motorized traffic.

Access points shall be located to reduce the possibility of weaving, lane shifts, or other conflicts in the traffic stream. Existing access on both sides of the roadway shall be analyzed to determine proper location for a new access. Spacing is important to maintain the safety and capacity of a roadway, as well as the driver's perception of a corridor. New access points shall be placed outside the functional area of nearby intersections and other existing access points. See Table 4-5 for the criteria that shall be used for determining the minimum spacing between access points.

Table 4-5: Access Spacing Criteria

Posted Speed Limit (per TMC Title 11)	Functional Classification (Transportation Master Plan)	Access Spacing* (centerline to centerline)
35 or greater miles per hour	All	600 feet
≤ 30 miles per hour	Principal or Collector Arterial	300 feet
	Minor or Unclassified Arterial	150 feet
	Local Street	50 feet

* The spacing standards are for full access. Restricted access (right-in, right-out), shall be half the amount shown in the table above provided that a physical median restricts left turns. No reduction shall be made on local streets (but the spacing criteria does not need to be applied relative to the other access points on the opposite side of the street), and no reduction shall be made when measuring from highway ramps, existing or planned traffic signals, or roundabouts.

If the spacing requirements and the connectivity requirements as outlined in this chapter cannot be met, the access shall be designed using the objectives herein and as approved by the City Engineer or designee.

6.4 Medians

Painted (flush medians), when legally abided by or enforced, and raised medians can provide effective access control when designed and implemented appropriately. Raised medians, whether used exclusively for access control or otherwise, shall be designed according to the design parameters in the AASHTO Policy and the following design criteria:

- The median shall be bordered by a concrete curb. This curb can be a traffic barrier curb or a curb and gutter, per City Standard Plan SU-03.
- The width of the median between the top of the back of curb on each side shall be 6 feet minimum.
- Medians can contain GSI, landscaping, irrigation, artwork (with approval), a brick paver style surfacing, or patterned concrete.
- For at-grade pedestrian crossings, a depressed section of the median can be used to provide a pedestrian refuge access at crosswalks.

- The Citywide Design Guidance Documents (Section 1.2.1) and Area-Specific Design Guidelines (Section 1.2.2) shall be applied to determine design aspects and/or amenities appropriate for the specific project area.
- Access/parking for authorized vehicles only shall be considered and provided as necessary for medians that contain items that require maintenance.

6.5 Driveways

All driveways shall be in conformance with the TMC 10.14, TMC 13.06, and the City Standard Plans. In cases where driveway provisions applicable to a particular application exist in either referenced TMC section, or other section of the TMC, all standards shall apply, with the more stringent provisions prevailing in the case of a conflict created by application of separate standards. Exceptions may be allowed by the City Engineer for public safety or if strict application of these standards would prohibit vehicular access to a development, pursuant to TMC 10.14.

New driveways are subject to review and approval by the City Engineer pursuant to TMC 10.14, taking into account safe traffic flow, existing and planned transit operations, the objectives and requirements of this chapter, and the efficient functionality of the development. New driveways can be prohibited or their associated traffic movements restricted on designated pedestrian streets (see TMC 13.06 and 13.06A for the list of applicable streets).

New driveways shall be located from an alley or court when suitable access is available, such as an abutting ROW that is or can practicably be developed.

City Standard Plan SU-07 and SU-08 show driveways used for residential and commercial access and at the entrance to private accessways. Driveways shall be designed to meet applicable ADA and Public Rights-of-Way Guidelines (PROWAG) standards, and applicable design guidelines of the City.

Type 1 and Type 2 concrete driveways are to be constructed where concrete curb and gutter is proposed or existing. Temporary asphalt driveways should be constructed elsewhere. Please note that for historic districts, special design standards may apply.

The City may require an increased driveway thickness or steel reinforcement in addition to the pavement requirements discussed in Section 5.5 for locations in the Commencement Bay Tideflats or where poor soil conditions exist.

6.6 Private Accessways

A private accessway serving four lots or fewer may be designed as outlined in this section. Private streets serving five or more lots shall be designed to City standards as outlined in this chapter and in CHAPTER 2. Private streets will not be allowed if there is the ability for a future roadway extension or pedestrian access route (PAR).

It is incumbent upon the design engineer to provide safe adequate access for all lots. The City strongly recommends that the design engineer follow the recommendations from the AASHTO Policy as discussed in this chapter.

All private streets and accessways shall:

1. ~~Address~~address adverse impacts to adjacent private property;

satisfy this requirement with the construction of a T-type/hammerhead or branch turn-around subject to approval by the City Engineer (see TMC 13.04.190).

Barricades with reflectors conforming to the City Standard Plan SU-13 (or approved alternate) shall be provided at dead ends, except those that terminate as a cul-de-sac. Two feet of clearance between the limits of the street improvements and the barricade shall be maintained. In areas where extreme slopes or other hazards exist, a Type 2 concrete barrier with reflectors may be utilized (see WSDOT/APWA Standard Plan C-8). Barricades or posts may not be required where a private driveway accesses the dead end street through the end of the street or turn-around.

6.10 Turn-arounds

A turn-around meeting the requirements discussed within this section and the International Fire Code (IFC), shall be designed and constructed for all dead end private accessways over 150 feet in length. All public dead end streets, regardless of length, shall terminate in a turn-around that is designed and constructed to the approval of the City Engineer.

For private accessways serving 3 to 4 lots a branch or hammerhead ("T-Type") turn-around should be constructed as shown in Figure 4-11 and Figure 4-12, respectively. For residential streets (or private accessways) serving 3 to 4 lots, a standard hammerhead turn-around should be used as shown in Figure 4-12.

Figure 4-11: Example of Branch Turn-around

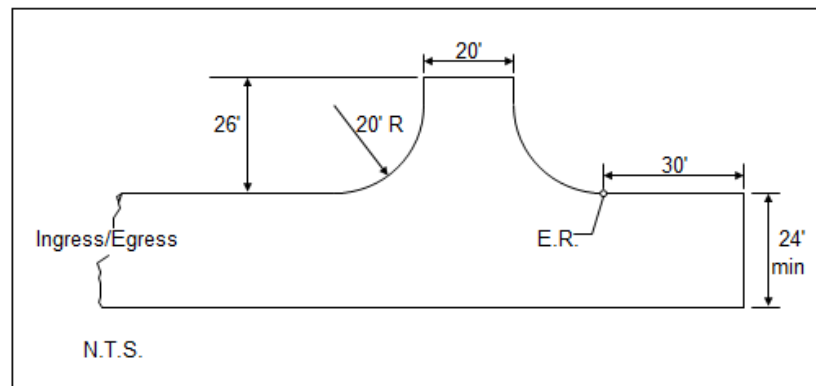
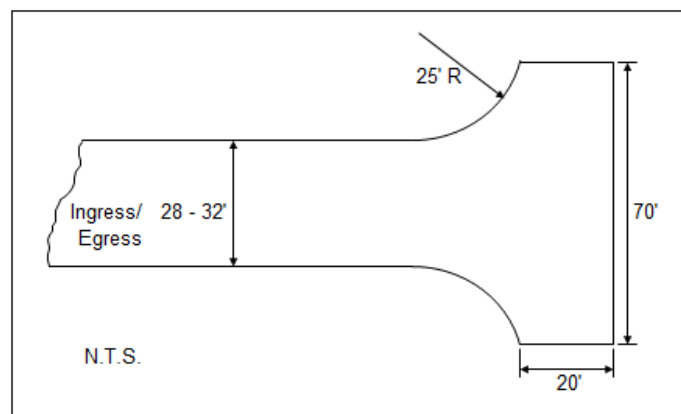


Figure 4-12: Example of Hammerhead (T-Type) Turn-around



6.11 Cul-de-sacs

Cul-de-sacs shall be constructed where a dead end street will serve 5 or more residential lots. Cul-de-sacs are primarily constructed as permanent improvements in City ROW where the future extension of the street is not likely. The typical cul-de-sac design will include a through connection for pedestrians and bicycles to the pedestrian network in the vicinity, when appropriate ~~for~~with the City street network, per the Complete Street Design Guidelines.

Cul-de-sacs shall be designed to meet the minimum requirements set forth in the City Standard Plan DR-06. Typically, cul-de-sacs shall be designed with a landscaped center island or designed to accept stormwater runoff with an approved design. A standard curb or mountable curb may be used to define the inner island.

SECTION 7 Mobility Facilities

Pedestrian mobility is a vital transportation mode. Designers must be aware of the various physical needs and abilities of pedestrians in order to ensure facilities provide universal access. All pedestrian facilities as outlined in this section shall be in compliance with the ADA requirements, the design guidelines outlined in Section 1.2 of this chapter and CHAPTER 8.

7.1 Sidewalk, Amenity Zone and Buffer Widths

The City minimum standard sidewalk width is 5 feet. Additional width is required in the circumstances listed below by roadway type/area.

At bus stops, a minimum 5 foot wide “connector pad” shall be provided between the curb and the edge of the sidewalk spanning the width of the associated planter strip. The distance from the face of curb to sidewalk shall be 8 feet to accommodate the access ramp deployment and associated maneuvering space. A portion of the 8 feet can be accommodated within the sidewalk if the conditions meet accessibility needs. Sidewalks adjacent to bus stops with no planter strip shall be a minimum of 8 feet wide (measured from the face of curb). The City will coordinate with the applicant to contact Pierce Transit’s Transit Development Group for more details.

7.1.1 Residential

Adjacent to residential streets, sidewalk widths shall be a minimum of 5 feet, excluding the curb and buffer or planting strip. A planter strip measuring 5 feet from the face of curb to the front of walk shall be provided. If necessary and approved by the City Engineer, the planter strip may be reduced to accommodate sidewalk widening.

7.1.2 Arterials

Adjacent to arterials, sidewalk widths shall be a minimum of 7 feet (excluding the curb and buffer or planting strip), unless otherwise specified in the TMC or City design guidelines. Wider sidewalks may also be required adjacent to angle parking to account for vehicle overhang.

7.1.3 Mixed-Use Centers

For these high pedestrian activity areas, the City Council has directed that wider sidewalk and amenity zones be provided (see Complete Streets Mixed-Use Centers Design Guidelines). The following requirements apply either to match

fully improved sidewalks or when a minimum half-block length (or 100 foot on longer frontages) site frontage improvements are being constructed.

On streets designated as pedestrian streets or primary pedestrian streets in TMC 13.06 and 13.06A respectively, a typical sidewalk width of 10 to 12 feet and an additional amenity zone width of 6 to 8 feet shall be provided. With the approval of the City Engineer, this combined total width of the sidewalk and amenity zone may be reduced to a minimum of 12 feet (excluding the curb) in order to accommodate a safety issue or unique site constraints. Reductions should be avoided if feasible on primary pedestrian streets. In all circumstances, a minimum width of no less than 7 feet shall be provided for unobstructed pedestrian passage.

7.1.4 Downtown

On streets within downtown Tacoma, specific sidewalk and amenity zone widths are called out by street in the Downtown Element of the Comprehensive Plan ([see Figure 4-13](#)). In all circumstances, a minimum 7 feet shall be provided for unobstructed pedestrian passage.

Table 4-7: Downtown Tacoma – Desired Sidewalk/Amenity Zone Widths

Street Types	Sidewalk/Amenity Zone Widths
Pedestrian, retail streets	15.5 feet
Transit priority	14 feet
Connectors	11 feet
Cycling boulevards	18 feet
Urban residential	10 feet
Green streets	20 feet
Yakima Avenue	20 feet
Warehouse District	Varies

7.2 Planting Area and Street Trees

In accordance with City policies to establish a healthy and diverse urban forest, as defined in the Urban Forest Policy Element of the Comprehensive Plan, refer to the Urban Forest Manual (UFM) for standards that apply to all trees required by TMC 13.06.502. See CHAPTER 9 for more information.

Planting areas are located between the curb and sidewalk or behind the sidewalk. They serve as a buffer between pedestrians and vehicles, as well as provide environmental benefits. Planting areas are not allowed to be paved. Basic design elements for a planting area include the following, and may be subject to review and approval by the City Engineer or designee:

- A minimum 3 foot depth of amended existing native soil or new topsoil non-mechanically compacted to account for settling shall be provided for all newly transplanted trees, except when the tree is planted within the drip line of existing mature trees. In the case of street trees, the finished soil level including mulch (finished grade) shall be 1 inch below the adjacent pavement surface or curb. Refer

7.3 Curb Ramps and Crosswalks

All curb ramps shall be designed and constructed to be ADA compliant in accordance with City Standard Plans and PROWAG. ADA and PROWAG requirements are discussed in ~~CHAPTER 9~~ CHAPTER 8. The City's Curb Ramp Installation Matrix should also be consulted to identify the extent of curb ramp improvements related to ROW improvements.

A legal crosswalk exists at every intersection, unless it is otherwise signed. However, marked crosswalks encourage pedestrians to cross at designated locations. Some marked crosswalks are best accompanied by other treatments such as signs or beacons. Traffic Engineering must approve all new marked crosswalks (see CHAPTER 7 for more information).

7.4 Traffic Calming and Intersection Treatments

Traffic calming is a way to design streets to improve safety, reduce the amount of cut-through traffic traveling on residential streets, and generally encourage people to drive slower. Traffic calming may include or be provided in conjunction with GSI features.

Although traffic calming is typically used on residential streets, there are certain tools that are appropriate for use on some arterial roadways. When a traffic calming approach is considered for any street (see Table 4-8), the City applies the following guidance:

- Vehicle speed is more critical than volume in terms of safety and should be addressed first where there are constraints.
- Neighborhood involvement is important to successful implementation. Rationale for traffic calming and management measures should be explained clearly to community residents and installation of these treatments should incorporate public input.
- Traffic calming and management measures should fit into, and preferably enhance, the street environment.
- Traffic calming designs should be predictable and easy to understand by drivers and other users.
- Devices that meet multiple goals are usually more acceptable. For example a raised crosswalk may be more understandable to motorists than a speed hump. The former has a clear goal whereas the latter may be perceived as a nuisance.
- Treatments need to be well designed and based on current available information on their applications and effects. Information on U.S. experiences with various traffic calming measures can be found in Institute of Transportation Engineers' [Traffic Calming: State of the Practice](#).
- Devices should accommodate emergency vehicles. Emergency response times shall be considered.
- Traffic calming areas or facilities should be adequately signed, marked, and lit to be visible to motorists.
- Treatments need to be spaced appropriately to have the desired effect on speed – too far apart and they will have a limited effect, too close and they will be an unnecessary cost and annoyance. Devices usually need to be spaced about 300 to

500 feet apart. If they are spaced too far apart, motorists may speed up between them.

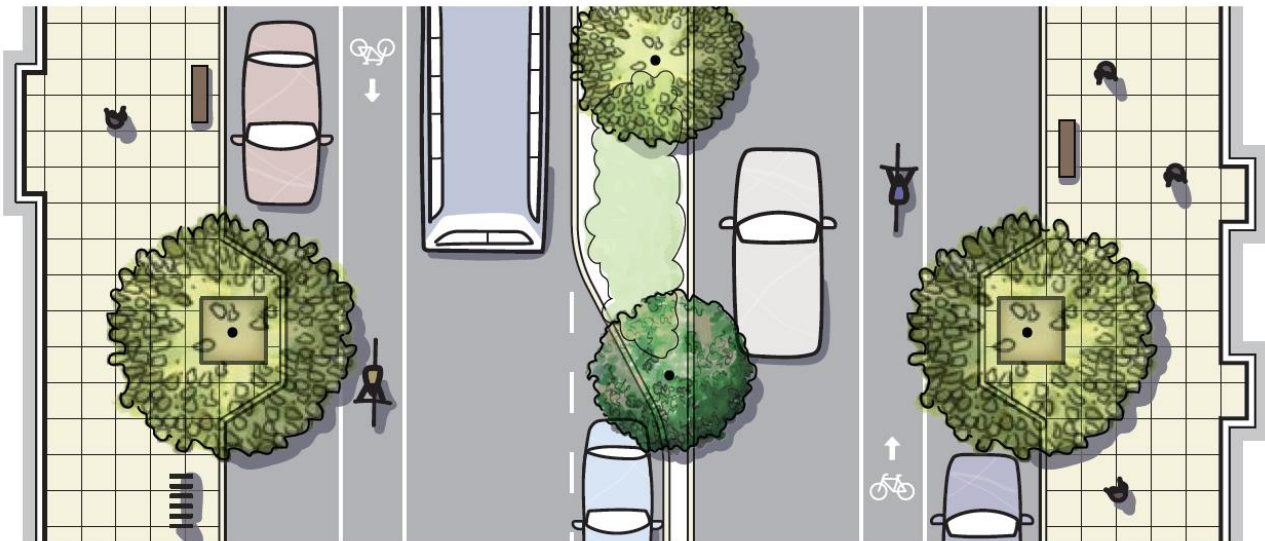
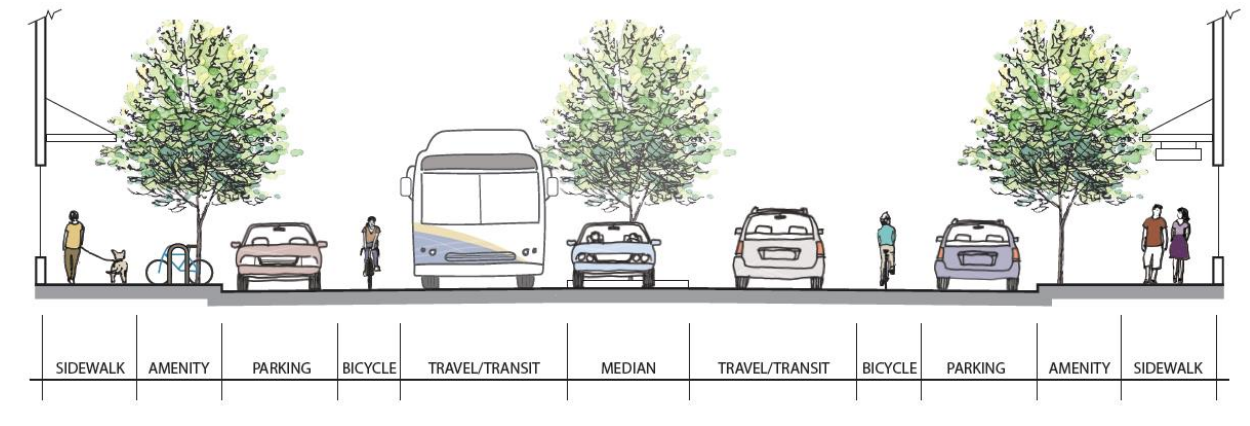
- Whole street designs are usually able to create an environment that supports slower speeds for the entire length.
- Facilities should not be under-designed or they will not work. Keeping the slopes too gradual for a speed table or curves too gentle for a chicane will not solve the problem.
- Traffic calming measures should accommodate bicyclists, pedestrians and people with disabilities, such as providing bicycle bypass features.
- If a measure is likely to divert traffic onto another local street, the area-wide street system should be considered to prevent shifting the problem from one place to another.
- Devices should be thought of as elements of a traffic calming system and be placed to improve pedestrian conditions throughout an area.

Table 4-8: Traffic Calming Devices and Applications

<u>Traffic Calming Device</u>	<u>Typical Use</u>	<u>Residential Street (non-arterial)</u>	<u>Collector Arterials</u>	<u>Minor Arterials</u>	<u>Principal Arterials</u>
<u>Curb bulb-outs</u>	<u>Pedestrian crossing conditions</u>	●	●	●	●
<u>On-street parking (parallel and angle)</u>	<u>Conditions along streets</u>	●	●	●	●
<u>Streetscape improvements (street trees, lighting, street furniture, special paving treatments)</u>	<u>Conditions along streets</u>	●	●	●	●
<u>Signs</u>	<u>Managing traffic</u>	●	●	●	●
<u>Crossing islands or short medians</u>	<u>Pedestrian crossing conditions</u>		●	●	●
<u>Medians</u>	<u>Managing traffic</u>		●	●	●
<u>Neighborhood speed watch program</u>	<u>Managing traffic</u>	●	●		
<u>Limited access</u>	<u>Managing traffic</u>	●	●		
<u>Raised crosswalks</u>	<u>Pedestrian crossing conditions</u>		●		
<u>Raised intersections</u>	<u>Managing traffic</u>		●		
<u>Chicanes</u>	<u>Managing traffic</u>	●			
<u>Chokers</u>	<u>Managing traffic</u>	●			
<u>Diverter</u>	<u>Managing traffic</u>	●			
<u>Partial street closure</u>	<u>Managing traffic</u>	●			
<u>Speed humps</u>	<u>Managing traffic</u>	●			
<u>Traffic circles</u>	<u>Managing traffic</u>	●			

- Key:
 (●) Appropriate for Consideration

Figure 4-14: Street Zones



Example functions of the above zones:

Sidewalk	pedestrian movement, business interface, sidewalk cafes (width permitting), signage and planters
Amenity	street furnishings, street trees, utilities, low impact design features, clear zone for parking, bicycle parking, bus stop/features and traffic signs.
Parking	on-street parking, bulb-outs, landscape islands, bus lane and on-street bicycle parking
Bicycle	bicycle traffic
Travel/Transit	vehicle movement, including streetcar
Median	turn movements (or restrictions thereof), trees/low impact development features, pedestrian refuge and aesthetics

Example character elements of the above zones:

Sidewalk	unobstructed path for 2 to 3 pedestrians abreast and distinctive paving (as allowable)
Amenity	hard surface except <u>where</u> low impact development is utilized, pervious pavers or tree grates
Parking	extension of travel/transit zone
Bicycle	visible pavement markings indicating separate or shared lane use for bicycles
Travel/Transit	minimized width while still accommodating larger vehicles such as emergency, freight, and transit
Median	landscaped or hard surface where needed to accommodate clear zone for emergency vehicles

9.4 Street Furniture

Street furniture such as benches, kiosks, newspaper stands, lighting, bicycle racks, trash bins, etc. play a major role in creating an inviting and comfortable pedestrian environment and can contribute to a neighborhood's identity and character. Several neighborhood business districts have developed streetscape design plans that identify a street furniture palette, which should be referred to when making streetscape improvements. See CHAPTER 5 for more information about pedestrian lighting, and Section 1.2 of this chapter for Citywide Design Guidelines.

9.5 Walls

Where a public wall supports fill material from entering onto the ROW, the wall shall be placed no closer than 2 feet from the back of the sidewalk or future sidewalk. In areas where a wall will be placed to support material within the ROW, care should be taken by the design engineer to provide measures that will assure the safety of both traffic and pedestrians.

Private walls shall be located at or behind the property line on private property. A Street Occupancy Permit shall be required for any private walls approved to be located within the ROW. A permit will be required for construction of a private wall within the ROW.

9.5.1 Rock Wall

Rock walls are designated as a protective facing to enhance the resistance of an exposed cut or fill face to weathering and erosion. While a rock wall possesses some undetermined retention qualities due to the mass, size and shape of the rocks, it is not to be used in place of an engineered retaining wall. Under no circumstances shall a rock wall be constructed to support a surcharge from the adjacent area or improvements. Where the wall will not be affected by a surcharge, a rock wall may be constructed up to a height of 4 feet (as measured from its footing to the tallest portion of the wall) without the need for a permit or requirement to submit a design for City approval. Rock walls over 4 feet in height shall be designed by a professional licensed by the State of Washington to perform the associated work and approved by the City.

9.5.2 Engineered Retaining Wall

In areas where a wall will be supporting a surcharge from an adjacent area and/or improvements, an engineered retaining wall will be required based on the following loadings:

Street: H-20

Sidewalk: 250 lbs/ft²

Concentrated Load: 8,000 lbs

Concentrated loading for sidewalks shall be distributed as specified in Table 1607.1 of the 2003 International Building Code (IBC).

9.6 Stairs, Fences, Handrails

All stairs, fences and handrails shall be constructed no closer than 2 feet behind the back of sidewalk, the future back of sidewalk alignment, or the edge of the roadway, and

To determine appropriate BUG ratings for specific projects, consider the adjacent property. A Lighting Zone (LZ) classifies areas based on their tolerance for light trespass.

IES generally defines five LZs:

3.1.1 LZ0: No Ambient Lighting

Applied to areas where the natural environment will be seriously and adversely affected by lighting. Impacts include disturbing the biological cycles of flora and fauna and/or detracting from human enjoyment and appreciation of the natural environment. For these areas, human activity is subordinate in importance to nature. The vision of human residents and users is adapted to the darkness, and they expect to see little or no lighting. When not needed, lighting should be extinguished.

3.1.2 LZ1: Low Ambient Lighting

Applied to areas where lighting might adversely affect flora and fauna or disturb the character of the area. The vision of human residents and users is adapted to low light levels. Lighting may be used for safety and convenience but it is not necessarily uniform or continuous. After curfew, most lighting should be extinguished or reduced as activity levels decline.

3.1.3 LZ2: Moderate Ambient Lighting

Applied to areas of human activity where the vision of human residents and users is adapted to moderate light levels. Lighting may typically be used for safety and convenience but it is not necessarily uniform or continuous. After curfew, lighting may be extinguished or reduced as activity levels decline.

3.1.4 LZ3: Moderately High Ambient Lighting

Applied to areas of human activity where the vision of human residents and users is adapted to moderately high light levels. Lighting is generally desired for safety, security and/or convenience and it is often uniform and/or continuous. After curfew, lighting may be extinguished or reduced in most areas as activity levels decline.

3.1.5 LZ4: High Ambient Lighting

Applied to areas of human activity where the vision of human residents and users is adapted to high light levels. Lighting is generally considered necessary for safety, security and/or convenience and it is mostly uniform and/or continuous. After curfew, lighting may be extinguished or reduced in some areas as activity levels decline.

As shown in [Table 5-1](#)~~Table 5-4~~, lighting in the ROW shall meet the following BUG ratings where adjacent to the following LZs. For projects spanning multiple LZs, consult with Traffic Engineering to determine rating. Additional back cut-offs/shields shall only be utilized as allowed by Traffic Engineering and per manufacturer's recommendations.



CHAPTER 7

Channelization and Signing

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[Attachment 7-1 City of Tacoma Channelization General Notes](#)

[Attachment 7-2 City of Tacoma Signing General Notes](#)

- Channelization elements shall conform to the applicable City Standard Plan. Substitution of a WSDOT Standard Plan or APWA standards is not acceptable unless explicitly approved by the City for use on the project.
- Traffic signs shall be installed using the following criteria:
 - Signs to be installed per City Standard Plans.
 - Generally, all sign posts are to be 2 inch square perforated metal in accordance with City Standard Plans but otherwise shall meet the requirements of Sections 8-21 and Section 9-28 of WSDOT Standard Specifications.
 - Placement of new signs that can take advantage of available City-owned streetlight poles is preferred (with prior approval from Traffic Engineering). Followed by combining new signs with existing signs, as appropriate, on new (and possibly taller) posts at already established locations. Signs may not be placed on utility poles owned by parties (e.g., Tacoma Public Utilities) other than the City.

1.3 Design Coordination

For unique conditions or in cases where the design standards cannot be met, the design engineer/designer shall coordinate with Traffic Engineering to determine the expected and acceptable design elements.

The design engineer/designer shall coordinate their efforts with other disciplines within the project (e.g., civil, traffic signal, landscaping, street lighting) and with other adjacent projects to ensure minimal design conflicts and continuity of the channelization and/or signing design. This coordination shall be conducted throughout the project process or as contributing design elements change. Special attention should be made to this coordination when the roadway geometry changes or elements of the roadway design may be unexpected by the driver, such as in the examples below:

- Lateral deflections (e.g., lane shifts), roadway tapers, and lane reduction tapers for the speed ranges shown below :

$$L \text{ (minimum)} = \frac{W(S^2)}{60} \quad [\text{less than 45 mph}]$$

$$L \text{ (minimum)} = WS \quad [45 \text{ mph or greater}]$$

Where:

L = length of deflection/taper in feet (as measured along roadway),
 S = posted speed in mph, and
 W = lateral shift in feet

- Storage lengths for turn lanes.
 - Typical minimum storage length of full width lane is 80 feet.
 - Typical minimum gap/opening length upstream of storage is 80 feet.
- Determination of advisory speeds when geometric design cannot accommodate posted or 85th Percentile Speed.

16. Indications of existing channelization to remain and/or to be removed
17. Existing signs* with designations of whether they will remain, or to be removed/salvaged, or to be relocated
18. New and existing signs* graphically depicted (or labeled in association with a sign table) in the direction of travel, with MUTCD sign name and code, size, station, and offset
19. New and existing* striping shall be called out with a channelization legend identifier with widths (center to center) completely dimensioned across the roadway at every transition point (e.g., begin/end of tapers, turn lanes, lane transitions, change of stripe type, etc.)
20. New pavement arrows, symbols, legends, and crosswalks shall be located at their centers with station and offsets
21. New stop lines shall be dimensioned to a physical feature that can be easily located in the field (e.g., face of curb at end of radius)
22. Dimensions indicating length of turn lanes and gaps, taper lengths (as measured parallel to the travel lane), transitions to/from intersections, and curved edge lines
23. Striping change locations with begin/end stations and offsets
24. Striping and curb angle points with stations and offsets
25. Radii of curved striping
26. Control points, clearly identifiable and dimensioned to a physical feature that can be easily located in the field
27. Supporting calculations for sight distances, taper lengths, advisory speeds, and curve designs
28. New and existing* streetlights, traffic signal poles, and traffic signal detection equipment
29. Existing* and proposed landscaping, vegetation, and/or structures that may obstruct (or limit) signs or sight visibility along the roadway as prescribed in the MUTCD
30. Any other information necessary to make the plans clear and complete and convey the intent of the channelization and signing

**These elements shall be shown screened back on the plan sheets.*

3.3 Design Guidance

Many of the typical channelization and signing needs within a project are addressed in the City's Standard Plans or are governed by the MUTCD. Any unusual circumstances or specialized needs shall be discussed with [the City's](#) Traffic Engineering [Section](#) as part of the design coordination phase of the project.

3.3.1 Crosswalk Installation

In particular, guidance for when marked crosswalks may be installed at uncontrolled locations is shown in the [Table 7-1Table 7-1Table 7-1Table 7-18-1](#). These guidelines include intersection and midblock locations with no traffic signals or "stop" signs on the approach to the crossing. They do not apply to

school crossings. A two-way center turn lane is not considered a median for the purposes of these criteria.

Crosswalks should not be installed at locations that could present an increased safety risk to pedestrians, such as where there is poor sight distance, complex or confusing designs, a substantial volume of heavy trucks, or other dangers, without first providing adequate design features and/or traffic control devices. Adding crosswalks alone will not make crossings safer, nor will they necessarily result in more vehicles stopping for pedestrians. Whether or not marked crosswalks are installed, it is important to consider implementation of other pedestrian facility enhancements (e.g., raised median, traffic signal, roadway narrowing, enhanced overhead lighting, traffic calming measures, curb extensions), as needed, to improve the safety of the crossing.

The indications in [Table 7-1](#)~~Table 7-1~~~~Table 8-1~~ are general recommendations. Good engineering judgment should be used, and ADA/PROWAG needs and/or implications should be considered in individual cases for deciding where to propose/install crosswalks.

Table 7-18-4: Guidance for Marked Crosswalks at Uncontrolled Locations

Roadway Traffic	Average Daily Traffic (2-way total) ≤ 9,000			Average Daily Traffic (2-way total) > 9,000 to 12,000			Average Daily Traffic (2-way total) > 12,000 to 15,000			Average Daily Traffic (2-way total) > 15,000		
	≤30	35	40	≤30	35	40	≤30	35	40	≤30	35	40
Total Lanes												
Two	C	C	P	C	C	P	C	C	N	C	P	N
Three	C	C	P	C	P	P	P	P	N	P	N	N
Four or more (with raised median*)	C	C	P	C	P	N	P	P	N	N	N	N
Four or more (without raised median)	C	P	N	P	P	N	N	N	N	N	N	N

Key:

C = Candidate sites for marked crosswalks (assuming ADA and PROWAG requirements are met)

P = Possible increase in pedestrian crash risk may occur if crosswalks are added without other pedestrian facility enhancements

N = Needs more treatment beyond just marking the crosswalk since pedestrian crash risk may be increased by providing marked crosswalks alone

*The raised median or crossing island must be at least 4 feet wide and 6 feet long to serve adequately as a refuge area for pedestrians, in accordance with the MUTCD and the AASHTO Policy

3.3.2 Candidate Sites for Marked Crosswalks

Marked crosswalks must be installed carefully and selectively. Before installing new marked crosswalks, an engineering study is needed to determine whether the location is suitable for a marked crosswalk. For an engineering study, a site

review may be sufficient at some locations, while a more in depth study of pedestrian volume, vehicle speed, sight distance, vehicle mix, and other factors may be needed at other sites. Consult with the City's Traffic Engineering section to determine what is applicable. It is recommended that a minimum utilization of 20 pedestrian crossings per peak hour (or 15 or more elderly and/or child pedestrians) be confirmed at a location before placing a high priority on the installation of a marked crosswalk alone.

In some situations (e.g., low-speed, two-lane streets in downtown areas), installing a marked crosswalk may help consolidate multiple crossing points. Engineering judgment should be used to install crosswalks at preferred crossing locations (e.g., at a crossing location at a streetlight as opposed to an unlit crossing point nearby). While overuse of marked crossings at uncontrolled locations should be avoided, higher priority should be placed on providing crosswalk markings where pedestrian volume exceeds the threshold mentioned above. Marked crosswalks and other pedestrian facilities (or lack of facilities) should be routinely monitored to determine what improvements are needed.

Certain locations have the potential for the pedestrian crash risk to increase if a crosswalk(s) is added without other pedestrian facility enhancements. These locations should be closely monitored and enhanced with other pedestrian crossing improvements, if necessary, before adding a marked crosswalk.

3.3.3 Additional Treatments at Crosswalks

Marked crosswalks alone are typically insufficient, since pedestrian crash risk may be increased by providing only marked crosswalks at some locations. Consider using other treatments, such as traffic calming treatments, traffic signals with pedestrian signals where warranted, or other substantial crossing improvement to improve crossing safety for pedestrians. See applicable scenarios in [Table 7-1](#)~~Table 7-1~~~~Table 8-1~~.

SECTION 4 Construction Requirements

As dictated by the design, the installation of channelization and/or signing shall be in accordance with Sections 8-21 and 8-22 of WSDOT Standard Specifications; City Standard Plans; City of Tacoma Channelization and Signing General Notes (Attachments 7-1 and 7-2); and the MUTCD.

All pavement markings in work areas where new channelization transitions into or replaces existing channelization shall be removed. Removal of channelization elements shall be required as specified in Section 8-22.3(6) of the WSDOT Standard Specifications or in accordance with the project specifications.

When work is performed in the roadway, traffic control devices shall be installed to warn and protect motorists, bicyclists, and pedestrians at all times. The City requires that all flagging, signs and all other traffic control devices conform to Section 1-07.23 and 1-10 of the WSDOT Standard Specifications as supplemented or amended by the Washington State Chapter of APWA. Construction traffic control shall also conform to the current edition of the MUTCD, Part 6 and the [City's Traffic Control Handbook](#).

A pre-construction meeting with City staff will be required prior to installing any signs, sign posts, or pavement markings within the ROW (see CHAPTER 2).

SECTION 5 Non-Essential Signs

5.1 Description

Destination/wayfinding signs, cultural interest signs, memorial signs, and other similar signs are supplemental to other signing and shall not be installed where there is insufficient spacing from signing of higher priority. These signs are not required for the safety and operation of the public transportation network. Costs related to the purchase, installation, and maintenance of these signs will be borne by the party requesting the sign. While no maintenance agreement is typically necessary, the signs will typically only be maintained by the City when requests are submitted ~~to~~for consideration by the City's Traffic Engineering Section. Advertising and private signs are not addressed herein, but instead are controlled by applicable City ordinances and state and federal regulations.

5.2 Historical and Honorary Street Names

Tacoma Resolution No. 38091, revising the City's Policy on Place Names and Name Changes, describes the process by which the City Council adopts historical and honorary street names. Such names are not used for addressing purposes, will be secondary to the sign which is used for addressing purposes, and will have an appearance and location consistent with the requirements and recommendations found in WAC-468-95 pertaining to the Uniform Traffic Control Devices for Streets and Highways Manual.

5.3 Private Street Name Signs

The construction of private street name signs shall follow the City's standards (contact the City's Traffic Engineering Section). Review of private street names shall follow the same process as for public street name signs in order to ensure proper review for addressing and emergency response purposes. Naming of streets shall adhere with the following and shall consist of three components:

1. Direction Prefix or Suffix

- The street name prefix shall consist of "N," "S," or "E" according to the following:
 - "N" – All streets north of Division Avenue/6th Avenue between Commencement Bay and Tacoma Narrows
 - "S" – All streets south of Division Avenue and west of 'A' Street except for those areas included under west end streets
 - "E" – All streets between 'A' Street and Marine View Drive
- The street name suffix shall consist of "W" or "NE" according to the following:
 - "W" – All streets south of South 19th Street and west of Orchard Street
 - "NE" – All streets east of Marine View Drive

2. Street Name

- Shall confirm to existing grid system
- Shall not duplicate or be similar to any other street names, unless ~~conforming~~confirming to the above or unless it is a numerical street name

- Shall not result in any duplicate intersections
3. **Street Type**
- “Avenue”
 - May only be used for north/south oriented streets
 - When streets are skewed from actual north/south, shall only be used when parallel streets are of the same type
 - “Street”
 - May be used for north/south or east/west oriented streets
 - May not be used for north/south numbered streets
 - When streets are skewed from actual north/south or east/west, shall only be used when parallel streets are of the same type
 - “Drive,” “Blvd,” “Way,” “Lane,” “Road,” and “Place”
 - May only be used for meandering streets which cannot conform to “Avenue” or “Street” criteria shown above
 - “Court”
 - May only be used in conjunction with “Street” or “Avenue” where alignment is slightly offset from the street or avenue
 - “Terrace,” “Circle,” and “Loop”
 - Not allowed

5.4 Temporary Signs

Political signs and other temporary signs placed within the ROW are allowed according to the provisions of the TMC (see TMC 2.05.275 for information about Political Signs). Other temporary signs not explicitly addressed by the TMC are not permitted within the ROW.

5.5 Adopt-a-Spot, Adopt-a-Roadway, and Memorial Signs

Roadside memorials are not permitted on City streets. However, citizens participating in the adopt-a-spot program may recognize people on the recognition sign installed with the adopt-a-spot sign.

Adopt-a-spot and adopt-a-roadway signs are allowed at locations participating in the litter reduction program administered by Neighborhood and Community Services Department.

When the City Council adopts an act or resolution memorializing or dedicating a highway, bridge, or other highway component, the associated memorial or dedication signs shall meet the requirements of Section 2M.10 of the MUTCD.

5.6 Gateway and Neighborhood Signs

Neighborhood gateway signage plans are permitted on a case-by-case basis in consultation with [the City's](#) Traffic Engineering [Section](#).

Attachment 7-1: City of Tacoma Channelization General Notes

The following general notes ~~shall~~should appear within the sheets comprising the channelization plans. Additional notes shall be added by the traffic designer as necessary to properly clarify the intent of the design.

1. The City of Tacoma Traffic Engineering section shall be notified at least three (3) business days prior to starting any striping work.
2. Unless otherwise specified, all pavement marking installations and removals shall conform to the requirements set forth in the City's specifications. Items not covered under the City specifications shall conform to the WSDOT/APWA Standard Specifications and the most recent edition of the Manual on Uniform Traffic Control Devices (MUTCD) as adopted and modified by Washington Administrative Code (WAC) 468-95.
3. Temporary traffic control shall conform to the most recent edition of the City of Tacoma Traffic Control Handbook, the MUTCD, and/or as directed by the City of Tacoma.
4. The Contractor shall be responsible for the layout and installation of the permanent pavement markings. Pavement marking dimensions are to the center of the stripe for single-line striping and to the center of the gap between the two lines for double-line striping. Where curb and gutter are present, dimensions are to the face of curb, or to the edge of pavement absent curb and gutter. The Contractor shall schedule inspection of the pavement marking layout at least three (3) business days prior to the installation of the permanent pavement marking. Inspection shall take place during daytime and on a business day prior to installation of permanent pavement markings. Any permanent pavement markings applied prior to field inspection by the Traffic Engineering section shall be removed and re-striped at the Contractor's expense.
5. The Contractor shall follow all dimensions, notes, details, and standards when installing pavement striping, markings, and markers. The channelization plans may be modified as directed by the City Traffic Engineer. The Contractor shall refer any questions concerning pavement markings to the Traffic Engineering section via the City's Construction Inspector for the project.
6. Generally, raised pavement markers (RPMs) shall be installed in conjunction with striping efforts and in accordance with City of Tacoma Standard Plans. Exceptions are possible; coordinate with the City's Traffic Engineering Section. All markers shall be installed so that the reflective face of each marker is facing the direction of approaching traffic and is perpendicular to the direction of traffic flow.
7. The Contractor shall remove all existing pavement markings and striping in conflict with the final striping plan by hydro-blasting or other approved noninvasive method. All removal methods shall be done in conformance with WSDOT/APWA Standard Specifications. If the removal damages the underlying pavement as described in the WSDOT/APWA Standard Specifications, then the pavement shall be restored to a state equaling or exceeding its previous state. If the obliteration causes shadowing (or "ghost" markings), or in the opinion of the City Traffic Engineer will cause confusion to drivers, the Contractor shall remedy through an approved means and method. Applying additional markings to obscure erroneous markings is not an approved method for obliteration. Striping obliteration may need to exceed the

Attachment 7-2: City of Tacoma Signing General Notes

The following general notes ~~shall should~~ appear within the sheets comprising the signing plans. Additional notes shall be added by the traffic designer as necessary to properly clarify the intent of the design.

1. The City of Tacoma Traffic Engineering Section shall be notified at least three (3) business days prior to starting any signing work.
2. Temporary traffic control shall conform to the most recent edition of the City of Tacoma Traffic Control Handbook, the MUTCD, and/or as directed by the City of Tacoma.
3. All signs shall conform to the MUTCD with respect to colors, shape, size, content, retroreflectivity, and placement relative to the roadway. All sign panels shall be 0.080-inch thick aluminum (non-recycled) with prismatic sheeting (Type IV or better, or as specified). Sign posts shall be 2-inch square perforated galvanized steel tubing per City Standard Plans, unless otherwise specified.
4. The Contractor shall submit all sign formats/layouts (with dimensions) to the City's Traffic Engineering Section for approval prior to fabrication.
5. Any traffic signs, including street name signs, which are in close proximity to an existing or proposed street light pole (confer with Traffic Engineering in advance for approval), shall be properly mounted to the pole instead of installing a new sign post. Any added expense relating to a need for different mounting hardware and/or equipment shall be the Contractor's responsibility. Prior to installation, sign locations and offsets may be adjusted by the City to improve visibility or safety.
6. Any existing signs that need to be removed as a result of construction, or due to conflict with installed signs, shall be done so by the Contractor at their expense. These signs shall be removed, protected, and stored for possible reinstallation by the Contractor or for salvaging and returning to the City. Signs damaged during construction shall be replaced at the Contractor's expense.
7. The Contractor shall ensure that at no time a traffic sign is installed in such a way as to be blocked by trees or vegetation, either existing or pending. All sign locations shall not interfere with pedestrian movement as defined by the Americans with Disabilities Act (ADA) and/or Public Rights-of-Way Accessibility Guidelines (PROWAG). In both of these cases, the Contractor shall contact the Traffic Engineering section to provide an alternate location for the installation of the sign(s) in question.
8. Temporary signs installed for construction purposes shall be to be mounted in the least intrusive locations and manner as possible to minimize damage to sidewalks or blocking of other signs/traffic control devices. Use of existing sign posts and street light poles is preferred. Any damage to City infrastructure caused by temporary sign installations shall be restored upon removal of the temporary sign/post.

Examples of PCPs



4.1 Accessibility Criteria for Pedestrian Circulation PathsPCPs

The following criteria apply across the entire width of the PCP, not just within the PAR.

4.1.1 Vertical Clearance

The minimum vertical clearance for objects, such as trees and canopies that protrude into or overhang a PCP is 80 inches (see PROWAG) unless otherwise specified in the MUTCD.

If the minimum vertical clearance cannot be provided, railings or other barriers shall be provided. The leading bottom edge of the railing or barrier shall be located 27 inches maximum above the finished surface for cane detection.

4.1.2 Horizontal Encroachment

Protruding objects on PCPs shall not reduce the clear width of the PAR to less than 5 feet, excluding the curb.

If an object must protrude farther than 4 inches into a PCP at a height that is greater than 27 inches and less than 80 inches above the finished surface, then it must be equipped with a warning device such as railing or other barriers that are cane detectable. The minimum clear width of the PAR must still be provided. For tree requirements, see CHAPTER 9 and Standard Detail LS-02 Street Tree Clearance.

4.1.3 Post-Mounted Objects

Objects mounted on posts, at a height that is greater than 27 inches and less than 80 inches above the finished surface, shall not protrude more than 4 inches into a PAR.

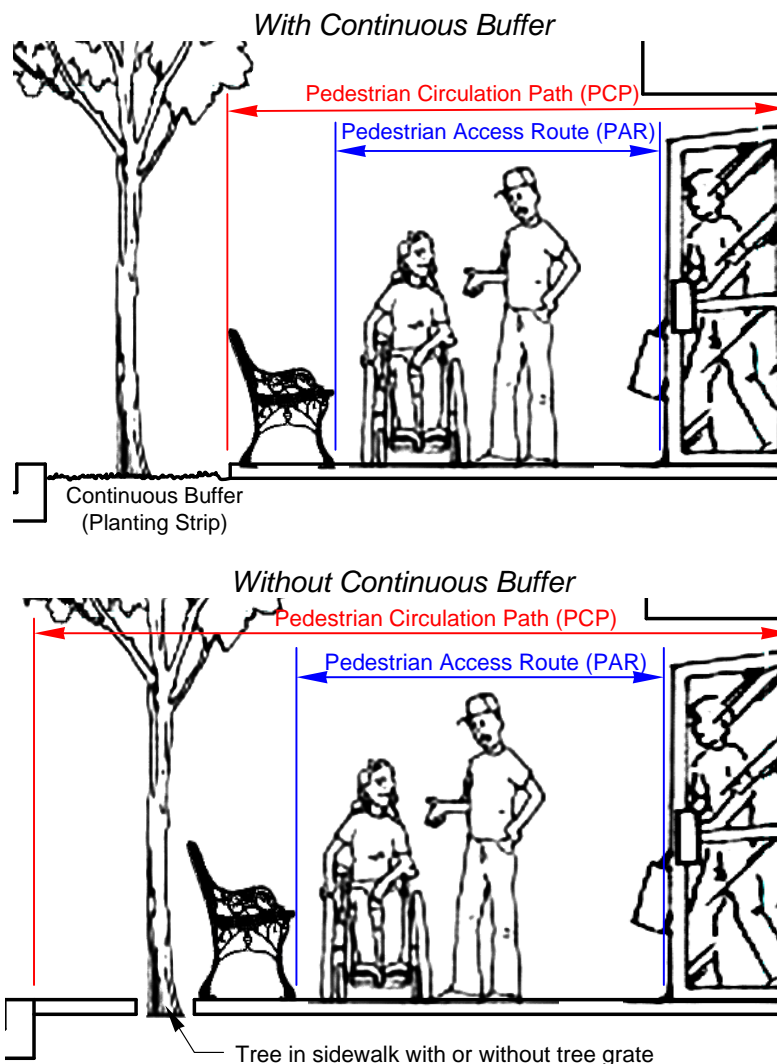
If an object must protrude farther than 4 inches into a PCP at a height that is greater than 27 inches and less than 80 inches above the finished surface, then it must be equipped with a warning device that is detectable by a vision-impaired person who navigates with a cane. The minimum clear width of the PAR must still be provided.

Where a sign or other obstruction on a PCP is mounted on multiple posts, and the clear distance between the posts is greater than 12 inches, the lowest edge of the sign or obstruction shall be either 27 inches maximum or 80 inches minimum above the finished surface.

SECTION 5 Pedestrian Access Routes

All PCPs are required to contain a continuous Pedestrian Access Route (PAR) that connects to all adjacent pedestrian facilities, elements, and spaces that are required to be accessible (see Figure 8-1). PARs consist of one or more of the following pedestrian facilities: walkways/sidewalks, crosswalks, curb ramps (excluding flares), landings, pedestrian overpasses/underpasses, access ramps, elevators, and platform lifts.

Figure 8-1: Relationship between PCPs and PARs



5.1 Accessibility Criteria for Pedestrian Access Routes PARs

5.1.1 Clear Width

The minimum continuous and unobstructed clear width of a PAR shall be 7 feet for arterial streets and 5 feet for all other streets, exclusive of the curb width.

Objects are not allowed to protrude into the clear width. For example, objects such as tree branches, vehicle bumpers, mailboxes, sign posts, and tree grates are not allowed to reduce the clear width of the PAR.

Example of Clear Width Obstruction



Provide wheel stops or a wider sidewalk to remedy the encroachment into the PAR.

5.1.2 Cross Slope and Grade

The cross slope of a PAR shall be 2 percent maximum. It is recommended that cross slopes be designed to less than the allowed maximum to allow for some tolerance in construction. Exceptions:

- Midblock crosswalks – The cross slope of the crosswalk and any connected curb ramp is permitted to match street grade.
- Pedestrian street crossing without yield or stop control – The cross slope of the crosswalk can be up to 5 percent maximum.

Where a PAR is contained within the roadway ROW, its grade shall not exceed the general grade established for the adjacent roadway. See Section 8-167.2 of this chapter for curb ramp accessibility criteria. Exception:

- The maximum grade in a crosswalk (marked or unmarked) is 5 percent, measured parallel to the direction of pedestrian travel in the crosswalk.

Where a PAR is not contained within the roadway ROW, the maximum running slope allowed is 5 percent unless designed as an access ramp. See Section 14.2 of this chapter for access ramp accessibility criteria.

For additional criteria when a PAR is supported by a structure, see Section 13 of this chapter.

Typical Sidewalk Design



SECTION 7 Curb Ramps

Curb ramps provide an accessible connection from a raised sidewalk down to the roadway surface. A curb ramp, or combination of curb ramps, is required to connect PARs to crosswalks (marked or unmarked) where curbs, sidewalks, or visual evidence of pedestrian traffic are present, except where pedestrian crossing is prohibited. See CHAPTER 4 for guidance on closed crossings.

Provide a curb ramp oriented in each direction of pedestrian travel and within the width of the crosswalk (marked or unmarked) the curb ramp serves. Every curb ramp shall have an opposing curb ramp that serves the other end of the crosswalk (marked or unmarked). If curb ramps are present, see the City of Tacoma Curb Ramp Installation Matrix, Existing Curb Ramp Evaluation Criteria.

Curb ramps shall be a minimum of 5 feet in width with a landing/turning space that is a minimum of 5 feet in length and 5 feet in width.

7.1 Types of Curb Ramps

Different types of curb ramps can be used: perpendicular, parallel, and combination. Carefully analyze and take into consideration drainage patterns, especially when designing a parallel or combination curb ramp. Prior approval from the City Engineer or designee and written justification are required for non-directional curb ramps.

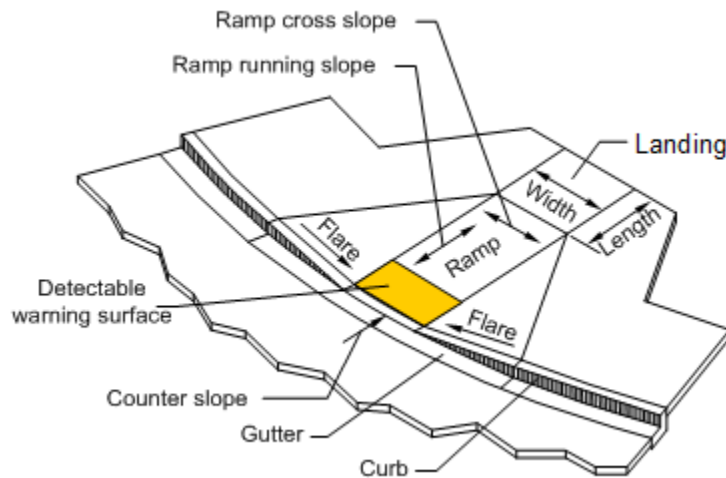
7.1.1 Perpendicular Curb Ramp

Perpendicular curb ramps are aligned to cut through the curb and meet the gutter grade break at a right angle (see [Figure 8-2](#)~~Figure 8-2~~). The landing is to be located at the top of the curb ramp. The following is a list of design considerations for incorporating perpendicular curb ramps:

- Having the path of travel aligned to cross the gutter grade break at a right angle facilitates usage by individuals with mobility devices.

- The height of the ramp run relative to the gutter elevation may facilitate drainage.
- The height of the ramp run relative to the gutter elevation discourages vehicular traffic from cutting across the corner.
- On small radius corners, the ramp alignment may be more closely aligned with the alignment of the crosswalk markings, which facilitates direction finding for the visually impaired.
- The ramp run and landing might not fit within available ROW.
- On small radius corners, the flares may not fit between closely spaced perpendicular curb ramps.

Figure 8-2: Perpendicular Curb Ramp Common Elements



7.1.2 Parallel Curb Ramp

Parallel curb ramps are aligned with their running slope in line with the direction of sidewalk travel, parallel to the curb (see [Figure 8-3](#)~~Figure 8-3~~). The landing is located at the bottom of the curb ramp. The following is a list of design considerations for incorporating parallel curb ramps.

- Requires minimal ROW.
- Allows ramps to be extended to reduce ramp grade within available ROW.
- Provides edges on the side of the ramp that are detectable to vision-impaired pedestrians who navigate with a cane.
- Depending on the style of parallel curb ramp, pedestrian through traffic on the sidewalk may need to negotiate two ramp grades instead of one, possibly making it more difficult to traverse for some.
- The installation of additional drainage features in the upstream gutter line may be necessary to prevent the accumulation of water or debris in the landing at the bottom of the ramp.

7.2.5 Flares and Pedestrian Curbing

Flared sides are to be used where a PCP crosses the curb ramp from the side. Flared sides are to have a slope of 10 percent maximum, measured parallel to the back of curb.

Pedestrian curbs are to be used only where there is landscaping or other appurtenances, such as railing, that prevent cross travel by pedestrians. Pedestrian curbs are to be located outside the PCP. Pedestrian curbs may not be used to prevent pedestrians from using street crossings.

7.2.6 Counter Slope

The counter slope of the gutter or street at the foot of a curb ramp or landing shall be 5 percent maximum.

7.2.7 Detectable Warning Surfaces

Detectable warning surfaces are required where curb ramps or landings connect to a street, or at alleys and driveways with high traffic volumes. Detectable warning surfaces shall contrast visually with the adjacent walkway surface, gutter, or street (see the City Standard Plans for placement details and other applications).

7.2.8 Surfaces

Surfaces of curb ramps shall be firm, stable, and slip resistant. Gratings, access covers, utility objects, and other appurtenances shall not be located on curb ramps, landings, or gutters within the PAR. See Section 5 of this chapter for more information.

7.2.9 Grade Breaks

Grade breaks at the top and bottom of curb ramps shall be perpendicular to the direction of travel. Surface slopes that meet at grade breaks shall be flush.

7.2.10 Clear Space

A clear space, to facilitate pedestrian turning maneuvers, is required within the roadway for all non-directional curb ramps. The 4 foot (minimum) by 4 foot (minimum) clear space shall be located beyond the curb face where the bottom of a non-directional curb ramp or landing meets the gutter, contained within the width of the crosswalk, and located completely outside the parallel vehicle travel lane.

7.3 Curb Ramp Drainage

Stormwater runoff from the roadway can flood the lower end of a curb ramp. ~~Consider providing catch basins or inlets to prevent ponding at the base of curb ramps and landings (see Figure 8-4).~~ Measures to prevent ponding at the base of curb ramps and landings (see Figure 8-4) must be taken. Refer to Chapter 11 Section 6 Curb Ramps for guidance and requirements. Verify that drainage structures will not be located in the PAR. Refer to the SWMM for additional information.

8.2 Crosswalks at Intersections

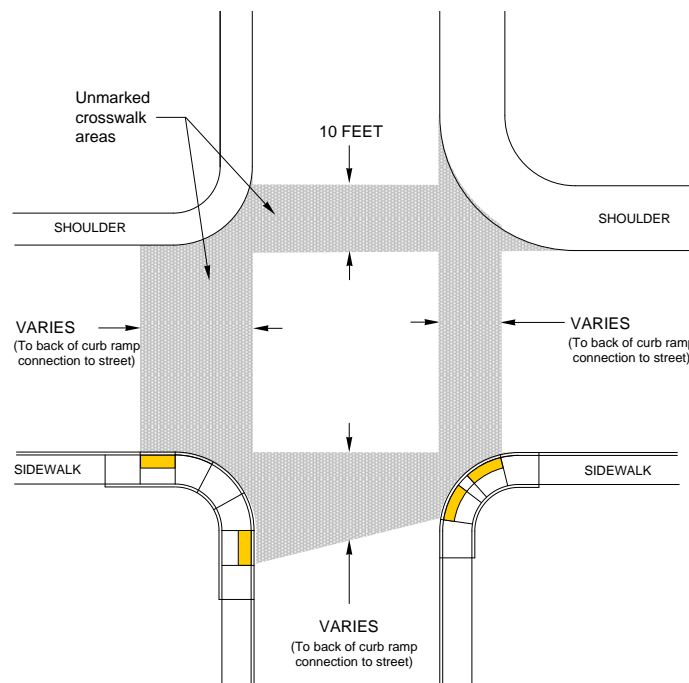
Provide a PAR within marked and unmarked pedestrian crossings. See Section 5 of this chapter for accessibility criteria for PARs.

Crosswalks (marked or unmarked) are provided on all legs of an intersection, except in rare cases. There are normally three crosswalks at a “T” intersection and four crosswalks at a four-leg intersection. For pedestrian route continuity, the minimum number of crosswalks is two at “T” intersections and three at four-leg intersections. One example where crosswalks might not be provided on all intersection legs is a location with substantial turn movements that would conflict with a crossing.

8.2.1 Unmarked Crossings

Legal crosswalks exist at all intersections, whether marked or not, regardless of the number of legs at the intersection. An unmarked crosswalk is the portion of the roadway behind a prolongation of the curb or edge of the through traffic lane and a prolongation of the farthest sidewalk connection or, in the event there are no sidewalks between the edge of the through traffic lane and a line 10 feet from there (per RCW 46.04.160) (see [Figure 8-5](#)).

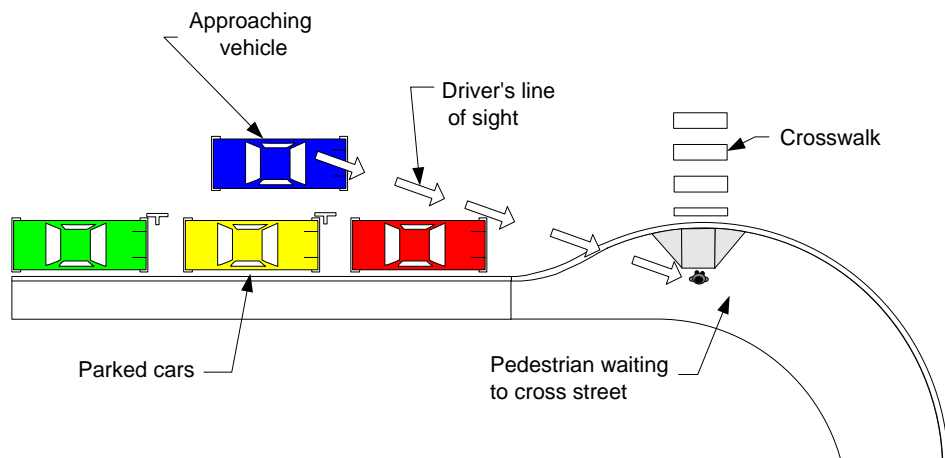
Figure 8-5: Unmarked Crosswalks



8.2.2 Marked Crossings

Marked crosswalks are used at intersections or midblock crossings. The City Traffic Engineer has the authority as outlined WAC 308-330-265 to designate and maintain, by appropriate devices, marks, or lines upon the surface of the roadway, including crosswalks. On state routes within the City, maintenance agreements and RCW 47.24.020(30) provide jurisdictional authority to the City for decisions to mark crosswalks based on a population threshold of 25,000. The decision to mark a crosswalk shall be based on the principles presented in CHAPTER 7.

Figure 8-7: Improved Line of Sight at Intersection



The right turn path of the design vehicle is a critical element in determining the size and shape of the curb extension. Sidewalk curb extensions tend to restrict the width of the roadway and can make right turns difficult for large trucks. Ensure the geometry of the curb extension is compatible with the turn path for the prescribed design vehicle. Avoid interrupting bicycle traffic with curb extensions.

Site features such as landscaping, cabinets, poles, benches, planters, bollards, newspaper stands, and sandwich boards should be selected and placed so they do not obstruct the vision of pedestrians or drivers within curb extension areas.

SECTION 9 Raised Medians/Traffic Islands

Wide multilane streets are often difficult for pedestrians to cross, particularly when there are insufficient gaps in vehicular traffic because of the number of vehicles. Consider raised medians and traffic islands with a pedestrian refuge area on roadways with the following conditions (see [Figure 8-8](#)):

- Two-way arterial with intermediate to high speeds (35 mph or greater), moderate to high average daily traffic, and high pedestrian volumes;
- Significant pedestrian collision history (reference crash data on the govME website);
- Vehicle turn volumes and patterns; and/or
- Complex or irregularly shaped intersections.

Prior approval by the City Traffic Engineer or designee will be required for design and installation of proposed raised medians and traffic islands.

A traffic island used for channelized right turn slip lanes can provide a pedestrian refuge, but the slip lane may promote faster turning speeds. Minimize the turning radius of the slip lane to keep speeds as low as feasible. To reduce conflicts, keep the slip lane as narrow as practicable and design a crosswalk alignment that is at a right angle to the face of curb.

The PAR through a raised median or traffic island can be either raised with curb ramps or a cut-through type (see [Figure 8-8](#)~~Figure 8-8~~). Curb ramps in medians and islands can add difficulty to the crossing for some users. The curbed edges of cut-throughs can be useful cues to the visually impaired in determining the direction of a crossing, especially on an angled route through a median or island. Design consideration shall include stormwater runoff and maintenance, such as roadway debris (see SWMM).

9.1 Accessibility Criteria for Raised Medians and Traffic Islands

There are many design considerations when deciding whether to ramp up to the grade of the median or island or to create a cut-through median or island matching the roadway grade. These considerations may include the profile grade and cross slope of the road, drainage patterns, and the length or width of the median or island.

The following accessibility criteria apply:

- Each raised median or traffic island shall contain a PAR connecting to each crosswalk (see Section 5 of this chapter).
- Cut-throughs shall be designed to have a minimum width of 5 feet to ensure a passing space is provided.
- Medians and pedestrian refuge islands shall be 6 feet minimum in length in the direction of pedestrian travel.
- The near edges of sequential detectable warning surfaces are to be separated by 2 feet minimum length in the direction of pedestrian travel.
- Detectable warning surfaces are located at each curb ramp or roadway entrance of a PAR through a raised median or traffic island. The detectable warning surface shall be located at the back of the curb (see [Figure 8-8](#)~~Figure 8-8~~).
- PARs of shared-use paths that go through raised medians or traffic islands shall be the same width as the shared-use path (see CHAPTER 10).

See the City of Tacoma Standard Plans for details.

Figure 8-8: Raised Islands with Curb Ramps and Pedestrian Cut-Throughs

Island Cut-Through



10.1 Accessibility Criteria for All Pedestrian Pushbuttons

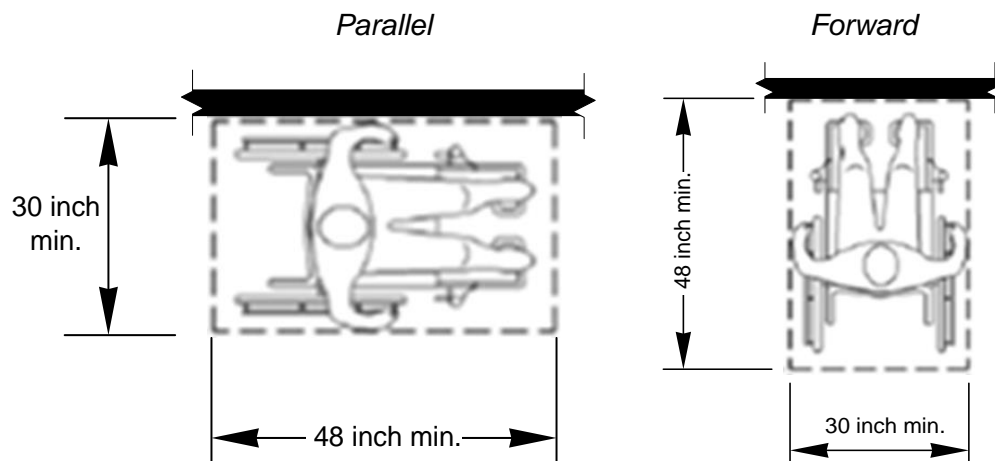
10.1.1 Location Requirements

- No greater than 5 feet from the crosswalk line (extended horizontally) that is farthest from the center of the intersection.
- Between 1.5 feet and 10 feet from the edge of the curb, shoulder, or pavement.
- Mounting height: 42 inches desirable, 48 inches maximum.

10.1.2 Clear Space Requirements

- Grade: 2 percent maximum running and cross slopes.
- Clear space dimensions: 30 inches minimum width by 48 inches minimum length. More width may be necessary to ensure accessibility (see [Figure 8-9](#)).
- Clear space is allowed to overlap other PAR elements (e.g., sidewalk/curb ramp landing).
- Clear space must be connected to the crosswalk served by the pedestrian pushbutton with a PAR.
- Additional maneuvering space may be required if the clear space is constrained on three sides (see PROWAG).

Figure 8-9: Clear Space Parallel and Forward Approach Orientation



Note: A desirable clear space accommodates the full spectrum of wheeled mobility device users approaching the pedestrian pushbutton from multiple directions. Consider providing 36 inches width and up to 84 inches length designed for a parallel approach with the pedestrian pushbutton centered within the length.

10.1.3 Reach Range Requirements

The provided clear space must be within reach range of the pedestrian pushbutton.

- An APS pushbutton provides high contrast (light-on-dark or dark-on-light) against its background.
- If extended pushbutton press features are available, the APS pushbutton shall be marked with three braille dots forming an equilateral triangle in the center of the pushbutton.
- If additional crossing time is provided by an extended pushbutton press feature, then a sign from the MUTCD (R10-32P) shall be mounted adjacent to or integral with the APS pushbutton.
- If the pedestrian clearance time is sufficient only to cross from the curb or shoulder to a median to wait for the next cycle, then an additional APS pushbutton shall be provided in the median.
- The desirable spacing between the APS pushbuttons is 10 feet minimum (5 feet minimum spacing on medians and islands), if feasible.
- If the spacing between the APS pushbuttons is 10 feet or greater, the audible 'WALK' indication shall be a percussive tone.
- If the spacing between the APS pushbuttons is less than 10 feet, the audible 'WALK' indication shall be a speech walk message, and a speech pushbutton information message shall be provided.

Refer to the MUTCD for further design guidance. Also, consult with City Traffic Engineering Section and CHAPTER 6 for current equipment specifications and additional maintenance requirements.

SECTION 11 On-Street Parking

When designing on-street parking, consider the needs of all users, especially those with mobility issues that are not able to walk long distances. The number of parking stalls required for each project will be considered on a case-by-case basis per the recommendations of the City Traffic Engineering section. Disability parking is required to ensure equal access for all users. The number of disability parking spaces required is based on the total number of parking stalls on a block perimeter. Disability parking spaces should be distributed along a block perimeter for easy access to businesses and each parking space must connect to the PAR. A curb ramp may be needed for each access aisle. Disability parking spaces must be a minimum of 8 feet in width with an 8 foot minimum width access aisle for perpendicular and angle parking. Disability parking spaces must be identified by signs displaying the International Symbol of Accessibility. Refer to the PROWAG for more information.

Passenger load zones (which are different than signed load zones) shall be signed and have an associated curb ramp to facilitate access for all to/from the sidewalk and passenger load zone area. If the load zone is in an angle parking area, the stall and associated access aisle shall be marked in traffic yellow. If the load zone is parallel to the curb, it shall be a minimum length of 20 feet. The top and face of the curb should be painted traffic yellow.

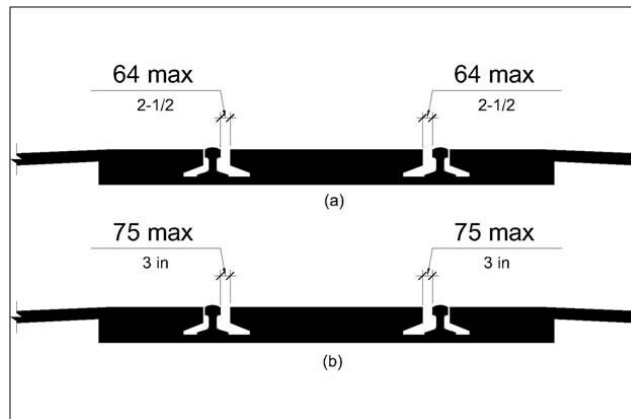
SECTION 12 At-Grade Railroad Crossings

The design of pedestrian facilities that cross railroad tracks often present challenges due to the conflicting needs of pedestrians and trains (see [Figure 8-10](#)~~Figure 8-10~~). The flangeway gap allow trains to traverse an intersecting surface (e.g., sidewalk, roadway), but may create a

significant obstacle for a person who uses a wheelchair, crutches, or walking aids for mobility. Flangeway gaps pose a potential hazard to pedestrians who use wheelchairs because the gaps can entrap the wheelchair casters. Whenever practicable, align pedestrian crossings perpendicular to the tracks in order to minimize potential problems related to flangeway gaps. Crossing surfaces may be constructed of asphalt, rubberized materials, or concrete. Concrete materials generally provide the smoothest and most durable crossing surfaces.

Flangeway gaps at pedestrian at-grade rail crossings shall be 2.5 inches maximum on non-freight rail track and 3 inches maximum on freight rail track (see [Figure 8–10](#)~~Figure 8–10~~).

Figure 8–10: Flangeway Gaps



When detectable warning surfaces are used at railroad crossings, place them according to the MUTCD stop line placement criteria.

There are a number of railroad crossing warning devices intended specifically for pedestrian facilities (see the MUTCD). When selecting warning devices, factors such as train and pedestrian volumes, train speeds, available sight distance, number of tracks, and other site-specific characteristics should be taken into account. Coordinate with the City Traffic Engineering section early in the design process so that all relevant factors are considered and an agreement may be reached regarding the design of warning devices and crossing surfaces.

SECTION 13 Pedestrian Grade Separations

On the approach to a bridge that has a raised sidewalk provide a ramp for the transition to the sidewalk from the paved shoulder if no sidewalk connection is present. A graded transition from a paved shoulder to a raised sidewalk on a bridge shall have a slope of 5 percent maximum and be constructed of asphalt or cement concrete. If a PCP (such as a raised sidewalk or shared-use path) is located near the bridge, consider eliminating the gap between the bridge sidewalk and the PCP by extending the bridge sidewalk to match into the nearby PCP.

At underpasses where pedestrians are allowed, it is desirable to provide sidewalks and to maintain the full shoulder width. When designing/constructing new bridges, there should be sufficient space between the columns and the side of the roadway to locate the pedestrian walkway for improved visibility and security.

In cases where there is a pedestrian collision history, and the roadway cannot be redesigned to accommodate pedestrians at grade, designers should consider providing a grade separated pedestrian structure.

- [Guide for the Development of Bicycle Facilities](#), AASHTO.
- ADA Standards for Accessible Design, USDOJ; consists of 28 CFR parts 35 & 36 and the ADA and Architectural Barriers Act Accessibility Guidelines for Buildings and Facilities, U.S. Access Board.
- FHWA-HRT-05-137 Evaluation of Safety, Design, and Operation of Shared-Use Paths: Final Report, which documents the research and the [spreadsheet calculation tool](#) and is the basis of FHWA-HRT-05-139 Evaluation of Safety, Design, and Operation of Shared-Use Paths Tech Brief. This report provides step-by-step instructions on how to use the LOS procedure and spreadsheet calculation tool, which can be downloaded from the Turner-Fairbank Highway Research Center.
- WSDOT Standard Plans

Local:

- City of Tacoma [Transportation Master Plan](#)
- City of Tacoma [Waterfront Design Guidelines](#)
- City of Tacoma [Pedestrian and Bicycle Design Guidelines](#)
- [MoMap](#)
- [Pedestrian Bicycle Information Center](#)
- Metro Parks [Tacoma Trail Management Plan](#)

SECTION 2 Shared-Use Path Design – The Basics

Shared-use paths shall be designed to accommodate all intended users and minimize conflicts. A shared-use path can accommodate several travel modes at altering speeds. Therefore a suitable bicycle design speed is just one of the critical elements to consider. For example, the pedestrian is generally the slowest mode so the design of an intersection crossing should be prioritized over a bicyclist which can travel at higher speeds.

2.1 Design Speed

The design speed for a shared-use path is based on the bicycle user and is dependent on the terrain and the expected conditions of use. Design the shared-use path to encourage bicyclists to operate at speeds compatible with other users. Higher speeds are discouraged in a mixed-use setting or in a densely populated urban setting. Design shared-use paths to maintain speeds at or below the speeds shown in [Table 10-1](#) by designing to the horizontal curve radii shown. Refer to the WSDOT Design Manual, Section 1 for additional guidance on bicycle design speed.

Table 10-1: Bicycle Design Speeds

Conditions	Design Speed (mph)	Curve Radius (feet)
Long downgrades (steeper than 4 percent and longer than 500 ft)	30	166
Open country (level or rolling); shared-use paths in urban areas	20	74
Approaching intersections	12	27

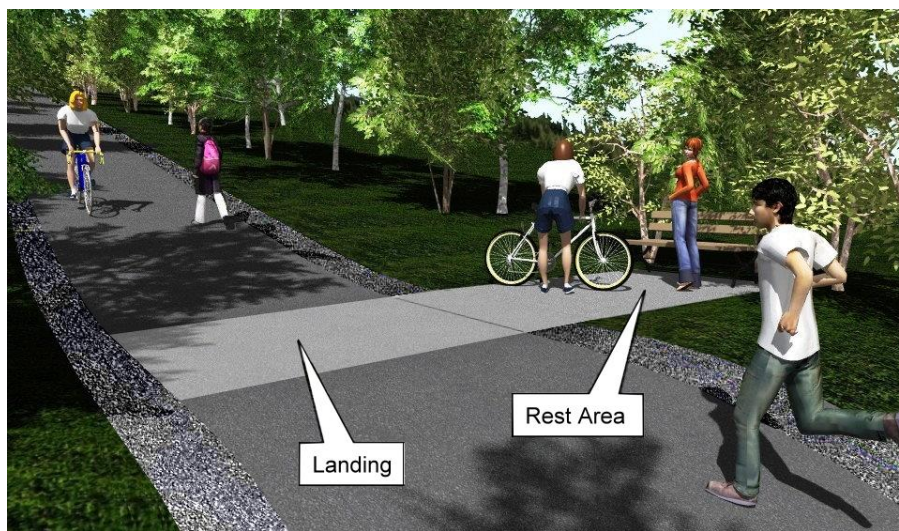
7.3 Rest Areas

Rest areas may be provided adjacent to the shared-use path outside of the pathway travelled as shown in [Figure 10-5](#)~~Figure 10-5~~.

Requirements for rest areas include:

- The maximum running slope and cross slope is 2 percent.
- The minimum landing size is 5 feet by 5 feet and it must be parallel and abutting the path.
- If features such as benches are provided, they must meet ADA requirements; consult with Traffic Engineering and ADA Coordinator for guidance.

Figure 10-5: Landing and Rest Area Example



Notes:

Design landings at least 5 feet long and as wide as the shared-use path.

SECTION 8 Pavement Structural Section

Design the pavement structural section as recommended by Public Works Engineering, considering the quality of the subgrade and the anticipated loads on the path. Design loads are normally for maintenance and emergency vehicles, reference CHAPTER 4. Provide a firm, stable, slip-resistant pavement surface.

Use crushed rock or other suitable material for shoulder graded areas, reference WSDOT Standard Specifications Division 9. Consult with Public Works Engineering as needed. On bridges or in tunnels, it is a common practice to pave the entire shared-use path area, including shoulders across the structure.

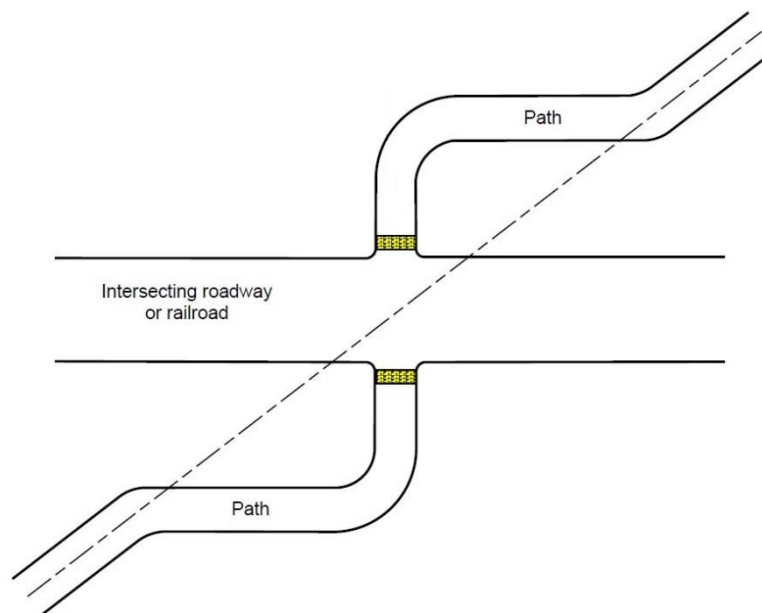
The use of pervious asphalt or porous concrete should be considered when practicable. Consult the SWMM Volume 6 for design methodology and to help determine feasibility of permeable pavements. Standard Plan PD-01 has section designs for porous asphalt and pervious concrete.

For roadway intersections with roundabouts, see WSDOT Design Manual Chapter 1320 Roundabouts.

Midblock crossings are located between roadway intersections. When possible, locate the path crossings far enough away from intersections to minimize conflicts between the path users and motor vehicle traffic. It is preferable for midblock path crossings to intersect the roadway at an angle as close to perpendicular as practicable. A minimum 60 degree crossing angle is acceptable to minimize ROW needs. A diagonal midblock crossing can be altered as shown in [Figure 10-6](#).

There are several considerations for the designer for midblock crossings. These include detectable warning surfaces, traffic ROW assignments, various traffic control devices, sight distances for both bicyclists and motor vehicle operators, refuge island use, access control, and pavement markings.

Figure 10-6: Typical Redesign of Diagonal Midblock Crossing



10.3 Adjacent Paths

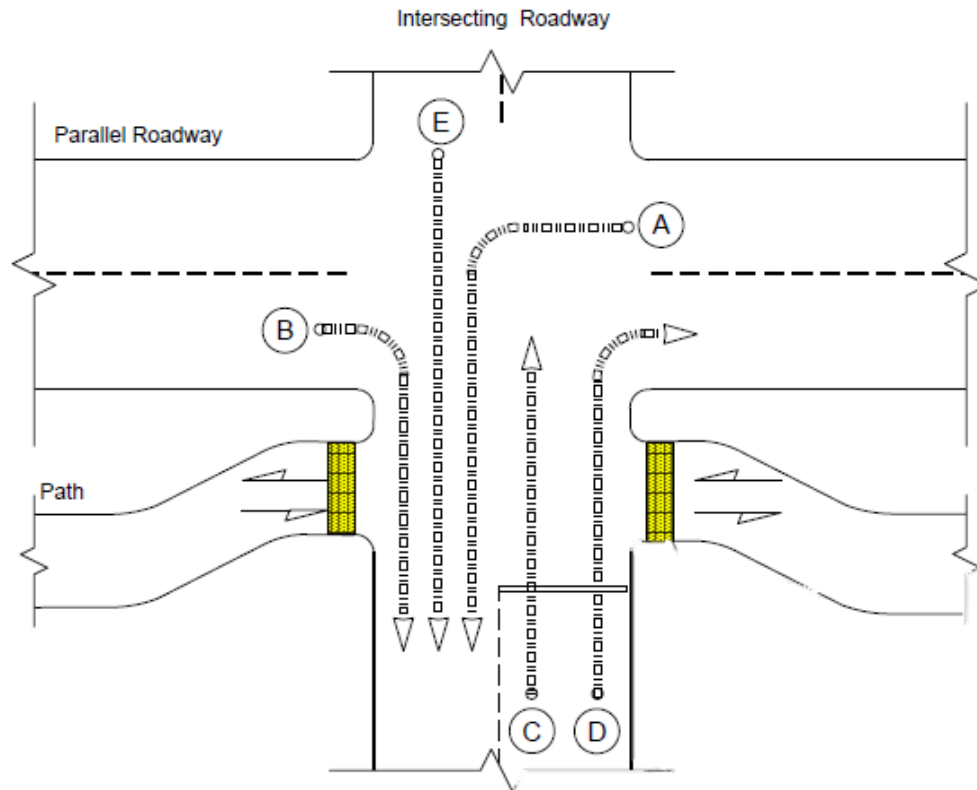
Adjacent path crossings are located at or near public intersection crosswalks and are usually placed with pedestrian crossings, where motorists can be expected to stop. If alternate intersection locations for a shared-use path are available, select the one with the greatest sight distance.

Adjacent path crossings occur where a path crosses an existing intersection of two roadways, a T intersection (including driveways), or a four-way intersection, as shown in [Figure 10-7](#). The applicant or design engineer should integrate this type of crossing close to an intersection so that motorists and path users recognize one another as intersecting traffic. The path user faces potential conflicts with motor vehicles turning left (A) and right (B) from the parallel roadway and on the crossed roadway (C, D, and E).

Traffic Engineering will consider crossing improvements on a case-by-case basis. Suggested improvements include: move the crossing; evaluate existing or proposed intersection control type; change signalization timing; or provide a refuge island and make a two-step crossing for path users.

Important elements that greatly affect the design of these crossings are traffic ROW assignments, traffic control devices, and the separation distance between path and roadway.

Figure 10-7: Adjacent Shared-Use Path Intersection



Note:

For more information search the various references from Section 1.2

10.4 Additional Roadway/Path Intersection Design Considerations

Additional roadway/path intersection design considerations include the following:

- Elevated crossings: Consider refuge islands or raised asphalt humps where a shared-use path crosses a non-arterial.
- The refuge area may either be designed with the storage aligned perpendicularly across the island or be aligned diagonal ([Figure 10-8](#)~~Figure 10-8~~). The diagonal storage area has the added benefit of directing attention toward oncoming traffic since it is angled toward the direction from which traffic is approaching.

10.5 At Grade Railroad Crossings

- It provides needed maneuvering room to avoid pedestrians and other bicyclists.

For undercrossings and tunnels, provide a minimum vertical clearance of 10 feet for path users from the path pavement to the structure above. This allows access by emergency, patrol, and maintenance vehicles on the shared-use path. Consult Public Works Engineering to verify that the planned path width meets their specifications.

If expansion joints are used in the shared-use path then they should be placed perpendicular to the path and have a maximum gap of 0.5 inch or be covered with a slip resistant plate. All joints must be ADA compliant, see CHAPTER 8.

If the shared-use path requires consideration of screening materials or railings, as identified in the above sections or to address neighborhood impacts, then consult with Public Works Engineering for such accommodation.

SECTION 12 Signing, Pavement Markings and Illumination

Refer to the MUTCD for guidance and directions regarding shared-use path signing (regulatory, warning, and way finding) and pavement markings. Wayfinding should be used on all trail corridors. The City is using the green and white MUTCD wayfinding as a standard to identify destinations of significance. Special districts may have individual signage styles, consult with Public Works Engineering.

For pavement markings around bollards and other obstructions see Section 13 of this chapter.

The level of illumination on a shared-use path is dependent on the amount of nighttime use expected and the nature of the area surrounding the facility. Illumination of the shared-use path should be considered for all segments not illuminated by arterial lighting or other sources. The City has an LED standard for pedestrian level illumination. Lighting may also require a cut-off shield to reduce light intrusion on to adjacent homes or properties. The applicant shall submit a lighting plan for review by Traffic Engineering that is consistent with guidance outlined in CHAPTER 5.

12.1 Mileage Markers

Mileage markers should be used in corridors with a distinct beginning and ending in increments of 0.5 miles. The markers should measure distance starting from 0 in each direction. Markers should be inset and flush with the shared-use path, such as a tile or metal plate.

SECTION 13 Restricted Use Controls

This section presents requirements on use of fencing and other treatments to separate motor vehicles from the shared-use path.

13.1 Fencing

Fencing or other forms of controlling access are generally necessary to ensure compliance of intended use and safety along the path. Shared-use paths constructed as shown in [Figure 10-8](#), likely require fencing. For guidance on fencing controls in the ROW, refer to WSDOT Design Manual, Division 5.

If the existing public stormwater system is determined to be under capacity, the project proponent may be required to upsize the existing downstream system or provide detention onsite.

SECTION 4 Gravity Pipe Design Criteria

4.1 Pipe Size

Any extension of a City stormwater or wastewater sewer greater than 12 inches in diameter will require an environmental checklist. Refer to ~~CHAPTER 9~~[CHAPTER 13 SECTION 5](#) for additional information regarding the environmental checklist.

4.1.1 Wastewater Sewer Pipe Size

The minimum pipe diameter for the wastewater conveyance system is 8 inches.

4.1.2 Stormwater System Pipe Size

The minimum pipe diameter for the City maintained stormwater conveyance system is 12 inches.

Catch basin leads shall be a minimum of 12 inches in diameter.

4.2 Pipe Slope

Maximum slopes, velocities, and anchoring requirements are shown in Section 4.9. If velocities exceed 15 feet per second, provide anchors and/or restrained joints at bends and junctions.

4.2.1 Wastewater System Pipe Slope

The minimum slope for wastewater pipes is 1 percent. Slopes less than 1 percent may be allowed provided calculations are provided showing that the proposed system meets or exceeds a 2 feet per second scouring velocity.

4.2.2 Stormwater System Pipe Slope

The minimum slope for all stormwater pipes is 0.5 percent. Slopes less than 0.5 percent may be allowed provided calculations are provided to demonstrate that a minimum velocity of 2 feet per second can be maintained at full flow.

4.3 Pipe Material

4.3.1 Wastewater Conveyance Pipe Material

The following table lists the acceptable pipe materials for the wastewater conveyance system. The maximum out of round deflection allowed in flexible pipes is 5 percent.

4.3.2 Stormwater Conveyance Pipe Materials

The following table lists the acceptable pipe materials for stormwater conveyance systems. See the SWMM for allowable pipe materials for stormwater treatment and flow control facilities. The maximum out of round deflection allowed in flexible pipes is 5 percent. Galvanized, aluminized, and/or corrugated iron or steel pipes are not allowed within the public ROW or as a connection to the municipal system.

4.4 Pipe Depth

The standard depth for new stormwater and wastewater conveyance systems is shown in City Standard Plans DR-04 and DR-05.

4.5 Pipe Cover

The minimum pipe cover is 3 feet unless otherwise specified by the pipe manufacturer. All pipe shall be designed using an HS-20 loading criteria. Pipe cover is measured from the finished grade elevation down to the top of the outside surface of the pipe.

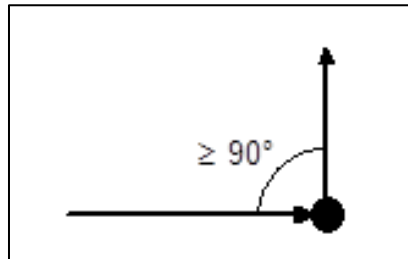
4.6 Pipe Alignment

The standard alignment for new stormwater conveyance system and wastewater sewers is shown on City Standard Plans DR-04 and DR-05.

Pipes shall be laid true to line and grade with no curves, bends, or deflections in any direction.

The angle between any wastewater sewer mains entering or exiting a manhole should not be less than 90 degrees, as shown in Figure [11-15-4](#).

Figure 11-1: Wastewater Sewer Mains Entering or Exiting Manhole Angle



Where crossing an existing or proposed utility, the alignment of the stormwater or wastewater sewers shall be such that the two systems cross as close to perpendicular as possible.

Where the vertical separation of two parallel systems exceeds the horizontal separation, additional horizontal separation may be required to provide future access to the deeper system.

4.6.1 Pipe Casings

Casings shall be required for all pipes when the depth of fill, adjacent improvements or structures, heavy traffic or any other considerations would make conventional open trench replacement or repair work impractical. Some examples of improvements that would require a casing for stormwater or

wastewater utilities are railroads, freeways, buildings, bridge abutments, retaining walls, structural slabs, and utility vaults. Requirements for casings include:

1. The casing material and joints shall be ductile iron or steel able to withstand the anticipated loadings.
2. The casing inside diameter shall be, at a minimum, 33 percent greater than the outside diameter of the carrier pipe or two standard pipe diameters larger than the carrier pipe, whichever is greater. However, the casing may need to be larger due to anticipated future upsizing of wastewater or stormwater sewer systems. Actual casing sizes will be specified by the Environmental Services Department.
3. The casing shall be leak proof. The ends of the casing pipe shall be sealed to prevent entry of water.
4. An analysis shall be performed to determine if cathodic protection or an increase in thickness is necessary to guarantee the pipes will maintain structural integrity for a minimum of 100 years.
5. All casing pipe welds shall be inspected by a third party testing agency, including both 100 percent visual weld inspection and using a non-destructive testing method recommended by the testing agency.
6. The casing shall extend to a point outside the loading zone of influence.
7. Pre-manufactured non-metallic or non-corrosive casing spacers shall be used to support the carrier pipe in the casing to facilitate pipe removal and installation and to prevent vertical movement of the carrier pipe. Spacing devices shall be sized to fit the casing pipe and installed in accordance with the manufacturer's recommendations.
8. The annular space between carrier pipe and casing may be required to be filled as specified by the Environmental Services Department.

4.7 Pipe Couplings

Rigid Couplings, manufactured by Romac Industries, Inc., or City approved equal, shall be used at any pipe joint in which bell and spigot or fused joints are not used and when connecting two dissimilar pipe materials. Flexible couplings are not permitted.

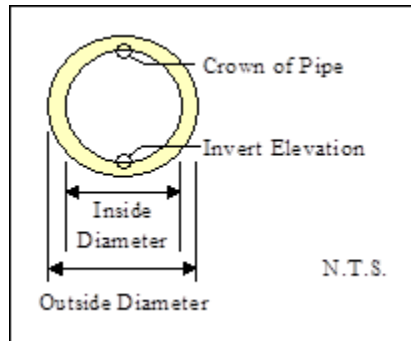
4.8 Pipe Bedding, Backfill and Backfill Compaction

Pipe bedding and backfill shall conform to City Standard Plan SU-16. Backfill compaction shall conform to City Standard Plan SU-28.

4.9 Pipe Anchors

The following table shows criteria to be used in determining whether pipe anchoring is required. Anchor design and spacing shall be submitted to the Environmental Services Department for approval. [Table 11-3](#) applies to pipe anchoring above and below ground. Only Solid Wall HDPE and Lined Ductile Iron pipe should be used in above ground installations.

Figure 11-2: Elevations Diagram when Connecting Mains of Different Diameters



Drop connections are not permitted for wastewater sewer mains or private side sewer connections to the City system unless otherwise approved by the Environmental Services Department. Drop connections are permitted for catch basin leads. Catch basin leads shall connect below the cone of the manhole.

A flexible pipe-to-manhole connector shall be employed in all connections of all pipes to new precast concrete manholes to provide a watertight joint between the pipe and the manhole. The connector shall be "Kor-N-Seal" with "Wedge Korband" (Type 1 or 2 as required for pipe diameter) manufactured by NPC, Inc. based in Milford, New Hampshire or the Environmental Services Department approved equal. The connectors shall be installed in accordance with the manufacturer's recommendations.

Connections to existing brick manholes may be allowed on a case by case basis. Manhole replacement may be required by the Environmental Services Department based upon the condition of the existing manhole.

SECTION 6 Catch Basins

The following criteria shall be used when designing a stormwater conveyance system that uses catch basins. Catch basins shall not be installed as part of the wastewater sewer system.

- Connections to the stormwater system shall be made at a structure. Tributary connections shall be made at 90 degrees to the main. Slight variations may be allowed.
- The maximum surface run between catch basins shall not exceed 350 feet. Catch basin locations shall be based upon the quantitative downstream analysis when required (see Section [3.22-2](#) of this chapter).
- Catch basin size shall be determined by pipe diameter and orientation at the structure. A plan view of the structure, drawn to scale, will be required when more than four pipes enter the structure on the same plane, or if angles of approach and clearance between pipes is of concern. The plan view (and sections if necessary) must demonstrate that the minimum distance requirements between knockouts per the City Standard Plans (SU-17, SU-18, SU-19) can be maintained.
- Catch basins shall be Type 1, Type 1L or Type 2 catch basins conforming to WSDOT Standard Plans B.5.2-01, B.5.4-01, or B.10.20-01. Additional catch basin styles may be considered on a case-by-case basis.
- Type 1 and Type 1L basin heights shall not exceed 8 feet.

SECTION 10 Access and Easements

See ~~CHAPTER 9~~[CHAPTER 13](#) for additional information concerning ROW and easements.

Maintenance access shall be provided for all City-owned facilities and conveyance systems. A minimum 15 foot wide access easement which is separate and distinct from the public utility easement shall be provided to manholes or other components of the system not accessible via a public utility easement. The public utility easement is the easement in which the utility and all appurtenances are contained though access to the structures may be necessary from another location, such as top of slope. The access easement shall have a minimum 12 foot wide crushed rock or HMA surface. The access may consist of HMA with a maximum grade of 15 percent or crushed surfacing base course (CSBC) with a maximum grade of 12 percent. HMA shall be a minimum thickness of 2 inches and in accordance with City Special Provision 5-04 and WSDOT Specification 5-04. CSBC shall be a minimum thickness of 3 inches and in accordance with WSDOT Specification 9-03.9(3). If access is required over sidewalks, sidewalks shall be designed for HS-20 loading.

Public easements are easements granted by private entities to the City for access, maintenance, and protection of City infrastructure.

For easements dedicated to the City for the purpose of stormwater systems or wastewater sewers, the following typically applies. The actual easement document will contain all applicable restrictions or allowances.

No permanent structures(s) shall be erected within the easement area(s) unless specifically approved in writing by the Director of Environmental Services. Permanent structures shall mean any concrete foundation, concrete slab, wall, rockery, building, deck, and overhanging structures, fill material, recreational sport courts, carports, portable sheds, private utilities, fences, or other site improvement that will unreasonably interfere with the need to access or construct utilities in said easements(s). Permanent structures shall not mean improvements such as normal landscaping, asphalt paving, gravel, or other similar site improvements that do not prevent the access of people, materials, and machinery across, along, and within the said easement area. Land restoration by the City within the said easement area will be strictly limited to grass seed, grass sod, and/or asphalt replacement unless otherwise determined by the City.

Preliminary project planning should take into account the potential loss of buildable area or the need to purchase more property as a result of stormwater facilities and wastewater sewers and their associated necessary easements and tracts.

All publicly maintained wastewater sewers and stormwater conveyance systems shall be located in dedicated tracts, public easements, or public ROWs. All pipes and channels shall be centered within the easement. Easement widths may be increased for pipes greater than 3 feet in diameter and open channels with top widths greater than 5 feet. The depth or proximity of steep slopes to the public system may necessitate a larger easement requirement for future excavation and maintenance purposes. See Table 11-4 and Table 11-5 below for appropriate easement widths based upon depth of pipe.

Public wastewater sewer easements shall conform to Table 11-4. Public stormwater easements shall be a minimum of 20 feet in width and conform to Table 11-5.