

## Chapter 4 Roadway Elements

### 4-1 Drainage

All roadways must have adequate crown or adequate cross-slope to get water off the roadway. Careful cross-slope design is especially important at the ends of horizontal curves with superelevation and at intersections. It must be recognized that many drainage ditches and culvert headwalls are usually in the clear area, or recovery area, which is an important roadway safety feature. In curb and gutter situations, especially where grades are at or near recommended minimums, the location and design of inlets becomes very important.

All drainage elements associated with the roadway design and construction or draining into or out of the roadway and within the project boundaries shall be designed in accordance with the requirements of Pierce County Code Title 17A and the *Pierce County Stormwater Management and Site Development Manual*.

### 4-2 Utilities

The primary purpose of right-of-way is to serve vehicular and non-motorized travel. In accordance with state law, utility facilities may be accommodated in road right-of-way. Use of the right-of-way by utilities should be planned to minimize interference with traffic using the road. Industry-recognized principles provide for general location and construction of utilities to minimize conflict between the use of the road right-of-way for vehicular and non-motorized travel and for its secondary purpose of providing space for location of utilities. However, all public or private utility installations within the County road right-of-way shall conform to the requirements outlined in the *Manual on Accommodating Utilities in Pierce County Rights-of-Way*, as adopted in Pierce County Code 17B.10.060.

It will be the Engineer's responsibility to coordinate with all utilities to see that the utilities are located in accordance with Pierce County Public Works and Utilities Department adopted standards, and that the installation work is coordinated with the road construction work. Above-grade utility facilities shall be located such that they do not interfere with sight distance, traffic signing and signals, drainage culverts, or other roadway features (including shoulders and sidewalks). Further, utility poles are not permitted within any roadway shoulder, buffer, or sidewalk area without approval of the County Engineer.

Improper location or construction of utilities will be sufficient reason for the refusal of the County to accept a road for dedication and maintenance.

Utility trenching or transverse cuts in new County roads will be discouraged. They will not be permitted unless it can be shown that an alternative such as boring, jacking, or

relocating outside the paved roadway area is not feasible. Utility trenching or transverse cuts may be allowed if the utility can be installed just prior to reconstruction or overlay of the road.

Utility patches shall be constructed in accordance with the standards set forth in the *Manual on Accommodating Utilities in Pierce County Rights-of-Way*.

### **4-3 Pavement**

Paving and subgrade material for impermeable non-arterial roads shall be in accordance with the *Standard Drawings*. Paving and subgrade materials for permeable non-arterial roads shall be in accordance with the Stormwater Management and Site Development Manual. Paving and subgrade material for arterial roads will be based on a pavement design analysis made by the Engineer. Supporting design criteria and calculations must be submitted to verify the design; however, in no case shall the design be less than that required for non-arterial roads. Paving for all impermeable roads shall be Hot Mix Asphalt Class 1/2 inch.

Pavement design for a major arterial road shall be for a 30-year performance period. Pavement design for all other arterial roads shall be for a 20-year performance period. Design criteria and standards established by AASHTO, WSDOT, the Asphalt Institute, or other nationally recognized organizations may be used to determine paving and subgrade depths and types of materials for the roadway section. Non-destructive testing or a falling weight deflectometer or a modulus value established by a geotechnical engineer should be used to determine the material characteristics of the existing soil conditions for the pavement design.

### **4-4 Lane Widths**

Unless otherwise approved or required by the County Engineer, lane widths shall be in accordance with the Roadway Design Parameters table:

## Roadway Design Parameters

	Chapter reference <i>Manual on Design Guidelines</i>	Local Roads					Arterials		
		Small Lot Developments		Cul-de-sac	Minor	Feeder	Collector	Secondary	Major
		Access Lanes <sup>(a)</sup>	Neighborhood Streets <sup>(a)</sup>						
<b>Design Vehicle</b>	2-3	P	P	P	SU/P	SU/P	SU/BUS	BUS/WB-40	BUS/WB-40
<b>Design Speed</b>	2-4								
<b>Urban</b>		20 mph	25 mph	25 mph <sup>(b)</sup>	25 mph	30 mph	35 mph <sup>(c)</sup>	40 mph <sup>(c)</sup>	45 mph <sup>(c)</sup>
<b>Rural</b>		n/a	n/a	25 mph <sup>(b)</sup>	25 mph	30 mph	40 mph <sup>(c)</sup>	45 mph <sup>(c)</sup>	45 mph <sup>(c)</sup>
<b>Lane widths <sup>(d)</sup></b>									
<b>Exterior <sup>(e)</sup></b>		10ft <sup>(f)</sup>	11ft <sup>(g)</sup>	see note (l)	see note (l)	12ft	11ft <sup>(h)</sup>	11ft <sup>(h)</sup>	11ft <sup>(h)</sup>
<b>Interior</b>		n/a	n/a	n/a	n/a	n/a	11ft	11ft	11ft
<b>TWLTL</b>		n/a	n/a	n/a	n/a	n/a	12ft	12ft	12ft
<b>Exclusive Turn Lane</b>		n/a	n/a	n/a	n/a	n/a	12ft	12ft	12ft
<b>Exclusive Bike Lane <sup>(i)</sup></b>	4-7	n/a	n/a	n/a	n/a	n/a	5'	5'	5'
<b>Geometrics</b>									
<b>Max. Super Rate</b>	3-2	Not Allowed		Not Allowed	0.02 ft/ft	0.02 ft/ft	0.04 ft/ft	0.04 ft/ft	0.04 ft/ft
<b>Max. Profile Grade <sup>(j)</sup></b>	3-3	12%	12%	15% <sup>(k)</sup>	12%	10%	10%	8%	8%

- (a) In accordance with Small Lot Developments per 18J.17.
- (b) 20 mph for stems 250 feet or less in length.
- (c) Design speeds shown are a guide only. The County Engineer will establish design speeds for all arterials.
- (d) All lane widths are exclusive of the curb and gutter sections, except as noted.
- (e) Widened curb lane, when required by the County Engineer, shall be 15 feet for 2- and 3-lane roadways and 14 feet for multi-lane roadways.
- (f) Lane width inclusive of the gutters.
- (g) Neighborhood Streets shall be 28 feet wide, which includes the gutters and 6-foot parking areas. Where curb bulb outs are used to delineate parking bays, the width shall be 22 feet inclusive of the gutter.
- (h) For two- and three-lane roadways, lane widths shall be 12-foot wide.
- (i) Lane widths inclusive of the gutters and delineated from through vehicle movement by a 4-inch white edge line.
- (j) Minimum centerline and gutter line grade shall be 0.7 percent with asphalt concrete gutter or uncontained drainage and 0.4 percent with cement concrete gutter.
- (k) Turnaround grade shall be 6 percent maximum.
- (l) For local road minor and cul-de-sacs, the roadway width shall be 28 feet except when open drainage, asphalt raised edge or parking is included (see *Standard Drawings*).

All intersection departure lanes (i.e., the egress lanes for traffic leaving the intersection) shall be designed with sufficient width to accommodate the vehicle tracking path of the appropriate design vehicles. For intersections along an arterial, all legs that have a single departure lane shall have a minimum pavement width of 15 feet for this departure lane and shall then taper to the normal lane width over a distance of 100 feet on arterials and 50 feet on local roadways. At intersections where double left or right turn lanes are being constructed, the departure lanes that receive these turning movements shall be flared or widened as necessary to be consistent with the tracking needs of the design vehicle for the intersection.

## 4-5 Shoulders

Shoulders shall be provided consistent with the requirements of the County Engineer and the roadway cross-sections shown in the *Standard Drawings*.

Shoulders provide the following advantages:

- Space for vehicles to make emergency stops away from the traveled way.
- Enhanced safety, roadway capacity, and sight distance.
- Lateral clearance from signs, ditches, above-ground utilities, and potential roadside obstacles.
- Structural support for the pavement and storm water is discharged farther from the traveled way.
- Improved maintenance operations.
- Space for pedestrian and bicycle use.
- Space for occasional encroachment of vehicles, such as mail delivery vehicles.

In particular, shoulders are an important and integral part of roadways in rural areas and in areas where curb, gutter, and sidewalk is not provided.

If a roadway designed with shoulders has been identified for use as a part of the non-motorized, bicycle facility network, the shoulders shall be paved. In urban areas where curb, gutter, sidewalk is provided and where future bike lanes or restriping for additional traffic lanes are envisioned, paved shoulders shall be provided between the traveled way and the curb and gutter as required by the County Engineer.

## 4-6 Curbs

Acceptable curb designs for cement concrete curb and gutter, and cement concrete rolled curb, are provided in the *Standard Drawings*.

The use of cement concrete rolled curb is only allowed in the following circumstances:

- Driveway accesses intended for maintenance vehicles.
- When the length of full height traffic curbing is reduced to short segments due to driveway spacing (requires prior County approval).

Asphalt concrete raised edges and asphalt concrete barrier curbs are not intended for use in urban growth areas, unless otherwise approved by the County Engineer. When used, they must be constructed integrally with the pavement construction.

## **4-7 Pedestrian and Bicycle Facilities**

Sidewalks, walkways, and shared-use paths, when used, shall conform to design parameters and direction provided by the County Engineer. Storm drain percolation systems shall not be permitted under any sidewalk or walkway.

Pedestrian facilities shall be provided in urban growth areas as a part of any newly constructed or reconstructed road. Shared-use paths or walkways shall be constructed in compliance with any applicable adopted County plan. The shared-use path or walkway may be located within the area of the road itself, or be separated from the road by a buffer, or be outside the roadway altogether.

### **4-7.1 Sidewalks**

Sidewalk facilities shall be constructed of pervious concrete, if feasible. Otherwise, the sidewalk shall be constructed of cement concrete materials. Curb ramps and sidewalk facilities shall meet the requirements of the “Americans with Disabilities Act” and conform to the design requirements of the County Engineer. Sidewalks are 6 feet wide when adjacent to an arterial road, 5-feet-wide when separated by a buffer or drainage ditch from an arterial road or included in a local roadway, and 4-feet-wide when used in a small lot design. A sidewalk shall not be placed immediately adjacent to an asphalt-raised edge or asphalt-barrier curb.

### **4-7.2 Walkways**

Walkway facilities shall be constructed of porous asphalt pavement, if feasible. Otherwise, the walkway shall be constructed of asphalt concrete materials. Curb ramps and walkways shall meet the requirements of the “Americans with Disability Act” and conform to the design requirements of the County Engineer. The width of an asphalt walkway shall be the same as used for a sidewalk. An asphalt walkway shall not be placed immediately adjacent to an asphalt raised edge or asphalt barrier curb.

### **4-7.3 Shared-Use Paths**

Shared-Use Paths are not normally expected within the road right-of-way, except in situations where the facility is part of an adopted plan. Minimum width of a shared-use path is 10 feet when the grade is equal or less than 5 percent and 13 feet if over 5 percent. There shall be a 2-foot graded area on each side of the shared-use path. If required by the County, such a pedestrian and/or bicycle facility design shall be coordinated with the County Engineer in order to receive specific design direction and parameters. When preparing a shared-use path design, the Engineer should consult the *Guide for the Development of Bicycle Facilities*, as published by the American Association of State Highway and Transportation Officials.

When pedestrian or bicycle facilities are provided as an independently constructed improvement along the frontage of property abutting an existing road, such improvement shall be constructed in accordance with the provisions outlined in this Manual in a location approved by the County Engineer.

## **4-8 Buffers and Medians**

A buffer is that area between the back of curb and near edge of sidewalk or walkway. The maximum width shall be 12 feet and the minimum width shall be 4 feet. The maximum height of vegetation, except for street trees, placed in a buffer shall be 24 inches above the roadway surface provided no safety related concern is created. Street trees conforming to the type and size outlined in Pierce County Code 18J.15.050, “Landscaping and Buffering”, are allowed within the buffer area on a local road within the boundary of a plat provided no safety or visibility related concern is created. Street trees are not allowed within the buffer area on an arterial road without the permission of the County Engineer. Placement of street trees within the buffer will not be allowed if safety or visibility issues will result. Utility poles shall not be located within the buffer area unless there are no other viable locations, and the placement of said poles can be accommodated in such a way as to not create a safety or visibility concern.

A median is that raised area within the roadway separating opposite directions of vehicular traffic. A travel lane of 18-feet in width shall be used when a two-lane roadway includes a raised median. The maximum width of any median shall be 16 feet from back of curb to back of curb. The maximum height of vegetation, except for street trees, placed in the median shall be 24 inches above the roadway surface. Street trees are allowed within the median on a local road within the boundary of a plat, provided the trees conform to the type and size outlined in Pierce County Code 18J.15.050, “Landscaping and Buffering”. Placement of street trees within the median will not be allowed if safety or visibility issues will result. The placement of utility poles in the median area is not allowed under any circumstances. Where the median is privately owned from back of curb to back of curb, installation of privately-owned irrigation systems are acceptable provided the irrigation water meter is also located within the median. The minimum length for a median is 200 feet.

Storm drain infiltration systems may be allowed within a buffer or median provided adequate soils exist (as determined by the County Engineer) and accessibility can be achieved.

## **4-9 Clear Areas**

The designer must be aware of the extensive tables of recommended clear area distances both in the “AASHTO Green Book” and WSDOT *Design Manual*. It must also be recognized, however, that serious accidents on low volume roads, especially on those below 200 ADT, are rare occurrences. At this low end of the scale, the cost of providing the recommended clear area may be prohibitive. Research undertaken to re-evaluate the

safety needs on low volume rural roads states that the suggested values for side slopes and clear areas should be recognized as idealistic objectives. A more realistic approach to roadside safety on low volume roads should depend on achieving a balance between the cost and the safety effectiveness of the design treatment.

It is further stated that while the application of such an analysis to low volume roads indicates individual roadside safety treatments yield very small safety contributions, some low cost improvements do appear to be cost effective, especially on the outside of curves. The removal of certain trees and relocation of utility poles may be recommended. Also cited as being cost effective are the placement of guardrail on steep slopes, removal of unnecessary guardrail on flat slopes, and the flattening of steep but low embankments. In this regard, it is most important that the designer is aware of pertinent published recommendations and associated research. In the final analysis, the designer must apply his or her own professional judgment in making the final design decisions, and be prepared to defend and justify them if necessary.

## **4-10 Roadside Control**

### **4-10.1 Cut/Fill Slopes**

Fill slopes shall be constructed no steeper than 2 H: 1 V for curbed sections and 4 H:1 V on shoulder sections. Cut slopes shall be no steeper than 1 H: 1 V. Flatter slopes are preferred and will be required if there are indications that the earth is unstable and subject to sliding, sloughing, or erosion. Fills are to be constructed using appropriate materials, compaction methods, and construction techniques to ensure stability.

Side slopes shall be stabilized by grass sod, hydroseeding, by other planting or surfacing materials, or by the use of other material types acceptable to the County. Side slopes may also be flattened to accommodate utility placement. Side slopes higher than 15 feet shall be terraced with 5-foot minimum wide bench for every 15 feet of vertical height sloped to drain properly.

### **4-10.2 Mailboxes**

Mailboxes shall be installed as far removed from the driving portion of the right-of-way as possible, so as not to obstruct sight distance, yet still be accessible to the U.S. Postal carrier. Mailbox supports shall be of breakaway design. U.S. Postal Service approval of type and design shall be required and any details provided by the U.S. Postal Service shall be included in the set of construction plans. Mailboxes shall maintain minimum clearances in accordance with ADA requirements and shall not obstruct sidewalks and/or walkways.

### **4-10.3 Landscaping**

Street trees and other vegetation over 18 inches in height located within the County right-of-way for a local road within the boundaries of a plat shall be placed a minimum of 6 feet back from the gutter line when a curbed section is used, and shall be placed a minimum of 6 feet back from the back of shoulder when no curb is used. Street trees and

other vegetation over 18 inches in height shall be placed a minimum of 12 feet back from the gutter line when a curbed section is used, and shall be placed a minimum of 12 feet back from the back of the shoulder when no curb is used in these two situations: for arterial road classifications and for local road classifications that are not within the boundaries of a subdivision. Street trees shall conform to the type and size outlined in Title 18J of the Pierce County Code. Street trees shall be placed a minimum of 3 feet from any sidewalk or walkway. Additionally, street trees used within County right-of-way shall not conflict with overhead utilities, traffic control devices, sight distance or visibility requirements, and root development shall not conflict with underground utilities, pavement, curbs, sidewalks, walkways, shared-use paths, or storm drainage facilities. Irrigation systems not specifically permitted or licensed by the County Engineer must be installed on private property.

#### **4-10.4 Guardrails**

The following manuals should be used as guidance to determine guardrail design and needs:

- *AASHTO Roadside Design Guide*
- *FHWA Barrier Guide for Low Volume and Low Speed Roads*
- *WSDOT Design Manual*

If it has been established that guardrail is justified on a particular improvement, the designer must determine the best location, type of construction, and post-spacing that would be most appropriate for the function and anticipated traffic volume of the facility. The designer should be aware that warrants and designs developed for high volume, high speed facilities are not necessarily appropriate for low volume and/or low speed locations.

### **4-11 On-Street Use**

At times the roadway area provides for additional secondary on-street uses. Such uses include on-street parking and bus turnouts.

#### **4-11.1 Parking**

When properly located, on-street parking can supplement off-street parking facilities. However, it should be allowed only where conditions are safe and where the impact on traffic flow is acceptable. On-street parking shall be allowed only with the approval of the County Engineer. Inappropriate on-street parking may impede traffic flow, contribute to accidents, or cause congestion. On-street parking will not be permitted along arterial roads unless the function of the arterial is low traffic volume and low operating speed. When used in residential developments, parallel parking areas or bays shall be delineated by the use of curb and gutter; Curb bulb-outs may be used at the intersections and other appropriate locations to separate the parking area from the through vehicular lanes of travel. The Engineer's design for on-street parking and curb bulb-outs shall be consistent with typical design layouts provided by the County Engineer.



### **4-11.2 Bus Turnouts**

The need for bus turnouts should be established at the discretion of the County Engineer in concert with the provider of the bus service such as a transit agency or school district. When provided, the bus turnout shall incorporate curb and gutter to define the limits of the bus turnout area. Storm drainage facilities must be included as required by the existing topographic conditions. Acceptable designs for bus turnouts are provided by the County Engineer.

### **4-12 Cul-De-Sac Bulbs**

When designing a local road opened at one end only, the Engineer shall provide for a vehicle turnaround area typically referred to as a cul-de-sac bulb. The bulb area should be circular and have a radius appropriate for emergency vehicles. Acceptable designs for cul-de-sac bulbs are provided in the *Standard Drawings*. Cul-de-sac bulbs are prohibited on Neighborhood Streets and Access Lanes.

### **4-13 Turnarounds for Neighborhood Streets and Access Lanes**

Turnarounds for Neighborhood Streets and Access Lanes shall be in accordance with the applicable detail in the *Standard Drawings* as prepared by the County Engineer.

### **4-14 Vertical Clearance**

All roads, cul-de-sacs, and turnarounds must have a minimum vertical clearance of 16.5 feet.

### **4-15 Obstructions in Public Road Right-of-Way or Private Road Easements**

Obstructions normally located on private property, including but not limited to fences, landscaping retaining walls, basketball hoops, or yard fixtures are not allowed within the public road right-of-way or private road easement.

Obstructions such as street lighting poles, power poles, utility boxes, telephone boxes, street trees, and/or landscaping material shall not be allowed in a manner or location that will interfere with the traveled surface, pedestrian area, and shoulder area.

Sight obscuring objects must be located so that required sight distances are still provided as required in this Manual.