Chapter 1515 Shared-Use Paths

1515.01 General (Rewritten 2024)

Shared-use paths are designed for the combined and exclusive use by pedestrians, bicyclists, skaters, equestrians, and other users. Motor vehicles other than maintenance vehicles are prohibited. Some common locations for shared-use paths are along rivers and streams, ocean beachfronts, utility rights of way, abandoned railroad rights of way, within college and business campuses, and parks.

Shared-use paths may also be placed along roadway corridors within the roadway right of way. Where a shared-use path is designed to parallel a roadway, provide a continuous separation between the path and the vehicular traveled way in accordance with this chapter.

Shared-use paths have three defining characteristics:

- A shared-use path is physically separated from motorized vehicular traffic by a continuous lateral offset, a continuous barrier or railing, or both (note: shared-use paths that lie on independent rights-of-way outside of roadway corridors are by definition separated from vehicular traffic)
- Shared-use paths minimize interactions with motorized vehicular traffic
- Shared-use paths are designed to accommodate two-way operation by a mix of both pedestrians and bicyclists (note: on corridors where one-way bicyclist operation is desired on either side of a street, it is preferable to provide one-way separated bike lanes with separate sidewalks)

An active transportation facility that does not fully provide for these three defining characteristics is not a shared-use path, but should instead be considered a walkway in which bicyclists may legally operate on the walkway much the same way that they can legally operate on sidewalks. Do not label such facilities as "shared-use paths" on the plans.

Shared-use paths may sometimes include the word "trail" in their names, but shared-use paths are not trails in the legal sense. Trails are typically intended to provide and support recreational experiences such as hiking and off-road bicycling, and typically are not required to provide the necessary ADA accessible infrastructure. Parts of trails might be accessible, but purely recreational trails typically are not required to be accessible. Trails do not usually have a firm, stable, or slip resistant surfaces, nor do they usually have accessible cross slopes, or running slopes. The Pacific Crest Trail is a good example of a trail. See Section 1710.05(17) Trails.

Note that the physical structure of an existing pathway does not determine whether it is a shared-use path or a trail under PROWAG or other legal definitions.

For example, an existing unpaved footpath through a wooded area that provides a connection between a residential area and a transit stop would be required to meet the requirements of a shared-use path if it is within a project's limits, even though it may have originated as an informal woodland trail.

As with roadway designs, shared-use paths should be designed to match the context of the project and its multimodal network. Shared-use paths serve many different needs, including transportation, recreation, and daily commuter needs, among others. When laying out the general alignment of a shared-use path, especially in less constrained settings such as parks and campuses, consider the potential distance added by of out of direction travel or limited access points along the route.

For additional information on pedestrian and bicycle facilities, see Chapter 1510 and Chapter 1520, respectively.

1515.02 Accessibility (New 2024)

As a facility that is designed for pedestrian use as well as bicycle use, a shared-use path must meet the full requirements for accessibility of Pedestrian Circulation Paths (PCP) and Pedestrian Access Routes (PAR). See Chapter 1510 for detailed information about accessibility requirements related to PCPs and PARs.

Note that existing shared use paths within a project's limits, as with sidewalks, must be improved by the project to meet current accessibility requirements.

Additionally, several accessibility requirements are specific to shared-use paths. These are provided in Chapter 1510 and are listed here for additional reference:

1. PAR width – the PAR on a shared-use path must match the full width of the shared-use path provided for pedestrian use (the PCP); any obstruction placed in the shared-use path, such as islands or bollards, must not reduce the clear width of any portion of the PAR to less than 4 feet.
2. Median cut throughs and pedestrian refuge islands – the PAR of a pedestrian cut through of a median or refuge island on a shared-use path must match the full width of the crosswalk.
3. Curb ramps – curb ramps (excluding any flared sides) on shared-use paths must match the full width of the shared-use path.
4. Curb ramp landings – curb ramp landings must match the full width of the shared-use path.
5. Curb ramp clear area – curb ramp clear areas must match the full width of the shared-use path.

Additional shared-use path-specific accessibility requirements are incorporated into the design guidance provided in this chapter.

1515.03 Complete Streets and Level of Traffic Stress (LTS) (New 2024)

A shared-use path that meets the requirements of this chapter by definition meets the requirements of an LTS 2 or better facility for both bicyclists and pedestrians.

1515.04 Shared-Use Path Design

When designing shared-use paths, the bicyclist may not be the critical design user for every element of design. For example, the crossing speeds of most intersections between roads and pathways should be designed for pedestrians, as they are the slowest users. Accommodate all intended users and minimize conflicts. When designing to serve equestrians, it is desirable to provide a separate bridle trail along the shared-use path to minimize conflicts with horses.

Exhibit 1515-1 Typical Shared-Use Path

1515.04(1) Design Speed (Rewritten 2024)

The design speed for a shared-use path is based on bicycle use and is dependent on the terrain, land use context, physical constraints, and the expected conditions of use. There are no individual design speeds that are recommended for all shared-use paths, and in some jurisdictions maximum legal speeds are set by local ordinances. Additionally, the design speeds chosen may vary in different segments of the path depending on changing contexts and uses. For example, a regional shared-use path that travels along an independent right-of-way for long distances in a rural area and then also passes through developed town centers will use different design speeds at different points along the trail (e.g., the Bill Chipman Palouse Trail in Pullman, the John Wayne Trail in Ellensburg, the Woodland Trail in Lacey, etc).

Do not choose unrealistic design speeds as a means of artificially minimizing construction extents or other environmental impacts. 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.

Considerations that may influence the selected design speed include, but are not limited to:

- Anticipated user types, especially if mixed types are expected – for example, a shared-use path passing through a developed area with high levels of connection to local activities should expect users of all ages and abilities to be on the shared-use path, and in this case may select a design speed from the lower end of the range (≤ 15 mph).
- Context – typical urban/suburban/rural town center shared-use paths are designed for a design speed of 15 mph or lower; rural paths outside town centers may be designed for up to 30 mph.
- Terrain – in very hilly contexts with long downgrades the selected design speed should be higher to allow for the higher speeds attained; however, design speed should not exceed 30 mph.
- Path volumes – higher volume paths should typically target lower design speeds (≤ 15 mph), while lower volume paths with a low percentage of pedestrian use can consider higher design speeds (≥ 18 mph).

The design speed of a higher-speed pathway should be reduced at approaches to crossings, constrained sightline of oncoming users, or other conflict points to provide bicyclists the opportunity to recognize the conflict without entering at a high speed. At these types of locations, the design speed must be passively enforced by introducing slowing features such as reverse curves ahead of the conflict point (see below). If passive slowing features cannot be incorporated then use signage, pavement markings, or other visual indicators to alert cyclists to upcoming conflict points.

The minimum radii for horizontal curves used in shared-use path design are provided in Exhibit 1515-2 below. In the design of shared-use paths, as opposed to roadway design, minimum radii are measured along the inside traveled edge of a curve, not along the path centerline, because the radius is provided as a controlling edge condition rather than a controlling centerline condition for path users.

For shared-use paths with design speeds 12 mph or lower and operational widths 10 feet or greater, horizontal curves below the minimum radii listed in Exhibit 1515-2 can be used at certain locations where the entry and exit tangents of a path edge meet at a point of tangency at an angle of 10 degrees or less. See Exhibit 1515-2 for application and guidance. Where entry and exit tangents of a path edge meet at a point of tangency at an angle of less than 5 degrees, a horizontal curve is not required; however, it is not desired for multiple angle points to be used in succussion in place of appropriate horizontal curves.

For all shared-use paths, regardless of design speed or operational width, where entry and exit tangents of a path edge meet at a point of tangency of less than 2 degrees, a horizontal curve is not required.

When minimum radius curves cannot be provided because of right of way, topographical, or other constraints, consider installing the following mitigation measures for speed control and to alert bicyclists approaching less than minimum radius curves:

- Chicanes in the alignment to slow or maintain desired speeds (see below for additional guidance on chicanes).
- Standard curve warning signs and supplemental pavement markings in accordance with the MUTCD.
- Perpendicular pavement markings across the pathway in decreasing intervals to alert riders to the changing conditions.
- Changes in pavement texture to encourage reductions in speed at tight curve approaches.

The negative effects of small radius curves can also be partially offset by widening the pavement through the curves.

Use solid centerline striping on curves below the minimum radius to help maintain separation between opposing directions of bicycle traffic; however, the use of solid centerline striping alone is not sufficient as a mitigation measure for curves below the minimum radius.

When minimum radius curves cannot be met, a Design Analysis is required. The Design Analysis should describe which measures are used to mitigate the curve radii, either from the list above or from other measures used in the design.

Chicanes and other features listed above can also be used to control speeds and alert bicyclists to other approaching conditions such as roadway crossings, path intersections, or significant changes in context such as transitioning from a high-speed intercity path to an urban context or town center path. Chicanes ahead of such conditions should be designed with care; do not use a pair of large-radius reverse curves on a straight alignment between the pathway and the feature being addressed by the chicane, as this design may encourage some riders to travel straight through the reverse curves and into the path of oncoming bicycle traffic. An effective chicane design is a pair of smaller-radius curves with a short tangent section between the curves to separate the curves into two movements. This chicane design is often accomplished by offsetting the approach alignment ahead of the location of the feature that is being addressed by the chicane, using the chicane to bring the path back to the point of conflict.

Exhibit 1515-2 Bicycle Design Speeds

Example Conditions	Design Speed (mph)	Min. Curve Radius (ft)
Long downgrades (steeper than 4% and longer than 500 ft)	30	166
Open country (level or rolling)	20	74
Shared-use paths in developed areas	15	41
Approaching intersections	12	27
High-use areas such as campuses and parks	10	18[1]
At intersections or other crossings	8	12[1][2]

[1] For shared-use paths with operational widths 10 feet or greater, horizontal curves as low as ½ the minimum radii listed can be used at locations where the entry and exit tangents of a path edge meet at a point of tangency at an angle of 10 degrees or less. No horizontal curve is needed at locations where the entry and exit tangents of a path edge meet at a point of tangency at an angle of 5 degrees or less.

[2] At locations where very tight, low-speed turns can be expected for all users, such as ramp connections at intersections or stub path connections to adjoining properties, the design speed approaches zero and traveled way edge radii as small as 2 feet may be used; however, designers must consider that these turns may not be usable by all bicycle types, such as bicycles pulling trailers or cargo bicycles, and additional path width may be needed in order to offset the slow speed turning expectations.

[3] For all shared-use paths, no horizontal curve is needed at locations where the entry and exit tangents of a path edge meet at a point of tangency at an angle of 2 degrees or less.

1515.04(2) Widths, Cross Slopes, Side Slopes, and Clearances

1515.04(2)(a) Shared-Use Path Operational Width

The appropriate operational width for a shared-use path depends on the context, volume, and mix of users. The desirable operational width of a shared-use path, excluding the shoulders on either side, is 12 feet. The minimum operational width, excluding the shoulders on either side, is 10 feet. In limited circumstances an exception to this minimum width can be used; see Section 1515.04(2)(d).

The operational width of the shared-use path must provide a stable, firm, and slip-resistant surface to meet accessibility requirements. Additionally, to serve bicyclist traffic a continuous paving material such as asphalt paving should be used in order to provide a smooth ride. If cement concrete paving is used, specify clean cut joints rather than troweled joints in order to provide a smooth surface.

Note that shoulders are always required in addition to the operational width; shoulders are sometimes paved along with the operational width, but the width needed for the shoulders must still be provided in addition to the operational width of the path (see following section).

An operational width of more than 12 feet, excluding the shoulders on either side, may be appropriate when substantial use by both pedestrians and bicyclists is expected or maintenance vehicles are anticipated. Operational widths wider than 12 feet do not require documentation in the Design Documentation Package.

Shared-use path shoulders are typically unpaved and 2 feet wide on either side. Exhibit 1515-3 through Exhibit 1515-7 provide additional information and cross-sectional elements.

On bridges or tunnels, it is common to pave the entire shared-use path, including shoulders. This usable width can be advantageous for emergency, patrol, and maintenance vehicles and allows for maneuvering around pedestrians and bicyclists who may have stopped. It also keeps the structure uncluttered of any loose gravel shoulder material.

1515.04(2)(b) Shared-Use Path Shoulders (New 2024)

Shared use path shoulders are provided in addition to the operational width of the path. Shoulders are typically unpaved and are a minimum of 2 feet wide on each side of the path. Where 2-foot shoulders cannot be provided, provide justification for the decision (note the exception for continuous vertical elements below). Shoulder widths greater than 2 feet do not require documentation in the Design Documentation Package.

Shoulder widths are designed in conjunction with horizontal clearances; see Section 1515.04(2)(g). Shoulder widths are also designed in conjunction with side slopes; see Section 1515.04(2)(f).

On bridges or in tunnels, it is common to pave the entire shared-use path width, including both the operational width and the shoulders. The paving of the shoulder width can be advantageous for emergency, patrol, and maintenance vehicles, and allows for maneuvering around pedestrians and bicyclists who may have stopped. It also keeps the structure uncluttered of any loose gravel shoulder material. Paving the entire width of a shared-use path does not eliminate the requirement to provide the shoulder width on the path along with the operational width.

On shared-use paths that provide barrier separation from traffic, it is typical to pave the shared-use path shoulder that lies immediately behind the barrier, but not pave the shoulder on the outside of the shared-use path. See Exhibit 1515-6.

Exception: where continuous vertical elements such as walls, railings, fences, or barriers are provided along the edge of a shared-use path, the minimum shoulder width is reduced to 1 foot; however, it is desirable to provide a 2-foot shoulder if possible. In these cases, the shoulder width functions as an operational shy distance to the railings or walls that run alongside the path. A white edge line can assist in identifying the shy distance if desired. A reduction of a shoulder width to 1 foot in front of a continuous vertical element does not require design documentation; however, provide a justification for a reduction of either or both shoulders to a width below 1 foot.

Unpaved shoulders are designed with a maximum 6H:1V cross slope. In most cases a paved shoulder should match the cross slope of the operational width of the pathway (maximum 2% cross slope) since these shoulders may be considered part of the PCP and therefore part of the PAR.

Exhibit 1515-3 through Exhibit 1515-9 provide additional information and cross-sectional elements.

1515.04(2)(c) Exceptions to Minimum Path Operational Width

In very rare circumstances, a reduced operational width as low as 8 feet may be used where all of the following conditions prevail:

- Bicycle traffic is expected to be low, even on peak days or during peak hours.
- Pedestrian use of the facility is not expected to be more than occasional.
- Horizontal and vertical alignments provide frequent, well-designed passing and resting opportunities.
- The shared-use path will not be regularly subjected to maintenance vehicle loading conditions that would cause pavement edge damage.
- The shared-use path is a short distance (≤ 100 feet)

The transition to a narrower operational width should be marked and signed according to guidance provided in the MUTCD. If the narrowing is significant (for example, from a 10-foot operational width with two 2-foot shoulders to an 8-foot operational width with 1-foot shoulders) provide additional signage to alert bicyclists to the change in width.

If all of the above conditions are met and an operational width below 10 feet is used, document the decision in the Design Documentation Package, with specific discussions about the conditions listed above. If any of the conditions above are not met but an operational width below 10 feet must be used, this decision requires a justification.

Note that shoulder widths must still be provided for and documented as described in the previous section. For very constrained locations it is the designer's discretion as to how to identify the components of the paved width in order to best address the decision and documentation needs of the project.

An operational width below 8 feet is not covered by the exception listed in this section and requires a Design Analysis to document.

1515.04(2)(d) Existing Shared-Use Paths – Considerations

Some existing shared-use paths were constructed with narrower dimensions, sometimes providing only 8 feet of pavement. Evaluate existing paths for current needs, as these paths may not have documented design variances. Consider widening existing shared-use paths to meet current standards, especially if existing paths do not meet current ADA requirements. Additional improvement to address sightlines, adding missing shoulders, and other current attributes may be warranted.

Many existing shared-use paths were designed to meet active transportation needs based on past demand. Evaluate current use levels and potential additional demand growth to identify locations on existing paths that may benefit from widening.

1515.04(2)(e) Cross Slope

The maximum cross slope on a paved shared-use path is 2%. The cross slope of the shoulders can be no steeper than 6H:1V. It is best practice to design the cross slope to be less steep than the allowed maximum to account for some tolerance in construction. For example, design for a 1.5% cross slope (rather than the 2.1% maximum).

To accommodate drainage, the entire section, including shoulders, should transition through curves. It is desirable to design the pivot point on the outside edge of one side of the shoulder or the other to avoid a pavement crown (see Exhibit 1515-3 through Exhibit 1515-7).

Sloping the pavement surface to one side is desirable and usually simplifies drainage design and surface construction. Generally, surface drainage from the path is dissipated as it flows down the side slope.

1515.04(2)(f) Side Slopes (Rewritten 2024)

Fill Slopes

Fill side slopes typically are designed to be 6H:1V or flatter; however, fill side slopes up to 3H:1V may be used.

For shared-use paths with fill side slopes greater than or equal to 3H:1V, or where obstacles or waterways may exist, provide a shoulder width of at least 5 feet. Where a 5-foot shoulder cannot be provided, or significantly increases the slope of the side slope, provide a physical barrier (either constructed or vegetated), pedestrian railing, or fence under the following conditions:

- Slopes 3H:1V or steeper, with a drop of 6 feet or greater, or leading to a body of water or other substantial obstacle.

- Slopes 2H:1V or steeper, with a drop of 4 feet or greater.
- Slopes 1H:1V or steeper, with a drop of 1 foot or greater.
- Where side slopes are replaced by a vertical wall of any height.

At locations with side slopes steeper than 3H:1V where the above guidance does not lead to the recommendation of a railing or barrier, consider whether a 5-foot shoulder is sufficient to address the specific combination of existing obstacles and side slopes at that location.

Cut Slopes

Cut side slopes are designed to be no steeper than 2H:1V. Consult the Region Materials Engineer (RME) for cut slopes steeper than 2H:1V.

1515.04(2)(g) Clearances (Rewritten 2024)

Horizontal Clearance

The minimum horizontal clearance from the edge of pavement (including shoulder, if paved) to a spot obstruction (such as a bridge pier, utility pole, or tree) is 2 feet. This clearance may be reduced to a practical minimum of 1 foot if necessary; document this decision in the Design Documentation Package. Note that a horizontal clearance of 2 feet from the inside edge of a post-mounted sign is always required in order to meet MUTCD minimums.

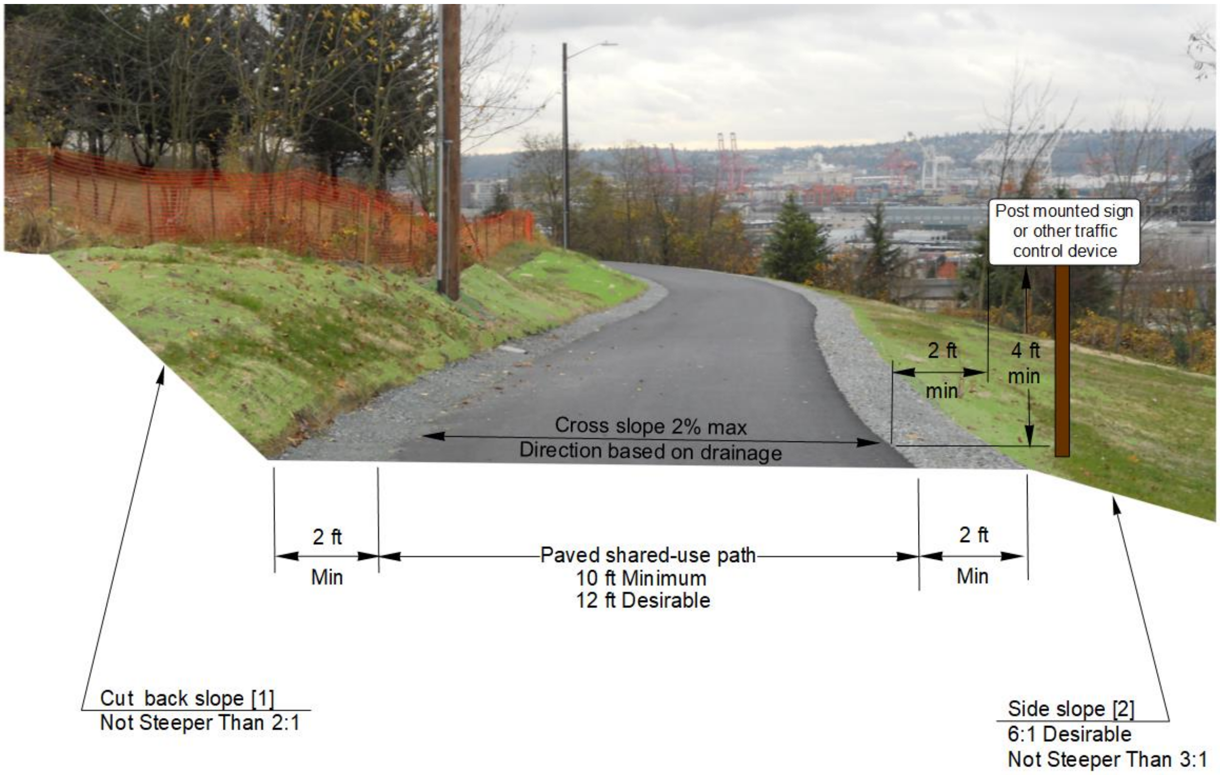
If a shared-use path cannot be designed to meet the clearance requirements for a spot obstruction (other than post-mounted signs), narrow the operational width of the pathway per Section 1515.04(2)(c) and provide appropriate markings and signage to identify the obstruction. In locations where a paved shoulder is used, consider transitioning to an unpaved (e.g., gravel) shoulder ahead of the obstruction to establish the necessary clearance.

For continuous obstructions such as fences and walls, see Section 1515.04(2)(b).

Vertical Clearance

The minimum vertical clearance for all obstructions is 10 feet. In some locations additional vertical clearance may be required to provide maintenance or emergency service access. Engage Region Maintenance, Emergency Services, and others that may need to cross under or through the facility to determine whether additional vertical clearance may be needed. Account for existing or proposed overhead obstructions (lighting, signals, sign, etc.) that would reduce the available vertical clearance.

Exhibit 1515-3 Two-Way Shared-Use Path: Independent Alignment



Notes:

[1] Consult Region Materials Engineer (RME) for cut back slopes steeper than 2:1.

[2] See Section 1515.04(2)(f) for other side slope options and pedestrian railing when needed.

Exhibit 1515-4 Two-Way Shared-Use Path: Adjacent to Roadway (≤ 35 mph)

Note:

[1] 3 ft minimum. Provide as much separation from the roadway as practicable.

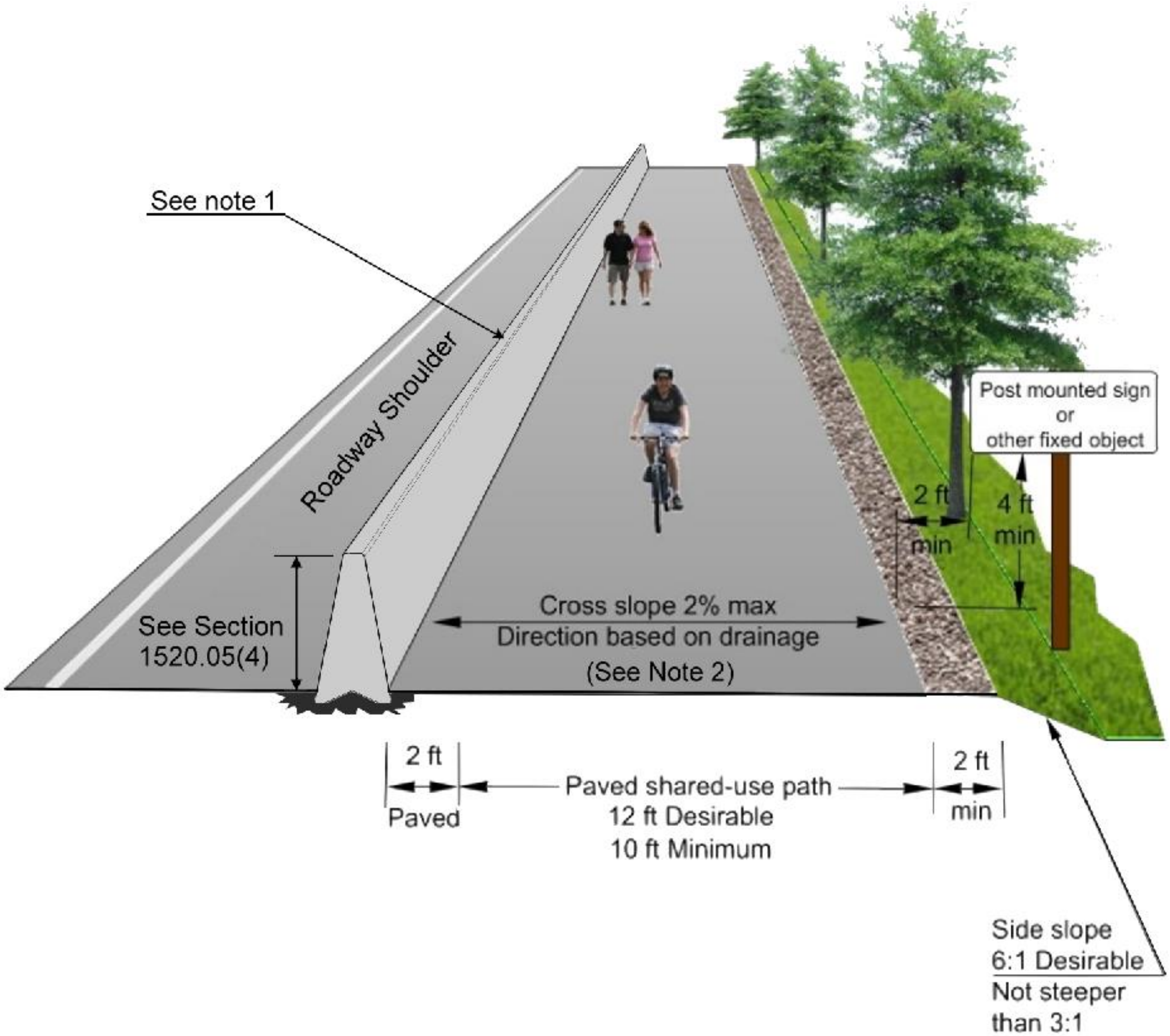
Exhibit 1515-5 Two-Way Shared-Use Path: Adjacent to Roadway (> 35 mph)

Note:

A separation greater than 5 feet is required for path user comfort. If separation greater than 5 feet cannot be obtained, provide barrier separation in accordance with Exhibit 1515-6.

See Chapter 1600 for roadway clear zone design guidance for fixed objects.

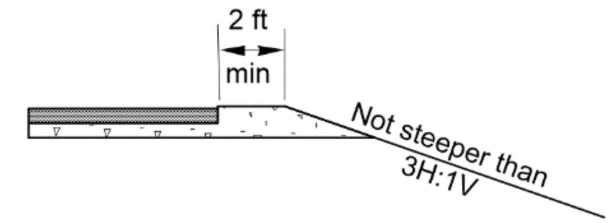
Exhibit 1515-6 Two-Way Shared-Use Path: Barrier Between Roadway and Shared-Use Path



Notes:

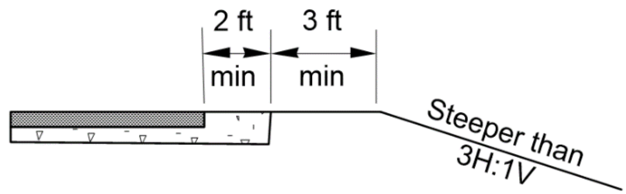
1. Use single-slope concrete barrier tall enough to support bicycles. See Section 1520.05(6) (see Section 1610.06(1)(b) for embedment depth depending on surface material).
2. It is desirable for the cross slope to slope toward grass areas for drainage.

Exhibit 1515-7 Shared-Use Path Side Slopes and Railing



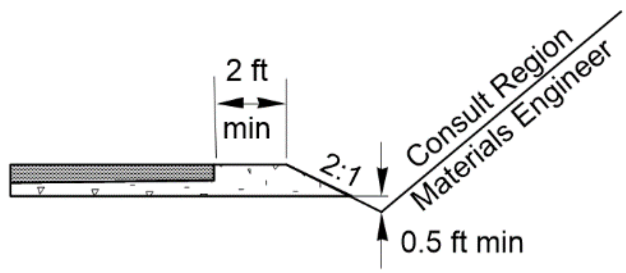
Example 1: Embankment

Based on context, flatter slopes are desirable.



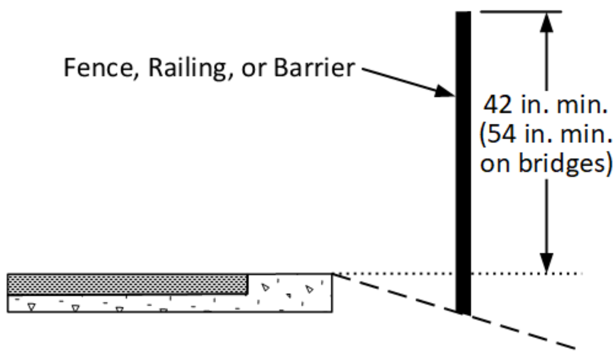
Example 2: Shoulder widening to 5 feet or more

Used with steeper fill slopes to provide clear space between the hinge point and path. Vegetation can also be used as a buffer on slopes. Consider a natural or physical barrier in lieu of 3 ft additional widening.



Example 3: Cut section with ditch

Consult with the Region Materials Engineer to determine for appropriate cut slopes.



Example 4: Barriers, railings, fences, or walls that are 5 feet or closer to shared-use paths or bike lanes, need to be a minimum of 42 in. high above the traveling surface. Where a barrier is needed and bicycle speeds are likely to be high (such as on a downgrade), where high winds are typical (such as on bridges), or where a bicyclist could impact the object at a 25-degree angle or greater (such as on a curve), consider a continuous vertical element 54 inches high. See Section 1520.05(6).

Note: These drawings depict some common applications for various slope alternatives.

1515.04(3) Running Slopes, Landings, and Rest Areas

1515.04(3)(a) Running Slopes

Design running slopes (grades) on shared-use paths less than or equal to 5% to accommodate all user types, including pedestrians with disabilities.

When the path is within the highway right of way, its running slope can match the general grade established for the adjacent roadway.

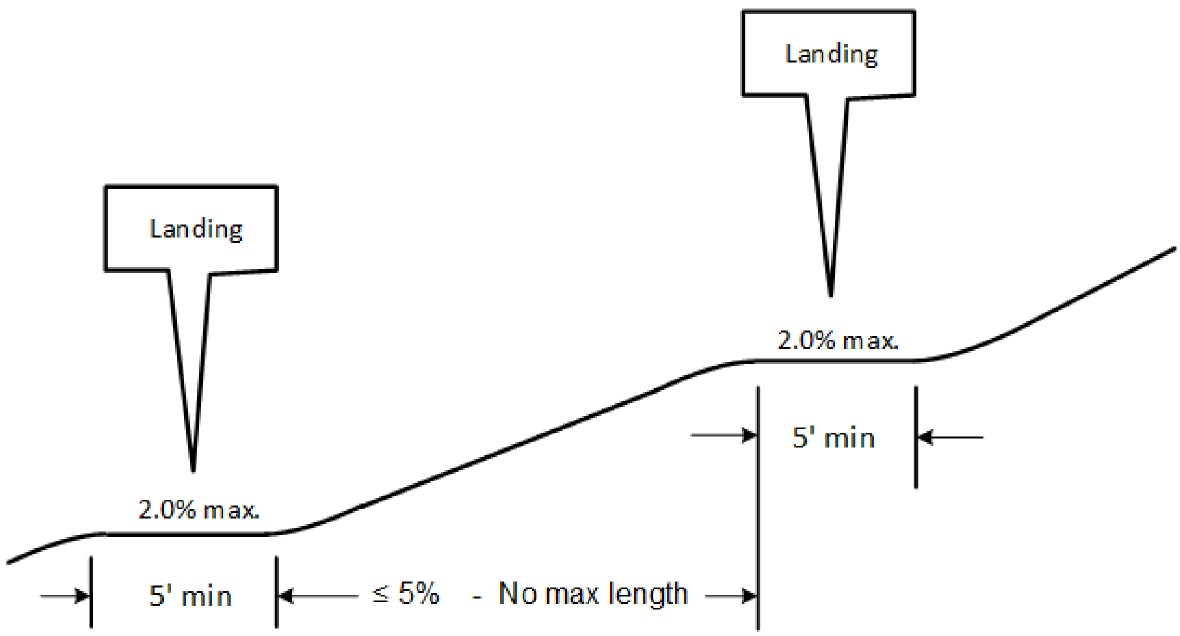
1515.04(3)(b) Landings

Shared-use path landings provide users a level place to rest on extended grades. Exhibit 1515-8 and Exhibit 1515-9 show these features.

Design landings to:

- Permit users to stop periodically and rest.
- Not exceed maximum running slopes and cross slopes of 2%.
- Be in line and as wide as the shared-use path. Landings are to be at least 5 feet long.
- Avoid abrupt grade changes or angle points. Design transitions to landings using vertical curves.

Exhibit 1515-8 Shared-Use Path Landing Profile



Notes:

Landings are desirable on extended grades.

Design vertical curves to transition from the grade to the landing.

Exhibit 1515-9 illustrates a landing and a rest area.

1515.04(3)(c) Rest Areas

Although not required, rest areas may be provided adjacent to the shared-use path outside of the path travelled way as shown in Exhibit 1515-9.

Requirements for rest areas include:

- The maximum running slope and cross slopes are 2%.
- The minimum size is to be 5 feet by 5 feet.
- If features such as benches are provided, they must meet ADA requirements; consult with the region ADA Coordinator for guidance.

Exhibit 1515-9 Shared-Use Path Landing and Rest Area

Notes:

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

Design inline landings with a maximum cross slope and running slope of 2%.

1515.04(4) Pavement Structural Section

Design the pavement structural section of a shared-use path in the same manner as a highway, considering the quality of the subgrade and the anticipated loads on the path. (Design loads are normally maintenance and emergency vehicles.) Provide a firm, stable, slip-resistant pavement surface.

Design the pavement structural section as recommended by the Region Materials Engineer.

Use crushed rock or other suitable material for shoulder graded areas as recommended by the Region Materials Engineer. On bridges or tunnels, it is common to pave the entire shared-use path, including shoulders across the structure.

1515.04(5) Stopping Sight Distance

The distance needed to bring a shared-use path user to a complete stop is a function of the user's perception and braking reaction time, the initial speed, the coefficient of friction between the wheels and the pavement, the braking ability of the user's equipment, and the grade. Exhibit 1515-17 and Exhibit 1515-18 provide a graph and an equation to obtain minimum stopping sight distances for various design speeds and grades.

1515.04(5)(a) Stopping Sight Distance on Crest Vertical Curves

Exhibit 1515-19 provides a chart or equations to obtain the minimum lengths of crest vertical curves for varying stopping sight distances and algebraic differences in grade. The values are based on a 4.5-foot eye height for the bicyclist and a 0-foot height for the object (path surface).

1515.04(5)(b) Stopping Sight Distance on Horizontal Curves

Exhibit 1515-20 gives the minimum clearances to line-of-sight obstructions for sight distance on horizontal curves. Provide lateral clearance based on the sum of stopping sight distances from Exhibit 1515-17 and Exhibit 1515-18 for bicyclists traveling in both directions and the proposed horizontal curve radius. Where this minimum clearance cannot be obtained, provide curve warning signs and use centerline pavement markings in accordance with the MUTCD.

Exhibit 1515-17, Exhibit 1515-18, Exhibit 1515-19, and Exhibit 1515-20 are presented at the end of the chapter.

1515.05 Intersections and Crossings Design

This section covers path/roadway intersections and grade-separated crossings. Detectable warning surfaces are required where shared-use paths connect to the roadway.

1515.05(1) Intersections with Roadways

Clearly define who has the right of way and provide sight distance for all users at shared-use path and roadway intersections.

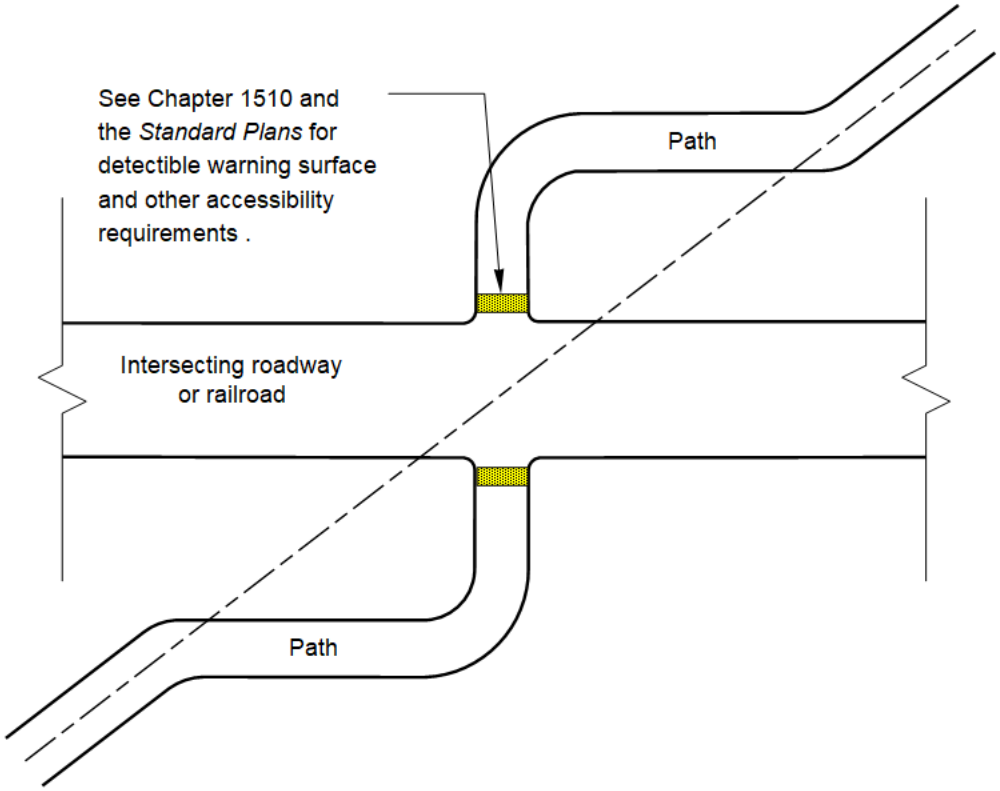
The common types of shared-use path/roadway at-grade intersection crossings are midblock and adjacent.

For roadway intersections with roundabouts, see Chapter 1320.

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 right of way needs. A diagonal midblock crossing can be altered as shown in Exhibit 1515-10.

There are other considerations when designing midblock crossings. They include traffic right of way assignments; traffic control devices; sight distances for both bicyclists and motor vehicle operators; refuge island use; access control; and pavement markings.

Exhibit 1515-10 Typical Redesign of a Diagonal Midblock Crossing



Notes:

For path and highway signing and markings, see the MUTCD and the *Standard Plans*. www.wsdot.wa.gov/publications/fulltext/Standards/english/PDF/m09.60-00_e.pdf

For radii approaching roadway intersections, see Exhibit 1515-2.

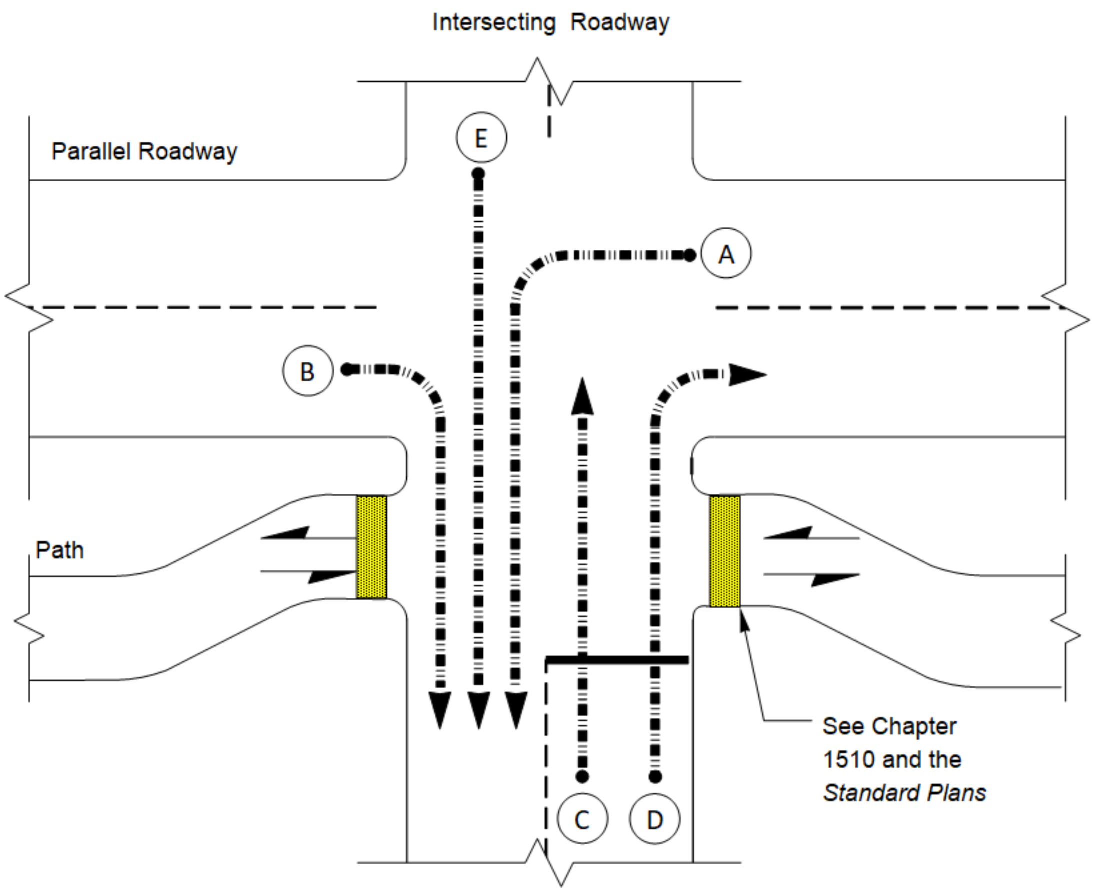
Adjacent path crossings are located at or near public intersection crosswalks and are normally placed with them. These crossings are usually placed with pedestrian crossings, where motorists can be expected to stop. If alternate intersection locations for a shared-use path are available, select the one 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 Exhibit 1515-11. It is desirable to 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).

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 right of way assignments, traffic control devices, and the separation distance between path and roadway.

Exhibit 1515-11 Adjacent Shared-Use Path Intersection



Note:

For signing and pavement markings, see the MUTCD and the *Standard Plans*.

Additional Roadway/Path Intersection Design Considerations

Additional roadway/path intersection design considerations include the following:

- **Evaluate Intersection Control**
  Determine the need for traffic control devices at path/roadway intersections by using MUTCD warrants and engineering judgment. Bicycles are considered vehicles in Washington State, and bicycle path traffic can be classified as vehicular traffic for MUTCD warrants. Provide traffic signal timing set for pedestrians.
- **Signal Actuation Mechanisms**
  Place the manually operated accessible pedestrian pushbutton in a location that complies with ADA requirements. For additional information, see Chapter 1330 and Chapter 1510. A detector loop in the path pavement may be provided in addition to the manually operated accessible pedestrian push button.
- **Signing**
  Provide sign type, size, and location in accordance with the MUTCD. Place path STOP signs as close to the intended stopping point as feasible. Do not place the shared-use path signs where they may confuse motorists or place roadway signs where they may confuse shared-use path users. For additional information on signing, see the MUTCD and Chapter 1020.

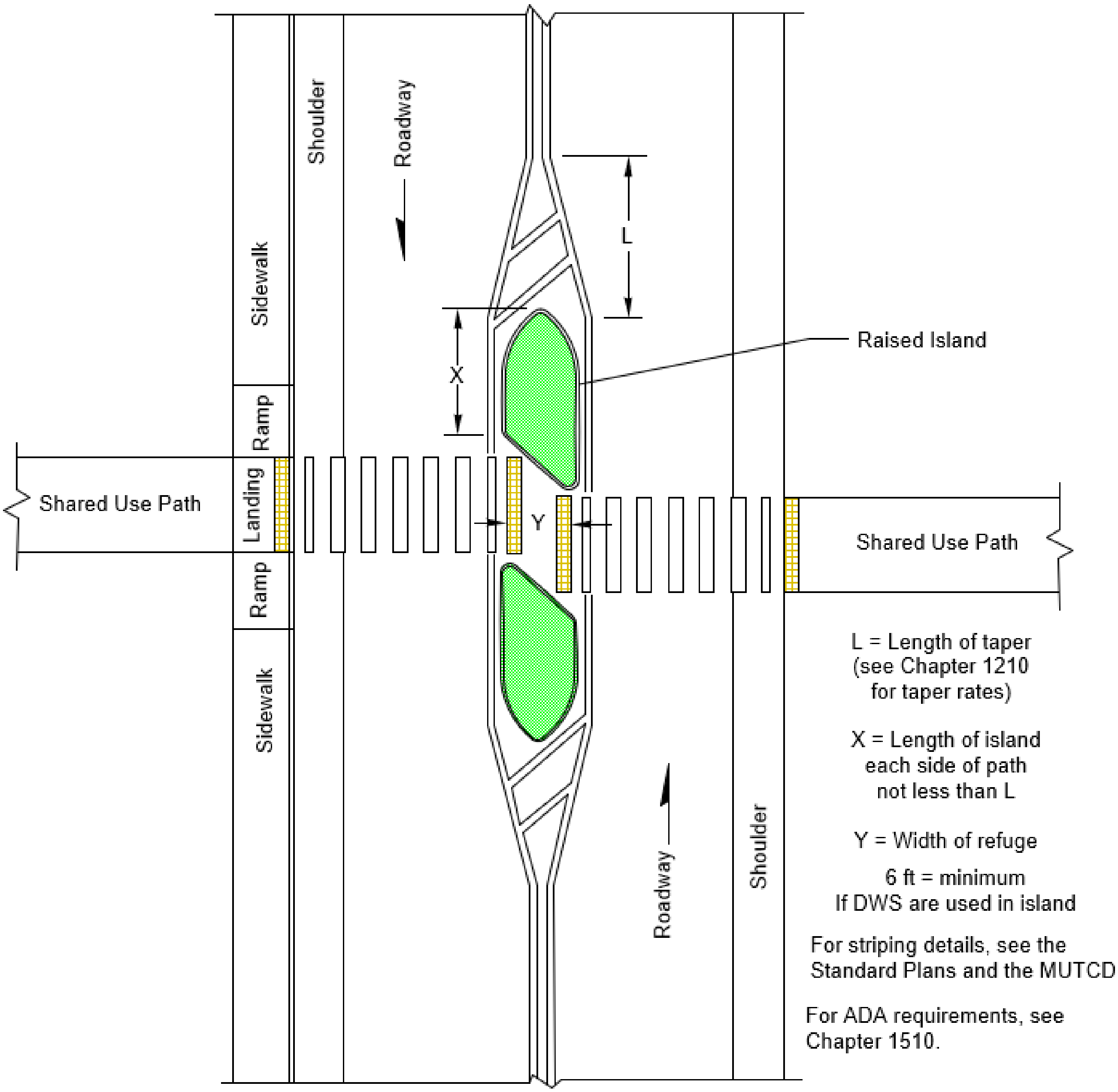
- **Approach Treatments**
  Design shared-use path and roadway intersections with level grades, and provide sight distances. Provide advance warning signs and pavement markings that alert and direct path users that there is a crossing (see the MUTCD). Do not use speed bumps or other similar surface obstructions intended to cause bicyclists to slow down. Consider some slowing features such as horizontal curves (see Exhibit 1515-2 and Exhibit 1515-10). Avoid locating a crossing where there is a steep downgrade where bike speeds could be high.
- **Sight Distance**
  Sight distance is a principal element of roadway and path intersection design. At a minimum, provide stopping sight distance for both the roadway and the path at the crossing. Decision sight distance is desirable for the roadway traffic. Refer to Chapter 1260 for stopping sight distance for the roadway and Section 1515.04(5) for shared-use path stopping sight distance.
- **Curb Ramp Widths**
  Design curb ramps with a width equal to the shared-use path. Curb ramps and barrier-free passageways are to provide a smooth transition between the shared-use path and the roadway or sidewalk (for pedestrians). Curb ramps at path/ roadway intersections must meet the requirements for curb ramps at a crosswalk. For design requirements, see Chapter 1510, and for curb ramp treatments at roundabouts, see Chapter 1320.
- **Refuge Islands**
  Consider refuge islands where a shared-use path crosses a roadway when one or more of the following applies:
    - High motor vehicle traffic volumes and speeds
    - Wide roadways
    - Use by the elderly, children, the disabled, or other slow-moving users

  The refuge area may either be designed with the storage aligned perpendicularly across the island or be aligned diagonal (as shown in Exhibit 1515-12). 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.

1515.05(2) At-Grade Railroad Crossings

Wherever possible, design the crossing at right angles to the rails. For signing and pavement marking for a shared-use path crossing a railroad track, see the MUTCD and the *Standard Plans*. Also, see Chapter 1510 for design of at-grade pedestrian railroad crossings.

Exhibit 1515-12 Roadway Crossing Refuge Area



Note:

This exhibit shows a case where a path intersects a roadway framed with both a sidewalk and a paved shoulder, for the purpose of showing detectible warning surface placements.

1515.06 Grade Separated Structures

Provide the same minimum clear width as the approach paved shared-use path plus the graded clear areas.

Carrying full widths across structures has two advantages:

- The clear width provides a minimum lateral clearance from the railing or barrier.
- It provides needed maneuvering room to avoid pedestrians and other bicyclists.

For undercrossings and tunnels, it is the Designer's responsibility to determine the correct minimum vertical clearance (shared use path pavement surface to overhead obstruction) of each undercrossing or tunnel based on coordination with maintenance and emergency services.

Many types of maintenance and emergency vehicles need more than the 10 feet of vertical clearance needed for bicyclists and/or equestrians.

Engage Region Maintenance, Emergency Services, and others that need to cross under or through the facility to determine an appropriate minimum vertical clearance. Account for existing or proposed overhead obstructions (lighting, signals, sign, etc.) that would reduce the available vertical clearance.

Consult the region Maintenance Office and the HQ Bridge Preservation Office to verify that the planned path width and vertical clearance meets their needs. If not, widen and/or increase vertical clearance to their specifications.

Use expansion joints that accommodate shared-use path users. Expansion joints should be perpendicular to the path and have a maximum gap of ½ inch or be covered with a slip-resistant plate.

Bridge screening is sometimes used on structures to deter the throwing of objects and/or to discourage jumping. It is taller than pedestrian railing, bridge railing, and bridge barrier, and its applicability is analyzed on a case-by-case basis. Refer to Section 720.03(13) for guidance.

Exhibit 1515-13 Shared-Use Path Bridge and Approach Walls

Note:

On structures, the bridge railing type and height are part of the structure design. Contact the HQ Bridge and Structures Office for additional information.

Exhibit 1515-14 Bridge and Pedestrian Rail

Notes:

- The photo above shows a bridge with a shared-use path separating the users from the roadway. Pedestrian rail is used on the outside edge.
- On structures, the bridge railing type and height are part of the structure design. Contact the HQ Bridge and Structures Office for additional information.

1515.07 Signing, Pavement Markings, and Illumination

Generally, WSDOT does not provide continuous centerline striping or channelization for user modes on shared-use paths. However, signing and pavement markings can be beneficial to warn shared-use path users of curves, grades, obstructions, and intersections.

Refer to the MUTCD for guidance and directions regarding signing (regulatory, warning, and way finding) and pavement markings.

The *Standard Plans* shows shared-use path pavement markings at obstructions in accordance with the MUTCD and also shows placement of detectible warning surfaces.

For pavement marking around bollards and other obstructions, see Standard Plan M-9.60:
www.wsdot.wa.gov/publications/fulltext/standards/english/pdf/m09.60-00_e.pdf

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. If illumination is used, provide illumination in accordance with Chapter 1040.

1515.08 Restricted Use Controls

This section presents considerations on use of fencing and other treatments to restrict roadway and path users to their domains.

1515.08(1) Fencing

Limited access highways often require fencing or other forms of controlling access. Shared-use paths constructed within these corridors, such as shown in Exhibit 1515-15, likely require fencing. For guidance on fencing, limited access controls, and right of way, refer to Division 5 of the *Design Manual*. Evaluate the impacts of fencing on sight distances.

Exhibit 1515-15 Shared-Use Path in Limited Access Corridor

1515.08(2) Preventing Motor Vehicle Access

At locations where shared use paths meet roadways, design and sign shared-use path entries and crossings to clearly indicate that motor vehicle access is prohibited. Use design features to reduce the probability of either intentional or accidental access by motor vehicles. Effective prevention of motor vehicle entry is often possible using signage and pavement markings. Additional treatments include path geometry and splitter islands as discussed below. The primary method of controlling motor vehicle access at path/roadway intersections is the use of pavement markings and signage to indicate that motor vehicle access is prohibited. However, where there is a documented history of unauthorized intrusion at a specific location, use path geometry curvature and/or splitter islands as described below.

A common design feature to incorporate into the shared-use path geometry, ahead of the point of crossing, is a reverse curve in the shared-use path. A reverse curve can both slow higher speed shared-use path users and also alert all shared-use path users to the upcoming crossing, as well as dissuade vehicular intrusion into the pathway. As discussed above, do not use a pair of large-radius reverse curves on a straight alignment between the pathway and the potential access point, as this design may encourage some bicycle riders to travel straight through the reverse curves and into the path of oncoming bicycle traffic. An effective design is a pair of smaller-radius curves with a short tangent section between the curves to separate the curves into two movements. This chicane design is often accomplished by offsetting the approaching pathway centerline ahead of the location of the potential access point.

Do not use barriers such as z-gates and fences located within the width of a shared-use path. These features, as well as bollards, create fixed objects to path users on new or upgraded path entries. Barriers can also slow access for emergency responders. Determined violators often gain entry despite these barriers and can damage path structures/adjacent vegetation in the process. A Design Analysis is required to use bollards within the width of the shared-use path.

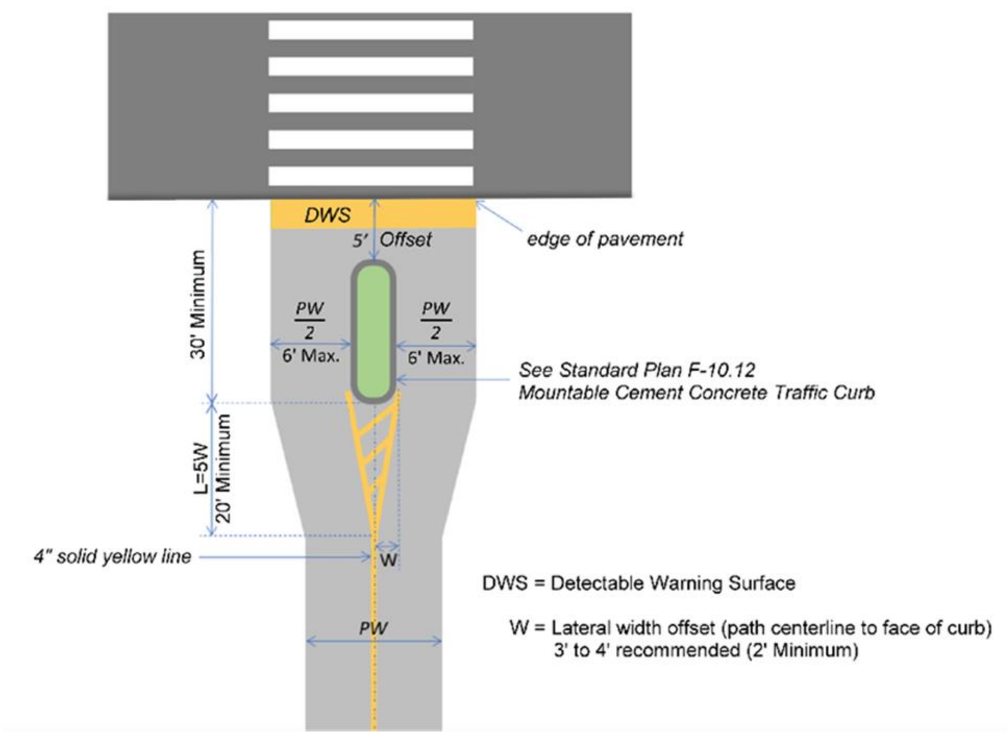
1515.08(2)(a) Shared-Use Path Splitter Islands

When pavement markings, signage and shared-use path geometry are not sufficient to prevent motor vehicle intrusion, the preferred method of physically restricting entry of motor vehicles is to split the path into two narrower pathways at the roadway intersection, separated by a median island. This method directs path users around an island rather than installing a bollard or other barrier within the usable width of the pathway. Design islands to allow emergency/maintenance vehicle access if alternate access points are not provided.

Design features of splitter islands include:

- Use mountable cement concrete traffic curb (see *Standard Plan* F-10.12) around the perimeter of the island to reduce the potential for pedal strikes. Paint perimeter curbing yellow to increase visibility of the island.
- For islands that include plantings, use low-growing, hardy vegetation capable of withstanding the occasional emergency/maintenance vehicle traveling over it. Consult with your region landscape architect for appropriate landscape design.
- Design path sections around the island to be half the primary path width, but not more than 6 feet wide.
- Delineate the approach to the island with solid line pavement markings as shown in Exhibit 1515-16.

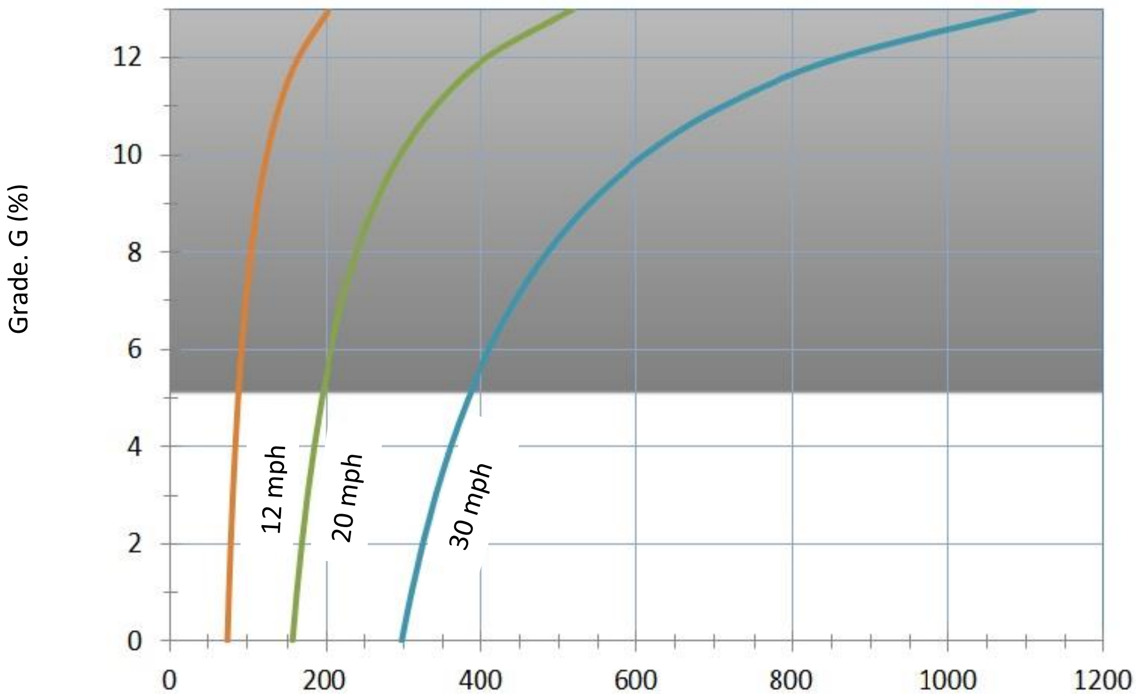
Exhibit 1515-16 Landscaped Islands



1515.09 Documentation

For the list of documents required to be preserved in the Design Documentation Package and the Project File, see the Design Documentation Checklist: Design guidance & support | WSDOT (wa.gov)

Exhibit 1515-17 Stopping Sight Distance for Downgrades



Stopping Sight Distance, S (ft)
(Based on 2.5 second reaction time)

Note:

Shaded area represents grades greater than 5%.

$$S = \frac{V^2}{0.30(f - G)} + 3.67V$$

Where:

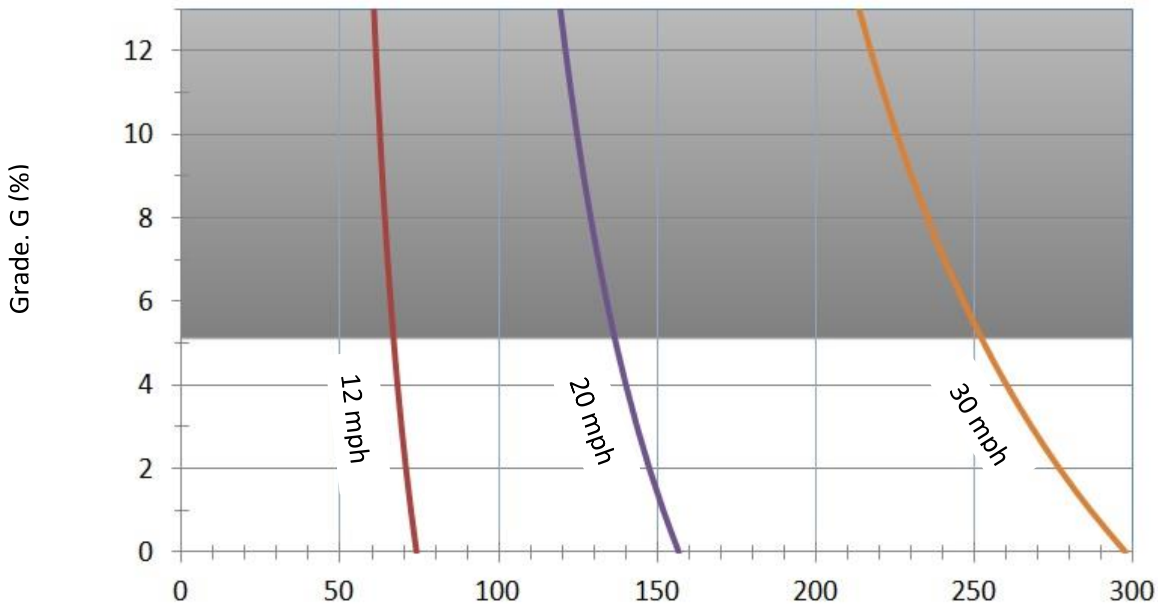
S = Stopping sight distance (ft)

V = Speed (mph)

f = Coefficient of friction (use 16)

G = Grade (%)

Exhibit 1515-18 Stopping Sight Distance for Upgrades



Stopping Sight Distance, S (ft)
(Based on 2.5 second reaction time)

Note:

Shaded area represents grades greater than 5%.

$$S = \frac{V^2}{0.30(f + G)} + 3.67V$$

Where:

S = Stopping sight distance (ft)

V = Speed (mph)

f = Coefficient of friction (use 16)

G = Grade (%)

Exhibit 1515-19 Minimum Lengths for Crest Vertical Curves

A (%)	Stopping Sight Distance, S (ft)													
	40	60	80	100	120	140	160	180	200	220	240	260	280	
2	3	3	3	3	3	3	3	3	3	3	30	70	110	150
3	3	3	3	3	3	3	20	60	100	140	180	220	260	300
4	3	3	3	3	15	55	95	135	175	215	256	300	348	400
5	3	3	3	20	60	100	140	180	222	269	320	376	436	500
6	3	3	10	50	90	130	171	216	267	323	384	451	523	600
7	3	3	31	71	111	152	199	252	311	376	448	526	610	700
8	3	8	48	88	128	174	228	288	356	430	512	601	697	800
9	3	20	60	100	144	196	256	324	400	484	576	676	784	900
10	3	30	70	111	160	218	284	360	444	538	640	751	871	1,000
11	3	38	78	122	176	240	313	396	489	592	704	826	958	1,100
12	5	45	85	133	192	261	341	432	533	645	768	901	1,045	1,200
13	11	51	92	144	208	283	370	468	578	699	832	976	1,132	1,300
14	16	56	100	156	224	305	398	504	622	753	896	1,052	1,220	1,400
15	20	60	107	167	240	327	427	540	667	807	960	1,127	1,307	1,500
16	24	64	114	178	256	348	455	576	711	860	1,024	1,202	1,394	1,600
17	27	68	121	189	272	370	484	612	756	914	1,088	1,277	1,481	1,700
18	30	72	128	200	288	392	512	648	800	968	1,152	1,352	1,568	1,800
19	33	76	135	211	304	414	540	684	844	1,022	1,216	1,427	1,655	1,900
20	35	80	142	222	320	436	569	720	889	1,076	1,280	1,502	1,742	2,000
21	37	84	149	233	336	457	597	756	933	1,129	1,344	1,577	1,829	2,100
22	39	88	156	244	352	479	626	792	978	1,183	1,408	1,652	1,916	2,200
23	41	92	164	256	368	501	654	828	1,022	1,237	1,472	1,728	2,004	2,300
24	43	96	171	267	384	523	683	864	1,067	1,291	1,536	1,803	2,091	2,400
25	44	100	178	278	400	544	711	900	1,111	1,344	1,600	1,878	2,178	2,500

Minimum Length of Vertical Curve, L (ft)

When $S < L$

$$L = \frac{AS^2}{900}$$

When $S > L$

$$L = 2s - \frac{900}{A}$$

Where:

S = Stopping sight distance (ft)

A = Algebraic difference in grade (%)

L = Minimum vertical curve length (ft)

Note:

Below ▬▬ represents $S \leq L$.

Shaded area represents A>10%.

Based on an eye height of 4.5 ft and an object height of 0 ft.

Exhibit 1515-20 Lateral Clearance for Horizontal Curves

Height of eye: 4.50 ft

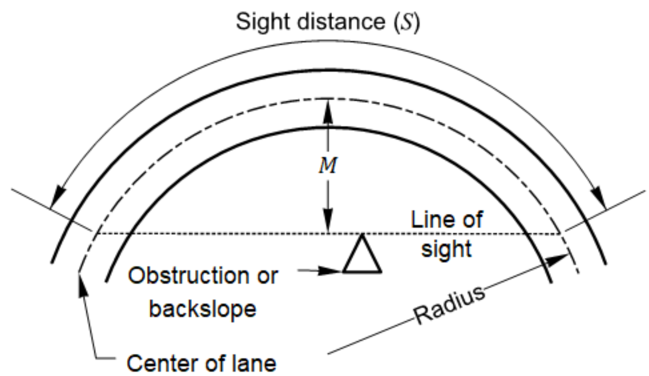
Height of object: 0.0 ft

Line of sight at the M distance is normally 2.3 ft above centerline of inside lane at point of obstruction, provided no vertical curve is present in horizontal curve.

$$M = R\left(1 - \cos\frac{S28.65}{R}\right)$$

$$S = \frac{R}{28.65}\left[\cos^{-1}\left(\frac{R-M}{R}\right)\right]$$

S ≤ Length of curve. Angle is expressed in degrees.



Where: S = Sight distance (ft) R = Centerline radius of inside lane (ft) M = Distance from inside lane centerline (ft)

R **(ft)**	**Stopping Sight Distance, S (ft)[1]**													
	40	**60**	**80**	**100**	**120**	**140**	**160**	**180**	**200**	**220**	**240**	**260**	**280**	**300**
25	7.6	15.9												
50	3.9	8.7	15.2	23.0	31.9	41.5								
75	2.7	5.9	10.4	16.1	22.7	30.4	38.8	47.8	57.4	67.2				
95	2.1	4.7	8.3	12.9	18.3	24.6	31.7	39.5	47.9	56.9	66.2	75.9	85.8	
125	1.6	3.6	6.3	9.9	14.1	19.1	24.7	31.0	37.9	45.4	53.3	61.7	70.5	79.7
150	1.3	3.0	5.3	8.3	11.8	16.0	20.8	26.2	32.1	38.6	45.5	52.9	60.7	69.0
175	1.1	2.6	4.6	7.1	10.2	13.8	18.0	22.6	27.8	33.4	39.6	46.1	53.1	60.4
200	1.0	2.2	4.0	6.2	8.9	12.1	15.8	19.9	24.5	29.5	34.9	40.8	47.0	53.7
225	0.9	2.0	3.5	5.5	8.0	10.8	14.1	17.8	21.9	26.4	31.2	36.5	42.2	48.2
250	0.8	1.8	3.2	5.0	7.2	9.7	12.7	16.0	19.7	23.8	28.3	33.0	38.2	43.7
275	0.7	1.6	2.9	4.5	6.5	8.9	11.6	14.6	18.0	21.7	25.8	30.2	34.9	39.9
300	0.7	1.5	2.7	4.2	6.0	8.1	10.6	13.4	16.5	19.9	23.7	27.7	32.1	36.7
350	0.6	1.3	2.3	3.6	5.1	7.0	9.1	11.5	14.2	17.1	20.4	23.9	27.6	31.7
400	0.5	1.1	2.0	3.1	4.5	6.1	8.0	10.1	12.4	15.0	17.9	20.9	24.3	27.8
500	0.4	0.9	1.6	2.5	3.6	4.9	6.4	8.1	10.0	12.1	14.3	16.8	19.5	22.3
600	0.3	0.7	1.3	2.1	3.0	4.1	5.3	6.7	8.3	10.1	12.0	14.0	16.3	18.7
700	0.3	0.6	1.1	1.8	2.6	3.5	4.6	5.8	7.1	8.6	10.3	12.0	14.0	16.0
800	0.2	0.6	1.0	1.6	2.2	3.1	4.0	5.1	6.2	7.6	9.0	10.5	12.2	14.0
900	0.2	0.5	0.9	1.4	2.0	2.7	3.6	4.5	5.5	6.7	8.0	9.4	10.9	12.5
1,000	0.2	0.4	0.8	1.2	1.8	2.4	3.2	4.0	5.0	6.0	7.2	8.4	9.8	11.2

Minimum Lateral Clearance, M (ft)

Note:

[1] S is the sum of the distances (from Exhibit 1515-17 and Exhibit 1515-18) for bicyclists traveling in both directions.