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310.01 General

Safety is the top priority of the Washington State Department of Transportation (WSDOT).

Roadside safety addresses the area outside of the roadway. It is an important component of total highway design. Since run-off-road accidents comprise almost one third of all motor vehicle accidents, the physical characteristics of the roadside can either reduce, or increase the seriousness of the consequences of vehicles leaving the roadway.

While safety of vehicle occupants is a major consideration in roadside design, the safety of personnel working along the roadside is also a critical consideration. Some of the same mitigation measures that protect vehicle occupants can allow personnel working in roadside areas escape routes, or shields. Those mitigation measures include making the slope traversable, or installing traffic barriers or earth berms.

WSDOT personnel are trained, and are familiar with the dangers inherent in working in roadside areas. Volunteers, such as Adopt-a-Highway groups, and contractors must also be aware of roadside hazards. Anyone working in roadside areas must wear highly visible vests and protective headgear, and use traffic control measures. In addition, make every effort to have workers face oncoming traffic. Check the [Safety Procedures and Guidelines Manual](#) and the [Construction Manual](#) for more detail.

310.02 References

310.02(1) Design Guidance

[Construction Manual](#), M 41-01, WSDOT – Safety issues

[Design Manual](#), M 22-01, WSDOT – Sight distance along the roadway; roadside safety; traffic safety elements; sight distance at intersections; sight distance at road approaches; and sight distance for paths and trails

[Roadside Policy Manual](#), M 3110, WSDOT

[Roadside Design Guide](#), AASHTO

[Safety Procedures and Guidelines Manual](#), M 75-01, WSDOT

[Traffic Manual](#), M 51-02, WSDOT

310.03 Resources

WSDOT Maintenance & Operations Programs (M&OP) Safety Office

WSDOT Headquarters (HQ) Design Office

Regional field offices

WSDOT Adopt-a-Highway coordinator

Landscape Architecture offices

Maintenance offices

Construction offices

310.04 Definitions

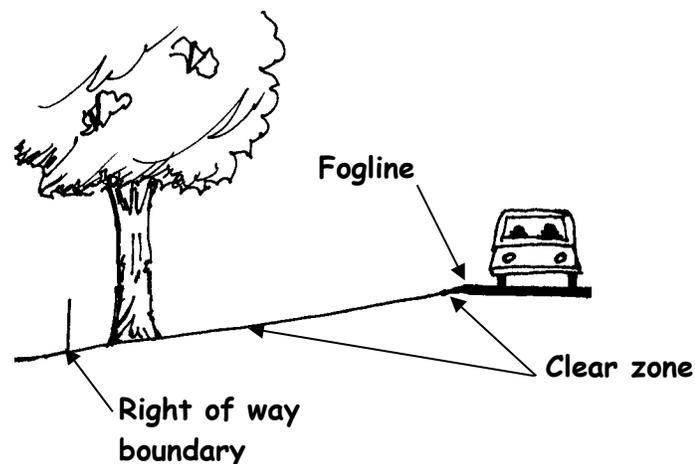
fixed service item A stationary facility or structure such as a utility box or light standard.

maintenance pull-off A widened shoulder area near fixed service items. Suggested width: 12 feet minimum. Suggested length: 100 feet maximum.

solar exposure Refers to the exposure of the road surface to the rays of the sun. Solar exposure can be blocked by landforms, structures, and vegetation adjacent to the roadway.

310.05 Safety of Vehicle Occupants

Exhibit 310-1 Clear zone example



310.05(1) Clear Zone

The clear zone (see Exhibit 310-1) is the total roadside border area, starting at the edge of the traveled way, available for use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a nonrecoverable slope, and/or a clear run-out area. The clear zone cannot contain a critical slope (slopes steeper than 3(H):1(V) are considered critical slopes). The Design Clear Zone is the minimum target value used in highway design. In areas with an open character, the clear zone may extend beyond the right of way boundary.

310.05(1)(a) Primary Considerations

Provide a clear zone, as discussed in the [Design Manual](#).

On new and major reconstruction projects, grade roadsides to mitigate impacts on errant vehicles whenever reasonable.

- Smooth and flatten slopes so there are no significant discontinuities and the fewest practical protruding fixed objects.
- Round toe of slope to make it traversable, and to assist an encroaching vehicle's contact with the surface.

These actions will have the added visual benefit of a more natural-appearing topography in most regions.

In some instances, removal of all trees within the Design Clear Zone may not be desirable (such as within a forest or park). If the impacts are minimal, a barrier or a deviation may be appropriate. In other cases, removal of trees may be necessary to increase driver safety. In these cases, analyze roadside-encroachment-accident reports to determine if roadside vegetation is contributing to accident rates. If a tree is removed, replace with shrubs or groundcovers according to the ratios found in the [Roadside Policy Manual](#).

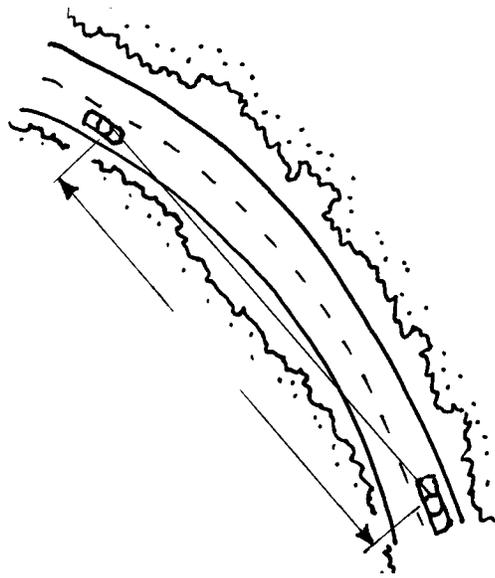
A deviation is required anywhere that a Design Clear Zone is not provided, or the driver is not protected from hazards.

310.05(2) Sight Distance

The sight distance is the length of highway visible to the driver (see [Exhibit 310-2](#)).

The decision sight distance is the sight distance required for a driver to (1) detect an unexpected or difficult-to-perceive information source or hazard, (2) interpret the information, (3) recognize the hazard, (4) select an appropriate maneuver, and (5) complete the maneuver safely and efficiently.

It is essential that the driver of a vehicle be able to see far enough to assess developing situations and take appropriate action. Roadside landforms, signs, structures, and vegetation must be designed, installed, and maintained to facilitate safe driving.

Exhibit 310-2 Sight distance primary considerations**310.05(2)(a) Primary Considerations**

- Allow for adequate sight distance at intersections and at vertical and horizontal curves when designing landforms, and locating signs, vegetation, and other roadside objects. (See the [Design Manual](#) for details.)
- Within sight distance on the inside of horizontal curves or at intersection approaches, select low-growing vegetation that, at maturity, will not obstruct signs or hazards from the view of the driver.
- Maintain vegetation growth in a desirable condition so that signs are not obscured.
- [RCW 47.32.130](#) provides for the removal of vegetation outside WSDOT right of way to increase roadway safety.

310.05(3) Traffic Barriers

A traffic barrier is any type of longitudinal barrier, including bridge rails, guardrails, earthen berms, or impact attenuators used to redirect vehicles from hazards located within the Design Clear Zone; to prevent median crossovers; to prevent errant vehicles from going over the side of a bridge structure; or to protect workers, pedestrians, or bicyclists from vehicular traffic. (See the [Design Manual](#) for details on their use and placement.)

310.05(3)(a) Considerations

There are barrier designs that visually fit into their surroundings. They can be used in sensitive areas, examples are: steel-backed timber rail, weathering steel or coated w-beam, simulated stone concrete barrier, etc. Contact the HQ Design Roadside Safety office for details.

Use these barriers to maintain corridor continuity or where they enhance the existing roadside character, as determined in the [Roadside Policy Manual](#), and where they are evident in, and similar to the adjacent surroundings.

310.05(4) Fire Control

The goal of roadside fire control is to reduce potential fire hazards. One of the objectives of Roadside Management Zone 1 is fire prevention. Grasses native to Eastern Washington with a blue-grey color are generally fire-resistant. Species include: Bluebunch wheatgrass, Sandberg bluegrass, Bottlebrush squirreltail, Common yarrow, Lewis blue flax, Prairie junegrass, and Sand dropseed.

310.05(5) Primary Consideration

Do not block access to fire hydrants when the hydrant is located in the right of way. This is a consideration when locating noise walls or thick hedges.

310.05(6) Roadway Shading

Forested areas are cooler in summer and warmer in winter due to the insulating effect of masses of trees. Removal of vegetation can result in problems with sunlight and headlight glare. Analyze the cause of shading to avoid removing trees unnecessarily. Appendix C shows the relationship of sun angle and vegetation to roadway shading.

- Too much shading might result in frost, snow, and ice remaining on the roadways, prolonging hazardous driving conditions. However, removing too much vegetation from the roadsides can create a sterile and barren appearance and increase solar glare. If it is determined that removing trees will increase solar exposure, re-vegetate the affected area with lower growing vegetation in conformance with the [Roadside Policy Manual](#). Wherever practical, locate structures and trees to limit shading on the road surface during early morning and late evening hours.

310.06(a) Primary Considerations

Consider the following:

- Analyze shading elements before the removal of trees and vegetation to determine if that action is warranted. Removal of vegetation will not increase solar exposure if a land form or structure will still be blocking sunlight.
- Accident history is available for any given location.
 - Use accident history to evaluate whether icing has contributed to accidents in a particular location.
 - Use accident history information to evaluate if shading by the vegetation is contributing to accident rates.
- Talk to maintenance personnel to determine where icing historically occurs.
- Deciduous trees that lose their leaves in winter can be used where solar exposure is desired. Planting evergreens to the north of the roadway will generally block wind without obstructing sunlight.

310.05(7) Sunlight and headlight glare

Glare caused by the low angle of the sun in winter, or during the early or late hours of the day can be a serious problem to the motorist. Glare from oncoming headlights can also be a problem.

310.05(7)(a) Primary Considerations

Locate roadside features to screen reflective objects where practical.

- Glare can be blocked with vegetation, glare screens, berms, walls, etc.
- Vegetation in medians can reduce headlight glare.
- Bright lights from land uses, such as adjacent industrial complexes, can be screened by walls or evergreen trees and shrubs.

Tunnel entrances present a particularly difficult situation where the driver's eye must adjust from the bright glare outside the tunnel to lower light levels inside the tunnel. Upon leaving the tunnel, the driver's eye must readjust from the lower light levels inside the tunnel to the bright glare outside. Each of these situations can present hazardous driving conditions for the driver.

Glare at a tunnel entrance can be mitigated with dark evergreen vegetation that helps the driver's eye transition to the lower light levels in the tunnel.

310.06 Worker and Pedestrian Safety

310.06(1) Maintenance Crew Safety

Maintenance access is especially critical in high traffic volume areas.

310.06(1)(a) Primary Considerations

- Follow the [Safety Procedures and Guidelines Manual](#) for traffic control. (See possible traffic control plans under the [Standard Plans](#).)
- During the planning and design phases of roadway construction, allow for the widest practical shoulder width near fixed service points. (See the [Design Manual](#), Division 12, for shoulder width requirements.)
- Provide for maintenance vehicle access where shoulder area is limited by providing maintenance pull-offs in a nearby location.
- When other options do not exist, design fall-protection fencing or harness tie off points where crews are able to secure themselves while working in areas with vertical elevation changes of 4 feet or more. [WAC 296-155](#) Part C-1 provides requirements for "Fall Restraint and Fall Arrest." The Washington State Department of Labor and Industries enforces this WAC.

310.06(1)(b) Recommendations

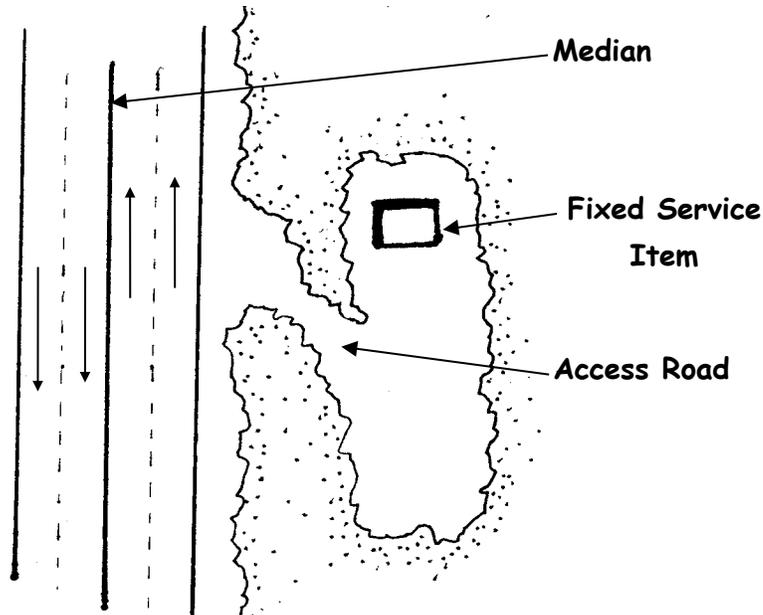
Coordinate with the regional Traffic Engineer.

When incorporated into designs, where practical, the following recommendations will enhance worker safety:

- Provide Maintenance pull-off areas or wide shoulders (minimum 12 feet) adjacent to a device or item requiring regular service. Near utility poles, sign bridges, pull-boxes, and junction boxes (fixed service points), the ideal shoulder width is 20 feet.

- o **Note:** Design these maintenance pull-off areas to support vehicles with a wide-stance and outriggers (Sign Trucks, aerial manlifts, portable VMS trailers). Balance this cost against the future cost of extensive lane and traffic control, the hazard of road crew exposure to traffic, and restriction of traffic flow.
- o Fill material for these shoulders must be flat, located above the Ordinary High Water Level of nearby surface waters, and be firm enough to support the weight of a 41,000 GVW maintenance vehicle. The footprint of these vehicles is 35 feet long by 12 feet wide.
- Place junction boxes, vaults, and other fixed service points on the right side of the roadway (rather than in median strips) as much as practical, with as much parking and re-entry area as practical.
- When fixed service points such as transmitters, cabinets, camera poles and sediment ponds are more than 24 feet from the roadway edge, provide an access support road capable of supporting large (17.5 ton) service vehicles. The configuration in Exhibit 310-3 is not as noticeable to passing motorists.
- When long stretches, 2,500 feet or more, of guardrail are used in areas with limited shoulder, provide a maintenance parking area adjacent to either end, where practical.

Exhibit 310-3 Possible maintenance access road configuration



310.06(2) Security

To minimize security problems at pedestrian areas (trails, safety rest areas, and viewpoints), it is essential to provide clear visibility into the facility from adjacent areas, and within the facility itself.

310.06(2)(a) Primary Considerations

- Locate buildings and other structures to provide the maximum practical visibility from other areas.
- At Safety Rest Areas, locate “Free Coffee” shelters to provide visibility to the largest area possible.
- Locate auxiliary structures (local information boards, panels, etc.) to allow maximum visibility of site.
- Where practical, install lighting and Emergency (911) cellular phone linkages to discourage vandalism, theft, and person-to-person crimes.

The following are general recommendations for areas where security concerns regarding vegetation are present. These actions have been used successfully in a number of areas to alleviate security concerns while minimizing impacts on existing vegetation. These actions are only applicable to an existing security concern, and are not intended as a standard treatment for every roadside or pedestrian area!

- Analyze the area to determine the security concern source and extent. Tailor all actions to preserve as much vegetation as possible while alleviating the security concern.
- Complete removal of all vegetation (clearing) is not an acceptable method of alleviating every security concern.

Where vegetation is reducing desired visibility, consider the following actions:

- Limb branches of large evergreen trees (Western Red Cedar, Douglas fir, etc.) to approximately 10 feet above ground level. Since branches of these trees tend to droop down, prune off the ends of branches that hang lower than 6 feet above ground level.
- Prune smaller deciduous trees to encourage an open habit with leaves above a 6-foot elevation (Hazelnut, Serviceberry, Vine Maple, etc.). Remove only branches that are within the direct line of vision.
- Trim shrubs and groundcover to 2 feet in height and do not allow them to grow higher than 3 feet in height (Salal, Snowberry, Nootka Rose, etc.).
- Limit the use of shrubs in areas directly adjacent to paths, parking areas, and remote picnic sites. Use groundcover plants instead.

Consult with the region’s Landscape Architecture Office or the HQ Roadside and Site Development Section for site and species specific pruning methods.