Part 300 Cross Section Elements

Section 301 Introduction

Part 300 Provides direction for applying the appropriate design criteria to project cross section design. Performance-Based Practical Design and design flexibility is a strategy to deliver focused benefits for the State's transportation system while working with the realities of a fiscally constrained environment. ODOT's Blueprint for Urban Design (BUD) has been incorporated into the Highway Design Manual to further provide flexibility, particularly in the urban context. These strategies encourage project teams to use engineering judgment to make cost effective system improvements. Understanding of the cross-section elements contained herein will allow the practitioner to make sound decisions in keeping the project within scope and budget. The first portion of this Part 300 provides information on urban and rural contexts, the current industry direction on urban design, connecting ODOT's current highway segment designations to ODOT's six urban contexts, determining the context, and evaluating and prioritizing design elements.

The cross-section elements of the roadway are as important as the alignments of the roadway and can have as much effect on traveling vehicles. Corresponding care must be given to the cross-section elements to assure safe operation of the facility. In addition to cross-section elements for the six ODOT urban contexts, Part 300 provide the 3R, 4R, 1R, and Single Function cross section criteria for urban and rural freeways, urban and rural expressways, rural arterials, collectors, and local routes, as well. In addition, this Part provides design guidance for cross slope, vertical clearance, roadside design, curb placement, shy distance and roadside barriers, safety edge, rumble strips, ditches, earthwork, rounding cutbanks, and median design.

Projects that are not intended to modernize the roadway, thus leaving the existing widths and alignments, still can make significant improvements to the overall safety of the facility by addressing the cross-sectional elements discussed in this chapter.

Within this manual are specific font changes that are used to show the documentation and/or approval that is required for not meeting the value shown.

Text within some parts of this manual is presented in specific fonts that show the required documentation and/or approval if the design does not meet the requirements shown. Table 300-1 shows the four text fonts used that include Standard, Guidance, Option, and General Text along with their descriptions.

Standard - A statement of required, mandatory, or specifically prohibitive practice regarding a roadway geometric feature or appurtenance. All Standard statements appear in bold type in design parameters. The verb "provide" is typically used. The adjective "required" is typically used in figures to illustrate Standard statements. The verbs "should" and "may" are not used in Standard statements. The adjectives "recommended" and "optional" are only used in Standard statements to describe recommended or optional design features as they relate to required design features. Standard statements are sometimes modified by Options. A design exception is required to modify a Standard. The State Traffic-Roadway Engineer (STRE) gives formal approval, and FHWA approves as required.

Table 300-1: Font Key

Font Key Term	Font	Deviations	Approver
Standard	**Bold text**	Design Exceptions	State Traffic-Roadway Engineer (STRE) and for some projects, FHWA
Guideline	***Bold Italics tex***t	Design Decisions Document	Region with Tech Expert input
Option	*Italics Text*	Document decisions	EOR
General Text	Not bold or italics	N/A	N/A

Guideline - A statement of recommended practice in typical situations. All Guideline statements appear in bold italicized type in design parameters. The verb "should" is typically used. The adjective "recommended" is typically used in figures to illustrate Guideline statements. The verbs "provide" and "may" are not used in Guideline statements. The adjectives "required" and "optional" are only used in Guideline statements to describe required or optional design features as they relate to recommended design features. Guideline statements are sometimes modified by Options. While a formal design exception is not required, documentation of the decisions made by the Engineer of Record in the Design Decision documentation or other engineering reports is required. Region approval, with input from Technical Experts, is formally recorded for urban projects via the Urban Design Concurrence Document in the Design Decision portion. The Urban Design Concurrence document is located on the Highway Design Manual website.

Option - A statement of practice that is a permissive condition and carries no requirement or recommendation. Option statements sometimes contain allowable ranges within a Standard or Guideline statement. All Option statements appear in italic type in design parameters sections. The verb "may" is typically used. The adjective "optional" is typically used in figures to illustrate Option statements. The verbs "shall" and "should" are not used in Option statements. The adjectives "required" and "recommended" are only used in Option statements to describe required or recommended design features as they relate to optional design features. While a formal design exception is not required, documentation of the decisions made by the Engineer of Record in the Design Decision documentation or other engineering reports is best practice.

General Text - Any informational statement that does not convey any degree of mandate, recommendation, authorization, prohibition, or enforceable condition. The remaining text in the manual is general text and may include supporting information, background discussion, commentary, explanations, information about design process or procedures, description of methods, or potential considerations and all other general discussion. General text statements do not include any special text formatting. General text may be used to inform and support design exception requests, particularly where narrative explanations show best practices or methods of design that support the requested design exception.

301.1 Definitions

1R/3R Record of Decision - Documentation to determine whether the 1R or 3R standard applies to a paving project.

ADA Ramp - See Section 102.

Context Sensitive Solutions (CSS) - A planning and design approach to advance programs and projects in a collaborative manner and in a way that fits into the community and environment.

Design Exception - Approval authorized by the State Traffic-Roadway Engineer to deviate from a design criteria standard. Design Exceptions are submitted on the Design Exception Request Form (see HDM Part 1000).

Design Concurrence Document - Documentation to determine project context, define project design criteria, and document project design decisions for projects. The Design Concurrence Document is included in the DAP submittal.

National Truck Network - The National Network was authorized by the Surface Transportation Assistance Act of 1982 (P.L. 97-424) and specified in the U.S. Code of Federal Regulations (23 CFR 658) to require states to allow conventional combinations on "the Interstate System and those portions of the Federal-aid Primary System serving to link principal cities and densely developed portions of the United States on high volume routes.

Urban - Relating to, or characteristic of a town or city.

Urban Context - Relates to all nearby built and natural features, as well as social, economic and environmental factors impacting a location. Urban context is based on existing and future land use characteristics, development patterns, and roadway connectivity in an area. For purposes related to the Highway Design Manual, urban context is not limited to places within the current Urban Growth Boundary (UGB)

Urban Design - For the HDM, the term applies to urban contexts relating to land uses that broadly identify the various built environments along ODOT roadways.

301.2 Acronyms

CC - Commercial Center

EOR - Engineer of Record

OHP - Oregon Highway Plan

STA - Special Transportation Area

UBA - Urban Business Area

UDC - Urban Design Concurrence

Section 302 Approval Processes

302.1 Design Exceptions

Any deviation from any design standard or approved design criteria range requires design exception approval by the State Traffic-Roadway Engineer. Design exceptions require signature by both the Engineer of Record (EOR) and State Traffic-Roadway Engineer. Design exceptions and the design exception process is addressed in Part 1000 of the HDM. Design exceptions may also require approval by the Federal Highway Administration (FHWA) for a project of interest.

302.2 Urban Design Concurrence Document

The Blueprint for Urban Design (BUD), which has been incorporated into the HDM, established the Urban Design Concurrence Document Form to determine project context, define design criteria, and document design decisions on urban projects including rural communities. Authority for approval of the urban design concurrence document resides in the Region Technical Center. ***The Region Technical Center Manager provides final approval of design concurrence with collaborative input from Region Planning, Traffic, Roadway, and Maintenance.***

302.3 1R/3R Record of Decision Document

The 1R/3R Record of Decision document is to be filled out by Pavements staff, Region Roadway staff, and Traffic staff. Approval signatures are the Pavements Engineer, the Region

Roadway Manager, and the Region Traffic Manager. The Transportation Project Manager's or Resident Engineer – Consultant Projects' role is to coordinate the process.

Section 303 Cross Section Elements

The Standard Roadbed Sections and the ODOT 4R/New Standards outlined in Part 300 give the dimensions to be used for the design of new facilities, the modernization of existing facilities, and the preservation of facilities. These include shoulders, travel lanes, medians, and other cross-sectional elements. Design frontage roads in accordance with the anticipated traffic and their location.

When the width computed for the lateral support of the surfacing material is a fractional width, round the lateral support width up to the nearest foot.

Section 304 Cross Section Realms

304.1 Cross Section Realms and Considerations

This section provides an overview of the importance of integrating design, safety and operations in conjunction with maintenance needs and provides a summary of potential tools for measuring and evaluating considerations and trade-offs. This discussion provides the next level of detail and the range of considerations for design elements within the roadway cross section, which are organized into "cross section realms" as shown in Figure 300-1. The figure provides a graphical overview of the various cross section realms, their positions across the section and the intended function they may serve in an urban area. T*he elements and dimensions of these realms will vary depending on the urban context, the anticipated users, and desired project outcomes.* Table 300-2 is a summary of the Cross Section Realms.

Figure 300-1 Example of Cross Section Realms

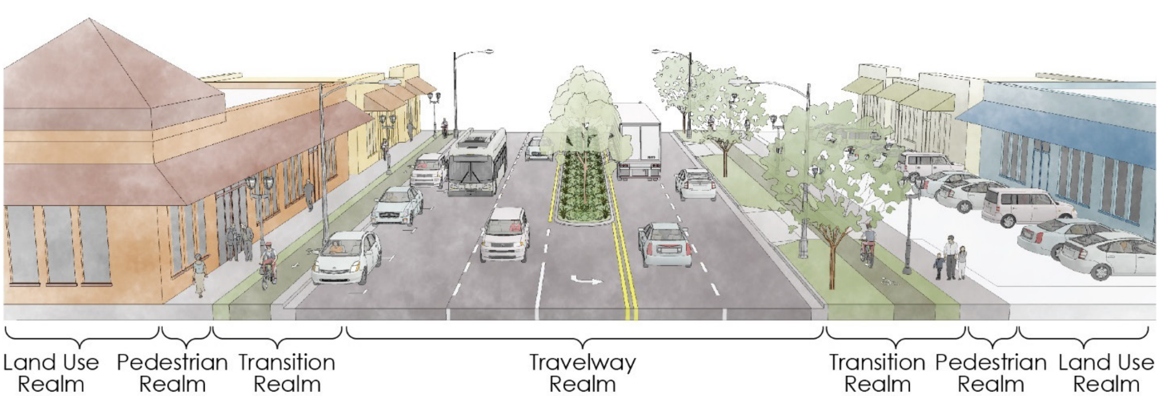


Table 300-2 Summary of Cross Section Realms

Street Realm	Location	Function
Land Use Realm	Immediately adjacent to the roadway right-of-way	Typically, privately owned, the land use realm contributes to the urban context of the place. This space can also serve a variety of other functions in some cases, including pedestrian space, amenities such as bicycle parking, utilities, landscaping, parking, and other uses. Awnings or building appurtenances, signs and other activities that require use of the public right-of-way or overhang into the Pedestrian Realm must be permitted by ODOT or the local agency (if sidewalk is locally owned).
Pedestrian Realm	Includes the sidewalk and the buffer or furniture zone	Serves pedestrians and access to land uses. Buffer/furniture zone often used as a place for utilities, lighting, signs, street trees, and other furnishings. May also serve as public space for art, sidewalk seating, or other types of public uses if sidewalk is locally owned.
Transition Realm	The area immediately adjacent to the curb or sidewalk edge (e.g., parking, loading, transit stops). May also include non-pedestrian areas behind the curb (e.g., curb-separated bicycle lanes).	Bicycle movement or parking, pedestrians, planters, transit stops, parking, loading/unloading, pick-up/drop-off. May serve multiple functions in same block or location, may vary by time of day. May also include street trees and/or other green streets treatments
Travelway Realm	The center of the right-of-way used for movement, typically including travel lanes, median, and/or turn lanes	Primarily functions to serve various types of vehicle movement (including motor vehicles, buses, light rail vehicles, streetcars, bicycles, motorcycles, freight, etc.) Can provide or manage vehicular access through turn lanes, medians, and other treatments. Median can function as a place for vegetation, green streets storm water treatments, and as a pedestrian refuge.

The next set of figures (Figure 300-2 through Figure 300-7) and tables (Table 300-2 through Table 300-7) provide key questions and considerations for primary design elements typically found within each of the cross-section realms. These questions and considerations guide practitioners in making decisions about how to apply the context, evaluate the desired project goals and outcomes, and design the cross-sectional elements as an iterative process. Subsequent sections provide specific design guidance for elements within the realms for each urban context. If a project team finds that a roadway is not able to attain the design recommendations, the information in these tables can support the project team's approach to evaluating trade-offs and documenting design decisions as part of the ODOT urban design concurrence process. Project teams consider the existing urban context and the potential future context desired by the community. Understanding the context considerations, while outlining clear desired project outcomes (for the near-term and long-term needs of the community) can help guide project teams with decision making.

304.2 Land Use Realm

The land use realm shown in Figure 300-2, and described in Table 300-3, is a key defining feature of the urban context. ODOT does not typically own or control the adjacent land use directly. Instead, it is typically private property, regulated by the local jurisdiction. ***ODOT project teams work in parallel with the local jurisdiction to verify that the street design supports the desired context and desired project outcomes.***

The function of the land use realm in a Traditional Downtown/CBD area is different from that in the other contexts. Where there is zero setback in a downtown area, business entrances are at the back of the sidewalk, so the roadway speed, volume, and operations influence the attractiveness of the businesses. By contrast, in a Commercial Corridor, entrances farther from the roadway are typically preferred. The road noise caused by higher speeds may impact real estate and the attractiveness of businesses. However, there can also be zero setback in a Commercial Corridor (typically the back wall of a business).

Figure 300-2: Land Use Realm

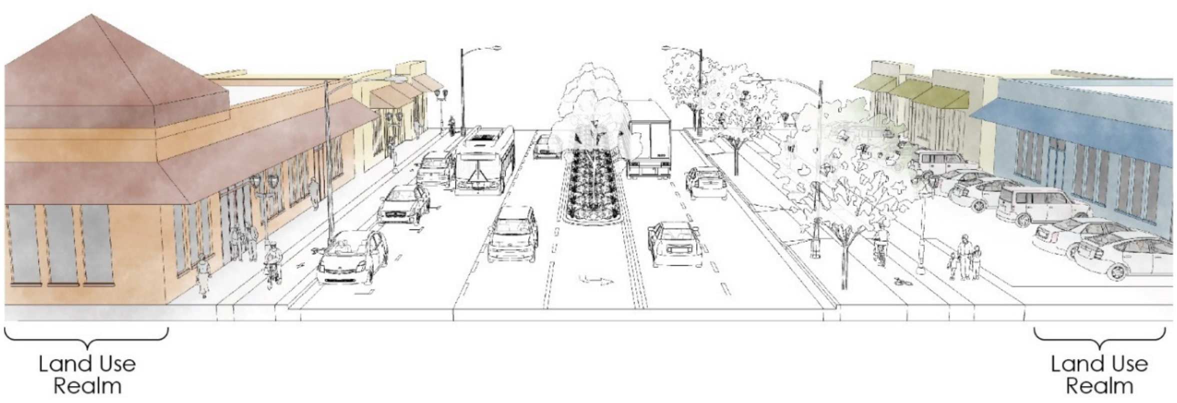


Table 300-3 Design Element Considerations within the Land Use Realm

Design Element	Considerations
Access to commercial development / storefront	In traditional downtown type land use, buildings often have zero setback, creating a welcoming environment for pedestrians. To ensure adequate space for building frontage in addition to pedestrian movement, wider sidewalks may be necessary. In other contexts, buildings may have zero setback or a significant setback. In these situations, evaluate and consider the likely pedestrian path between land uses and to/from transit stops to determine where there is likely a demand for street crossings.
Elements supportive of pedestrian realm	In some urban contexts, the land use realm can offer space that is supportive of the pedestrian realm, potentially reducing demands on the street right-of-way. Consider whether there is the potential to work with the local jurisdiction and property owners to include any of the following: Additional sidewalk width Pedestrian plazas / parks Landscaping adjacent to the sidewalk Stormwater facilities (green streets) Awnings or building appurtenances, signs, and other activities that require use of the public right-of-way must be permitted by ODOT or the local agency (if sidewalk is locally owned).
Elements supportive of other street functions	The land use realm can also provide space to support other functions. Consider whether it would be appropriate to rely on the adjacent land use for parking. In many cases, local jurisdiction development code requires property owners to provide bicycle parking. In some cases, an easement can allow for utilities to be located on adjacent land.

304.3 Pedestrian Realm

The pedestrian realm, shown in Figure 300-3 and described in Table 300-5 includes the frontage zone, the pedestrian zone (Pedestrian Access Route), the buffer zone, and, in some urban contexts, this may also include the curb zone. Exhibit 300-1 illustrates the Pedestrian Zones within the Pedestrian Realm. Section 810.4, Pedestrian Zones, provides more in-depth discussion about pedestrian zones. Depending on how or where a bicycle facility is included, the curb zone may be considered in either the Pedestrian realm or the Transition Realm. For consistency in this document, it is shown in the Pedestrian Realm. However, bear in mind, if a separated bicycle facility is incorporated with the final design, the curb may be included with the Transition Zone. Where a multi-use path design is employed, both the curb and the bicycle facility could be included as part of the Pedestrian Realm.

The greatest need for pedestrian accommodation is along urban highways where sidewalks separated with a buffer are the preferred facility for pedestrians. **Provide sidewalks on all urban highways within city limits with the possible exception of limited access expressways or interstate highways.** Sidewalks will most likely be needed on highways beyond city limits, within the urban growth boundary, or in unincorporated areas, based on existing and planned land use.

Human factors can play a huge role in how a particular driver perceives and reacts to roadway design and conditions and this can affect pedestrian safety as well. As roadway systems experience an aging population of drivers, the range of human factors of that demographic becomes increasingly important. Older drivers and older pedestrians often experience declining vision acuity, reduced body movement affecting head turning ability and other physical movement, increase in reaction time, and changes in cognitive function to name a few. For more information on human factors and considerations for roadway design, see NCHRP Report 600, Human Factors Guidelines for Road Systems, second edition. For assistance with interpreting the document, contact ODOT Technical Services, Traffic-Roadway Section. Understanding pedestrian activity along a corridor, needed access to land use, and potential buffers in the Pedestrian Realm helps prioritize the design decisions for this section of the roadway and support the need to balance the trade-offs amongst the various cross section constraints.

When considering the Pedestrian Realm, pedestrian permeability across the roadway is of critical importance in urban locations. ***Sidewalks provide mobility along the highway, but full pedestrian accommodation also requires frequent, safe and convenient crossing opportunities.*** To help determine final decisions on crossing spacing needed by pedestrian activity in the area, look at pedestrian origins and destinations within adjacent blocks to help evaluate spacing needs. Wide highways carrying large traffic volumes can be barriers to pedestrians, making facilities on the other side difficult to access. Consider mid-block and uncontrolled intersection crossings, as people will take the shortest route to their destination. Prohibiting such movements is counter-productive if pedestrians cross the road with no protection. It is better to design highways that enable pedestrians to cross safely. Evaluate pedestrian crossing locations in relation to origins and destinations to determine appropriate spacing to meet demand. Table 300-4 provides target spacing for pedestrian crossings. These values are starting points with further analysis needed to determine appropriate spacing for a given corridor location. Section 307, Pedestrian Crossing Location, provides more information on crossing spacing. See Part 800 for detailed information about designing for pedestrians.

Table 300-4: Target Crossing Spacing

Urban Context	Target Spacing (ft.)
Traditional Downtown/ CBD	250-550
Urban Mix	250-550
Commercial Corridor	500-1,000
Residential Corridor	500-1,000
Suburban Fringe	750-1,500
Rural Community	250-750

All pedestrian crosswalks, marked and unmarked, must meet accessibility requirements provided throughout this manual. HDM Part 800, Pedestrian Design, provides detailed information and guidance to design appropriate and accessible pedestrian facilities.

Figure 300-3 Pedestrian Realm

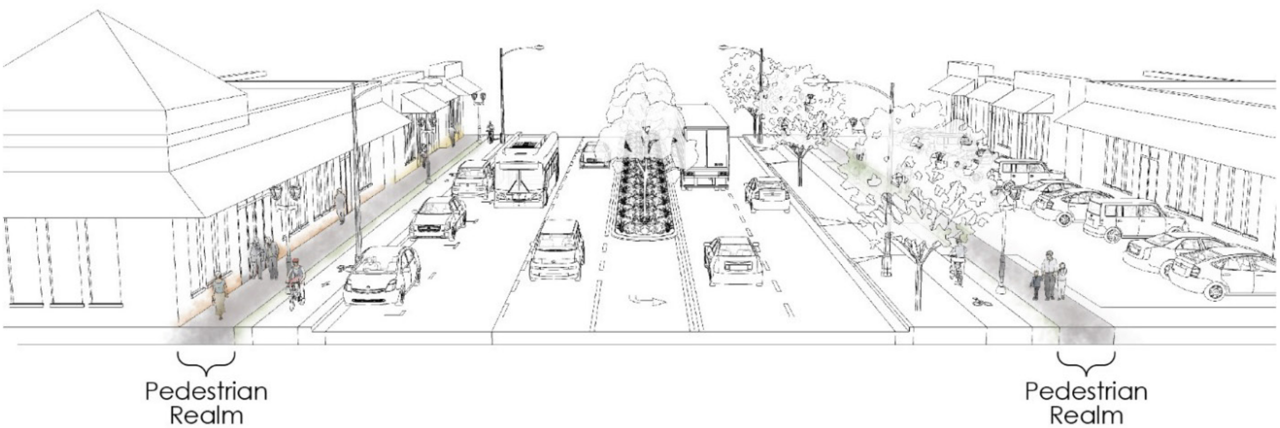


Exhibit 300-1, Pedestrian Realm Zones

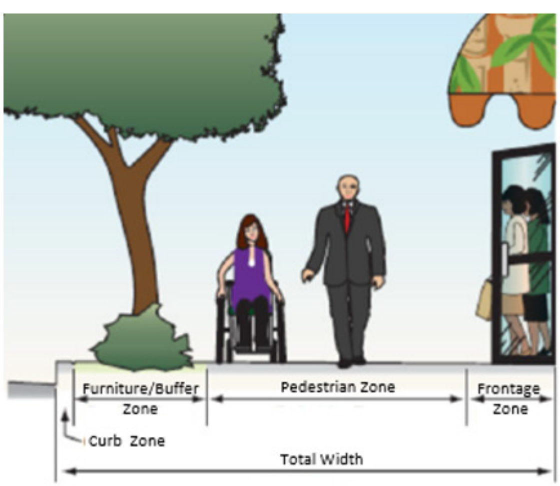


Table 300-5 Design Element Considerations within the Pedestrian Realm

<table>
<tr><th>Design Element</th><th>Considerations</th></tr>
<tr><td>Frontage Zone</td><td>The frontage zone is located between the pedestrian zone and the right-of-way.
Depending on the available space, this zone may include items such as sandwich boards (if sidewalk locally owned), bicycle racks, and benches.
This area is used by window shoppers and is where people enter and exit buildings.
The width of the frontage zone is needed to prevent adjacent property owners from installing a fence at the back of walk, or for maintenance personnel to make sidewalk repairs.
In a Traditional Downtown/CBD context, additional width is needed to provide space for merchandise and sidewalk cafés (if sidewalk is locally owned and permitted), and opening doors (typically needs 4 feet).</td></tr>
<tr><td>Pedestrian Zone</td><td>What is the travel speed next to the sidewalk?
Is the street a high priority for pedestrian activity, based on community input and local jurisdiction planning efforts?
If so, prioritize serving pedestrians with a high-quality facility (width and buffer).
What level of pedestrian activity is occurring today? Is there a desire or potential for higher pedestrian activity?
Select sidewalk widths with sufficient space to accommodate anticipated/desired level of activity.
What is the target pedestrian level-of-traffic-stress for this location?
A pedestrian accessible route is provided in the pedestrian zone.</td></tr>
<tr><td>Buffer Zone</td><td>People walking need to be buffered from motor vehicle movement. Ensure that a buffer is provided within the pedestrian realm or the transition realm, or that generous sidewalk width provides sufficient space for buffering if sidewalk is curb tight.
Permitted items such as sandwich boards, bicycle racks, and other street furniture are typically placed in this zone.
Additional design elements to consider in sidewalk design include:
Pedestrian scale lighting
Utility pole placement
Do transit stops need extra buffer?
Where vehicle speeds or volumes are high, sufficient buffer is important.
Downtown area may have parked cars that can serve as a buffer.
Suburban areas have no parking but may include a planter strip.</td></tr>
</table>

Table 300-5 (continued) Design Element Considerations within the Pedestrian Realm

Design Element	Considerations
Curb Zone	The curb zone is the transition between a sidewalk and the roadway. • At a crosswalk or intersection, the design of the gutter pan (apron) is important for accessibility standards. • A curb and gutter is typically 2 feet, and the gutter portion can be part of the adjacent transition realm. Where separated bicycle lanes exist, the curb is on the other side of the bicycle lane, so in lieu of the curb zone being defined as the curb between the bicycle lane and sidewalk, this zone is characterized by the buffer space between the bicycle lane and the sidewalk. Most urban streets with sidewalks are typically curbed. A vertical curb channelizes drainage and prevents vehicles from parking on the sidewalk.

304.4 Transition Realm

The transition realm, shown in Figure 300-4 and described in Table 300-6 includes the area immediately adjacent to the curb or sidewalk edge (e.g., parking, loading, transit stops) and may also include non-pedestrian areas behind the curb (e.g., curb-separated bicycle lanes). *The primary design elements within this realm are the right-side shoulder, bicycle facilities, and on-street parking. Storm water and landscape considerations are also relevant in this realm and can impact the overall roadway cross section.*

Figure 300-4 Transition Realm

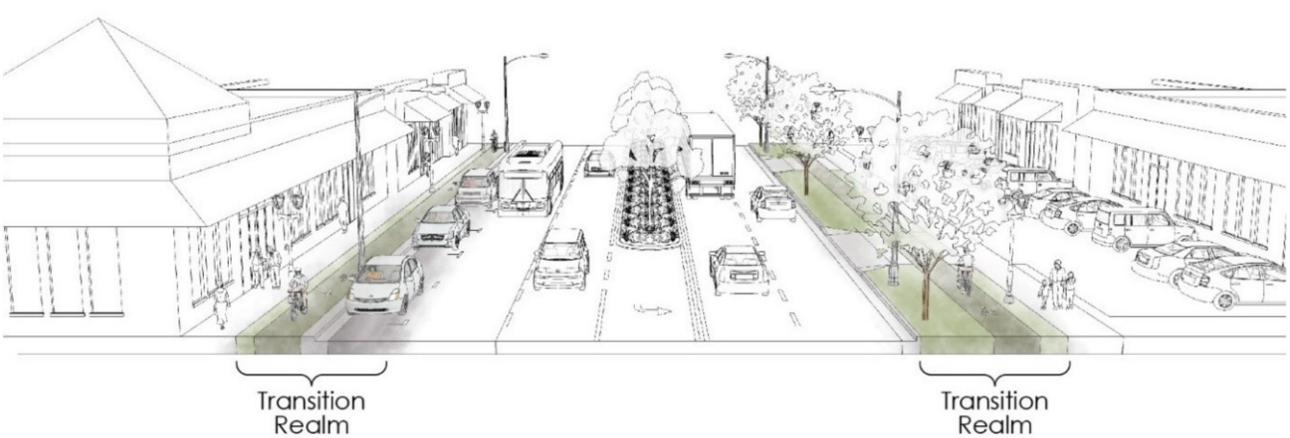


Table 300-6 Design Element Considerations within the Transition Realm

Design Element	Considerations
Right Side Shoulder	What is the purpose of this space? Is there a need for roadside recoverable area or shy distance based on the urban context, target speed, and/or run-off the road crashes? Is storm water allowed to encroach into travel lanes (spread) given the context and target speed?
Bicycle Facility (See Part 900 for Design Details)	What cross-sectional elements are next to the bicycle lane (e.g., narrow travel lane with higher percentage of trucks)? What are speeds? • When speeds are higher, the project team needs to consider additional separation, such as extra buffer or moving bicycles behind the planter strip. • Street buffers function to increase the sense of comfort and safety for bicyclists. This space can serve many functions from green treatments to transit boarding platforms. Features that are necessary to be accessed from the travel lane, typically located in the sidewalk buffer, such as mailboxes, should be in the street buffer. Is the street part of the regional bicycle network? • If so, prioritize serving bicycle access and mobility. What type of bicyclist is currently served? What are the forecast volumes of bicyclists, and is the width sufficient to serve them? If curb and gutter is used for drainage, consider how the gutter pan affects the functionality of the bicycle facility. Bicycles need a usable space, not just space. What level of facility is needed to serve riders of all ages and abilities? • On a shoulder bicycle lane, bicyclists can pass other bicycles by using part of the adjacent vehicle lane. However, when bicycle lanes are constrained between curbs or other objects, passing may be restricted. Where separated bicycle lanes are used, the bicycle lane should consider the ability for a bicycle to be passed or for two bicycles to travel side-by-side. What are the forecast volumes of bicyclists, and is the width sufficient to serve them? Can buffer widths be minimized by providing greater physical protection? Is there a parallel route that is equally direct/accessible and/or that has been identified in a local jurisdiction plan? Can anticipated volumes of bicyclists and pedestrians be served with a multi-use path on one or both sides of the street?

Table 300-6 (Continued): Design Element Considerations within the Transition Realm

Design Element	Considerations
Bicycle / Street Buffer Zone	Stormwater/Landscape Strip What are the green street treatment locations that present the fewest trade-offs on this street? • Curb extensions work well with on-street parking but are more challenging to implement in conjunction with separated bicycle facilities. • Linear facilities in transition zone provide "greening" benefits along the length of street but require width for the entire cross section. Street trees are often required by local jurisdictions in the landscape zone and must meet sight distance standards and be permitted by ODOT. • Basins can be implemented in right-of-way remnants. Are there opportunities to reduce impermeable surface to reduce run-off volumes? Transit Stops Are buses stopping in the travel lane or in a bus pullout? What is the transit agency's guidance along the specific corridor? Are bus stops upstream or downstream of intersection? What would be the interaction between the bus stop and the bicycle facility, as well as access to pedestrian facilities? Transit stops may be incorporated in the buffer and curb zones that are part of the pedestrian zone.
On-Street Parking	What is the off-street parking situation? What about parking availability on side streets? Consult a parking study if available or determine available capacity on side streets or off-street and compare that to the utilized capacity on the study street. Ensure availability of accessible parking and EV charging spaces. Identify the need to allocate space for the following: • Bicycle parking • On-street loading/unloading • Freight • Pick-up/drop-off of people
Maintenance	When determining appropriate elements for the transition zone, the ability for maintaining the facility shall be considered. Consult ODOT maintenance staff for input when determining the following: • Sweeping, snow removal, and maintaining constrained cycle track facilities. • Restriping and maintaining markings for buffered bicycle lanes. • Maintaining vertical elements like tubular markers used for delineation and separation of the bicycle facility and the travel lane. Consider intergovernmental agreements with the local jurisdiction for maintenance of the transition zone and elements within it. This may include the pedestrian realm as well.

304.5 Travelway Realm

The travelway realm, shown in Figure 300-5 and described in Table 300-7, focuses on the movement of motor vehicles and includes travel lanes, median, and/or turn lanes. Understanding the user priorities and desired outcomes for a project can help prioritize the trade-offs for the design elements within the travelway realm.

Figure 300-5 Travelway Realm

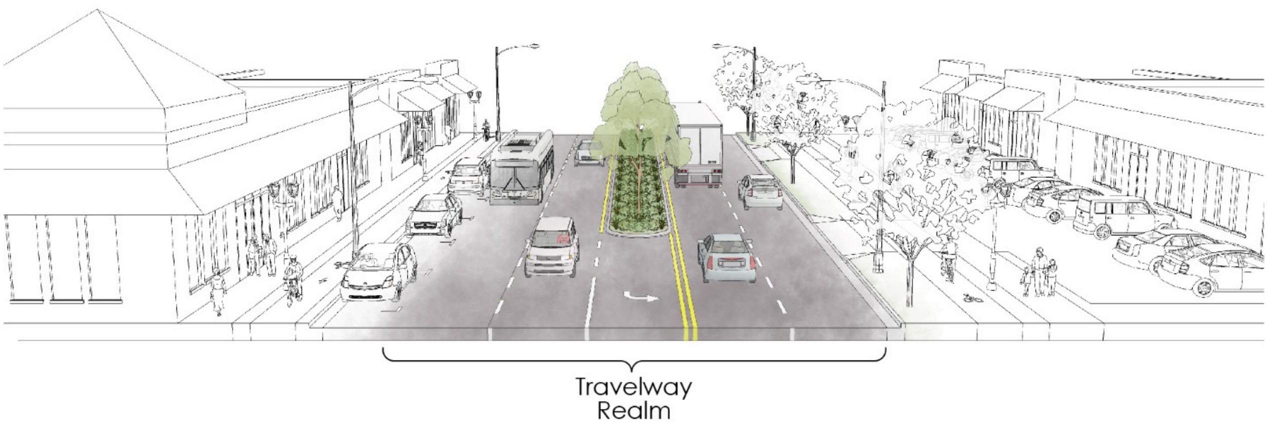


Table 300-7 Design Element Considerations within the Travelway Realm

Design Element	Considerations
Travel Lane Width	What is the land use context and target speed for the street? • In slower, denser urban contexts, consider narrow, minimum lane widths. • In suburban contexts, consider narrower lane width. • In higher speeds, maintain wider lane. • Maintain typical lane width for the context. What design elements are adjacent to the lane? • Evaluating the appropriate lane width may depend on the design elements adjacent to the lane. • The width of a travel lane adjacent to shy distance or a buffered bicycle lane, may have flexibility to be narrowed while still meeting the roadway needs. • A travel lane directly adjacent to a curb may benefit from a full width to allow for adequate width for users on the roadway. What are the appropriate number of through travel lanes? • If a street has several through lanes per direction, consider a detailed operational evaluation of a road reorganization (i.e., road diet) to reallocate space to other functions and get public input. • Consider if it is appropriate to accept higher levels of congestion. What role does this street play in the regional transit network? • If the street is part of the frequent bus network (or any rail or high-capacity transit), prioritize designs that prioritize transit. What role does this street play in the freight network? • If the street is part of the regional or statewide freight network, prioritize designs that preserve adequate vehicular capacity for the demand. What role does this street play in Reduction Review Route? • Follow the appropriate process outlined in OAR 731-012
Turn Lane Width	What design elements are adjacent to the left-turn lane? • Is there a median with a shy distance that may provide an opportunity to narrow the lane width? • What is the median striping width in the opposing direction? What design elements are adjacent to the right-turn lane? • How are bicycles addressed at right-turns?

Table 300-7 (continued): Design Element Considerations within the Travelway Realm

Design Element	Considerations
Left Side Shy Distance	In low-speed urban contexts, consider minimizing additional width needed for shy distance (e.g., median or curb). • Lower target speeds • Use fewer vertical elements (which require shy distance) • Zero shy distance may be acceptable when considering trade-offs and design considerations in relation to the context
Striped Median Width	What is the speed along the street and the potential of vehicles to cross into oncoming traffic?
Raised Curb Median	What is the purpose of the median? • Access management. • Landscaping to create "boulevard" effect.

Section 305 Cross-Section and Realm Design Guidance

As noted previously in Section 304, Table 300-2 through Table 300-7 provide guidance to help project teams consider various design elements typically found within each of the cross section realms. Having an understanding of all the elements and how they interact with each other will guide practitioners in making decisions about how to apply, evaluate, and design the cross-sectional elements.

A holistic evaluation of the cross section that considers the individual design elements together, rather than separately, can help verify that the overall roadway cross section aligns with desired project outcomes and balances the needs of each user. Section 305.1 through Section 305.6 including Table 300-8 through Table 300-13 and Figure 300-6 through Figure 300-11 provide recommendations for design elements within the six urban contexts described in Part 200.

- Section 305.1 - Traditional Downtown/CBD
- Section 305.2 - Urban Mix
- Section 305.3 - Commercial Corridor
- Section 305.4- Residential Corridor
- Section 305.5 - Suburban Fringe
- Section 305.6 - Rural Community

These sections provide design guidance recommendations for roadway cross sections within each ODOT urban context. The ODOT Urban Design Concurrence document and the decision-making process described in Part 100 are used to justify and document the project team decisions and reasoning for the preferred solutions and final cross-section design. When reviewing the tables and figures from a pedestrian and bicycle user perspective and preference, the higher end of the dimension range should be the starting point for evaluation, as shown first in the tables. For travel lanes, the intent is to begin evaluation with the generally preferred lower width dimension and increase as needed depending on the context, users, and roadway characteristics. This would include consideration for large vehicles and freight needs. Final dimensions chosen from within the acceptable ranges are determined by project goals and design outcomes in conjunction with all roadway user needs. The individual dimensions need to be appropriate for the context and project parameters as a whole and not chosen because they are what one wants them to be. Trade-offs will need to be made between design elements and realms to determine an appropriate final cross-section that meets all user needs and project goals.

The design elements within each of the design tables relating to the design contexts developed for Table 300-8 through Table 300-13, cannot be used in isolation. Each element across the section is integral to the others. Key considerations to keep in mind when determining the final cross-section elements and their dimensions are:

1. How urban context influences roadway design while designing for multimodal users considering highway designations, classifications, characteristics, operations and safety.
2. How design elements fit together within the respective cross section realms as well as with each other.
3. How the final cross-section meets the modal needs of all users and fits with goals and outcomes for the project.

Design decisions related to each design element within the respective urban context should consider integrating the trade-offs for design, operations, maintenance and safety. Practitioners need to have an understanding of the considerations within the respective cross section realms within the urban context. See 0, Cross Section Realms for information.

305.1 Traditional Downtown/Central Business District

Table 300-8 provides design criteria for the respective design elements for ODOT roadways through the Traditional Downtown/CBD context. With this design approach, the goal is to design roadways in the Traditional Downtown/CBD context for a target speed of 20-25 mph. Target speed is discussed in Section 207.10. Figure 300-6 illustrates various cross section scenarios for how the design elements within this type of context may be arranged.

Exhibit 300-2 is an example of land types in this context and depicts the Traditional Downtown/CBD context with higher development and greater building heights containing mixed uses that are generally built up to the sidewalk and street within a well-connected roadway network. It is the responsibility of the project team to determine final cross-section elements.

Exhibit 300-2 Typical Traditional Downtown/CBD Context - Tillamook (US101: OR131-OR6)

Table 300-8 Design Element Recommendations for Traditional Downtown/CBD Context

Realm	Design Element	Width
Pedestrian Realm	Frontage Zone	4′ to 2′
	Pedestrian Zone	10′ to 8′
	Buffer/Furniture Zone	6′ to 0′
	Curb/Gutter[1]	2′ to 0.5′
Transition Realm[6]	Separated Bicycle Lane Width (Curb Constrained Facility)[2]	8′ to 7′
	On-Street Bicycle Lane Width (not including Buffer)[2]	6′ to 5′
	Bicycle/Street Buffer[2]	3′ to 2′
	Right Side Shoulder (if travel lane directly adjacent to curb)[3,5]	2′ to 0′
	On-Street Parking	7′ to 8′
Travelway Realm[5]	Travel Lane[4,5]	11′
	Right Turn Lane (including Shy Distances)	11′ to 12′
	Left Turn Lane[4]	11′
	Left Side / Right Side Shy Distance	1′ to 0′
	Two-Way-Left-Turn Lane	11′ to 12′
	Raised Median – No Turn Lane (including Shy Distances)	8′ to 11′
	Left-Turn Lane with Raised Curb Median/separator (includes 16″ separator & Shy Distances)	12′ to 14′

[1] Where curb and gutter is used and on-street parking is provided or travel lane is directly adjacent to curb, gutter pan should be included in shoulder/shy or on-street parking measurement. Gutter pan should be included in travel lane, bicycle lane or turn lane measurements only where a smooth transition from gutter pan to roadway surface is provided.

[2] Refer to Bicycle Facility Selection process (Section 306 and Part 900) to determine appropriate bicycle facility type. Consider raised bicycle lanes where appropriate. Except for right-turn channelizations, 5-foot on-street bicycle lane is allowed only with a street buffer. When a raised buffer is used to protect the bicycle lane, the width should be 6′ if parking is adjacent or if signs or other features are anticipated.

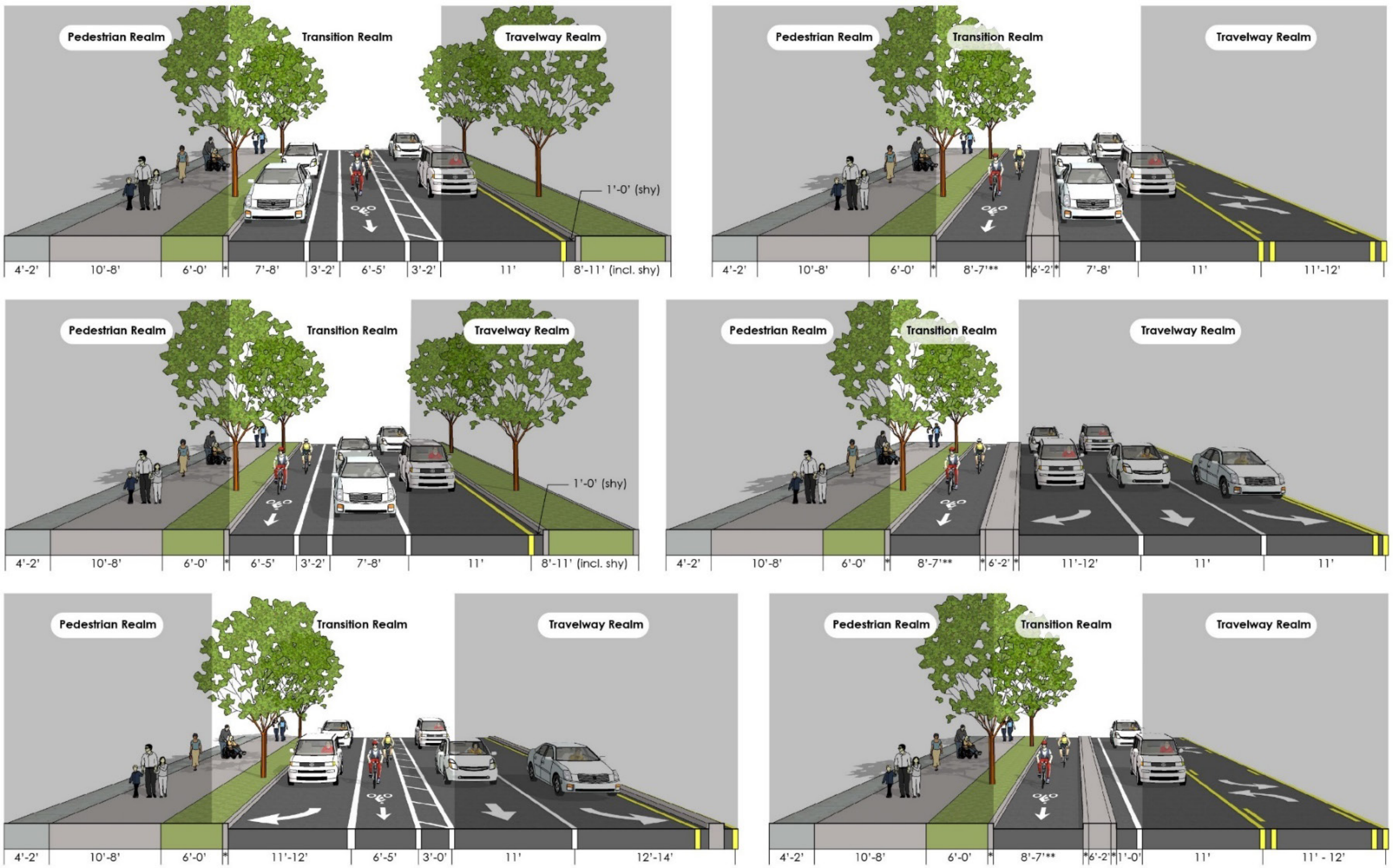
[3] Overall shoulder width depends on other section elements. Elimination of shoulder width/lateral offset should only be considered in constrained locations and needs to be balanced with all cross-section and drainage needs. If the travel lane is next to a curb with a gutter (e.g., a 2-foot curb zone), the gutter typically serves as the right-side shoulder. A wider shoulder may be needed to accommodate drainage based on hydrological analysis or other specific needs.

[4] 11-foot lane width preferred; 12-foot lane optional, where needed; **10-foot lane width requires a formal design exception from the State Roadway Engineer.** On freight- or transit-oriented streets, a 10-foot travel lane is generally not appropriate without a buffer zone or shoulder.

[5] On Reduction Review Routes, comply with ODOT Freight Mobility Policies, ORS 366.215 and OAR 731-012. Element dimensions may need to be modified.

[6] When painted buffers or vertical elements like curbing or flexible delineators are proposed to provide separation in a bicycle facility design, evaluate long-term maintenance needs and provide a solution to identified problems.

Figure 300-6 Example Cross-Section Options for Traditional Downtown/CBD, See Table 300-8 for additional information



* 0.5' (curb) or 2' (curb & gutter)

** Consider raised bicycle lane

Note: When painted buffers or vertical elements like curbing or flexible delineators are proposed to provide separation in a bicycle facility design, evaluate long-term maintenance needs and provide a solution to identified problems.

305.2 Urban Mix

Table 300-9 provides design criteria for the respective design elements for ODOT roadways through the Urban Mix context. With this design approach, the goal is to design roadways for a target speed of 25-30 mph. Figure 300-7 illustrates various cross section scenarios for how the design elements within this type of context may be arranged.

Exhibit 300-3 depicts the Urban Mix context that includes a mix of land uses within a well-connected roadway network. Commercial or retail uses front on the street and may be mixed with older residential properties, some of which have been repurposed as professional offices. Residential neighborhoods are often directly behind the properties fronting on the highway. Modal integration in the Urban Mix context is a balance between vehicle mobility/throughput and bicycle, pedestrian and transit needs. Exhibit 300-3 is an example of the land use typically found in an Urban Mix context. It is not intended to depict specific design aspects. It is the responsibility of the design team to determine the final design criteria for a project cross-section to meet the goals and outcomes of a specific project.

Exhibit 300-3 Example of Urban Mix Context - Hillsboro, SE Baseline St. (OR 8, Tualatin Valley Hwy.)

Table 300-9 Design Element Recommendations for Urban Mix

Realm	Design Element	Width Guidance
Pedestrian Realm	Frontage Zone	1′
	Pedestrian Zone[7]	8′ to 5′
	Buffer Zone	6′ to 0′
	Curb/Gutter[1]	2′ to 0.5′
Transition Realm[6]	Separated Bicycle Lane Width (Curb Constrained Facility)[2]	8′ to 7′
	On-Street Bicycle Lane Width (not including Buffer)[2]	6′ to 5′
	Bicycle/Street Buffer (preferred for On-Street Lane)[2]	4′ to 2′
	Right Side Shoulder (if travel lane directly adjacent to curb)[3,5]	2′ to 0′
	On-Street Parking	8′
Travelway Realm[5]	Travel Lane[4,5]	11′ to 12′
	Right Turn Lane (including Shy Distances)	11′ to 12′
	Left Turn Lane[4]	11′ to 12′
	Left Side / Right Side Shy Distance	1′ to 0′
	Two-Way-Left-Turn Lane	11′ to 12′
	Raised Median – No Turn Lane (including Shy Distances)	8′ to 11′
	Left-Turn Lane with Raised Curb Median/Separator (including 16” separator & Shy Distances)	12′ to 14′

1 Where curb and gutter is used and on-street parking is provided or travel lane is directly adjacent to curb, gutter pan should be included in shoulder/shy or on-street parking measurement. Gutter pan should be included in travel lane, bicycle lane or turn lane measurements only where a smooth transition from gutter pan to roadway surface is provided.

2 Refer to Bicycle Facility Selection process (Section 306 and Part 900) to determine appropriate bicycle facility type. Consider raised bicycle lanes where appropriate. Except for right-turn channelizations, 5-foot on-street bicycle lane is allowed only with a street buffer. When a raised buffer is used to protect the bicycle lane, the width should be 6′ if parking is adjacent or if signs or other features are anticipated.

3 Overall shoulder width depends on other section elements. Elimination of shoulder width/lateral offset should only be considered in constrained locations and needs to be balanced with all cross-section and drainage needs. If the travel lane is next to a curb with a gutter (e.g., a 2-foot curb zone), the gutter typically serves as the right-side shoulder. A wider shoulder may be needed to accommodate drainage based on hydrological analysis or other specific needs.

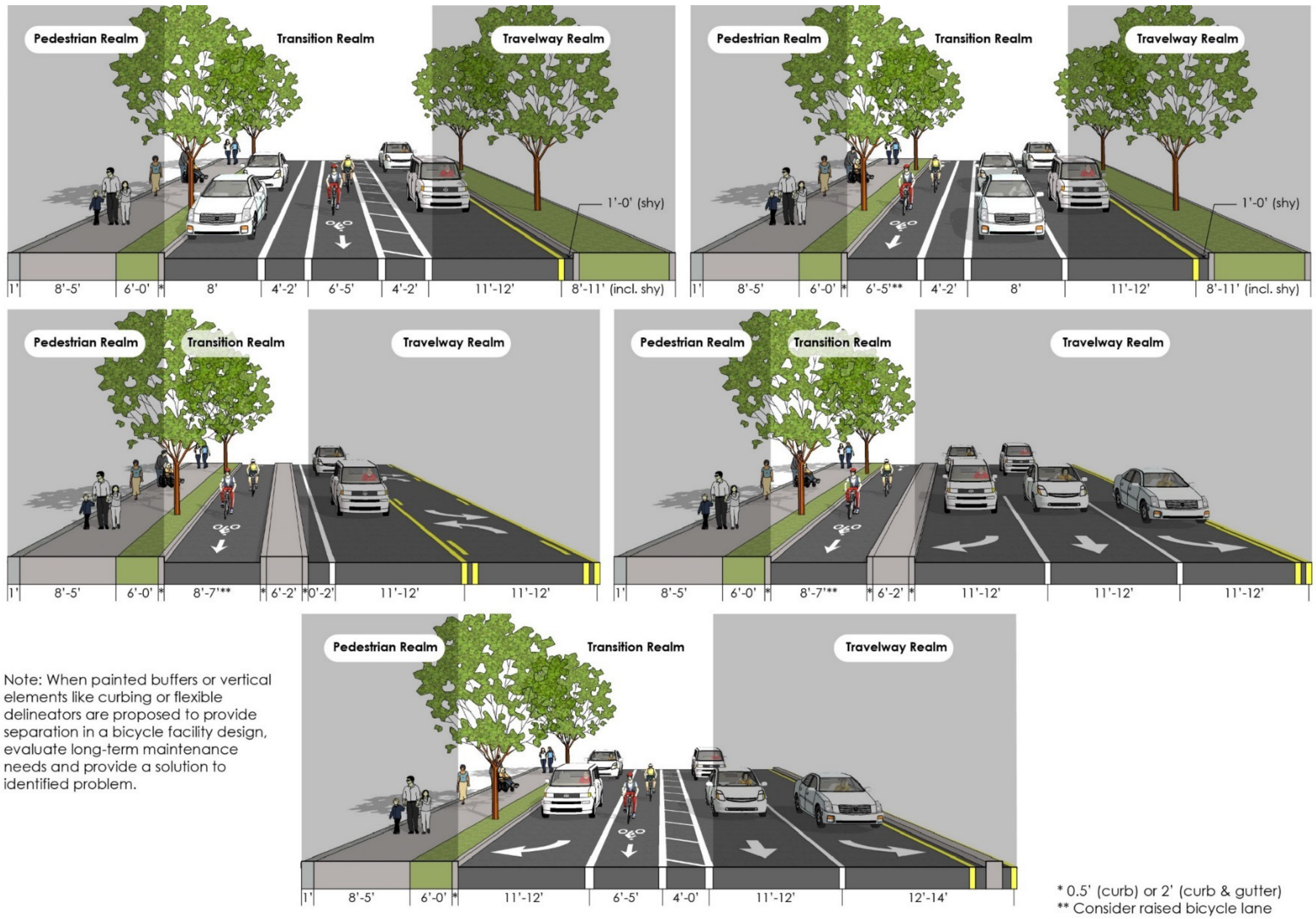
4 11-foot lane width preferred; at 40 mph and above, a 12-foot lane width preferred; **10-foot lane width requires a formal design exception from the State Roadway Engineer.** On freight- or transit-oriented streets, a 10-foot travel lane is generally not appropriate without a buffer zone or shoulder.

5 On Reduction Review Routes, comply with ODOT Freight Mobility Policies, ORS 366.215 and OAR 731-012. Element dimensions may need to be modified.

6 When painted buffers or vertical elements like curbing or flexible delineators are proposed to provide separation in a bicycle facility design, evaluate long-term maintenance needs and provide a solution to identified problems.

7 5-foot pedestrian zone requires a paved frontage zone and/or a paved buffer zone. **Minimum sidewalk width is 6-feet.**

Figure 300-7 Example Cross-Section Options Urban Mix, See Table 300-9 for additional information



305.3 Commercial Corridor

Table 300-10 provides design criteria for the respective design elements for ODOT roadways through the Commercial Corridor context. With this design approach, the goal is to design roadways for a target speed of 30-35 mph. Figure 300-8 illustrates various cross section scenarios for how the design elements within this type of context may be arranged.

Exhibit 300-4 depicts a Commercial Corridor context with large building footprints set within large blocks, large parking lots and a disconnected or sparse roadway network. The Commercial Corridor context can also include industrial land uses and is traditionally focused heavily on vehicle mobility. It is important in this context to also provide access for transit, bicycles and pedestrian needs to the highest level possible to encourage multi-modal use. Exhibit 300-4 is an example of the land use typically found in the Commercial Corridor context. It is not intended to depict specific design aspects. It is the responsibility of the design team to determine the final design criteria for a project cross-section to meet the goals and outcomes of a specific project.

Exhibit 300-4 Typical Commercial Corridor Context - Grants Pass (OR 199, Redwood Hwy.)

Table 300-10 Design Element Recommendations for Commercial Corridor

Realm	Design Element	Width Guidance
Pedestrian Realm	Frontage Zone	1′
	Pedestrian Zone[9]	8′ to 5′
	Buffer Zone	5′ to 0′
	Curb/Gutter[1]	2′ to 0.5′
Transition Realm[8]	Separated Bicycle Lane Width (Curb Constrained Facility)[2]	8′ to 7′
	On-Street Bicycle Lane Width (not including Buffer)[2]	6′ to 5′
	Bicycle/Street Buffer (preferred for On-Street Lane)[2]	5′ to 2′
	Right Side Shoulder (if travel lane directly adjacent to curb)[3,5]	4′ to 0′
	On-Street Parking	N/A
Travelway Realm[5]	Travel Lane[4,5]	11′ to 12′
	Right Turn Lane (including Shy Distances)	12′ to 13′
	Left Turn Lane[6]	12′ to 14′
	Left Side / Right Side Shy Distance[3]	1′ to 0′
	Two-Way Left-Turn Lane[6]	12′ to 14′
	Raised Median – No Turn Lane (including Shy Distances)	8′ to 11′
	Left-Turn Lane with Raised Curb Median/Separator (including 16″ separator & Shy Distance)[7]	14′ to 16′

[1] Where curb and gutter is used and on-street parking is provided or travel lane is directly adjacent to curb, gutter pan should be included in shoulder/shy or on-street parking measurement. Gutter pan should be included in travel lane, bicycle lane or turn lane measurements only where a smooth transition from gutter pan to roadway surface is provided.

[2] Refer to Bicycle Facility Selection process (Section 306 and Part 900) to determine appropriate bicycle facility type. Consider raised bicycle lanes where appropriate. Except for right-turn channelizations, 5-foot on-street bicycle lane allowed only with a street buffer. When a raised buffer is used to protect the bicycle lane, the width should be 6′ if parking is adjacent or if signs or other features are anticipated.

[3] Overall shoulder width depends on other section elements. Elimination of shoulder width/lateral offset should only be considered in constrained locations and needs to be balanced with all cross-section and drainage needs. If the travel lane is next to a curb with a gutter (e.g., a 2-foot curb zone), the gutter typically serves as minimum right-side shoulder width. A wider shoulder may be needed to accommodate drainage based on hydrological analysis or other specific needs. At 35 mph and above, at a minimum, include a 1-foot shoulder/shy distance.

[4] At 40 mph and above, a 12-foot lane is preferred; **10-foot lane width requires a formal design exception from the State Roadway Engineer.** On freight- or transit-oriented streets, a 10-foot travel lane is generally not appropriate without a buffer zone or shoulder.

[5] On Reduction Review Routes, comply with ODOT Freight Mobility Policies, ORS 366.215 and OAR 731-012. Element dimensions may need to be modified.

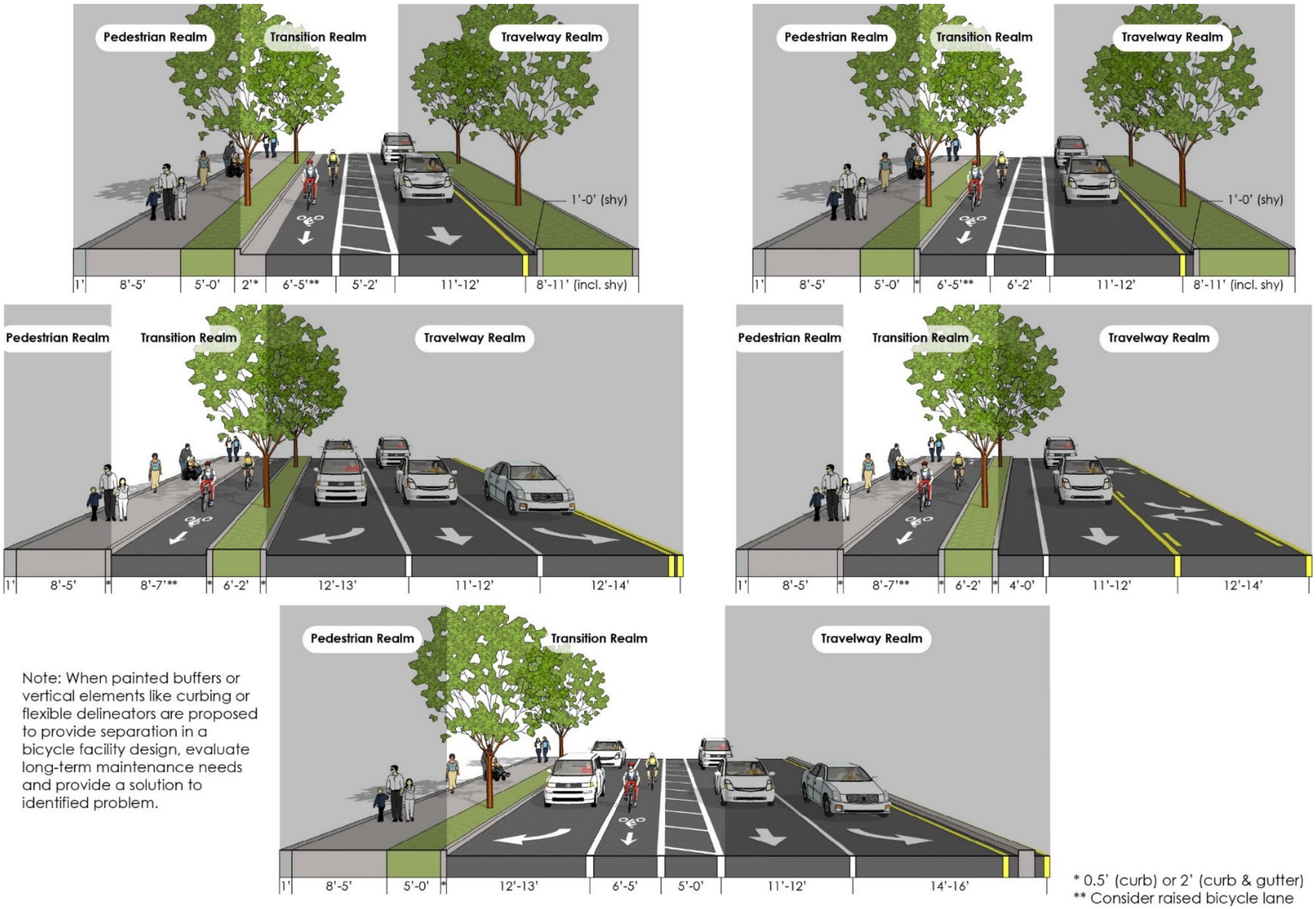
[6] At 40 mph and above, a 14-foot lane is preferred.

[7] At 40 mph and above, a 16-foot width is preferred.

[8] When painted buffers or vertical elements like curbing or flexible delineators are proposed to provide separation in a bicycle facility design, evaluate long-term maintenance needs and provide a solution to identified problems.

[9] 5-foot pedestrian zone requires a paved frontage zone and/or a paved buffer zone. **Minimum sidewalk width is 6-feet.**

Figure 300-8 Example Cross-Section Options for Commercial Corridor, See Table 300-10 for more information



305.4 Residential Corridor

Table 300-11 provides the design criteria for the respective design elements for ODOT roadways through the Residential Corridor context. With this design approach, the goal is to design roadways for a target speed of 30-35 mph. Figure 300-9 illustrates various cross section scenarios for how the design elements within this type of context may be arranged.

Exhibit 300-5 depicts a Residential Corridor context. This context contains mostly residential land uses with a well-connected to somewhat connected roadway network. The Residential Corridor context may extend for long distances with single-family homes or apartment complexes intermixed that have direct access to the roadway. However, access is often through public street connections on major arterials where vehicle mobility is more of a focus. With residential uses being the primary land use in a Residential Corridor, it is important to provide access for transit, bicycles and pedestrian needs to the highest level possible to encourage multi-modal use and provide equity for all socioeconomic groups. Residential Corridors are often on the fringes of Commercial Corridors or Urban Mix areas. Having a variety of modal choices for residents living along the Residential Corridor to access adjacent Commercial Corridors or Urban Mix areas to obtain goods and services is critical to livability and sustainability. Providing alternative modal facilities can affect change and work towards statewide goals to reduce greenhouse gas levels as well as reducing the overall carbon footprint. Exhibit 300-5 is an example of the land use typically found in the Residential Corridor context. It is not intended to depict specific design aspects. It is the responsibility of the design team to determine the final design criteria for a project cross-section to meet the goals and outcomes of a specific project and fit the needs of all roadway users.

Exhibit 300-5 Example of a Residential Corridor context - Tigard - OR 141 (Hall Blvd.)

Table 300-11 Design Element Recommendations for Residential Corridor

Realm	Design Element	Width Guidance
Pedestrian Realm	Frontage Zone	1′
	Pedestrian Zone[9]	8′ to 5′
	Buffer Zone	6′ to 0′
	Curb/Gutter[1]	2′ to 0.5′
Transition Realm[8]	Separated Bicycle Lane Width (Curb Constrained Facility)[2]	8′ to 7′
	On-Street Bicycle Lane Width (not including Buffer)[2]	6′ to 5′
	Bicycle/Street Buffer (preferred for On-Street Lane)[2]	5′ to 2′
	Right Side Shoulder (if travel lane directly adjacent to curb)[3,5]	4′ to 0′
	On-Street Parking	N/A
Travelway Realm[5]	Travel Lane[4,5]	11′ to 12′
	Right Turn Lane (including Shy Distances)	12′ to 13′
	Left Turn Lane[6]	12′ to 14′
	Left Side / Right Side Shy Distance[3]	1′ to 0
	Two-Way Left-Turn Lane[6]	12′ to 14′
	Raised Median – No Turn Lane (including Shy Distances)	8′ to 11′
	Left-Turn Lane with Raised Curb Median/Separator (including 16″ separator & Shy Distances)[7]	14′ to 15′

[1] Where curb and gutter is used and on-street parking is provided or travel lane is directly adjacent to curb, gutter pan should be included in shoulder/shy or on-street parking measurement. Gutter pan should be included in travel lane, bicycle lane or turn lane measurements only where a smooth transition from gutter pan to roadway surface is provided.

[2] Refer to Bicycle Facility Selection process (Section 306 and Part 900) to determine appropriate bicycle facility type. Consider raised bicycle lanes where appropriate. Except for right-turn channelizations, 5-foot on-street bicycle lane allowed only with a street buffer. When a raised buffer is used to protect the bicycle lane, the width should be 6′ if parking is adjacent or if signs or other features are anticipated.

[3] Overall shoulder width depends on other section elements. Elimination of shoulder width/lateral offset should only be considered in constrained locations and needs to be balanced with all cross-section and drainage needs. If the travel lane is next to a curb with a gutter (e.g., a 2-foot curb zone), the gutter typically serves as minimum right-side shoulder width. A wider shoulder may be needed to accommodate drainage based on hydrological analysis or other specific needs. At 35 mph and above, at a minimum, include 1-foot shoulder/shy distance.

[4] At 40 mph and above, a 12-foot lane is preferred; **10-foot lane width requires a formal design exception from the State Roadway Engineer.** On freight- or transit-oriented streets, a 10-foot travel lane is generally not appropriate without a buffer zone or shoulder.

[5] On Reduction Review Routes, comply with ODOT Freight Mobility Policies, ORS 366.215 and OAR 731-012. Element dimensions may need to be modified.

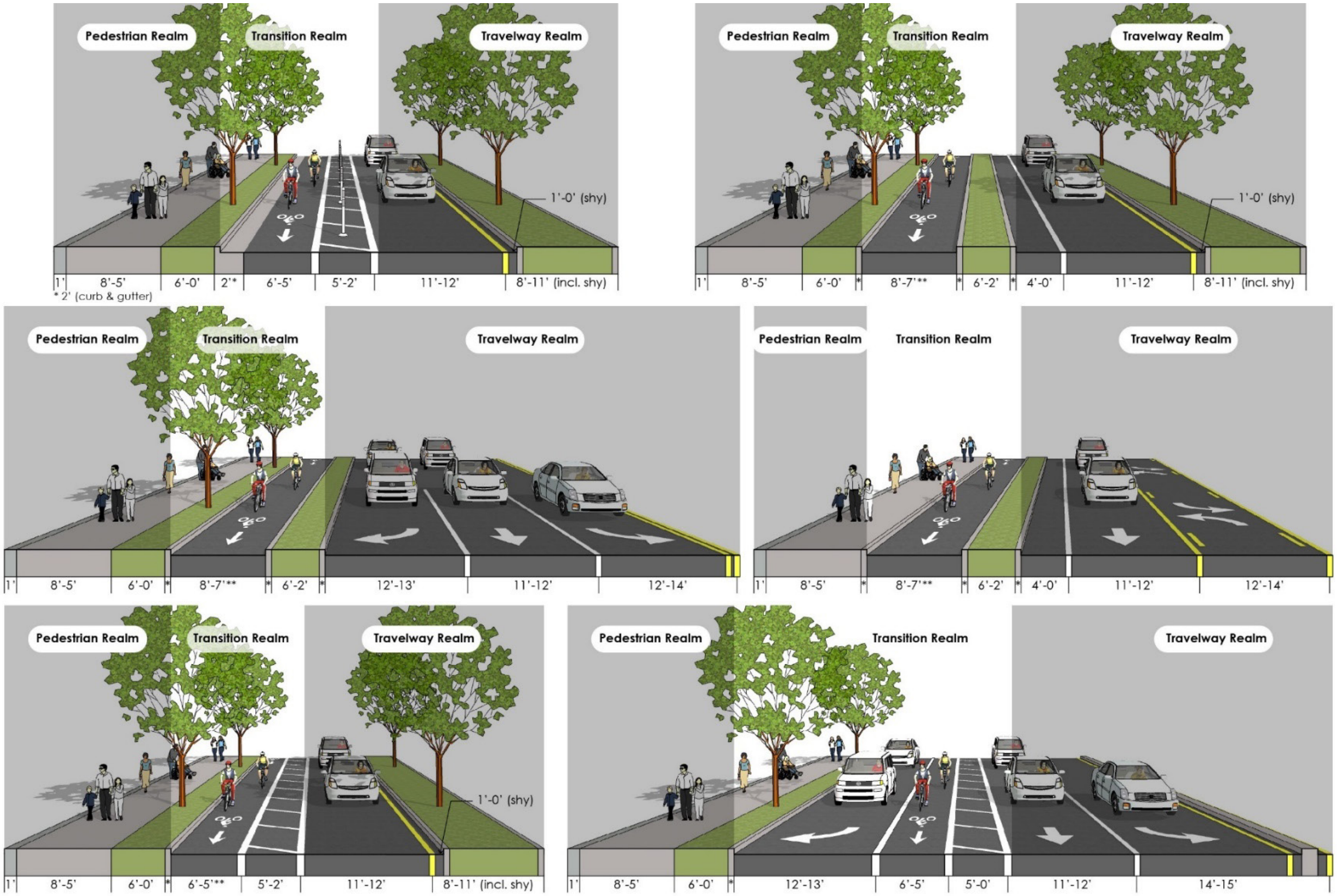
[6] At 40 mph and above a 14-foot lane is preferred.

[7] At 40 mph and above, a 15-foot width is preferred.

[8] When painted buffers or vertical elements like curbing or flexible delineators are proposed to provide separation in a bicycle facility design, evaluate long-term maintenance needs and provide a solution to identified problems.

[9] 5-foot pedestrian zone requires a paved frontage zone and/or a paved buffer zone. **Minimum sidewalk width is 6-feet.**

Figure 300-9 Example Cross-Section Options for Residential Corridor, See Table 300-11 for additional information



* 0.5' (curb) or 2' (curb & gutter)   ** Consider raised bicycle lane

Note: When painted buffers or vertical elements like curbing or flexible delineators are proposed to provide separation in a bicycle facility design, evaluate long-term maintenance needs and provide a solution to identified problems.

305.5 Suburban Fringe

Table 300-12 provides design criteria for the respective design elements for ODOT roadways through the Suburban Fringe context. With this design approach, the goal is to design roadways for a target speed of 35-40 mph. Figure 300-10 illustrates various cross section scenarios for how the design elements within this type of context may be arranged.

Exhibit 300-6 depicts the Suburban Fringe context that generally contains sparsely developed lands that are typically at the edge of the urban growth boundary of a city or the established urban area of a town. Land uses can include large lot residential, small-scale farms or intermittent commercial or industrial properties. The Suburban Fringe context is often the area between higher speed rural roads and lower speed urban roads. A key component of design in this context is to indicate to drivers they are entering an urban area and need to slow their speed for the upcoming urban context. Rural transit stops may be present within the Suburban Fringe area and need to be designed to accommodate buses stopping and starting with higher speed traffic. It is critical to investigate and determine existing and future pedestrian activity to and from these rural transit stops to develop and design appropriate access. Local transit agencies can be a resource for information. Bicycle facilities are incorporated as needed for connectivity to facilities within the adjacent urban context.

Exhibit 300-6 Example of Suburban Fringe, Prineville, SE Combs Flat Rd. (OR 380)

Table 300-12 Design Element Recommendations for Suburban Fringe

Realm	Design Element	Width Guidance
Pedestrian Realm	Frontage Zone	1′
	Pedestrian Zone[9]	8′ to 5′
	Buffer Zone	6′ to 0′
	Curb/Gutter[1]	2′ to 0.5′
Transition Realm[8]	Separated Bicycle Lane Width (Curb Constrained Facility)[2]	8′ to 7′
	On-Street Bicycle Lane Width (not including Buffer)[2]	6′
	Bicycle/Street Buffer (physical separation preferred for On-Street Lane)[2]	5′ to 2′
	Right Side Shoulder (if travel lane directly adjacent to curb)[3]	6′ to 0′
	On-Street Parking	N/A
Travelway Realm[5]	Travel Lane[4,5]	11′ to 12′
	Right Turn Lane (including Shy Distances)	12′ to 13′
	Left Turn Lane[6]	12′ to 14′
	Left Side / Right Side Shy Distance[3]	1′ to 0′
	Two-Way Left-Turn Lane[6]	12′ to 14′
	Raised Median – No Turn Lane (including Shy Distances)	8′ to 13′
	Left-Turn Lane with Raised Curb Median/Separator (including 16″ separator & Shy Distances)[7]	14′ to 16′

1 Where curb and gutter is used and on-street parking is provided or travel lane is directly adjacent to curb, gutter pan should be included in shoulder/shy or on-street parking measurement. Gutter pan should be included in travel lane, bicycle lane or turn lane measurements only where a smooth transition from gutter pan to roadway surface is provided.

2 Refer to Bicycle Facility Selection process (Section 306 and Part 900) to determine appropriate bicycle facility type. The preferred bicycle and pedestrian facility in Suburban Fringe is a 10-foot to 16-foot shared use path with a 6-foot buffer from the roadway. On-street bicycle lanes shall include the widest street buffer that can be accommodated and should include physical separation (e.g., flexible delineator posts) where feasible. Consider raised bicycle lanes where appropriate. When a raised buffer is used to protect the bicycle lane, the width should be 6 feet if parking is adjacent or if signs or other features are anticipated. Except for right-turn channelizations, 5-foot on-street bicycle lane allowed only with a street buffer.

3 Overall shoulder width depends on other section elements. Elimination of shoulder width/lateral offset should only be considered in constrained locations and needs to be balanced with all cross-section and drainage needs. If the travel lane is next to a curb with a

gutter (e.g., a 2-foot curb zone), the gutter typically serves as minimum right side shoulder width. A wider shoulder may be needed to accommodate drainage based on hydrological analysis or other specific needs. At 35 mph and above, at a minimum, include a 1-foot shoulder/shy distance. In transition areas from higher speed to lower speed, shoulder width should taper from wider, higher speed shoulder width to appropriate lower speed urban shoulder width.

[4] At 40 mph and above, a 12-foot lane is preferred; **10-foot lane width requires a formal design exception from the State Roadway Engineer**. On freight- or transit-oriented streets, a 10-foot travel lane is generally not appropriate without a buffer zone or shoulder.

[5] On Reduction Review Routes, comply with ODOT Freight Mobility Policies, ORS 366.215 and OAR 731-012. Element dimensions may need to be modified.

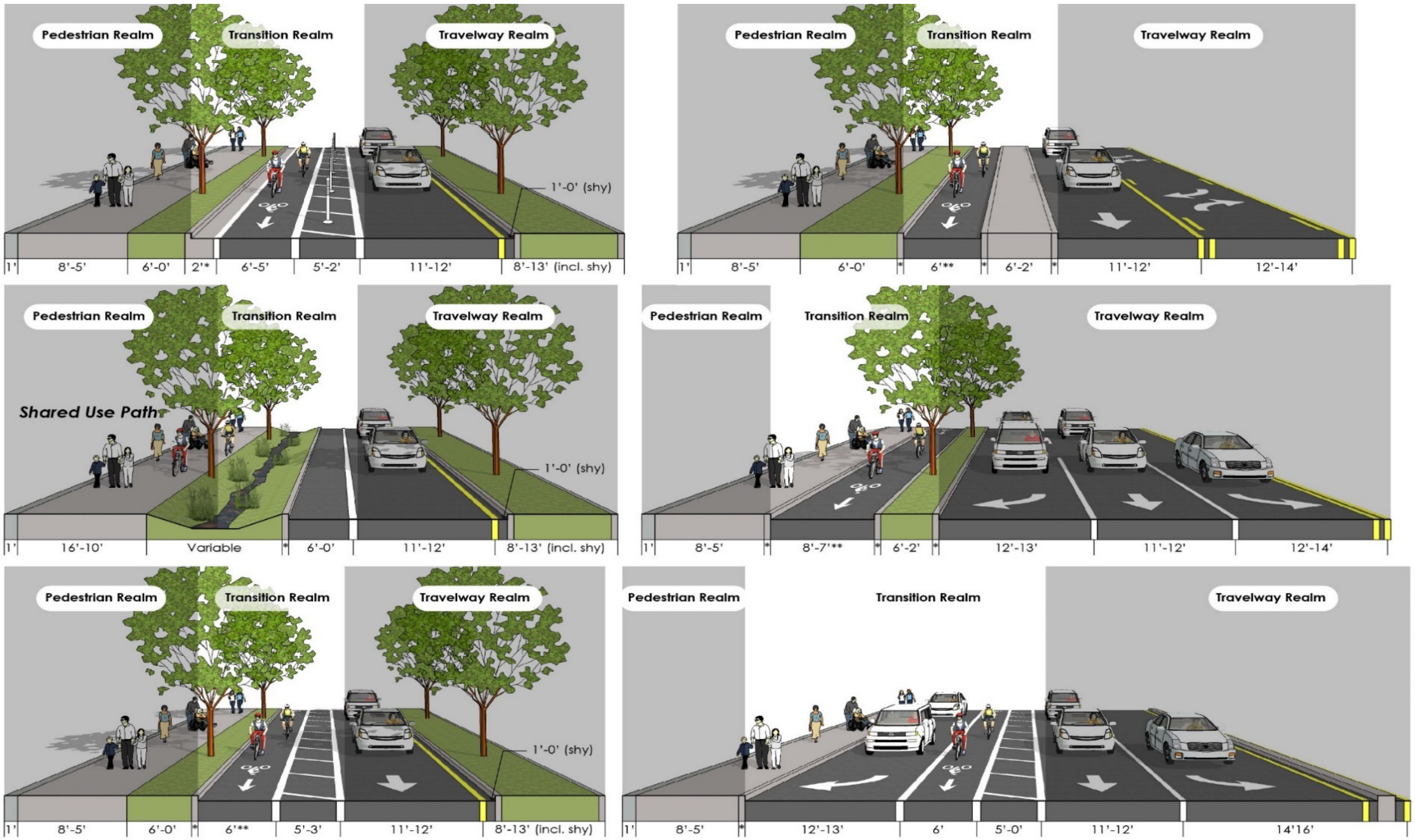
[6] At 40 mph and above a 14-foot lane is preferred.

[7] At 40 mph and above a 16-foot width is preferred.

[8] When painted buffers or vertical elements like curbing or flexible delineators are proposed to provide separation in a bicycle facility design, evaluate long-term maintenance needs and provide a solution to identified problems.

[9] 5-foot pedestrian zone requires a paved frontage zone and/or a paved buffer zone. **Minimum sidewalk width is 6-feet**.

Figure 300-10 Example Cross-Section Options for Suburban Fringe, See Table 300-12 for more information



* 0.5' (curb) or 2' (curb & gutter)   ** Consider raised bicycle lane

Note: When painted buffers or vertical elements like curbing or flexible delineators are proposed to provide separation in a bicycle facility design, evaluate long-term maintenance needs and provide a solution to identified problems.

305.6 Rural Community

Table 300-13 provides design criteria for the respective design elements for ODOT roadways through the Rural Community context. With this design approach, the goal is to design roadways for a target speed of 25-35 mph. Figure 300-11 illustrates various cross section scenarios for how the design elements within this type of context may be arranged.

Exhibit 300-7 is an example of a Rural Community context. This context encompasses small concentrations of developed areas immediately surrounded by rural undeveloped areas. Areas considered a Rural Community context can take many forms and are comprised of primarily residential uses but also include other uses that help to make the community self-sufficient. The Rural Community context isn't just a cluster of buildings along the roadway. There needs to be a central focal point or gathering place like a post office, store, school or community center that creates activity and movement of people around the community. These areas are often smaller unincorporated towns that don't meet the federal minimum population density of 5,000 to be classified as urban, but still have communities that are clustered around the highway with urban type needs where people need to safely cross the roadway to access goods and services. In many of these locations, the highway carries a rural arterial or collector designation in terms of the statewide highway network, but consideration must be given to the need to create a more urban feel with project design through these communities.

Designers should be aware of several issues when designing a highway through a Rural Community context. Issues such as speed, pedestrian safety and access are very important to the local community. The speed of traffic on the highway is a primary concern. The highway classification, importance as a freight route, traffic volume, and importance as a recreational route in addition to the roadside characteristics of the community must all be considered when selecting design elements. When reduced traveling speeds are desired, traffic calming techniques and development of roadside culture can be effective.

Traffic speed often has a significant physical, emotional and psychological impact to pedestrian crossing safety. Utilizing appropriate techniques to manage traffic vehicle speed is important in the Rural Community context. A variety of techniques could be employed, including, but not limited to, roundabouts, lane narrowing, speed feedback signs, curb extensions, median islands, etc. It is the responsibility of the project team to determine what treatments are appropriate for the location and that meet the performance and project goals. The Technical Services Roadway Engineering Unit can assist with developing traffic calming designs for these communities.

Pedestrian safety in rural communities is often a major concern. These communities often have small centers of activity on both sides of the highway that require pedestrians to cross. Providing safe and clear sidewalks is also an important design element to include in the Rural Community context. Sidewalks in these areas can be separated from the roadway with a buffer strip. This buffer strip can be landscaped to increase the visual appearance of the area and may also assist with speed management. Other techniques like providing clearly defined pedestrian crossings at adequate spacing and delineating them where appropriate by the use of markings, signing, and construction materials all may be considered to improve the visibility of pedestrian crossing areas. Other features such as curb extensions and raised medians may also improve pedestrian crossing safety. The designer also needs to be aware of and take into account historic elements, areas or sites, which may impact the use of certain roadway designs.

Rural communities often need a high level of highway access to preserve the economic vitality and functionality of the community. This is generally caused by the lack of a supporting roadway network to reduce the dependence upon direct highway access. OAR 734 Division 51 provides guidance for access spacing. Where access spacing is less than standard, the designer can investigate alternative access techniques including but not limited to frontage roads, shared access, restricting turn movements, and completing local street systems to reduce highway access dependency.

Speed control, pedestrian safety, bicycle safety, access management, and community goals are important considerations for the Rural Community context. However, the designer must still consider the highway classification and other highway designations for these locations. The designer needs to balance accommodating through traffic with local movements when developing project designs in the Rural Community context.

Exhibit 300-7 Example of Rural Community, Rhododendron, Mt. Hood Hwy (US 26)

Table 300-13 Design Element Recommendations for Rural Community

Realm	Design Element	Width Guidance
Pedestrian Realm	Frontage Zone	1′
	Pedestrian Zone[8]	9′ to 5′
	Buffer Zone	5′ to 0′
	Curb/Gutter[1]	2′ to 0.5′
Transition Realm[7]	Separated Bicycle Lane Width (Curb Constrained Facility)[2]	8′ to 7′
	On-Street Bicycle Lane Width (not including Buffer)[2]	6′ to 5′
	Bicycle/Street Buffer[2]	4′ to 2′
	Right Side Shoulder (if travel lane directly adjacent to curb)[3]	6′ to 0′
	On-Street Parking	8′
Travelway Realm[5]	Travel Lane[4,5]	11′ to 12′
	Right Turn Lane (including shy)	11′ to 12
	Left Turn Lane	11′ to 12′
	Left Side / Right Side Shy Distance[3]	1′ to 0′
	Two-Way Left-Turn Lane	11′ to 12′
	Raised Median – No Turn Lane (including Shy Distances)	8′ to 11′
	Left-Turn Lane with Raised Curb Median/Separator (including 16″ separator & Shy Distances)[6]	12′ to 14′

1 Where curb and gutter is used and on-street parking is provided or travel lane is directly adjacent to curb, gutter pan should be included in shoulder/shy or on-street parking measurement. Gutter pan should be included in travel lane, bicycle lane or turn lane measurements only where a smooth transition from gutter pan to roadway surface is provided.

2 Refer to Bicycle Facility Selection process (Section 306 and Part 900) to determine appropriate bicycle facility type. Consider raised bicycle lanes where appropriate. Except for right-turn channelizations, 5-foot on-street bicycle lane allowed only with a street buffer. When a raised buffer is used to protect a bicycle lane, the width should be 6 feet if parking is adjacent or if signs or other features are anticipated.

3 Overall shoulder width depends on other section elements. Elimination of shoulder width/lateral offset should only be considered in constrained locations and needs to be balanced with all cross-section and drainage needs. If the travel lane is next to a curb with a gutter (e.g., a 2-foot curb zone), the gutter typically serves as minimum right-side shoulder width. A wider shoulder may be needed to accommodate drainage based on hydrological analysis or other specific needs. At 35 mph and above, at a minimum, include a 1-foot shoulder/shy distance. In transition areas from higher speed to lower speed, shoulder width should taper from wider, higher speed shoulder width to appropriate lower speed urban shoulder width.

4 11-foot lane width preferred, at 40 mph and above, a 12-foot lane is preferred. **10-foot lane width requires a formal design exception from the State Roadway Engineer**. On freight- or transit-oriented streets, a 10-foot travel lane is generally not appropriate without a buffer zone or shoulder.

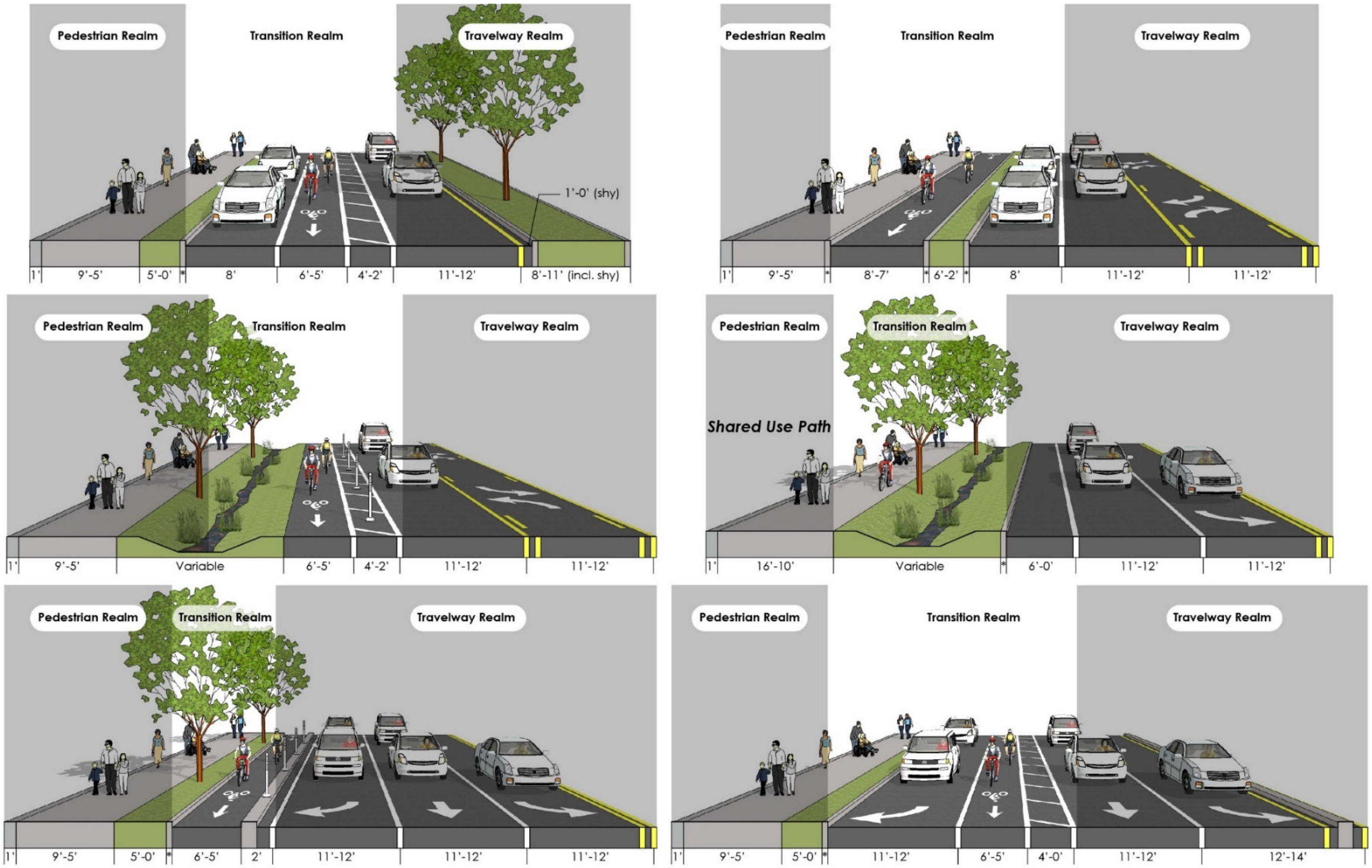
[5] On Reduction Review Routes, comply with ODOT Freight Mobility Policies, ORS 366.215 and OAR 731-012. Element dimensions may need to be modified.

[6] At 40 mph and above, a 14-foot width is preferred.

[7] When painted buffers or vertical elements like curbing or flexible delineators are proposed to provide separation in a bicycle facility design, evaluate long-term maintenance needs and provide a solution to identified problems.

[8] 5-foot pedestrian zone requires a paved frontage zone and/or a paved buffer zone. **Minimum sidewalk width is 6 feet.**

Figure 300-11 Example Cross-Section Options for Rural Community, See Table 300-13 for additional information



* 0.5' (curb) or 2' (curb & gutter) ** Consider raised bicycle lane

Note: When painted buffers or vertical elements like curbing or flexible delineators are proposed to provide separation in a bicycle facility design, evaluate long-term maintenance needs and provide a solution to identified problems.

305.7 On-Street Parking

On-street parking is typically an element of STAs or Traditional Downtown/Central Business Districts. There are two types of on-street parking, parallel parking and diagonal parking. Both are discussed further in sub-sections below. On-street parking provides friction between the driver and the downtown environment and has potential for reducing speeds and can provide a traffic calming effect. The parked vehicles also provide a buffer between the traffic and pedestrians. An area of concern for designing on-street parking is that it may reduce the visibility of pedestrians and vehicles approaching or entering the roadway. Additionally, in a narrow cross-section where space is not available to designate a specific bike area, it is more difficult for bicyclists to negotiate the roadway advancing with traffic, while watching for the potential of a driver opening a car door into their path. In an STA or a Traditional Downtown/Central Business District, vehicle speed and bicycle speed are more closely matched and utilizing a shared lane condition to provide additional space to parked cars may be more appropriate than in other roadway designations. See sections 920.2 and 941.4.3, for information on appropriate use of bicyclists sharing lanes with motor vehicles.

Landscaping in conjunction with on-street parking can provide an urban roadway with a more inviting and visually pleasing effect. Landscaping, especially trees, can be a traffic calming technique as well. Trees provide a vertical element and have an impact on driver behavior, much in the same way as parked vehicles or adjacent buildings. A row of trees, buildings at the back of sidewalk, or parked cars gives the appearance to the driver that the roadway is narrower and calms traffic. Parked vehicles and trees or other landscaping features need to be located in appropriate locations so that sight distance, especially at intersections, is not compromised. See ORS 811.550 for where stopping, standing, or parking are prohibited. See Section 407 for placement requirements for median or street trees.

When parking is marked, accessible parking spaces must be provided in accordance with Oregon Transportation Commission Standards for Accessible Parking Places. The number and location of accessible parking spaces is a function of the entire block or parking lot on a site. Some coordination with the local jurisdiction may be required. Review any Electric Vehicle (EV) parking plans or any other parking plans for the community. Electric Vehicle parking is separate from on-street parking and specific accessibility requirements apply.

305.7.1 Parallel Parking

Parallel parking is the preferred type on the state highway system where on-street parking is deemed appropriate. On-street parking is often a necessary component for maintaining a functioning and economically viable-downtown area. Businesses are generally close to the sidewalk, often with limited off-street parking opportunities. When making decisions to include on-street parking in these areas, consider the highway classification and function, viability of parallel roadways, adequacy of side street parking, availability of other parking strategies, overall safety, and maintaining the economic vitality of the downtown area.

Generally, on-street parking should be included with roadway designs for STAs and the Traditional Downtown/Central Business District context whenever possible. On-street parallel parking is also permissible in the Urban Mix and Rural Community contexts if deemed appropriate. For Commercial Corridor, Residential Corridor, and Suburban Fringe contexts, on-street parking is not applicable.

On-street parking increases the potential for conflict between bicyclists and motor vehicles. Through these areas, bicyclists need room to operate and maneuver for opening car doors, mirrors of motor vehicles, and vehicles exiting parking spaces. Where parallel on-street parking is deemed appropriate, the combined on-street parking and bicycle travel width shall not be less than 12 feet in an STA or Traditional Downtown/Central Business District (7 feet for parking and 5 feet for bicycle accommodation). More than the minimum space for bicycles is better and strongly encouraged. Separated facilities for bicyclists are preferred. See Table 300-8 for design guidance in STAs and Traditional Downtown/Central Business District contexts. In Urban Mix and Rural Community contexts, refer to Table 300-9 and Table 300-13 respectively for bicycle facility and on-street parking dimensions. Although not a preferred treatment, if constraints prohibit parallel parking and a bike lane side-by-side and the posted speed is 25 mph or less, it may be possible to accommodate bicycle travel by sharing the travel lane. See Part 900 for bicycle facility design and specifically Section 920.2 for shared lanes and Section 941 for the urban bicycle facility selection process. See the ODOT Traffic Line Manual for shared lane marking criteria.

NOTE: Only parallel parking is allowed on state highways. Any other type requires an exception.

305.7.2 Diagonal Parking

Diagonal parking should only be installed where the below criteria are met and space is available to safely accommodate all users, including pedestrians and bicyclists. When diagonal parking is analyzed, impacts to travel lane, bike lane, and parking widths and any subsequent compromises must be balanced for all operational needs. The formal approval process will ensure that the conditions below have been met and documented.

The decision to approve diagonal parking is only made where the diagonal parking is justified, found to be reasonably safe, and does not detract from providing a high level of pedestrian and bicyclist design and accommodation. STA and Traditional Downtown/CBD context locations are meant to be very pedestrian and alternative mode friendly; diagonal parking should not reduce any of these features to unacceptable levels.

Due to operational deficiencies and restricted sight distances diagonal parking is generally not permitted on state highways and is not recommended. However, communities designated and approved by the OTC as an STA may have situations where diagonal parking may be considered. The Traditional Downtown/Central Business District context may be appropriate for diagonal parking as well, since it generally is consistent with STA characteristics. The Urban Mix and Rural Community contexts also allow on-street parking. However, this is limited to parallel style parking.

In addition to traditional head-in diagonal parking, many cities have been experimenting with back-in diagonal parking. In locations where diagonal parking is being considered in general, back-in diagonal parking may also be considered where deemed appropriate. Back-in diagonal parking has advantages and eliminates some of the operational deficiencies and sight distance problems encountered with traditional head-in diagonal parking. When diagonal parking is being evaluated, strongly consider back-in diagonal parking with the analysis. Drivers can pull into the traffic stream with a good view of oncoming traffic that includes bicyclists. Back-in diagonal parking for accessible parking spots is not prohibited.

For all diagonal parking requests, the State Traffic-Roadway Engineer must approve the installation of diagonal parking through the design exception process. In order to receive this approval, the diagonal parking is only allowed in an approved and designated STA or an established Traditional Downtown/Central Business District context as determined by guidance from the Highway Design Manual. The following considerations are required when requesting approval for diagonal parking.

1. A parking utilization study must be completed documenting the need for additional parking opportunities in the subject area. The study should be in compliance with the Institute of Transportation Engineers (ITE) guidelines for parking studies and show an existing utilization factor of 85 percent or greater.
2. The community must demonstrate that the parking demand cannot be met by increasing side street parking opportunities or developing off-street shared parking areas.
3. The highway must have a posted speed of 25 mph or less.
4. The Average Daily Traffic (ADT) on the highway should be less than 6,000 vehicles. On multi-lane couplets, the ADT should be less than 6,000 vehicles per direction.
5. The available right of way must be sufficient to provide standard cross section features. For a two-lane roadway and 60-degree angle parking, a minimum distance of 33 feet from the curb line to the centerline stripe of the highway without a bike lane is required. With a bike lane, the minimum distance is 40 feet. In addition, a minimum 10-foot sidewalk is desirable in STAs and Traditional Downtown/CBD contexts. Sidewalk widths should not be reduced below the minimum standard to install diagonal parking.
6. Bike lanes should only be striped where sufficient room exists to allow a shy distance to the bike lane and travel lane. Buffered bicycle lanes are preferred with space provided to both the travel lane and parked cars.

Exhibit 300-8 Examples of On-Street Parking

Parallel Parking
Minimum Bicycle Lane

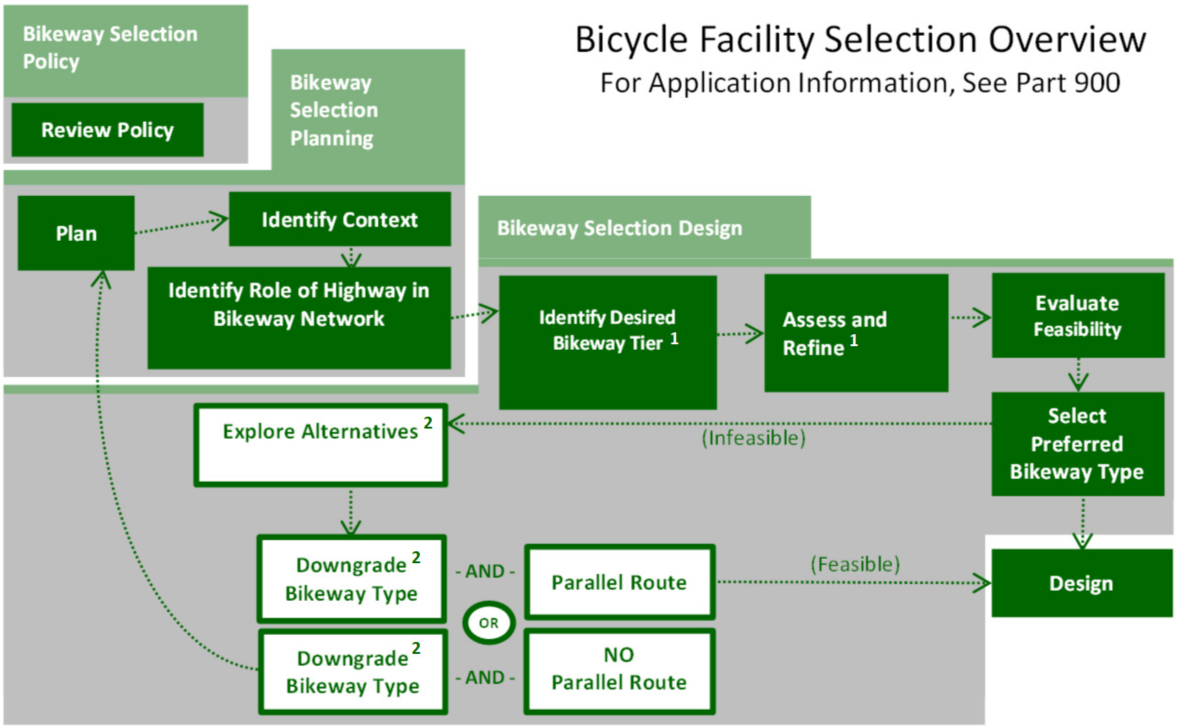
Typical Head-in Diagonal Parking
Reduced Visibility to Oncoming
Vehicles and Bicyclists

Back-in Diagonal Parking
Improved Visibility to Oncoming
Vehicles and Bicyclists

Section 306 Bicycle Facility Selection

In Oregon, all public urban roadways should have appropriate walkways and bikeways provided, regardless of whether or not they are a “designated” route. **Per ORS 366.514, walkways and bikeways must be provided whenever a roadway is “constructed, reconstructed, or relocated.”** *Providing the preferred bicycle facility type on ODOT facilities that are part of state, regional, local bicycle routes, scenic bikeways, US Bicycle Routes, or other designated bikeways is the primary goal.* On highways that are not part of a planned bicycle route, accommodations for bicycle traffic is still the goal and providing a facility with riders of all ages and abilities in mind is beneficial, unless a low-stress parallel route has been identified by the local jurisdiction or an adopted network plan. When parallel routes are selected, they should be as direct as possible and well-signed for bicycle wayfinding. To be viable, parallel routes provide equivalent access to destinations along the highway, provide facilities and crossings for “Interested but Concerned” users, and increase average trip lengths by less than 0.27 miles or 1.5 minutes for short trips.

Figure 300-12 Bicycle Facility Selection Process



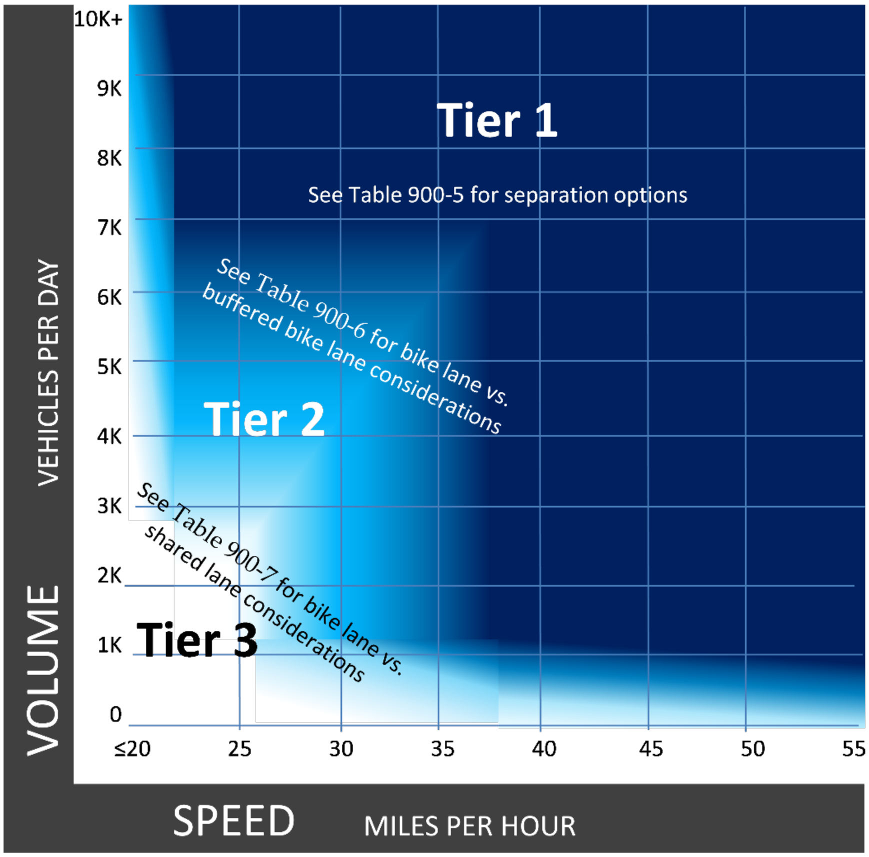
[1] See Figure 300-13. For application, see Part 900 and Figure 900-3.

[2] See Part 900

Encouraging and accommodating bicycles as a transportation mode is a priority within urban projects and an important aspect to be integrated into the cross-section. In order to expand the portion of the bicyclist demand served, appropriate bicycle facilities need to be evaluated and included early in project planning and development. Understanding current guidance about bicycle facility selection, identifying the degree of separation, and evaluating trade-offs are key to effective implementation. Reviewing various options using a decision-making framework can help prioritize trade-offs, refine decisions, and lead to a solution that supports the project needs. Bicycle facilities are generally located in the transition realm, but depending on facility type selected, could also be considered part of the pedestrian realm, as in a design that integrated the bicycle facility as a shared use path.

Figure 300-12 illustrates the framework for the bicycle facility selection process and Figure 300-13 depicts guidance on the type of bicycle facility to use based upon vehicle speeds and vehicle volumes commensurate with appropriate design tiers. *This section is introductory for bicycle facility design and is included here in reference to the previous sections on realms and cross section design criteria. Additional detail on bicycle facility selection and design is located in Part 900.*

Figure 300-13 Bicycle Facility Tier Identification Matrix



Section 307 Pedestrian Crossing Locations

Identifying and prioritizing pedestrian crossing locations on ODOT facilities is a priority within urban projects. Providing adequate crossing opportunities for pedestrians to access destinations easily and comfortably is a focus for urban design. ***When crossings are located with too great of a distance between pedestrian origins and destinations, add crossings to increase pedestrian permeability to the roadway section according to the target spacing table and process outlined in the ODOT Traffic Manual, Section 310.1.*** Considerations for pedestrian crossing locations and the trade-offs of various options are decision topics that begin during the planning process through project delivery and maintenance. Planning level information and specific local needs are important aspects in the analysis. In some cases, an existing crossing might be better if relocated. When considered as part of a larger project, such as a corridor project, strive to meet the spacing targets at a minimum. ***If the target crossing spacing cannot be met on a project, the project team provides documentation as part of the ODOT design documentation process. Similarly, if a crossing is proposed for removal and would lead to a spacing distance beyond the target range for the context, justification is provided.***

Once crossing locations have been identified, an engineering study is done at each crossing according to the ODOT Traffic Manual to determine what, if any, enhancements are needed at each crossing. If enhancements are proposed to be added along a section of highway listed as a Reduction Review Route that would change or restrict the cross-section for large vehicles, the project must follow the process outlined in OAR 731-012.

Section 308 Median Design

308.1 General

Highway medians are important design elements that can significantly impact the safety, function, and/or efficiency of a highway. Highway medians provide separation of opposing traffic streams, separation of turning and through traffic, safety buffer and recovery area, positive longitudinal guidance, and positive control of turning movements. Some median designs improve pedestrian crossings by providing a refuge for pedestrians crossing, minimizing the exposure time to traffic and reducing the crossing distance. Other benefits may include enhanced aesthetics and reduced headlight glare. This section will discuss general design elements and standards for various median treatments on roadways other than freeways. Freeway median design is covered in Section 310, Urban and Rural Freeway. Section 310.6 discusses median treatment for 3R projects and Section 310.13 outlines median treatment for 4R projects.

Additional information for non-freeway median design relating to specific roadway classifications can be found in the following sections:

- Urban Expressways – Section 311.14 and Section 311.16
- Rural Expressways - Section 311.18
- Rural Arterials, Collectors, Local Routes – Section 312.8
- Urban Arterials, Collectors, Local Routes – Section 313.8

Medians can be either traversable or non-traversable designs. Traversable medians are those that do not physically prevent vehicles from crossing or entering the median. These include Continuous Two Way Left Turn Lanes (CTWLTLs) and painted medians. A non-traversable median is designed to discourage or prevent vehicles from crossing the median except at designated locations. Examples of non-traversable medians include raised curb, concrete barrier, or depressed medians. Designers need to be aware that medians striped with “double-double yellow lines with transverse markings” are physically traversable but specifically illegal to cross.

Wherever a raised median or concrete barrier is being considered for installation where it did not exist previously, considerations of access management criteria and freight mobility must be followed. Access management criteria found in ORS 374.305 to 374.330 must be included in the design. **Highway designs must follow the procedure and guidelines in OAR 731-012 for the implementation of ORS 366.215, "Creation of state highways; reduction in vehicle carrying capacity" to ensure freight mobility issues have been addressed.**

As noted above, the design of highway medians can significantly impact safety. Review of freeway median cross-over crashes resulted in changes in ODOT freeway median closure design. Specific guidance on the closing of interstate and freeway medians and freeway median barrier warrants can be found in Part 400, Section 401.

308.2 Continuous Two Way Left Turn Lanes

Continuous Two Way Left Turn Lanes (CTWLTLs) are often used in urban areas to provide full movement access to adjacent properties and roadways while minimizing impacts of left turning vehicles on through traffic. CTWLTLs are a reasonable tool to improve system safety and efficiency for roadways with low to moderate traffic volumes and speeds. CTWLTLs are generally not be used on roadways with any of the following conditions:

1. Traffic volumes over 28,000 vehicles a day
2. Speeds of 45 mph or more and with multiple, closely spaced accesses.

Under these types of conditions, the preferred median treatment is a non-traversable median that controls left turn movements. CTWLTLs can be considered in high volume and/or high-speed locations when the access points are all located on one side of the highway or are spaced at least 1000 feet apart when the access points are on opposite sides of the highway. On roadways with existing CTWLTLs, the existing median should not be converted to a painted median until all private accesses have been removed; this is generally only true on limited access highways.

While CTWLTLs are generally a good safety technique to use, the designer needs to be aware of potential competing use of the CTWLTLs for making either a two-stage left turn or at over lapping left turns access locations. Both of these conflicts place vehicles in a potential head-on configuration.

Continuous left turn lanes should be considered only on roadways where:

1. Access to adjacent properties is desired and not otherwise precluded.
2. Left turning vehicles stopped in travel lanes may present an unexpected obstacle.
3. Left turning vehicles significantly reduce roadway capacity.

4. Property access points are clearly defined, and the safety of pedestrian traffic is given the highest priority.
5. Passing opportunities on two-lane roadways are not appreciably reduced.

When the use of a continuous left turn lane is deemed appropriate, the following design features should be considered.

1. The volume of left turning vehicles should not exceed the available storage nor create a high conflict potential in the turn lane.
2. The continuous left turn lane should not extend through a railroad crossing or signalized intersection.
3. Horizontal and vertical alignment should be considered in the design of the continuous left turn lane to maximize sight distance.
4. The design of the continuous left turn lane and other median treatments should be consistent within a given highway section.
5. Care should be given to avoid overlapping left turns. This may require relocating or offsetting approach points. Consideration should also be given to restricting the approaches to “right-in / right-out” configuration to mitigate overlapping left turns.

Design Criteria for an urban CTWLTL can be found in Sections 305.1 through 305.6 for the six ODOT urban contexts with additional information in Section 313.8 covering median design for Urban Arterials, Collectors, and Local Routes.

308.3 Painted Medians

Painted medians are generally narrower than CTWLTLs. This type of median typically utilizes double solid yellow lines to define the median area. Painted medians are intended to prohibit vehicles crossing the median or using it as a CTWLTL. This type of median control may be used on moderate volume and speed highways in rural areas. In these situations, the painted median is often used as a precursor to installing a non-traversable median such as a concrete barrier. In urban areas however, this median treatment should be used carefully. For new applications this treatment should be limited to urban areas where no adjacent property approach exists and intersection spacing is very long, one-half mile or longer. Generally, these conditions will only be present on limited access highways. The major concern is that the painted median will be used as a CTWLTL and may increase crash experience due to the narrow width.

308.4 Non-Traversable Medians (Non-Freeway)

By law, all proposals to install raised or depressed barriers on two-lane segments of state highways requires collaboration specifically with representatives of the freight industry and automobile users and may include representatives of local government and other transportation stakeholders, as appropriate (See ORS 374.326).

Raised medians are the preferred type of median treatment for most Statewide NHS and some Regional highways (See Oregon Highway Plan, Appendix D for Highway Classification information). Raised medians should also be considered on other highway classifications where the safety and operational benefits are significant and where improved pedestrian crossing opportunities are desired. Raised medians can be designed with either curbs or concrete barriers. Curbed raised median designs are the preferred treatment in urban areas as they are often more aesthetic than the concrete barrier and afford the opportunity to provide accessible pedestrian crossings. However, the concrete barrier may be a more appropriate treatment in rural areas, high-speeds sections, or where right of way is constrained but may require crosswalk closure treatments and formal approval of closure at intersections. Most of the design elements discussed apply to either type of median design. The remainder of this section will describe design standards and guidelines for both types of raised medians. In addition, raised curbed medians are described as two sub-sets. Full width medians refer to the curb-to-curb dimensions of the median between intersections or over long distances. A median traffic separator is that portion of the median that defines left turn channelization areas. Refer to the Median Policy from the Oregon Highway Plan for more information on raised median locations.

308.5 Raised Median Design Standards

308.5.1 Median Width

(Note: The raised median widths include the raised portions only, in contrast to the total median width which includes shy distance and inside shoulders).

The width of raised medians is variable between intersections. Factors such as pedestrian accommodation, landscaping, and right of way control median widths.

1. The minimum median traffic separator width at intersections is 4 feet when the design does not include a median pedestrian refuge area and the design speed is equal to or above 55 mph. For design speeds below 55 mph, the raised median traffic separator can be reduced to 2 feet in constrained locations. However, if a 2-foot median is used, additional measures (such as paint, pavement markers, or delineator posts) should be included to provide conspicuity of the narrow median for motorists and pedestrians.

Narrowness of the median can limit roadway users' recognition of its presence. For improved visibility, a wider median traffic separator may be preferred with widths up to 4 feet even when the design speed is less than 55 mph.

2. When crossing 4 lanes of traffic, analysis is performed to determine the need for pedestrian refuge accommodation in the median. **However, when crossing more than 6 lanes or 6 lanes and a 20-degree skew angle or more, the medians and median traffic separators must be designed to accommodate pedestrians mid-way across an intersection with a refuge area.** The number of lanes includes turn and through lanes. Changes in the median traffic separator will impact the overall median width.

3. When pedestrians are to be accommodated mid-way with a refuge area, the median or median traffic separator width shall be as follows:

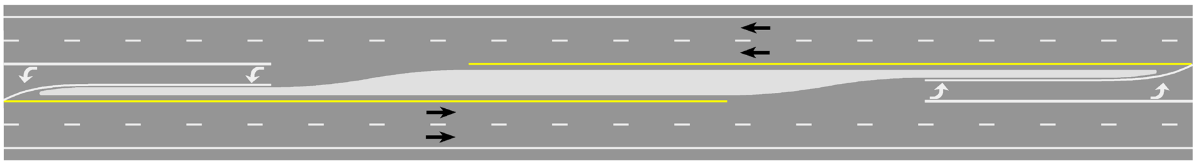
Design Hour Ped. Volume	Width
≤ 100	At least 6 feet
≥ 101	At least 8 feet

4. Where left turns are not accommodated over a significant length, one-half mile or longer, the minimum raised curb median width should be no narrower than 6 feet. Where left turn accommodation is provided at intersections the minimum median width preferred provides a 4-foot median traffic separator, a 12 foot left turn lane and the appropriate shy distance for opposing traffic. (See Table 300-14 Left Side Shy Distance for shy distance requirements.) The intent is to minimize the hourglass effect of widening the median at intersections and narrowing between.

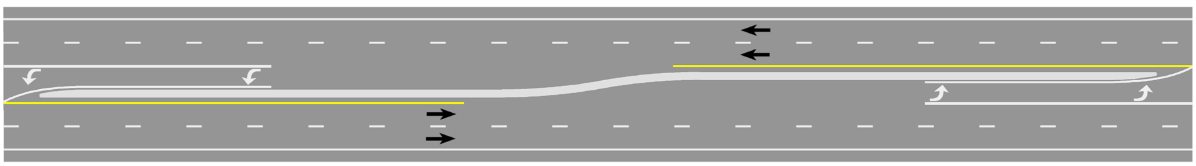
5. Where intersection spacing is relatively short, left turn bays often become back-to-back in nature. It is desirable to have some full width median between the left turn bays. The full width median allows for better visibility of the driver and also allows a place to install signing. Figure 300-14 shows an example of a full width median. The desirable full width median section should be as follows:

Design Speed	Length of Full Width
≤ 30 mph	65 feet
35 mph	100 feet
45 mph	130 feet
≥ 50 mph	165 feet

Figure 300-14 Raised Median Width



FULL WIDTH MEDIAN SECTION



NOT A FULL WIDTH MEDIAN SECTION

308.5.2 Shy Distance from Raised Medians

Whenever barriers, such as curbs, are introduced into the roadscape it is desirable to provide a buffer space. This buffer helps improve safety of the users, traffic flow, and operational efficiency. This buffer is often referred to as "E" or Shy Distance. **Table 300-14 establishes the shy distance requirements from raised medians. This table is not to be used for determining the shy distance for higher speed expressways (See Table 300-26 and Table 300-27).** The table also applies to left side shy distance for other conditions such as curbed sections on one-way roadways.

When raised curb or concrete barrier medians are not continuous, an additional 1 foot of shy distance should be added to the median width values shown above. Table 300-14 is used in place of the direction give in Section 318.

Table 300-14 Left Side Shy Distance

Design Speed (mph)	Curb 12 ft. Lane (feet)	Curb 11 ft. Lane (feet)	Concrete Barrier All Lane Width (feet)
25	1 (0)	1 (0)	2 (1)
30	1 (0)	1 (0)	2 (1)
35	2 (1)	2 (1)	2 (1)
45	2 (1)	2 (1)	2 (1)
50	2	3 (2)	3
55+	3	4	4

Note: Preferred Design Widths; ( ) Urban Context Minimum Widths

308.5.3 Sight Distance

Sight distance at both unsignalized and signalized intersections is critical to provide a safe and efficient median opening. It is desirable to provide intersection sight distance at all median openings. However, in many situations, this is not practical. *The designer is encouraged to provide the highest level of sight distance practical. Sight distance is covered in more detail in Part 200, Section 217.*

308.5.4 Landscaping Accommodation

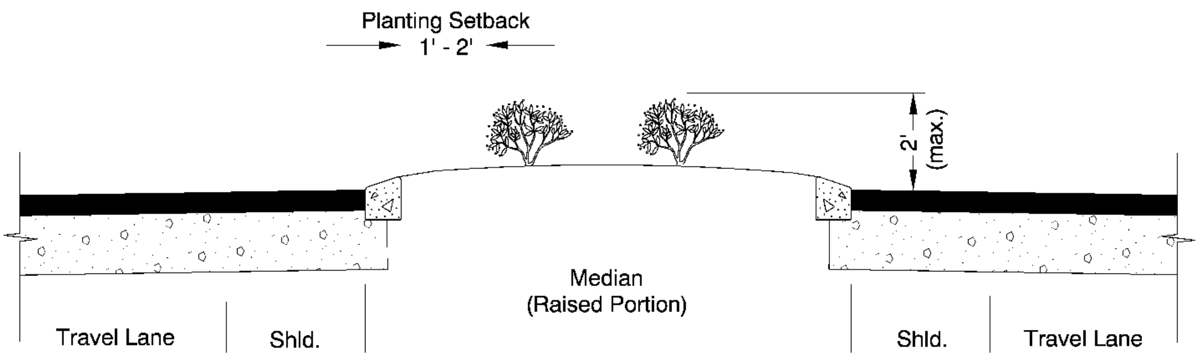
Landscaping is an important feature to raised curb medians. Landscaping enhances the visibility of the median as well as the aesthetics. *Two major concerns with landscaping are sight distance and maintenance. Sight distance concerns are crucial at both signalized and unsignalized intersections. The maintenance concerns include the amount of maintenance, median access, and cost.* However, not all landscape techniques are labor intensive. Many types of vegetation are considered native and require almost no special care. In addition, landscaping features such as paving blocks, bricks, rocks, or other materials are relatively maintenance free.

Figure 300-15 provides guidance for low vegetation in medians. Figure 300-16 provides guidance for median tree placement.

The following are important design elements to consider when landscaping medians:

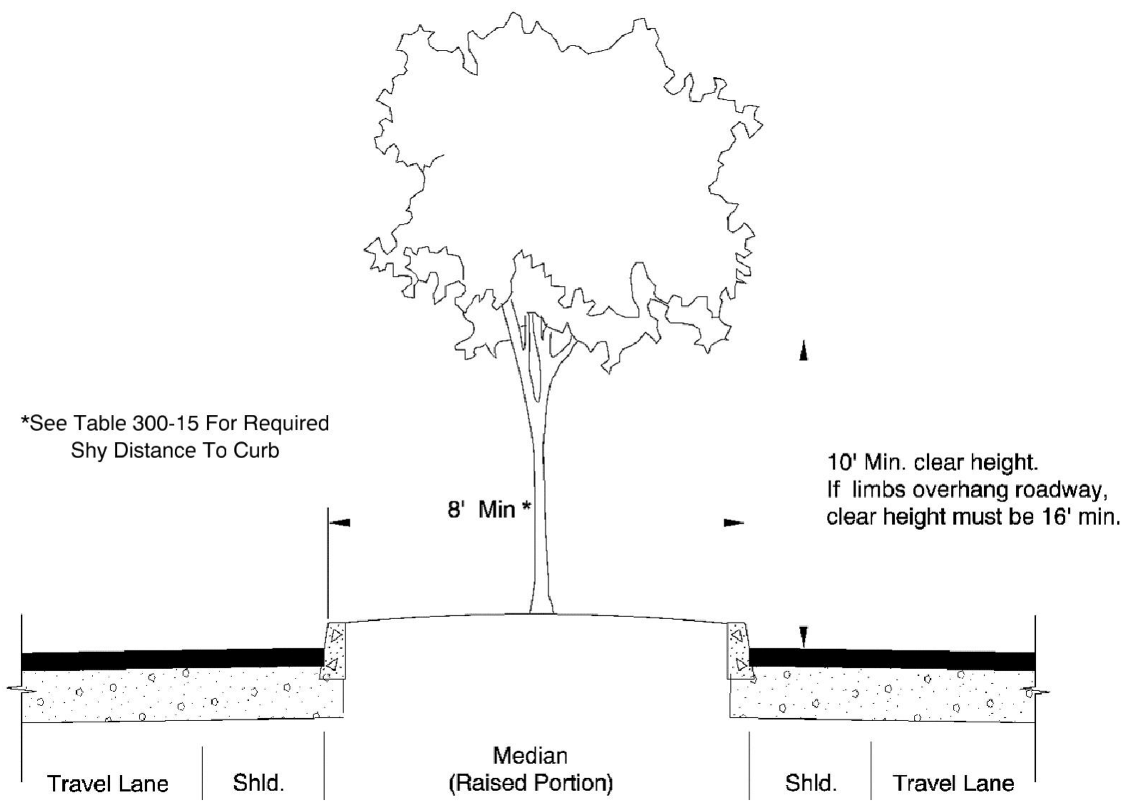
1. *It is desirable to provide a vertical element within the median to increase visibility. However, to ensure sight distance lines are preserved, vegetation or mounding should not extend higher than 24 inches above the pavement surface within the functional area* of intersections. Sight distance must also be preserved where pedestrian crossings are provided mid-block.
2. **The minimum median width to accommodate landscaping is 6 feet.** *Care should be taken to not use landscaping that impairs sight distance. There should also be a planting setback. The use of trees in a raised median are typically not recommended and should only be considered in urban situations where the design criteria shown in (5) below can be met.*
3. **Side slopes within the median for mounding shall be no steeper than 1:3 and preferably flatter.**
4. *A planting set back of 1 foot to 2 feet should be considered where median width allows. The planter strip should be structural to support maintenance equipment. This could minimize the maintenance requirements or ease maintenance operations, such as mowing.*
5. *Consider using planter boxes rather than continuous vegetation to reduce maintenance. Planter boxes are also effective treatments for improving median visibility. Planter boxes may either be flush or raised. Raised planter boxes should be 6 inches or less above the curb height.*

Figure 300-15: Landscaping Accommodation



Roadside and median trees are also discussed in Part 400, which includes specific design criteria for placement of trees.

Figure 300-16: Median Tree placement



308.5.5 End Treatments

Starting and ending raised median treatments can create conflict areas to roadway users and must be designed carefully. Raised median sections should be designed with logical starting and ending points within a given section of highway. End treatments are critical to ensure the appropriate and safe function of the raised median.

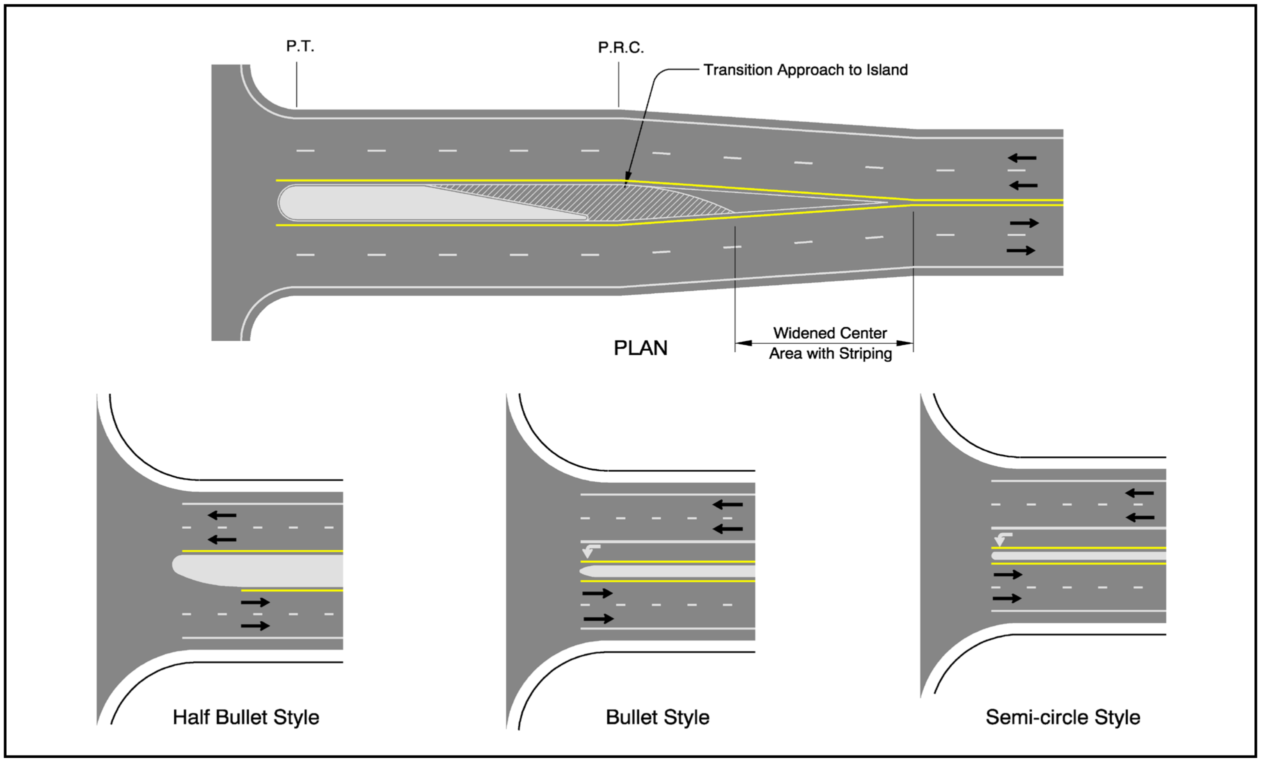
Haphazardly placing small sections of raised median throughout a highway segment may offset any safety benefits and may actually increase the crash frequency over that anticipated without any median treatment. In urban situations, it is preferred to have the median begin and end at an intersection. Rural areas may not allow this intersection approach. In these cases, the designer is to determine logical termini based upon the intended function of the median and roadside character of the highway. It is important to remember that raised medians are a barrier and can be a roadway hazard.

Concrete barriers generally require an impact attenuator to protect the ends. The type of attenuator used must conform to the ODOT approved materials list. AASHTO's "Roadside Design Guide - 2011" can provide additional information regarding end treatment design for concrete barriers.

Raised curbed medians generally do not require any special end treatments but a squared off, blunt end style is an unacceptable end treatment. *In high-speed situations, design speeds over 45 mph, and where pedestrian accommodation in the median is not required, the curb line should be tapered to 2 inches in height.* This tapered section should be accomplished over 15 feet. Standard Drawing RD706 provides additional detail for this tapered treatment.

Two other concerns about end treatments are pedestrian refuges and truck off-tracking. At signalized intersections, the preferred median treatment is to stop the raised median prior to the cross walk. Generally, the pedestrian movement through a signalized intersection should be made in one stage. Pedestrian refuges create two stage crossings. At a signalized intersection, the refuge requires additional signal equipment and signal timing that needs to be considered prior to adding the refuge feature. *The preferred design, when providing a pedestrian refuge for crossings at unsignalized intersections, is to utilize the cut-through option. This treatment requires a protective nose area that should be at least 13 square feet or more.* The nose can be designed with either a semi-circle or half bullet type design. The semi-circle design type is only recommended for median traffic separator widths of 4 feet or less. Wider medians should utilize the half bullet type design to better facilitate truck turning movements. All end treatment designs need to consider the off-tracking characteristics of the appropriate design vehicle. The designer must use caution when providing a pedestrian refuge and using the half bullet type nose design. The half bullet design may reduce the available refuge for pedestrians. In some situations, the crossing may need to be moved back slightly to provide a full width refuge. This is especially prevalent where the nose must be moved back to provide for adequate truck turning movements. The transition approach to island area at the beginning and end of a raised median is the appropriate location for additional low-cost warnings, such as rumble strips or painted chevrons. These additional warnings are not required at all locations. *Figure 300-17 provides additional detail regarding end treatments for raised curb medians. For additional design specifics, see Part 500 Intersection Design.*

Figure 300-17: End Treatments



308.5.6 Accommodating U-Turns

The use of a raised median significantly reduces the opportunities for vehicles to make left turns. To facilitate traffic's ability to reach destinations on the left side of the highway, U-turn opportunities need to be included with the design. *The preferred approach is to provide U-turn capabilities at signalized median openings.* This approach offers greater protection for the U-turning vehicles. *The second option is to utilize an unsignalized median opening. This approach should be used in conjunction with a jug handle design.* Executing a U-turn through the oncoming traffic lanes creates a greater exposure to the U-turning vehicle and through traffic and should be avoided in high volume or high-speed conditions. ***When accommodating U-turning vehicles, the designer needs to consider the following:***

1. Speed of the highway
2. Volume of traffic opposing and executing the U-turn

3. The design vehicle to be accommodated
4. The adjacent roadside culture, and
5. The opportunity to use existing roadways to accommodate U-turn movements

A left turn lane shall always be included when accommodating U-turning vehicles. U-turn movements are never to be allowed out of a through travel lane. Part 500, Section 504.6 provides additional information and illustrations for accommodating U-turns.

Consult the Region Traffic and Roadway Sections when considering accommodating U-turns on state highways. U-turns must be located with respect to legal requirements [ORS 810.130(3), ORS 811.365, OAR 734-020-0025]. The State Traffic-Roadway Engineer must approve all U-turns at signalized intersections; consult with the Engineering and Technical Services Branch, Traffic-Roadway Section.

308.5.7 Type of Curb

When using raised curb medians, the designer needs to determine the appropriate curb type. The preferred curb type is the mountable curb. Mountable curb is a design that provides delineation for pedestrians, landscaping, or other objects in the median, while also enhancing the aesthetics of the median. The use of low-profile mountable curb also requires substantial mounding for visibility and safety. Standard curb can be substituted for mountable curb when desired by the project team when design speeds are less than or equal to 45 mph. The use of standard curb may also be appropriate for urban or urbanizing areas where the posted speed is 45 mph. **For roundabout design, use low profile mountable curb as shown in RD170**.

Section 309 ADA Requirements for Resurfacing, Rehabilitation and Reconstruction Projects

When paving alterations occur adjacent to an ADA ramp, the ADA ramp is required to be accessible. Reconstruct ADA ramps that are both adjacent to pavement alterations and listed as having a poor functional status in the ODOT ADA Ramp inventory. This requirement applies to all projects under the Interstate Maintenance,1R, 3R, 4R, and SF standards discussed in the following sections in Part 300. Refer to the Bridge Design Manual Appendix B for paving alterations near bridges with walkways. **Curb ramps at radial driveways are required to be upgraded when the paving limits incorporate portions of the private approach and impact the pedestrian access route.** Pavement treatments are described in MG100-107 detailing alterations versus maintenance treatments (e.g. chip seal alone is not an alteration paving treatment however when multiple surface treatments are combined it may result in an alteration). Paving alterations are not limited to just asphalt roadbeds and include other surfacing materials such as reinforced concrete sections. Utility trench work is typically not considered a paving alteration; consultation with the Technical Services, Traffic-Roadway Section is recommended.

Section 310 Urban and Rural Freeway

This section provides 1R, 3R, 4R, and 4R Single Function (SF) design guidance for urban and rural freeways, including the interstate. Freeways are the highest form of arterials and have full access control with the primary function of providing mobility and higher speeds for all vehicle modes. As Part 200 provided the geometric requirements such as vertical and horizontal curvature, vertical clearance, sight distance, and grades, this section focuses on the cross-section elements such as lane width, shoulder width, cross slope, vertical clearance, roadside design, clear zone, median design, and other cross-sectional features.

When the width computed for the lateral support of the surfacing material is a fractional width, round the lateral support width up to the nearest foot.

310.1 ODOT 1R Urban and Rural Freeway Resurfacing

The primary intent of a 1R project is to preserve the existing pavement before it deteriorates to a condition where extensive reconstruction would be necessary to rehabilitate the roadway section. Projects under the 1R category consist primarily of paving the existing roadway surface and generally deferring other improvements to future 4R, 3R, specific safety, or single function projects. When project programming and funding are being determined, the ODOT Practical Design Policy and design flexibility can be employed in deciding if a particular preservation project should be in the 1R category or if there is enough value being added to the highway system or corridor for the additional cost if the project is placed in the 3R category that would trigger additional improvements. Safety considerations outlined in the 1R guidance should also be part of the process in determining the appropriateness of a project being selected for 1R. ***The safety evaluation is a critical part of determining whether a project belongs in the 1R or 3R categories and is integral to the process. The 1R/3R Record of Decision form is used to aid the decision process to determine if a 1R project should be upgraded to a 3R project to provide immediate safety improvements.***

The ODOT 1R project standard will apply to Preservation projects that are limited to a single lift non-structural overlay or inlay. Many of the safety items that have traditionally been addressed in 3R projects can be more effectively dealt with in a statewide strategic program. For example, establishing a prioritized program for upgrading guardrail to current standards along a highway corridor instead of upgrading between specific project limits. A program of this nature has the ability to better utilize funding to target higher need locations for safety item improvements rather than only making safety item improvements based on paving projects. *However, the replacement of safety items such as guardrail, guardrail terminals, concrete barrier, impact attenuators, and signs may be included in the 1R project category when necessary if funding other than Preservation funds are used and the added work will not delay the scheduled bid date.* **Any safety features that are impacted by the proposed resurfacing must be adjusted or replaced by the 1R project. Existing safety features cannot be degraded to a level below the existing condition as a result of the paving project.**

310.2 Urban and Rural Freeway 1R Resurfacing Standards

These are projects that extend the pavement life of existing highways. **When paving alterations occur adjacent to an ADA ramp, the ADA ramp is required to be accessible. Reconstruct ADA ramps that are both adjacent to pavement alterations and listed as having a poor functional status in the ODOT ADA Ramp inventory.** Refer to Section 309 for more information. Other safety enhancements are not required to be included; however, *safety features may be added to 1R projects where other (non-preservation) funding is available.* ***Any existing safety features that are impacted by the proposed resurfacing must be adjusted or replaced, thus necessitating some work in addition to paving.***

Since 1R projects will generally not address safety upgrades, pedestrian and/or bicycle enhancements, in no case shall safety, pedestrian and/or bicycle conditions be degraded. *The safety feature is addressed based on system priorities in standalone projects or other STIP projects.* When scoping 1R projects, the safety feature databases are used to identify opportunities to add safety enhancements with other (non-preservation) funding. Subsequent subsections in 310.2 outline the ODOT Resurfacing 1R project standard. While the criteria primarily relates to the paving treatment and the ability to pave without degrading existing conditions, there may be corridors where analysis of the crash history indicates that a full 3R project is warranted. *Therefore, projects are screened for 1R eligibility from a safety perspective as well.*

310.2.1 Scoping Requirements

In order to ensure the intent of the program is met in addressing pavement and safety needs, adequate advance information is needed to assure adequate statewide decisions are made with consistency.

1. **1R/3R Record of Decision Form**
    - This form steps the scoping team through the scoping process. Parts of the form are filled out by different sections including Pavements, Traffic, and Roadway.

- Use of this form provides a statewide uniform approach to determining the project design standard – 1R vs 3R – that will be applied to a pavement preservation project.

2. **Urban Design Concurrence Document (Draft)** – For Urban Expressway projects using context-based design under 45 mph.

   This document identifies the project context and is used by the scoping team to provide a concept design and provide documentation of decisions leading to that design. The Draft Urban Design Decision document is part of the final scoping package for project initiation.

3. **Urban Design Concurrence Memo** - or Urban Expressway projects using context-based design under 45 mph.

   There may be a small number of urban projects with scope too limited and outside the roadway that an Urban Design Concurrence document may not be necessary. Projects that could meet the criteria are ITS projects installing cable, a bridge screening project that does not impact the roadway or similar type projects. The primary focus of the work is outside the roadway and peripheral to it. For these types of projects, an Urban Design Concurrence Exemption Memo is required and, if granted, takes the place of the Urban Design Concurrence document on the DAP Checklist.

310.2.2 Project Initiation Requirements

1. At project initiation, the 1R/3R Record of Decision Form must be reviewed and approved to ensure the project will be developed under the appropriate design standard.
2. For urban expressway projects with at-grade intersections using context-based design and under 45 mph, the project development team reviews the Draft Urban Design Concurrence (UDC) document to understand the decisions made by the project scoping team and to verify the conditions, decisions and concept are still appropriate to meet project goals and outcomes. Existing conditions may have changed between scoping and project initiation. ***If changes are needed, the project development team modifies the Draft UDC to meet project goals and/or planning needs. The Draft UDC is further developed as project development continues and is reviewed again at each project milestone to ensure the final design meets the scoping expectations, goals, aspirations, and outcomes for the project.***
3. For urban expressway projects with at-grade intersections using context-based design and under 45 mph, if the scoping team determined an Urban Design Concurrence document isn't needed and obtains an Urban Design Concurrence Exemption Memo, the project development team reviews the project scope to determine the exemption memo is still appropriate for the project scope. **At any time during project development, if the scope of the project changes to include work impacting the roadway, the project**

development team is required to complete the Urban Design Concurrence document for submittal at the Design Acceptance phase.

310.2.3 1R Project Requirements

1. A paving project is initially designated 1R based on the appropriate paving treatment – a single lift overlay or inlay. (There is no formal requirement for pavement design life for an individual project; however, since the 1R treatment is location specific, it is expected that an 8-year pavement life will be the goal of the program).
    - Pavement Services is the final authority regarding the pavement design.
2. Where less than approximately 5 percent of a project (based on lane miles paved) includes more than a single lift non-structural overlay or inlay, the project may be designated 1R.
3. **Where up to approximately 25 percent of a project (based on lane miles paved) includes more than a single lift non-structural overlay, the project may be designated 1R; however, this requires the approval of a design exception.**
4. **Where more than approximately 25 percent of a project (based on lane miles paved) includes more than a single lift non-structural overlay, the project must be designated 3R.**
    - **As an exception to this is rule, a grind and inlay plus an overlay may also be considered for development under the 1R standard; however, this would be uncommon and requires the approval of a design exception.**
5. Where the appropriate course of action is not clear based on the percentages noted above, include Technical Services Roadway Engineering Unit staff in the discussion.
6. Chip seals are 1R projects and subject to the requirements of the 1R standard. Chip seal alone is not an alteration paving treatment however when multiple surface treatments are combined it may result in an alteration (see Section 309).

310.2.4 Unprotected and Unconnected Bridge Ends

On 1R paving projects, any bridge rail with unprotected ends or unconnected transitions exposed to traffic must be mitigated. Provide an end treatment meeting the current standard, or a design exception must be obtained. For possible funding options, contact the Senior Roadway / Roadside Design Engineer in the Technical Services Traffic-Roadway Section.

- Unprotected ends – Where the end of the bridge rail is exposed with no end treatment such as a transition to guardrail or a crash cushion.

- Unconnected transition – Where there is no crashworthy transition between the end of the bridge rail to the guardrail or other barrier.

310.2.5 Responsibilities

1. 1R/3R form filled out by Pavements staff, Region Roadway and Traffic Staff. There are approval signatures by the Pavements Engineer, Region Roadway Manager & Traffic Manager. It will be the Transportation Project Manager's or Resident Engineer-Consultant Projects' role to coordinate. Form is housed in ProjectWise.
2. Final Urban Design Concurrence document is completed and approved by the Region Technical Center Manager, with concurrence from the Region Maintenance, Traffic and Roadway units. The final UDC is part of the Design Acceptance Package submittal. It is the Transportation Project Manager's or Resident Engineer-Consultant Projects' role to ensure the final UDC is submitted.

310.3 ODOT 3R Urban and Rural Freeway Typical Section

When a project on the freeway system has been classified as 3R, the standard cross section elements outlined in Table 300-16 below apply. *The development of a freeway 3R project should also be responsive to the considerations given in Part 100 concerning purpose, applicability, scope, determination, and design process. The standards for those specific listed elements are based on the AASHTO publication, "A Policy on Design Standards-Interstate System", which provides guidelines for work on the Interstate system.* **The following standards are considered as allowable minimums. For those design elements not specifically addressed below, the guidelines in the AASHTO Green Book are to be followed. 3R projects that include specific horizontal and vertical curve corrections are to use ODOT 4R standards for those curve correction design elements. In addition to these standards, Interstate Maintenance Design Features in Table 300-15, are to be incorporated into all interstate freeway 3R projects.** The "Have To" list is the recommended minimum treatment for the listed project elements. The "Like To" list includes treatments for elements which should be considered when economically feasible, i.e., minimal extra cost, or funds available from sources other than the Preservation Program.

Technical Resources have been identified for a number of the project elements. These resources should be utilized by the Project Team to aid in determining if a "Like To" measure is warranted, cost-effective and fundable or if a design exception should be sought to do less than the "Have To" requirements. ***Design exceptions should be identified as soon as possible (typically during project scoping), and the appropriate design exception request officially submitted for approval as soon as all pertinent information can be determined and analyzed.*** Design exceptions are covered in Part 1000.

Table 300-15: Interstate Maintenance Have To/Like To

Project Element	Corrective Measure		Technical Resource
	"Have To"	"Like	
ADA Ramps	• Replace when asset is in "Poor" condition with a paving alteration. See Section 309.		Roadway Section
Guardrail	• Upgrade all guardrail and end terminals and transitions not meeting NCHRP Report 350 or MASH to the current standard. • Provide transitions at unconnected bridge ends. • Install protection at unprotected bridge ends. • Adjust MGS guardrail to 31 inches where the height to the top of the rail is 28 inches or less. • Adjust 350 guardrail to at least 29 inches where the top of the rail is 28 inches or less. • Removal of guardrail and replacement with concrete barrier where minimum offsets are not met for bridge column protection.		Roadway Section
Concrete Barrier	• Upgrade all concrete barrier not meeting NCHRP Report 350 or MASH to the current standard. • Pre-NCHRP Report 350 concrete shoulder or median barrier that retains earth behind the barrier may remain in service. • All barrier in which the proposed finish grade exceeds the 3" vertical lip (reveal) of the barrier shall be replaced or reset.		Roadway Section
Interchange Ramps	• Ramp surfacing to the ramp termini.		Roadway Section
Roadside Obstacles	• Cost effective removal or shielding of rock outcroppings, trees, concrete structures higher than 4", utility poles, non-breakaway sign and light poles and other potential hazards within the clear zone.		Roadway Section

Table 300-15 (Continued): Interstate Maintenance Have To/Like To

Project Element	Corrective Measure "Have To"	Corrective Measure "Like To"	Technical Resource
Bridges	• See BDM	Bridge painting, widening, deck replacement, scour protection and seismic retrofit.	Bridge Section
Delineators	• Install missing delineators. • Replace damaged delineators.		Roadway Section
Fencing	• Replace damaged or rotting fencing.	Fill in incomplete sections	
Attenuators	• Replace damaged or non-standard (not meeting NCHRP 350 or MASH) attenuators. • Adjust attenuators as needed. • Install attenuators if warranted.		Roadway Section
Rumble Strips	• Install on rural portions as per ODOT Rumble Strip Standards and Policies.		Roadway Section
Pavement Life	• Project Dependent		Pavement Unit
Striping	• High volume, Urban areas would have all durable lines. • Mountainous sections with lots of curves would have all durable lines. • Flat tangent sections will have durable skip lines only.		Region Traffic
Drainage	• See Hydraulics Manual		Fish Program Manager & Hydraulics Unit
Signal Loops	• Project Dependent		Traffic Section

Table 300-16: ODOT 3R Freeway Design Standard Minimums

Design Feature	Flat Terrain	Rolling Terrain	Mountainous Terrain	Urban Characteristics
Design Speed	Posted Speed	Posted Speed	Posted Speed	Posted Speed
Lane Width	12′	12′	12′	12′
Right Shoulder Width	10′	10′	10′	10′
Left Shoulder Width 4 Lane Section	4′	4′	4′	4′
Left Shoulder Width 6 Lane Section	10′	10′	10′	10′
Median Width	36′	36′	10′	10′
Vertical Clearance	See Section 317	See Section 317	See Section 317	See Section 317

Design Feature	Minimum Width (all terrains)	
Bridges to Remain in Place (Less than 200′ in length)		12′ Lane 10′ Right Shoulder 3.5′ Left Shoulder
Bridges to Remain in Place (200′ or more in Length)		12′ Lane 3.5′ Right Shoulder 3.5′ Left Shoulder
Tunnels (Desirable Width)	44′ – total	12′ Lane 5′ Left Shoulder 10′ Right Shoulder Two- 2.5′ Safety Walks (Contact Traffic Section for delineation requirements)
Tunnels (Minimum Widths)	30′ – total	12′ Lane Two - 1.5′ Safety Walks (Contact Traffic Section for delineation requirements)

310.4 ODOT 3R Urban and Rural Freeway Lane Width

All traffic lanes for 3R freeway projects are 12’ wide.

310.5 ODOT 3R Urban and Rural Freeway Shoulders

On the left side of traffic on a four-lane section, the standard shoulder width is 4 feet. On six or more lane sections, the standard shoulder width is 10 foot paved.

The designer should be aware of snow zone locations where there is a shoulder break and an overlay is being placed. There is potential for pavement removal by the snowplows cutting into the pavement in the shoulder break areas. The designer should work with the Project Team to discuss the need for additional leveling quantities to bring the shoulder slope up to match the existing slope of the travel lanes.

310.6 ODOT 3R Urban and Rural Freeway Medians

Medians in rural areas having level or rolling topography shall be at least 36 feet wide. Medians in urban and mountainous areas shall be at least 10 feet wide. *Consideration should be given to decking median openings between parallel bridges when the opening is less than 30 feet wide*. Due to terrain constraints many of the rural freeways were originally constructed with an urban median width of 8 to 10 feet. ***For those locations in rural and urban areas that have an existing median width of 8 to 10 feet, a design exception will not be required.***

310.7 ODOT 3R Freeway Bridges to Remain in Place

Mainline bridges on the Interstate system may remain in place if, as a minimum, they meet the following values. The bridge cross section consists of 12-foot lanes, 10-foot shoulder on the right, and a 3.5-foot shoulder on the left. For long bridges (200 feet or more), the offset to the face of parapet or bridge rail on both the left and the right side is 3.5 feet measured from the edge of the nearest traveled lane. Bridge railing shall meet or be upgraded to current standards. Refer to the ODOT BDM for bridge railing requirements.

310.8 ODOT 3R Freeway Structure Cross Section

At a minimum, the width of all bridges, including grade separation structures, measured between rails, parapets, or barriers shall equal the full paved width of the approach

roadways. The approach roadway includes the paved width of usable shoulders. Long bridges, defined as bridges having an overall length of 200 feet or more, may have a lesser width. Such bridges shall be analyzed individually. **On long bridges, offsets to parapet, rail, or barrier shall be at least 3.5 feet measured from the edge of the nearest traffic lane on both the left and the right sides.**

Narrow structures should be considered for widening to full shoulder on major rehabilitation projects; in particular, on those projects where the design life after rehabilitation is expected to be 20 to 30 years. Each structure should be looked at individually to determine whether widening is appropriate. For example, it may not be appropriate to widen a narrow, long structure or a structure that is 2 feet short of being able to accommodate full shoulders.

310.9 ODOT 3R Freeway Tunnels

The desirable width for tunnels is at least 44 feet. This width consists of two 12-foot lanes, 10-foot right shoulder, 5-foot left shoulder, and 2.5-foot safety walk on each side. However, because of the high cost, a reduced tunnel width can be accepted, but it must be at least 30 feet wide, including at least a 1.5-foot safety walk on both sides.

310.10 ODOT 4R Urban and Rural Freeway Typical Section

This section provides 4R design guidance for urban and rural freeways, including the interstate. As previously discussed, freeways are the highest form of arterial and provide for mobility and high speeds. **The 4R cross section elements listed below are to be used on all 4R freeway projects. See Figure 300-18 and Figure 300-19.**

Figure 300-18: Standard Urban Freeway Section (Includes Non-Interstate Facilities)

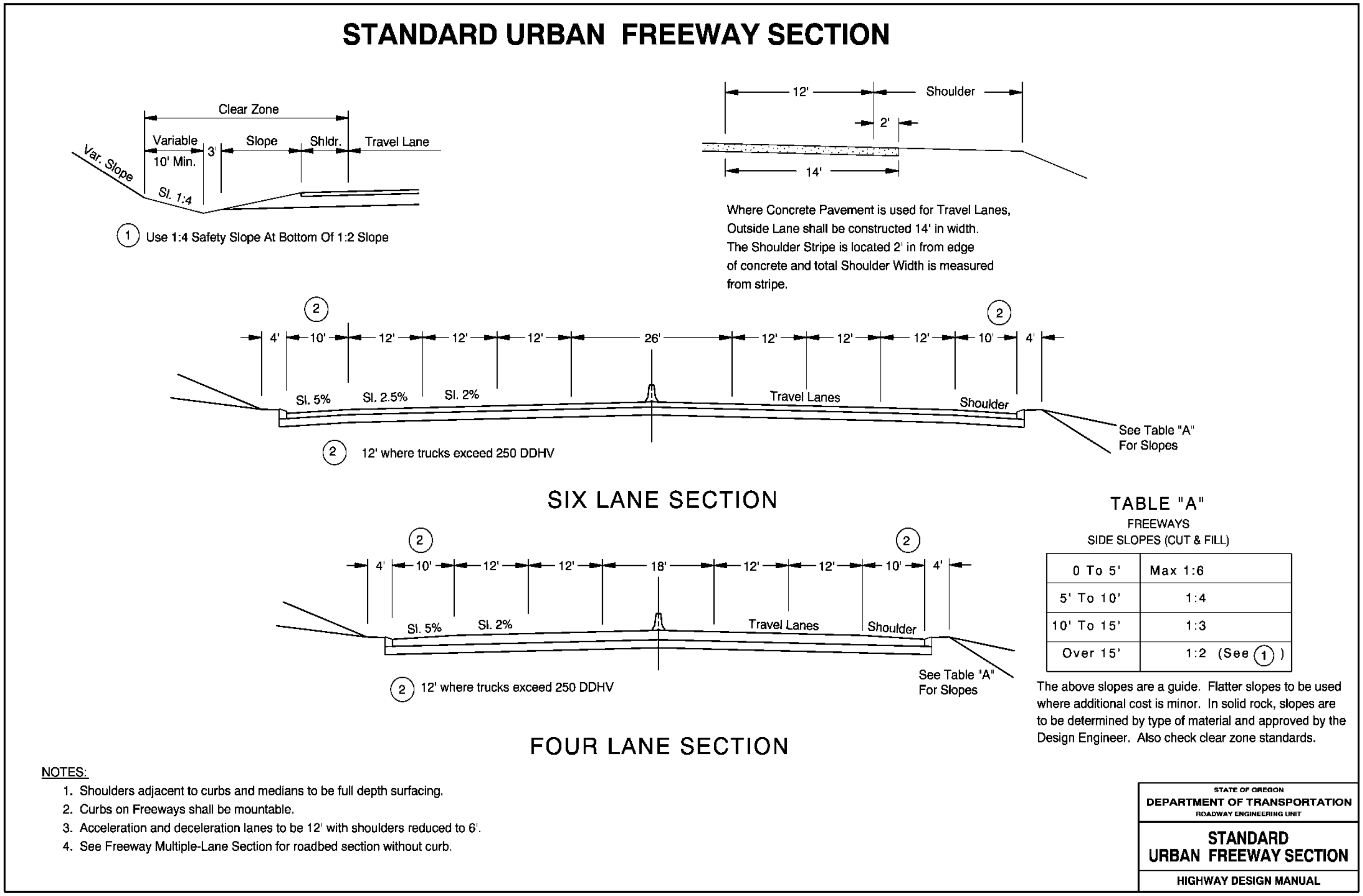


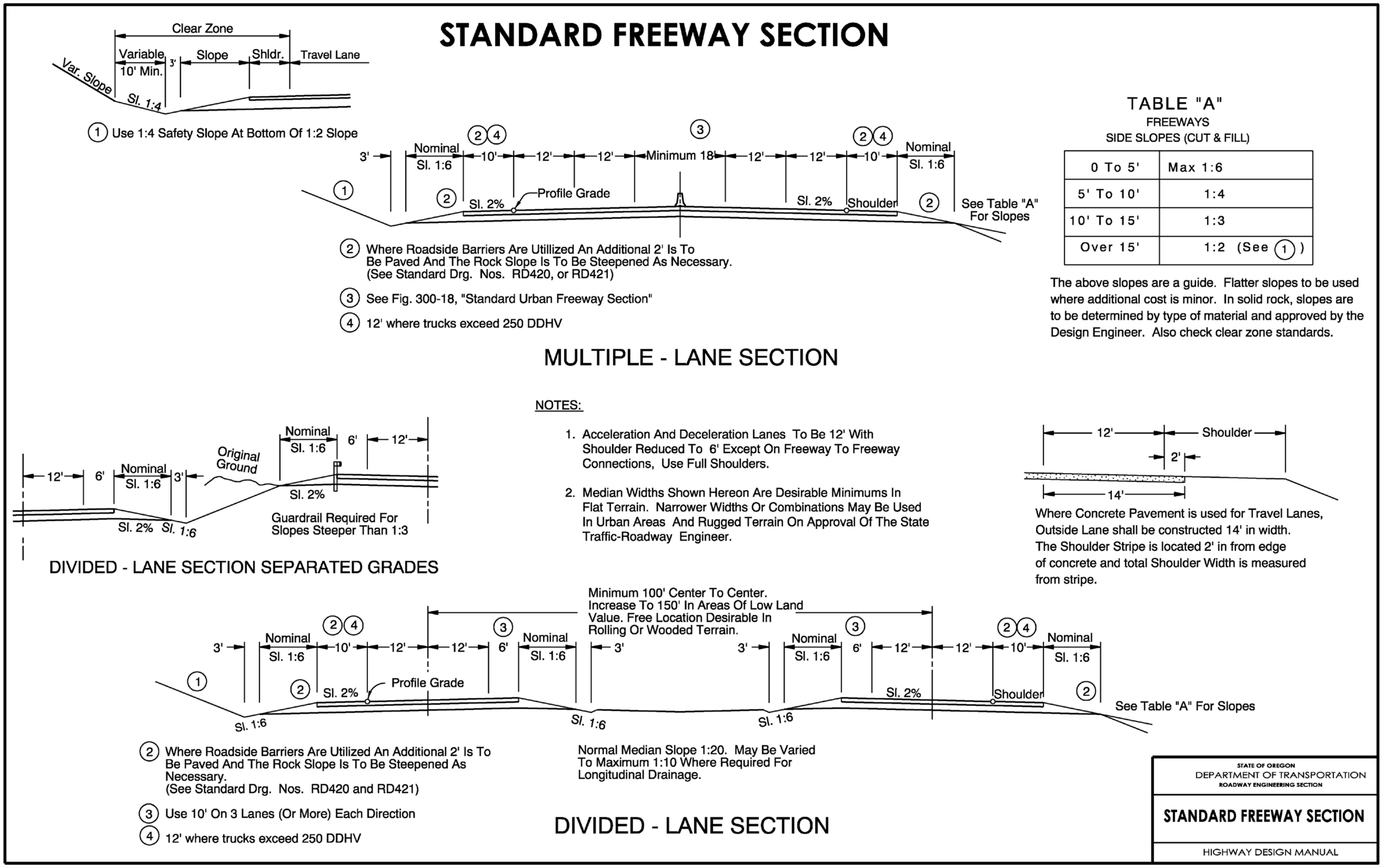
TABLE "A"
FREEWAYS
SIDE SLOPES (CUT & FILL)

0 To 5'	Max 1:6
5' To 10'	1:4
10' To 15'	1:3
Over 15'	1:2 (See 1)

The above slopes are a guide. Flatter slopes to be used where additional cost is minor. In solid rock, slopes are to be determined by type of material and approved by the Design Engineer. Also check clear zone standards.

NOTES:
1. Shoulders adjacent to curbs and medians to be full depth surfacing.
2. Curbs on Freeways shall be mountable.
3. Acceleration and deceleration lanes to be 12' with shoulders reduced to 6'.
4. See Freeway Multiple-Lane Section for roadbed section without curb.

Figure 300-19: Standard Freeway Section (Includes Non-Interstate Facilities)



310.11 ODOT 4R Freeway Lane Width

The travel lane width for both urban and rural freeways shall be 12 feet. See Figure 600-32 and section 605.9 in Part 600 for more information regarding freeway ramps. **A design exception is required for non-standard lane widths.**

310.12 ODOT 4R Urban and Rural Freeway Shoulders

The shoulder width of urban and rural freeways is dependent upon the number of lanes of the facility. **The right side shoulder for both urban and rural freeways shall be 10 feet. This width allows for emergency parking of vehicles on the right hand shoulder. The left side shoulder is dependent on the number of freeway lanes. When there are two lanes in each direction on the freeway, the left side shoulder shall be a minimum of 6 feet wide. When the freeway consists of three or more lanes in each direction, the left side shoulder shall be a minimum of 10 feet wide**. This wide left side shoulder on a multi-lane section allows for vehicles in the left lane to use the left side shoulder in an emergency instead of crossing two lanes of traffic to find refuge in the right-side shoulder. Wider shoulders also provide other benefits in addition to emergency parking, such as providing space for incidence response, emergency vehicle travel, maintenance activities and stage construction of future modernization and preservation projects. See Figure 600-32 and section 605.9 in Part 600 for more information regarding freeway ramps.

For interstate freeways, when truck traffic Directional Design Hourly Volume (DDHV) is greater than 250, the right-side shoulder shall be increased to 12 feet. ***For non-interstate freeways, when the truck traffic DDHV is greater than 250, widening the right shoulder to 12 feet should be evaluated.***

For new construction, auxiliary and climbing lanes on the freeway should have the same shoulder and lane width as standard freeway shoulders. Typically, the right-side shoulder width should be 10 feet, with a minimum 8′ shoulder required, excluding shy distance requirements. Where truck traffic DDHV is greater than 250 or there is a roadside barrier, a 12-foot shoulder should be considered. In retrofit situations, such as operational and safety projects or adding auxiliary and climbing lanes to a preservation project, it is preferred that new construction shoulder width (minimum 8′) be installed. **When right side roadside barriers are used, the normal right side shoulder width shall be increased to provide a 2-foot "E" offset or "shy" distance. The 2-foot "shy" distance is not required when the shoulder width is 12 feet or more. When a roadside barrier is used on the left side shoulder of 10 feet or more in width, the left side shoulder shall also provide the 2-foot "E" distance. Exceptions to the 2-foot "E" widening may be approved by the State Traffic-Roadway Engineer when the additional shoulder widening is not practical.**

310.13 4R Urban and Rural Freeway Medians

Freeway medians provide a separation between the travel ways of opposing traffic. Medians provide a sense of security and convenience to the operators of motor vehicles. The wider the median the more comfortable the driver becomes with the facility. ***The width of urban and rural freeway medians is dependent upon available right of way. Because urban freeways have high speed and high-volume traffic, the median should be as wide and flat as possible.*** A wider median on an urban freeway can provide for future transit, rail, HOV (high occupancy vehicles), HOT (high occupancy toll), maintenance, construction staging, mitigation, or travel lanes. Many times, the width of medians is restricted due to the highly developed and expensive right of way.

For urban freeways the minimum median width for a freeway with two lanes in each direction and a concrete barrier is 18 feet between edges of travel lanes. This allows for 6-foot shoulders, a 2-foot “E” distance, and a nominal 2-foot concrete barrier width. **For urban freeways with three or more lanes in each direction and a concrete barrier, the median shall be 26 feet wide between edges of travel lanes.** This distance allows for 10-foot shoulders, a 2-foot “E” distance, and a nominal 2-foot concrete barrier width. ***The designer should be considering future needs of the facility when dealing with minimum median designs, particularly accommodating future lanes or transit.*** When determining four lane median width, consideration should be given to future six lane expansion.

The desirable median width in an urban and rural area is 76 feet (inside edge of travel lane to inside edge of travel lane). This allows for a median that has the flexibility of allowing additional lanes in the future. In areas where the right of way is inexpensive the edge of travel lane to edge of travel lane distance should be increased to 126 feet.

Freeway medians with a width of 100 feet or less shall be closed with an appropriate barrier system. Evaluate site specific conditions and crash data for wider freeway medians to determine if they should also be closed.

Median widths ranging from 76 to 126 feet (inside edge of travel lane to inside edge of travel lane) are very common for rural freeways. The median width allows for future widening, grading of an earth median (slopes shall be 6:1 or flatter), or drainage facilities. In areas of steep topography, the use of a wide median allows for the designer to use independent profiles and proper sideslopes. *In rural locations, where terrain prohibits the use of the rural median standard, the urban median width (18′/26′) can be considered and evaluated.* **Use of the urban median standard in a rural freeway setting requires a design exception.**

At freeway cloverleaf ramp terminals, there may be instances where some form of raised median placed between the exit and entrance ramps may be appropriate to reduce the potential for crossover crashes. See Section 600 for detail on ramp median treatments.

310.14 ODOT 4R Single Function (SF) Freeway Standards

The specific design standards used for a Single Function Standard project will generally be the same design standards used for a 4R/New Construction project. The difference is that the scope of work is very limited on SF projects, so the SF Standard does not require addressing non-related, non-standard features of the roadway. For example, if a guardrail upgrade qualifies as a Single Function project, it will not be necessary to address other non-standard features on the roadway, such as lane and shoulder width, horizontal and vertical alignment, etc.

310.14.1 Application of 4R Single Function (SF) Project Standards

Single Function projects include projects that are within the right of way but do not permanently impact the travel lanes or shoulders of the highway. Generally, projects that only include work outside the edge of pavement will qualify for the SF standard. The SF standard can also be applied to certain maintenance projects such as re-striping projects as long as the final configuration of the travel lanes and shoulders would not be changed in any way. These projects address a specific need. The scope of work is limited to features that are directly impacted as a result of addressing the specific need. See Section 113.1 for additional information about 4R Single Function project standards. **In no case shall safety, operations, pedestrian and/or bicycle conditions be degraded as a result of a SF project. Each feature constructed in a SF project must be built to the applicable standard for new construction.** The SF Standard does not apply to resurfacing projects.

ADA Program specific projects are technically not classified as Single Function but are classified as 4R projects with a very limited scope. While they are focused on a single overall objective, they have specific requirements that need to be met that often go beyond the intent of the Single Function category. For practical purposes, ADA Program specific projects can be considered similar to Single Function projects in that they do not need to address all elements across the roadway section and substandard roadway features are not addressed. ADA Program specific projects focus on the needed upgrades to meet applicable standards and any element that it affects as a result, such as signal hardware or associated drainage.

Section 311 Urban and Rural Expressway

Urban and rural highways can take several forms: freeways, expressways, arterials, collectors, and sometimes, local roads. Similar to urban and rural freeways, urban and rural expressways are a designation identified in the Oregon Highway Plan and mainly focus on vehicle mobility, although expressways may not have similar levels of access control as freeways. The following is from the Oregon Highway Plan:

> "Expressways are complete routes or segments of existing two-lane and multi-lane highways and planned multi-lane highways that provide for safe and efficient high speed and high-volume traffic movements. Their primary function is to provide for interurban travel and connections to ports and major recreation areas with minimal interruptions. A secondary function is to provide for long distance intra-urban travel in metropolitan areas. In urban areas, speeds are moderate to high. In rural areas, speeds are high."

Because expressways may consist of grade separated or at-grade intersections, the level of modal accommodation will vary. Speeds are often relatively high ranging from 45 to 70 mph depending on urban or rural environments.

Designing urban and rural expressway highway projects presents designers with a variety of challenges. Designers must balance the needs of autos, trucks, transit, bicyclists, and pedestrians, while considering highway function, speed, safety, alignment, channelization, right of way, environmental impacts, land use impacts, and roadside culture. Part 200, Section 208 through Section 222 addresses the design standards for design speed, horizontal alignment and superelevation, vertical curvature, grades, and stopping sight distance while cross sectional design criteria are addressed in this section and will discuss a variety of issues, concerns, and areas for consideration when designing urban and rural expressways for all project types.

One critical distinction when designing a project on an urban expressway is if the section has grade-separated intersections or if intersections are at-grade.

- If the expressway section has at-grade intersections, then the six urban contexts and their respective design criteria apply to determine appropriate design decisions and the Urban Design Concurrence document is used. (Section 204 through Section 209 and Section 310)
- If the expressway section has grade-separated intersections (interchanges), then design decisions are based on freeway and higher operating speed design criteria.

Expressways that fit into the six identified contexts are designed from the design criteria for the context the expressway section fits. ***While expressways in general are expected by OHP definition to provide greater vehicle mobility, expressways located in the Traditional Downtown/Central***

Business District, Urban Mix, or Residential Corridor contexts must balance vehicle mobility with pedestrian, bicycle and transit mobility as well as safety.

When the width computed for the lateral support of the surfacing material is a fractional width, round the lateral support width up to the nearest foot.

311.1 ODOT 1R Urban and Rural Expressway Resurfacing

The primary intent of a 1R project is to preserve the existing pavement before it deteriorates to a condition where extensive reconstruction would be necessary to rehabilitate the roadway section. Projects under the 1R category consist primarily of paving the existing roadway surface and generally deferring other improvements to future 4R, 3R, specific safety, or single function projects. When project programming and funding are being determined, the ODOT Practical Design Policy and design flexibility can be employed in deciding if a particular preservation project should be in the 1R category or if there is enough value being added to the highway system or corridor for the additional cost if the project is placed in the 3R category that would trigger additional improvements. Safety considerations outlined in the 1R guidance should also be part of the process in determining the appropriateness of a project being selected for 1R. ***The safety evaluation is a critical part of determining whether a project belongs in the 1R or 3R categories and is integral to the process. The 1R/3R Record of Decision form is used to aid the decision process to determine if a 1R project should be upgraded to a 3R project to provide immediate safety improvements.***

The ODOT 1R project standard will apply to Preservation projects that are limited to a single lift non-structural overlay or inlay. Many of the safety items that have traditionally been addressed in 3R projects can be more effectively dealt with in a statewide strategic program. For example, establishing a prioritized program for upgrading guardrail to current standards along a highway corridor instead of upgrading between specific project limits. A program of this nature has the ability to better utilize funding to target higher need locations for safety item improvements rather than only making safety item improvements based on paving projects. *However, the replacement of safety items such as guardrail, guardrail terminals, concrete barrier, impact attenuators, and signs may be included in the 1R project category when necessary if funding other than Preservation funds are used and the added work will not delay the scheduled bid date.* **Any safety features that are impacted by the proposed resurfacing must be adjusted or replaced by the 1R project. Existing safety features cannot be degraded to a level below the existing condition as a result of the paving project.**

311.2 Urban and Rural Expressway 1R Resurfacing Standards

These are projects that extend the pavement life of existing highways. **When paving alterations occur adjacent to an ADA ramp, the ADA ramp is required to be accessible. Reconstruct ADA ramps that are both adjacent to pavement alterations and listed as having a poor functional status in the ODOT ADA Ramp inventory.** Refer to Section 309 for more information. Other safety enhancements are not required to be included; however, *safety features may be added to 1R projects where other (non-preservation) funding is available.* ***Any existing safety features that are impacted by the proposed resurfacing must be adjusted or replaced, thus necessitating some work in addition to paving.*** **Since 1R projects will generally not address safety upgrades, pedestrian and/or bicycle enhancements, in no case shall safety, pedestrian and/or bicycle conditions be degraded.** *The safety feature is addressed based on system priorities in standalone projects or other STIP projects.* When scoping 1R projects, the safety feature databases are used to identify opportunities to add safety enhancements with other (non-preservation) funding. Subsequent subsections in 311.2 outline the ODOT Resurfacing 1R project standard. While the criteria primarily relates to the paving treatment and the ability to pave without degrading existing conditions, there may be corridors where analysis of the crash history indicates that a full 3R project is warranted. *Therefore, projects are screened for 1R eligibility from a safety perspective as well.*

311.2.1 Scoping Requirements

In order to ensure the intent of the program is met in addressing pavement and safety needs, adequate advance information is needed to assure adequate statewide decisions are made with consistency.

1. **1R/3R Record of Decision Form**
   - This form steps the scoping team through the scoping process. Parts of the form are filled out by different sections including Pavements, Traffic, and Roadway.
   - Use of this form provides a statewide uniform approach to determining the project design standard – 1R vs 3R – that will be applied to a pavement preservation project.
2. **Urban Design Concurrence Document (Draft)** – For Urban Expressway projects using context-based design under 45 mph.

   This document identifies the project context and is used by the scoping team to provide a concept design and provide documentation of decisions leading to that design. The Draft Urban Design Decision document is part of the final scoping package for project initiation.

3. **Urban Design Concurrence Memo** - or Urban Expressway projects using context-based design under 45 mph.

   There may be a small number of urban projects with scope too limited and outside the roadway that an Urban Design Concurrence document may not be necessary. Projects that could meet the criteria are ITS projects installing cable, a bridge screening project that does not impact the roadway or similar type projects. The primary focus of the work is outside the roadway and peripheral to it. For these types of projects, an Urban Design Concurrence Exemption Memo is required and, if granted, takes the place of the Urban Design Concurrence document on the DAP Checklist.

311.2.2 Project Initiation Requirements

1. At project initiation, the 1R/3R Record of Decision Form must be reviewed and approved to ensure the project will be developed under the appropriate design standard.
2. For urban expressway projects with at-grade intersections using context-based design and under 45 mph, the project development team reviews the Draft Urban Design Concurrence (UDC) document to understand the decisions made by the project scoping team and to verify the conditions, decisions and concept are still appropriate to meet project goals and outcomes. Existing conditions may have changed between scoping and project initiation. ***If changes are needed, the project development team modifies the Draft UDC to meet project goals and/or planning needs. The Draft UDC is further developed as project development continues and is reviewed again at each project milestone to ensure the final design meets the scoping expectations, goals, aspirations, and outcomes for the project.***
3. For urban expressway projects with at-grade intersections using context-based design and under 45 mph, if the scoping team determined an Urban Design Concurrence document isn't needed and obtains an Urban Design Concurrence Exemption Memo, the project development team reviews the project scope to determine the exemption memo is still appropriate for the project scope. **At any time during project development, if the scope of the project changes to include work impacting the roadway, the project development team is required to complete the Urban Design Concurrence document for submittal at the Design Acceptance phase.**

311.2.3 1R Project Requirements

1. A paving project is initially designated 1R based on the appropriate paving treatment – a single lift overlay or inlay. (There is no formal requirement for pavement design life for an individual project; however, since the 1R treatment is location specific, it is expected that an 8-year pavement life will be the goal of the program).

- Pavement Services is the final authority regarding the pavement design.

2. Where less than approximately 5 percent of a project (based on lane miles paved) includes more than a single lift non-structural overlay or inlay, the project may be designated 1R.
3. **Where up to approximately 25 percent of a project (based on lane miles paved) includes more than a single lift non-structural overlay, the project may be designated 1R; however, this requires the approval of a design exception.**
4. **Where more than approximately 25 percent of a project (based on lane miles paved) includes more than a single lift non-structural overlay, the project must be designated 3R.**
   - **As an exception to this is rule, a grind and inlay plus an overlay may also be considered for development under the 1R standard; however, this would be uncommon and requires the approval of a design exception.**
5. Where the appropriate course of action is not clear based on the percentages noted above, include Technical Services Roadway Engineering Unit staff in the discussion.
7. Chip seals are 1R projects and subject to the requirements of the 1R standard. Chip seal alone is not an alteration paving treatment however when multiple surface treatments are combined it may result in an alteration (see Section 309).

311.2.4 Unprotected and Unconnected Bridge Ends

On 1R paving projects, any bridge rail with unprotected ends or unconnected transitions exposed to traffic must be mitigated. Provide an end treatment meeting the current standard, or a design exception must be obtained. For possible funding options, contact the Senior Roadway / Roadside Design Engineer in the Technical Services Traffic-Roadway Section.

- Unprotected ends – Where the end of the bridge rail is exposed with no end treatment such as a transition to guardrail or a crash cushion.
- Unconnected transition – Where there is no crashworthy transition between the end of the bridge rail to the guardrail or other barrier.

311.2.5 Responsibilities

1. 1R/3R form filled out by Pavements staff, Region Roadway and Traffic Staff. There are approval signatures by the Pavements Engineer, Region Roadway Manager & Traffic Manager. It will be the Project Leaders role to coordinate. Form is housed in ProjectWise.
2. Final Urban Design Concurrence document is completed and approved by the Region Technical Center Manager, with concurrence from the Region Maintenance, Traffic and Roadway units. The final UDC is part of the Design Acceptance Package submittal. It is the Project Leaders role to ensure the final UDC is submitted.

311.3 ODOT 3R Urban Expressway Typical Section

As noted in Part 200, the 3R urban design guidance for urban expressways is generally the same as the 3R urban arterial design guidance found in Section 311 through Section 316 below. The urban expressway 3R guidance is slightly different than the rural expressway 3R guidance and is listed separately. ***Additionally, urban expressways with at-grade intersections meeting one of the six urban contexts described in Part 200 use design criteria from Section 205 through Section 211, as well as 305.7 and Section 307 in conjunction with Section 311. Urban expressways not considered in the six urban contexts use Tables in Section 311 for relevant design criteria. These expressways generally have posted speeds 45 mph or above.***

The intent of 3R projects is pavement preservation with additional focus on safety items. Some of those safety items include mandatory 3R design features such as curb ramps and deficient guardrail, consideration of low-cost safety mitigation measures, and in the case of urban expressways, the corrective measures located in the 3R urban preservation strategy and the consideration of additional urban design features. **Table 300-17 below provides the cross-section minimums for urban expressways not categorized as one of the six urban contexts outlined in Part 200.**

3R Urban Expressway projects are a good opportunity to provide incremental improvements towards long-range urban corridor goals. Work with region Active Transportation Liaisons to determine feasible options for alternative transportation users that can be included.

Table 300-17: ODOT 3R Urban Non-Freeway Design Standards for Roadways with Posted Speed 45 mph and Greater (Use also for Urban Expressways with Interchanges)

Highway Feature	Highway Average Daily Traffic (ADT)			
	< 750	750 - 2000	2001 - 4000	> 4000
Travel Lane [1] <10% Trucks [2] >10% Trucks [2]	 10′ 10′	 10′ 11′	 11′ 12′	 11′ 12′
Left Turn Lane [3]	12′	13′	13′	14′
Right Side Shoulder [4]	2′	3′	4′	6′
Left Side Clearance (Shy Distance) [5] posted speed 40-45 mph posted speed ≥ 45 mph	 1′ 2′	 1′ 2′	 1′ 2′	 1′ 2′
Curbside Sidewalk[5]	6′	6′	6′	6′
Cross Slope (crown) [6]	2%	2%	2%	2%
Maximum Superelevation [7] design speed ≤ 40 mph design speed ≥ 45 mph	 4% 6%	 4% 6%	 4% 6%	 4% 6%
Vertical Clearance	See Section 317			

[1] For the National Network - 23 CFR 658.9 – "The route consists of lanes designed to be a width of 12 feet or more or is otherwise consistent with highway safety." (see current Route Map 7) and a minimum 11-foot lane is required on all NHS Routes on State jurisdiction roadways only. Local Agencies may use AASHTO standards for lane width on Local Agency jurisdiction roads.

[2] Trucks are defined as heavy vehicles, single unit configuration or larger (six or more tires).

[3] Left turn lane width include 2-foot median separator.

[4] Where a right side shoulder is not used, a right side shy distance from curb or on-street parking is required. This shy distance is 2 feet for posted speeds up to 35 mph and 3 feet for 40 mph and above.

[5] Left side clearance (shy distance) required from the curb or on-street parking and is the only applicable to one way roadways. Curbside sidewalks are discouraged when design speed is greater than 45 mph.

[6] See Table 300-19 and Table 300-20 for improvement criteria and corrective measures.

[7] Numbers shown are for new design.

311.4 Mandatory 3R Urban Expressway Design Features

The following is a list (Table 300-18) of mandatory design features that must be incorporated into Preservation projects:

Table 300-18: Mandatory 3R Design Features

Deficiency	Mandatory Corrective Measure
ADA Ramps	• If absent, curb ramps, accessible entrances/exits to crosswalks, landings shall be added at intersections • Existing non-standard curb ramps shall be upgraded to current standards. • Refer to Part 800 for current standards and requirements
Narrow Bridges/Deficient Rails	Refer to the BDM
Guardrail	• Upgrade all guardrail and end terminals and transitions not meeting NCHRP Report 350 or MASH to the current standard. • Provide transitions at unconnected bridge ends. • Install protection at unprotected bridge ends. • Adjust MGS guardrail to 31 inches where the height to the top of the rail is 28 inches or less. Adjust 350 guardrail to at least 29 inches where the top of the rail is 28 inches or less. • Removal of guardrail and replacement with concrete barrier where minimum offsets are not met for bridge column protection.
Concrete Barrier	• Upgrade all concrete barrier not meeting NCHRP Report 350 or MASH to the current standard. • Pre-350 concrete barrier with earth support behind the barrier may remain in service. • All barrier in which the proposed finish grade exceeds the 3" vertical lip (reveal) of the barrier shall be replaced or reset.

311.5 Low-Cost Safety Mitigation Measures 3R Urban Expressway

Table 300-19 is a list of low-cost safety measures that should be considered on all projects utilizing ODOT 3R urban design standards and can be used as mitigation in justification for design exceptions.

Table 300-19: Low-Cost Safety Measures

Item	Low-Cost Safety Measure	
Narrow Lanes and/or Shoulders	- Pavement edge lines	- Raised pavement markers
Steep Side-slopes/Roadside Obstacles	- Remove or relocate obstacle - Roadside hazard markings - Round ditches	- Install guardrail - Slope flattening - Breakaway hardware
Narrow Bridges/Deficient Rails	- Install supplementary signing	- Hazard and pavement markings
Sharp Horizontal Curve	- Install supplementary signing - Correct superelevation - Gradual side-slopes	- Pavement anti-skid treatment - Obstacle removal or shielding - Install post delineators
Poor Sight Distance at Hill Crest	- Install supplementary signing - Fixed-hazard removal	- Driveway relocation - Illumination
Intersection	- Install supplementary signing - Signalization - Speed control (traffic calming, visual cues, etc.)	- Pavement anti-skid treatment - Illumination
Bicycle Access	- Restripe roadway to include a buffered bike lane - Signal timing changes to improve bicycle progression	
Pedestrian Access	- Vehicle speed control (traffic calming measures, visual cues, continental striping crosswalks) - Reduce crossing distance (striping or curb radius reduction options) - Improve visibility of pedestrian (Illumination, curb extensions)	

NOTE: Designers need to exercise engineering judgment based upon engineering principles and practices in selecting appropriate mitigation measures from the above list.

311.6 ODOT 3R Urban Preservation Strategy

The 3R Urban Preservation Strategy is a good place to utilize the ODOT Performance-based, Practical Design Policy and design flexibility. Urban areas are complex with many conflicting needs. An urban 4R project would attempt to rebuild and improve a roadway section on the whole. Whereas the intent of a 3R project is pavement preservation with improvements to selected design elements for safety and operations. *Improvements to some of those design elements may be required by regulation or mandate. Other design elements may or may not be improved at the discretion of the project team. It is these elements where Performance-Based Practical Design can be employed to aid in the determination of the amount of value added to the system or corridor by making the improvements on either a wholesale basis or as an incremental improvement.*

Due to the complexity and cost of urban preservation type projects, the Urban Preservation Strategy has developed a set of criteria for evaluating other design features for possible modifications or improvements. Table 300-20 contains the list of "Have To" and "Like To" corrective measures. **The corrective measures listed under the "Have To" column must be addressed on all urban 3R preservation projects.** *The corrective measures listed under the "Like To" column should be considered where economically feasible (i.e., minimal extra cost or funds available from sources other than Preservation funding).* **Design exceptions are required for each design feature not meeting the "Have To" corrective measures.**

Under some conditions, the "Like To" corrective measures are required as part of an Urban Preservation Project. These conditions include:

1. Pavement condition requiring reconstruction, or
2. Curb exposure less than 6 inches, or
3. Cross slope greater than 8 percent.

If any of these above conditions are met, design exceptions are required for not meeting the corrective measures from the "Like To" column of Table 300-20.

While Urban Preservation projects must meet the design standards and features described above or obtain a design exception, depending upon certain conditions, it is often desirable to provide additional improvements in urban environments. Table 300-21 shows other design features considered only if additional funding sources are available other than Preservation and where improvements are cost effective. This optional list is not a requirement for Urban Preservation projects and does not require design exceptions if these items are not included in a project.

Along with preservation paving, urban 3R projects provide opportunities to make improvements to facilities for other roadway users. When determining project scope on 3R urban project, perform evaluation and include feasible improvements to bicycle and pedestrian facilities within 3R guidelines. *Restriping after paving may provide a low-cost opportunity within a 3R project to provide buffered bicycle lanes where appropriate. Preservation paving projects can provide opportunities to make incremental improvements to facilities and should not be overlooked when striving to meet long term planning goals.* In some cases, additional funding from specific sources can be added to a 3R project to make greater improvements for vulnerable road users. ***The Urban Design Concurrence document is used on 3R urban projects to document project context and decisions to establish the final design. These 3R urban projects include 3R urban expressway projects with at-grade intersections.***

Table 300-20: Urban Preservation Design Features

Project Element	Corrective Measure		Technical Resource
	"Have To"	"Like To"	
Pavement Life	• 8 to 15 year minimum (unless life cycle benefit/cost justifies an alternative) for overlays, inlays or appropriate treatment.	• 15 year minimum life for reconstruction (may be triggered by cross slope, curb exposure or pavement condition).	Pavement Unit
Signal Loops	• Adjust or replace with non-invasive detection (e.g., radar detection) as necessary.		Traffic-Roadway Section
Striping	• Install pavement markings with materials selected according to Chapter 5 of the ODOT pavement Markings Design Guidelines.		Region Traffic
Signing	• Replace or add signs according to the ODOT Sign Design Manual.		Traffic-Roadway Section
Utilities (manholes, valves, vaults)	• Adjust.		Traffic-Roadway Section
Drainage	• Adjust as necessary to maintain basic system. • Address high priority fish culverts identified in Salmon program.	• Reroute bridge drains which drain directly into waterway. • Address lower priority fish culverts as required.	Fish Prog. Mgr. & Hydraulics Unit
Obstacles behind curbs	• Reconstruct curb to re-establish delineation and drainage function if grades & existing R/W permit. • Relocate to meet standards where practical.	• Meet required clear zone standards for obstacles behind curb. Relocate if necessary.	Traffic-Roadway Section

Table 300-20 (Continued): Urban Preservation Design Features

Project Element	Corrective Measure		Technical Resource
	"Have To"	"Like To"	
Roadside obstacles with demonstrated safety issues	• Remove or mitigate.		Traffic-Roadway Section
ADA Ramps	• Ramps shall be added where absent. • Upgrade or Replace Existing Sub-Standard Ramps to meet accessibility requirements	• Meet accessibility standards on sidewalks and driveways.	Traffic-Roadway Section
Vertical Clearances	• Maintain existing or minimum vertical clearances. See Section 317	• Meet required vertical clearance.	Bridge Section
Narrow Bridges/ Deficient Rails	• See BDM	• Widen bridge, where practical • Meet current standard for bridge rails and connections	Bridge Section
Guardrail	• Upgrade all guardrail and end terminals and transitions not meeting NCHRP Report 350 or MASH to the current standard. • Provide transitions at unconnected bridge ends. • Install protection at unprotected bridge ends. • Adjust MGS guardrail to 31 inches where the height to the top of the rail is 28 inches or less. Adjust 350 guardrail to at least 29 inches where the top of the rail is 28 inches or less. • Removal of guardrail and replacement with concrete barrier where minimum offsets are not met for bridge column protection.	• Meet required standard.	Traffic-Roadway Section

Table 300-20 (Continued): Urban Preservation Design Features

Project Element	Corrective Measure		Technical Resource
	"Have To"	"Like To"	
Concrete Barrier	• Upgrade all concrete barrier not meeting NCHRP Report 350 or MASH to the current standard. • Pre-350 concrete barrier with earth support behind the barrier may remain in service. • All barrier in which the proposed finish grade exceeds the 3" vertical lip (reveal) of the barrier shall be replaced or reset.		Traffic-Roadway Section
Curb Exposure	• 4-inch minimum curb exposure for delineation of roadway. Additional exposure may be required for drainage.	• Meet required standard.	Traffic-Roadway Section
Cross Slope	• Maintain existing where applicable. • Minimize cross slope to meet standards where practical. Maximum cross slope not to exceed 8%.	• Meet required standard for superelevation rates and cross slopes.	Traffic-Roadway Section

The following optional items should be considered, IF cost effective AND additional funding (other than Preservation funding) is available.

Table 300-21: Additional Urban Design Features

Project Element	Corrective Measure	Technical Resource
Drainage	• Upgrade systems.	Traffic-Roadway Section
Access Issues	• Driveway relocations/closures.	Region Access Mgr.
Operational Issues	• Modify curb radii to facilitate truck movement. (Where demonstrate need – broken curb, tracks on sidewalk, etc.) • Islands (replacing, adding or removing). • Install/upgrade traffic control devices.	Traffic-Roadway Section
Safety Issues	• SPIS site addressed. • Rumble strips, pavement markings, slope flattening, illumination, etc.	Transportation Safety & Traffic-Roadway Section
Pedestrian	• Sidewalk infill - If less than 10% missing in length of project. • CQCR identified issues along project length • Curb extensions, Modified curb radius • Illumination (with local agreements) • Work with Traffic Section to identify potential ARTS, HSIP or other options that could be included	Traffic-Roadway Section
Bicycle	• Incremental of permanent improvements as additional funding allows (buffered bike lanes, separated facilities, protected intersections) • Work with Traffic Section to identify potential ARTS, HSIP or other options that could be included	Traffic-Roadway Section

311.7 ODOT 3R Rural Expressway Typical Section

Rural OHP designated expressways can be of two types, those with grade-separated interchanges that often function similar to a freeway or interstate highway and those with at-grade intersections that function more like a rural arterial. As noted in Part 200, Section 214.1, the 3R rural design guidance for rural expressways is the same as the 3R rural arterial design guidance found in this section. The rural expressway 3R guidance is slightly different than the urban expressway 3R guidance and is listed separately. In general, the intent of 3R projects is pavement preservation with additional focus on safety items. Some of those safety items include mandatory 3R design features such as curb ramps and deficient guardrail as well as consideration of other low-cost safety mitigation measures.

311.8 ODOT 3R Rural Expressway Roadway Widths

3R projects on OHP designated rural expressways with grade-separated interchanges that resemble and function much like a freeway or interstate highway, use ODOT 3R freeway design criteria.

Table 300-22 below provides the cross-section minimums for projects on OHP designated rural 3R expressways with at-grade intersections that resemble and function like rural arterial highways. These minimum dimensions are acceptable on 3R projects where existing cross-section elements are less than standard widths. They are not to be used to reduce existing cross-section elements that already meet standard widths. Use of the minimum widths shown in Table 300-22 to reduce existing standard widths requires a design exception.

Table 300-22: Minimum 3R Lane and Shoulder Widths - Rural Expressways with At-grade intersections (Non-Freeway Rural Arterials)

Design Year Volume (ADT)	Average Running Speed	Lane Width	Shoulder Width
Less Than 750 Vehicles	All Speeds	10′	2′
750 to 2000 Vehicles	Under 50 mph	11′	2′
750 to 2000 Vehicles	50 mph or over	11′	3′
Over 2000 Vehicles	All Speeds	11′	4′

NOTE: A minimum 11-foot lane is required on all NHS Routes on ODOT jurisdiction roadways only. Local Agencies may use AASHTO standards for lane width on Local Agency jurisdiction roads.

311.9 Mandatory 3R Rural Expressway Design Features

Following is a list (Table 300-23) of mandatory design elements that must be incorporated with 3R expressway projects:

Table 300-23: Mandatory Design Features

Geometric Deficiency	Mandatory Corrective Measure
ADA Ramps	• If absent, curb ramps, accessible entrances/exits to crosswalks, landings shall be added at intersections • Existing non-standard curb ramps shall be upgraded to current standards • Refer to Part 800 for current standards and requirements
Narrow Bridges/Deficient Rails	See BDM
Guardrail	• Upgrade all guardrail and end terminals and transitions not meeting NCHRP Report 350 or MASH to the current standard. • Provide transitions at unconnected bridge ends. • Install protection at unprotected bridge ends. • Adjust MGS guardrail to 31 inches where the height to the top of the rail is 28 inches or less. Adjust 350 guardrail to at least 29 inches where the top of the rail is 28 inches or less. • Removal of guardrail and replacement with concrete barrier where minimum offsets are not met for bridge column protection.
Concrete Barrier	• Upgrade all concrete barrier not meeting NCHRP Report 350 or MASH to the current standard. • Pre-350 concrete barrier with earth support behind the barrier may remain in service. • All barrier in which the proposed finish grade exceeds the 3" vertical lip (reveal) of the barrier shall be replaced or reset.

311.10 Low-Cost Safety Mitigation Measures 3R Rural Expressway

Table 300-24 is a list of low-cost safety measures that should be considered on all 3R projects. They can also be used as mitigation in justification for design exceptions.

Table 300-24: Low-Cost Safety Measures

Design Element	Low-Cost Safety Measure	
Narrow Lanes and/or Shoulders	• Pavement edge lines • Raised pavement markers • Post delineators	• Rumble strips • Safety Edge
Steep Sideslopes/ Roadside Obstacles	• Roadside hazard markings • Round ditches • Install guardrail • Remove or relocate obstacle	• Slope flattening • Breakaway hardware • Rumble Strips
Narrow Bridges/ Deficient Rails	• Install supplementary signing	• Hazard and pavement markings
Sharp Horizontal Curve	• Install supplementary signing • Shoulder widening • Shoulder paving • Lane Widening • Correct superelevation • Gradual side slopes	• Pavement antiskid treatment • Obstacle removal or shielding • Raised Pavement Markers • Install post delineators • Rumble Strips
Poor Sight Distance at Hill Crest	• Install supplementary signing • Fixed-hazard removal • Shoulder widening	• Driveway relocation • Illumination
Intersections	• Install supplementary signing • Illumination	• Pavement antiskid treatment • Speed control
Bicycle Access - Work with Traffic Section to identify potential ARTS, HSIP or other options that could be included	• Restripe roadway to include a buffered bike lane • Signal timing changes to improve bicycle progression	
Pedestrian Access - Work with Traffic Section to identify potential ARTS, HSIP or other options that could be included	• Vehicle speed control (traffic calming measures, visual cues, continental striping crosswalks) • Reduce crossing distance (striping or curb radius reduction options) • Improve visibility of pedestrian (Illumination, curb extensions)	

311.11 ODOT 3R Urban and Rural Expressway Bridge Width

A decision must be made to retain, widen or replace any bridge within the limits of a 3R project. Widening versus replacement should be evaluated to determine the most cost-effective treatment. Consider the AASHTO Green Book standards for bridges to remain in place, and Table 300-25, whichever is less, for minimum width. Additionally, analysis of the crash history and the cost of widening is required when determining if widening is cost effective. ***If the decision is made to replace an existing structure, new construction standards will apply to the bridge replacement portion of the project only, not to the roadway portion. Replacing structures does not change the remainder of a 3R Project to 4R.***

When a decision is made to retain a bridge, evaluate the bridge rail to determine if it can adequately contain and redirect vehicles without snagging, penetrating or vaulting. **Upgrade structurally inadequate or functionally obsolete bridge rail.** ***Consideration may be given to design standard exceptions for railing upgrades, roadway widths, etc., when the structure is listed in or determined eligible for the National Register of Historic Places.*** Discuss eligibility of historic determination with the State Historic Preservation Office (SHPO). **A design exception may be required based on final determination. Evaluate the bridge rail design for pedestrian needs and provide a design that accommodates pedestrians as necessary. If the clear roadway width on the structure is less than the approach roadway width, install appropriate traffic control devices.** *Refer to the ODOT Bridge Design Manual and the ODOT Bridge Section for additional information when determining bridge decisions on roadway projects.*

Table 300-25: Minimum Useable Bridge Widths

Volume (ADT)	Useable Bridge Width
0 – 750	Width of approach lanes
751 – 2000	Width of approach lanes, plus 2 feet
2001 – 4000	Width of approach lanes, plus 4 feet
Over 4000	Width of approach lanes, plus 6 feet

311.12 ODOT 4R Urban and Rural Expressway Lane Width

As discussed in previous sections, urban expressways have two design categories, those with grade-separated interchanges and those with at-grade intersections. **Urban expressway projects with at-grade intersections and a posted speed less than 45 mph utilize the urban context design criteria.** Since a fundamental element of an expressway designation is a high level of mobility, most expressways, including many urban expressways, have posted speeds at or above 45 mph. As such lane widths should be held to a higher operating standard. **All travel lane widths shall be 12 feet on all urban and rural expressways with speeds of 45 mph and above. Where right turn lanes are provided at intersections, they shall be in conformance with Figure 500-18 Right Turn Channelization. Left turn lanes shall include a 12-foot lane with a 4-foot traffic separator. The traffic separator shall be a minimum of 2 feet.** For major intersections, dual left turn lanes may be required. In these instances, the design should follow the recommendations in Part 500. *If the traffic separator is a raised curb, a 4-foot shy distance should be provided between the through travel lanes and the curb*.

Rural expressways are very similar to freeways as they offer a high level of mobility and safety. In addition, expressways may become freeways in the future as the roadway is upgraded to meet the needs of traffic demand.

311.13 ODOT 4R Urban Expressway Shoulders

Expressways must include an adequate shoulder for emergency parking, disabled vehicles, and emergency response vehicles. The shoulder also provides significant safety benefits to motorists and bicyclists, as well as improves traffic flow and capacity. In addition, a shoulder provides space for necessary maintenance and construction activities. **A minimum 8-foot right side shoulder shall be used for design speeds of 45 mph or greater where no roadside barriers are used.** This width of shoulder is necessary to help distinguish expressways as a higher order of roadway facility that should ultimately move towards being an access controlled facility and provide an area for disabled vehicles and emergencies. **The left side shoulder for four lane urban expressways with median barrier shall be 4' to the face of barrier and 8' to the face of barrier for six lane urban expressways.**

Where roadside barriers are used such as guardrail, concrete barrier, or bridge rail, the right-side shoulder should include an additional 2-foot shy distance from the shoulder to face of barrier.

Expressways can be physical barriers to well-connected bicycle route systems. As a result, when expressways run through urban areas, bicycles may need to use the expressway route as a connection to a destination if other routes are too far away. **On higher speed expressways that**

resemble freeways, a separated facility or a viable parallel street are options to accommodate bicyclists. ***If there is not an acceptable parallel street system available, a separated bicycle facility should be included with expressways.*** *Bike lanes adjacent to travel lanes are not appropriate on higher speed expressways due to large differentials in anticipated speed between motor vehicles and bicycles.* In addition, when a shoulder is designated as a bike lane, it cannot serve disabled vehicles or other activities appropriate for shoulder use. A separated path that serves the same destinations as the expressway should be provided. Providing enough width is allocated, a two-way path is appropriate for an expressway because access is restricted thereby reducing conflicts with cross traffic or access.

Design for bicycle accommodation along expressways can be challenging. However, ORS 366.514 requires that ODOT, cities and counties provide walkways and/or bikeways wherever a highway, road or street is being constructed, reconstructed, or relocated. They are not required if:

1. Sparsity of population or other factors indicate an absence of any need;
2. Costs are excessively disproportionate to need or probable use; or
3. Where public safety is compromised.

In most situations, the shoulder of a lower speed urban expressway with at-grade street connections can accommodate bicycle traffic if no other option is available. However, bicycle traffic is better accommodated on a separated facility or a multi-use path that also provides pedestrian access. Right turn channelization located with at-grade intersections on expressways can pose challenges for through bicyclists. How to best accommodate bicycle traffic along expressways should be handled on a case-by-case basis and will depend on balancing the needs and expectations of the various users of the roadway. For more information on multi-use paths and other bicycle accommodation methods, refer to Part 900 and the Oregon Bicycle and Pedestrian Guide.

311.14 4R Urban Expressway Medians

Expressways must include a median treatment. Generally, the preferred design is to use a non-traversable type of median. **Non-traversable medians are required on all new, multi-lane urban or rural expressways on new alignment.** *All other existing urban expressways should consider construction of a non-traversable median when projects are developed along these highways.*

Modernization of all rural, multi-lane Expressways, including Statewide (NHS), Regional and District level roadways require non-traversable medians.

For access management purposes, the preferred median type for urban expressways is a raised curb median. ***When mitigation for lane departure or median cross-over crashes is a design condition, then a barrier type non-traversable median should be installed.*** **If an urban expressway is also**

a freeway and the width between opposing travel lanes is 100 feet or less, then a barrier type non-traversable median must be installed. Guidance for Freeway Median Barrier Warrant and the closing of freeway medians can be found in Part 400.

At single left turn lane locations with a raised curb median, the raised portion should be a minimum of 12 feet wide (curb face to curb face) with two 4-foot left side (inside) shoulders (one for each direction of travel). This provides an overall travel lane to travel lane width of 20 feet. Consideration of double left turn lanes may be needed for high volume expressways with appropriate intersection spacing. With 4 foot inside shoulders, the overall median width for double left turn lanes would be 32 feet travel lane to travel lane.

Figure 300-20: Expressway Median Widths and Dual Left Turn Lanes

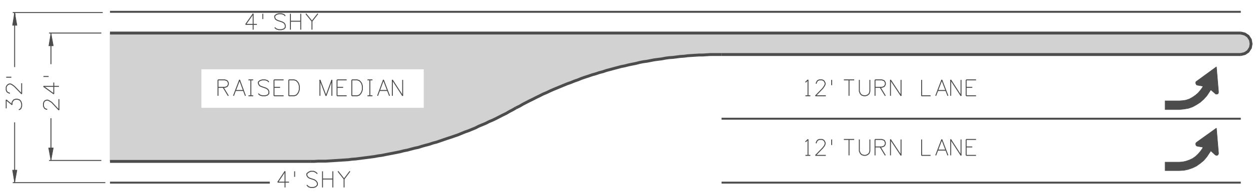
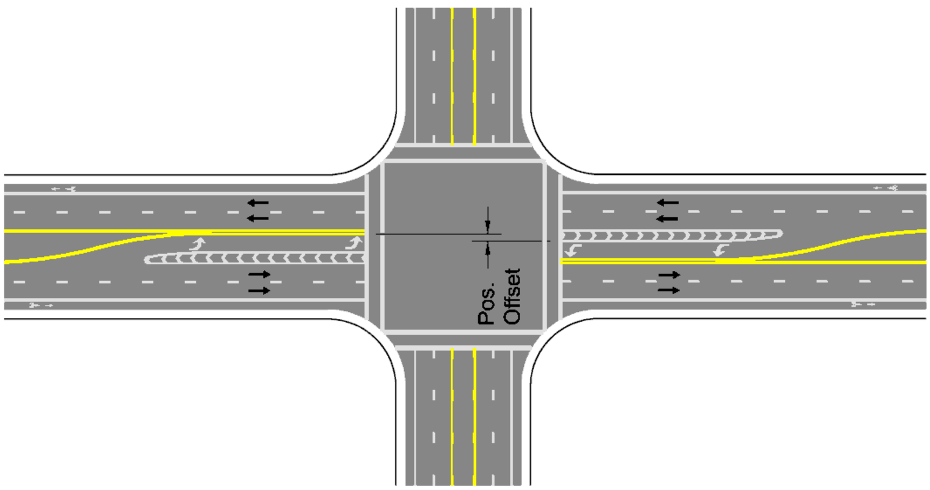


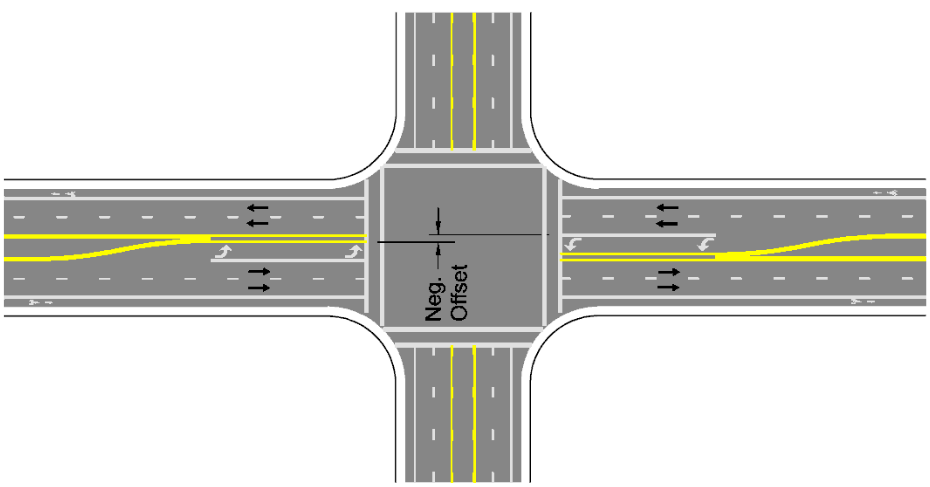
Figure 300-20 shows the different element widths for a double left turn. Even where only single left turn lanes are needed, the 32-foot width allows for future widening and also provides a positive off-set to oncoming traffic. To make a safe left turn, sight distance is important to a driver in order to see and identify an acceptable gap in oncoming traffic. *A positive offset from the opposing left turn lane can increase sight distance for a left turning driver and is most applicable at signalized intersections operating as permissive or permissive/protected left turn movements.* Depending on traffic volumes and queuing, a positive offset may aid left turning drivers at some unsignalized intersections as well. *Negative offset can be a greater hindrance to left turning drivers as their line of site may be blocked by vehicles waiting to turn left from the opposing left turn lane.* Positive offset is preferred at most intersections with left turns to improve sight lines and minimize potential for crashes. This is particularly critical on high-speed roadways where impact velocities create greater potential for serious injury and fatal crashes. *(See Figure 300-21 for more information on opposing left turn movements and positive/negative offsets).*

Since expressways are, from a functional classification perspective, a higher order facility, the left side shoulder should be held to a higher standard than the normal shy distance for other urban arterials. Where extensive right of way is available, a depressed median could be used. However, depressed medians will generally not be an option within urban environments. Both the raised curb and depressed median options should be considered first as they offer the greatest design flexibility. *In areas with right of way restrictions, a concrete barrier should be considered. The concrete barrier is 2 feet wide at the base and requires a 4-foot left side shoulder. Concrete barriers should be avoided in areas where pedestrian crossings or at-grade median openings may be expected.* Openings in concrete barriers present many design challenges including reduced sight distance and the need for impact attenuators, although attenuators are designed for safer impact when protecting a blunt end, it is another object that could potentially be hit causing vehicle damage and increased maintenance cost. **Wherever a raised median or concrete barrier is being considered for installation where it did not exist previously, considerations of access management criteria and freight mobility must be followed.** On expressways with a design speed equal to or less than 45 mph, a minimum 10-foot painted median could be used. Since painted medians are less desirable on expressways, raised median or concrete barrier is encouraged. Additional information about median design can be found in Section 308 Median Design.

Figure 300-21: Positive and Negative Offset



POSITIVE OFFSET BETWEEN LEFT-TURN LANES



NEGATIVE OFFSET BETWEEN LEFT-TURN LANES

311.15 ODOT 4R Urban Expressways and Pedestrians

Design for and accommodation of pedestrians along expressways is accomplished on a case by case basis. On those expressways that look and function closer to a freeway, pedestrians generally are not accommodated adjacent to the roadway. These are high speed, limited access facilities focused on vehicle mobility and for these types of expressways, pedestrian movements are better accommodated on parallel local roads and streets, if there is an appropriate parallel street system available. In some instances, a separate multi-use path may be constructed along expressways as the appropriate alternative. ***Where multi-use paths are used, a minimum width of 10 feet is recommended.*** **Where a multi-use path is parallel and adjacent to an expressway, a 5 foot or greater width separating the path from the edge of roadway is required.** See Part 900 for more information on bicycle facility design.

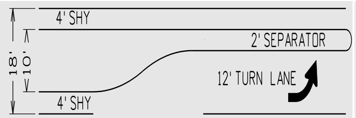
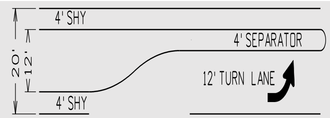
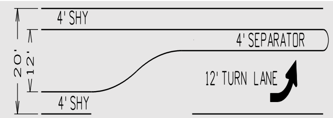
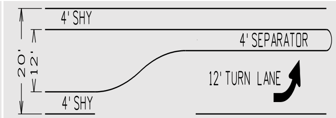
On some lower speed expressways, or along expressways in highly urbanized areas, pedestrians may be accommodated adjacent to the roadway. The preferred method is a sidewalk and buffer strip. The buffer strip should be at least 8 feet wide but may be as low as 4 feet under constrained conditions. Sidewalks separated by a buffer strip should be at least 6 feet wide, with wider sidewalk design encouraged. Curbside sidewalks should be avoided along expressways. Part 800 for pedestrian design and Part 900 for bicycle design and the Oregon Bicycle and Pedestrian Plan provide additional guidance to the design of bicycle and pedestrian facilities in these areas. Consult with the ODOT bicycle and pedestrian Design Engineer for specifics of design for pedestrians in urban expressway locations.

Pedestrian crossings should be located at signalized intersections or with grade-separation in order to provide safer crossing opportunities and to maintain the intended function of the expressway. Expressways, by OHP definition, are generally designed for vehicle mobility rather than access. Pedestrian activated crossings at uncontrolled locations are not appropriate on higher speed urban expressways and require special approvals for installation. Generally, the breakpoint between higher speed and lower speed expressways is considered to be 40 – 45 mph.

311.16 ODOT 4R Urban Expressway Typical Section

As established previously in Part 200 and in Part 300, Section 311, urban expressways can be categorized in two ways for design criteria purposes – those with interchanges and those with at-grade intersections. Most expressways, including many urban expressways, have posted speeds of 45 mph or greater. For urban expressways with at-grade intersections that fit with one of the urban contexts defined in Part 200 and have a posted speed less than 45 mph, use design criteria from Section 205 through Section 211 as well as 305.7 and Section 307. Table 300-26 provides 4R design guidance for urban expressway cross sectional elements for urban

Table 300-26: ODOT 4R/New Urban Standards – Expressways (Posted 45 mph or greater)

Design Elements	Design Speed			
	45 mph [1]	50 mph	55 mph	60 - 70 mph
Travel Lane	12′	12′	12′	12′
Right Turn Lane	12′ plus shoulder [2]	12′ plus shoulder [2]	12′ plus shoulder [2]	12′ plus shoulder [2]
Left Turn Lane				
Right Side Shoulder	8′	8′	8′	8′
Striped Median Raised Curb Median[3] Conc. Barrier Median	10′ 18′ Travel lane to travel lane 10′ (4 lane) 18′ (6 lane)	10′ 20′ Travel lane to travel lane 10′ (4 lane) 18′ (6 lane)	10′ 20′ Travel lane to travel lane 10′ (4 lane) 18′ (6 lane)	10′ 20′ Travel lane to travel lane 10′ (4 lane) 18′ (6 lane)
Continuous Left Turn Lane	N/A [4]	N/A [4]	N/A [4]	N/A [4]
Max. Superelevation [5]	6%	6%	6%	See Table 200-10
Max. Degree of Curvature	8°	6°45′	5°15′	See Table 200-10
Maximum Grade	6%	6%	5%	5%
Bicycle Facility	Undesignated – Shoulder Designated - Separated Path or Parallel Streets			
Curbside Sidewalk	8′	Undesirable [6]	Undesirable [6]	Undesirable [6]
Separated Sidewalk	6′ [7]	6′ [7]	6′ [7]	6′ [7]
On-street Parking	N/A [8]	N/A [8]	N/A [8]	N/A [8]
Vertical Clearance	See Section 317			

[1] The 45 mph design speed should generally only apply to retrofit situations.

[2] Shoulder on curbed and uncurbed sections shall be 3 feet and 4 feet respectively. For right turn lane design on Expressways with at-grade intersections, follow Figure 500-18 in Part 500.

[3] Minimum raised curb median. Consideration of 6′ raised traffic separator for pedestrian crossing may increase median width.

[4] Continuous turn lanes are not allowed on expressways with interchanges.

[5] Superelevation at intersections may need modification; see Part 500, Section 506 and Part 200, Section 218.

[6] Curbside sidewalks are discouraged when design speed is greater than 45 mph.

[7] Pedestrians are not normally accommodated adjacent to expressways. Where separated sidewalks are used, a minimum 8 foot buffer strip should be provided.

[8] On-street parking is not allowed on expressways.

311.17 ODOT 4R Rural Expressway Shoulders

Rural expressways must have an adequate shoulder for emergency parking, disabled vehicles, and emergency response vehicles. The shoulder also provides significant safety benefits to motorists and bicyclists, as well as improving traffic flow and capacity. *Rural expressways will typically have an 8-foot right hand shoulder for most design speeds on 4 lane facilities.* **The left side shoulder for four lane separated rural expressways shall be 4 feet. Separated rural expressways with more than two lanes in each direction shall have a 6-foot left side shoulder for a design speed of 50mph and 8 feet for 60 or 70 mph design speeds**. **For four lane rural expressways with median barrier, the left shoulder shall be 4′ to the face of barrier. For six lane rural expressways with median barrier, the left shoulder shall be 8′ to the face of barrier for a 50 mph design speed and 10′ to the face of barrier for a 60 mph or greater design speed.**

In addition to the standard shoulder width, where roadside barriers are used (guardrail, concrete barrier, or bridge rail), the right-side shoulder shall include an additional 2-foot "E" or shy distance from the face of barrier. On rural four lane expressways, left side shy distance is not required.

In most situations the shoulder can also accommodate bicycle traffic. In some situations, a shared-use path may better accommodate bicycle traffic. On access-controlled facilities, a separated path for shared bicycle and pedestrian use is optimal. Refer to Part 900, Section 971 and the Oregon Bicycle and Pedestrian Design Guide for additional information on multi-use paths.

311.18 4R Rural Expressway Medians

Note: The addition of any median treatment that changes or restricts the existing roadway cross-section will need to be investigated for freight mobility issues and comply with ORS 366.215, Creation of state highways; reduction of vehicle-carrying capacity. For guidance in complying with ORS 366.215, see ODOT guidance document Guidelines for Implementation of ORS 366.215, No Reduction of Vehicle-Carrying Capacity and the ODOT Highway Mobility Operations Manual.

Rural multi-lane expressways shall include some type of median treatment. This median could be a variety of types, such as depressed median, raised curb, or concrete barrier. For more information regarding types of median treatments refer to Section 308. The median should be a non-traversable type; however, in some situations a painted median is acceptable as in the case of at-grade intersections. **The 1999 Oregon Highway Plan requires the construction of a non-traversable median for:**

1. All new multi-lane highways constructed on completely new alignment; and
2. Modernization of all rural, multi-lane expressways, including Statewide (NHS), Regional, and District.

In rural developed areas such as rural communities and centers where left turn movements are necessary and would be allowed, the preferred median type is a 12-foot wide raised curb median (curb to curb). This would also require two 4 foot inside shoulders for an overall median width of 20 feet (travel lane to travel lane). Consideration of double left turn lanes on at-grade intersections on expressways should be given, resulting in a 24 foot raised island. The required two 4 foot inside shoulders would result in an overall median width of 32 feet (travel lane to travel lane).

For multi-lane expressways in most rural environments, a depressed median similar to freeways is the preferred median treatment. The depressed median allows flexibility on running independent grades, while providing a larger separation between travel directions. This type of median treatment should generally be used on rural multi-lane expressways, particularly where right of way is available. A 76 foot or wider (travel lane to travel lane) median is desirable for depressed medians on rural expressways. However, narrower medians could still be considered if adequate separation, proper side slopes, and drainage can be accommodated. Typically, a median width of at least 46 feet is necessary to provide the necessary design features. *Where the width is 60 feet or less, the median should be closed with concrete barrier or cable barrier to prevent crossover crashes. However, on expressways with at-grade intersections and driveway accesses, fully closing the median to reduce cross-over crashes should be balanced with the needs of local access.* As mentioned above, raised curb is generally only appropriate near rural development centers.

The median width necessary for a concrete barrier is shown in Table 300-26. The minimum median width for a four-lane facility is 10 feet (2-foot barrier and 4-foot shoulders). On six lane facilities, an additional 2-foot shy distance on each side of the barrier is required to

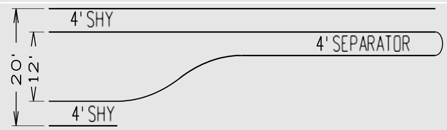
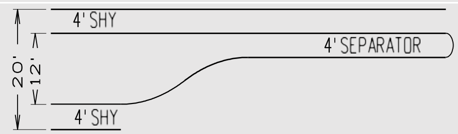
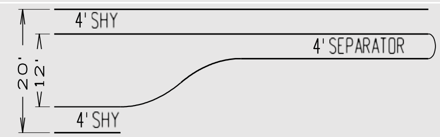
account for the increased probability that the shoulder will be used for emergency parking. Wherever concrete median barrier is used, carefully consider appropriate end treatments. These could include attenuators, or transitions to other median types such as depressed or raised curb.

Not all expressways, particularly rural sections, will be multi-lane facilities. **On two lane rural expressways, a controlled median is not required.** A non-traversable median on a two lane expressway should generally be discouraged except at critical locations such as interchanges, access points, or at-grade intersections median treatments may be used as appropriate for access control.

Where a painted traversable median is acceptable in rural areas, the median width shall be a minimum of 14 feet for design speeds of 50 to 55 mph and 16 feet for a design speed of 60 mph or greater. *Use of a 14-foot and 16-foot median should be in conjunction with access control measures to ensure that the median is not used as a continuous turn lane. The use of continuous two way left turn lanes (CTWLTL) on rural expressways is discouraged and should only be considered if other alternatives are not feasible.* **Left turn channelization may be provided at intersections only**.

311.19 ODOT 4R Rural Expressway Typical Section

Table 300-27 ODOT 4R/New Expressway Standards - Rural Expressway

Design Elements	Design Speed		
	50 mph	60 mph	70 mph
Terrain	Mountainous	Rolling/Flat	Flat
Travel Lane	12′	12′	12′
Right Turn Lane	12′ plus shoulder[1]	12′ plus shoulder[1]	12′ plus shoulder[1]
Left Turn Lane			
Right Side Shoulder	8′ (4 lane) 10′ (6 lane)	8′ (4 lane) 10′ (6 lane)	8′ (4 lane) 10′ (6 lane)
Left Side Shoulder	4′ (4 lane) 6′ (6 lane)	4′ (4 lane) 8′ (6 lane)	4′ (4 lane) 8′ (6 lane)
Striped Median Raised Curb Median[2] Concrete Barrier Median	14′ Minimum 20′ Travel Lane to Travel Lane 10′ (4 lane) 18′ (6 lane)	16′ Minimum 20′ Travel Lane to Travel Tane 10′ (4 lane) 22′ (6 lane, includes 2′ shy)	16′ Minimum 20′ Travel Lane to Travel Lane 10′ (4 lane) 22′ (6 lane, includes 2′ shy)
Continuous Left Turn Lane	N/A[3]	N/A[3]	N/A[3]
Maximum Superelevation[4]	See Table 200-10	See Table 200-10	See Table 200-10
Maximum Degree of Curvature	8° 00′	5° 00′	3° 15′
Maximum Grade	6%	4%	3%
On-street Parking	N/A[5]	N/A[5]	N/A[5]
Vertical Clearance	See Section 317		

[1] The minimum shoulder on curbed and uncurbed sections is 3 feet and 4 feet respectively; 5 feet is required on curbed sections where no through bike lane is provided.

[2] Minimum raised curb median. Consideration of 6’ raised traffic separator for pedestrian crossing may increase median width.

[3] Continuous turn lanes are not allowed on expressways.

[4] Superelevation at intersections may need modification, see Part 500 Superelevation rate used from Standard Superelevation Table 200-10, which is based on open road conditions.

[5] On-street parking is not allowed on expressways.

311.20 ODOT 4R Single Function (SF) Urban and Rural Expressway Standards

The specific design standards used for a Single Function Standard project will generally be the same design standards used for a 4R/New Construction project. *The difference is the scope of work is very limited on SF projects,* so *the SF Standard does not require addressing non-related non-standard features of the roadway.* For example, if a guardrail upgrade qualifies as a Single Function project, it will not be necessary to address other non-standard features on the roadway, such as lane and shoulder width, horizontal and vertical alignment, etc.

311.20.1 Application of 4R Single Function (SF) Project Standards

Single Function projects include projects that are within the right of way but do not permanently impact the travel lanes or shoulders of the highway. Generally, projects that only include work outside the edge of pavement will qualify for the SF standard. The SF standard can also be applied to certain maintenance projects such as re-striping projects as long as the final configuration of the travel lanes and shoulders would not be changed in any way. These projects address a specific need. The scope of work is limited to features that are directly impacted as a result of addressing the specific need. See Section 113.1 for additional information about 4R Single Function project standards. **In no case shall safety, operations, pedestrian and/or bicycle conditions be degraded as a result of a SF project. Each feature constructed in a SF project must be built to the applicable standard for new construction.** The SF Standard does not apply to resurfacing projects.

ADA Program specific projects are technically not classified as Single Function but are classified as 4R projects with a very limited scope. While they are focused on a single overall objective, they have specific requirements that need to be met that often go beyond the intent of the Single Function category. For practical purposes, ADA Program specific projects can be considered similar to Single Function projects in that they do not need to address all elements across the roadway section and substandard roadway features are not addressed. ADA Program specific projects focus on the needed upgrades to meet applicable standards and any element that it affects as a result , such as signal hardware or adjacent driveways.

Section 312 Rural Arterials/Collectors/Local Routes

This section provides 1R, 3R, 4R, and 4R Single Function (SF) typical section and design guidance for rural arterials, collectors, and local routes. As outlined in Part 200, arterials, make up a large percentage of the state highway mileage and cover a wide range of geographical and topographical conditions. As Part 200 provided the geometric requirements such as vertical and horizontal curvature, vertical clearance, sight distance, and grades, this section focuses on the cross section elements such as; lane width, shoulder width, cross slope, vertical clearance, roadside design, clear zone, median design, and other cross sectional features for rural arterials, collectors, and local routes. ***When the width computed for the lateral support of the surfacing material is a fractional width, round the lateral support width up to the nearest foot.***

312.1 ODOT 1R Rural (Non-Freeway) Arterial, Collector, and Local Route Design Standards

The primary intent of a 1R project is to preserve the existing pavement before it deteriorates to a condition where extensive reconstruction would be necessary to rehabilitate the roadway section. Projects under the 1R category consist primarily of paving the existing roadway surface and generally deferring other improvements to future 4R, 3R, specific safety, or single function projects. When project programming and funding are being determined, the ODOT Practical Design Policy and design flexibility can be employed in deciding if a particular preservation project should be in the 1R category or if there is enough value being added to the highway system or corridor for the additional cost if the project is placed in the 3R category that would trigger additional improvements. Safety considerations outlined in the 1R guidance should also be part of the process in determining the appropriateness of a project being selected for 1R. ***The safety evaluation is a critical part of determining whether a project belongs in the 1R or 3R categories and is integral to the process. The 1R/3R Record of Decision form is used to aid the decision process to determine if a 1R project should be upgraded to a 3R project to provide immediate safety improvements.***

The ODOT 1R project standard will apply to Preservation projects that are limited to a single lift non-structural overlay or inlay. Many of the safety items that have traditionally been addressed in 3R projects can be more effectively dealt with in a statewide strategic program. For example, establishing a prioritized program for upgrading guardrail to current standards along a highway corridor instead of upgrading between specific project limits. A program of this nature has the ability to better utilize funding to target higher need locations for safety item improvements rather than only making safety item improvements based on paving projects. *However, the replacement of safety items such as guardrail, guardrail terminals, concrete barrier, impact attenuators, and signs may be included in the 1R project category when necessary if funding other than Preservation funds are used and the added work will not delay the scheduled bid date.* **Any safety features that are impacted by the proposed resurfacing must be adjusted or replaced by the 1R project. Existing safety features cannot be degraded to a level below the existing condition as a result of the paving project.**

312.2 Resurfacing (1R) Project Standards

These are projects that extend the pavement life of existing highways. **When paving alterations occur adjacent to an ADA ramp, the ADA ramp is required to be accessible. Reconstruct ADA ramps that are both adjacent to pavement alterations and listed as having a poor functional status in the ODOT ADA Ramp inventory.** Refer to Section 309 for more information. Other safety enhancements are not required to be included; however, *safety features may be added to 1R projects where other (non-preservation) funding is available.* ***Any existing safety features that are impacted by the proposed resurfacing must be adjusted or replaced, thus necessitating some work in addition to paving.*** **Since 1R projects will generally not address safety upgrades, pedestrian and/or bicycle enhancements, in no case shall safety, pedestrian and/or bicycle conditions be degraded.** *The safety feature is addressed based on system priorities in standalone projects or other STIP projects.* When scoping 1R projects, the safety feature databases are used to identify opportunities to add safety enhancements with other (non-preservation) funding. Subsequent subsections in 312.2 outline the ODOT Resurfacing 1R project standard. While the criteria primarily relates to the paving treatment and the ability to pave without degrading existing conditions, there may be corridors where analysis of the crash history indicates that a full 3R project is warranted. *Therefore, projects are screened for 1R eligibility from a safety perspective as well.*

312.2.1 Scoping Requirements

In order to ensure the intent of the program is met in addressing pavement and safety needs, adequate advance information is needed to assure adequate statewide decisions are made with consistency.

1. 1R/3R Record of Decision Form

- This form steps the scoping team through the scoping process. Parts of the form are filled out by different sections including Pavements, Traffic, and Roadway.
- Use of this form provides a statewide uniform approach to determining the project design standard – 1R vs 3R – that will be applied to a pavement preservation project.

312.2.2 Project Initiation Requirements

At project initiation, the 1R/3R Record of Decision Form must be reviewed and approved to ensure the project will be developed under the appropriate design standard.

312.2.3 1R Project Requirements

1. ***A paving project is initially designated 1R based on the appropriate paving treatment – a single lift overlay or inlay.*** (There is no formal requirement for pavement design life for an individual project; however, since the 1R treatment is location specific, it is expected that an 8-year pavement life will be the goal of the program).

   Pavement Services is the final authority regarding the pavement design.

2. ***Where less than approximately 5 percent of a project (based on lane miles paved) includes more than a single lift non-structural overlay or inlay, the project may be designated 1R.***

3. **Where up to approximately 25 percent of a project (based on lane miles paved) includes more than a single lift non-structural overlay, the project may be designated 1R; however, this requires the approval of a design exception.**

4. **Where more than approximately 25 percent of a project (based on lane miles paved) includes more than a single lift non-structural overlay, the project must be designated 3R.**

   As an exception to this is rule, a grind and inlay plus an overlay may also be considered for development under the 1R standard; however, this would be uncommon and requires the approval of a design exception.

5. ***Where the appropriate course of action is not clear based on the percentages noted above, include Technical Services Roadway*** *Engineering Unit* ***staff in the discussion.***

6. Chip seals are 1R projects and subject to the requirements of the 1R standard. Chip seal alone is not an alteration paving treatment however when multiple surface treatments are combined it may result in an alteration (see Section 309).

312.2.4 Unprotected and Unconnected Bridge Ends

On 1R paving projects, any bridge rail with unprotected ends or unconnected transitions exposed to traffic must be mitigated. Provide an end treatment meeting the current standard, or a design exception must be obtained. For possible funding options, contact the Senior Roadway / Roadside Design Engineer in the Technical Services Traffic-Roadway Section.

- Unprotected ends – Where the end of the bridge rail is exposed with no end treatment such as a transition to guardrail or a crash cushion.
- Unconnected transition – Where there is no crashworthy transition between the end of the bridge rail to the guardrail or other barrier.

312.2.5 Responsibilities

1R/3R form filled out by Pavements staff, Region Roadway and Traffic Staff. There are approval signatures by the Pavements Engineer, Region Roadway Manager & Traffic Manger. It will be the Project Leaders role to coordinate. Form is housed in ProjectWise.

312.3 ODOT 3R Rural Arterials, Collectors, and Local Routes Typical Section

This section discusses the appropriate 3R design standards for rural non-freeway highway projects and is applicable to arterials, collectors, and local streets. In general, the intent of 3R projects is pavement preservation with additional focus on safety items. Some of those safety items include mandatory 3R design features such as curb ramps and deficient guardrail, as well as consideration of low-cost safety mitigation measures. Table 300-28 below provides the cross-section minimums for rural arterials. Table 300-29 provides the mandatory 3R design features and Table 300-31 provides the low-cost safety mitigation measures.

312.4 ODOT 3R Rural Arterial, Collector, and Local Route Roadway Widths

See Table 300-28 for minimum 3R roadway widths.

Table 300-28: Minimum 3R Lane and Shoulder Widths Rural Non-Freeway (Arterials, Collectors, Local Streets)

Design Year Volume (ADT)	Average Running Speed	Lane Width	Shoulder Width
Less Than 750 Vehicles	All Speeds	10′	2′
750 to 2000 Vehicles	Under 50 mph	11′	2′
	50 mph or over	11′	3′
Over 2000 Vehicles	All Speeds	11′	4′

NOTE: A minimum 11-foot lane is required on all NHS Routes on ODOT jurisdiction roadways only. Local Agencies may use AASHTO standards for lane width on Local Agency jurisdiction roads.

312.5 Mandatory 3R Rural Arterial, Collector, and Local Route Design Features

Following is a list of mandatory design elements that must be incorporated with 3R projects:

Table 300-29: Mandatory Design Features 3R Rural Arterial, Collector Local Routes

Geometric Deficiency	Mandatory Corrective Measure
ADA Ramps	• If absent, curb ramps, accessible entrances/exits to crosswalks, landings shall be added at intersections • Existing non-standard curb ramps shall be upgraded to current standards • Refer to Part 800 for current standards and requirements
Narrow Bridges/Deficient Rails	• See BDM.
Guardrail	• Upgrade all guardrail and end terminals and transitions not meeting NCHRP Report 350 or MASH to the current standard. • Provide transitions at unconnected bridge ends. • Install protection at unprotected bridge ends. • Adjust MGS guardrail to 31 inches where the height to the top of the rail is 28 inches or less. Adjust 350 guardrail to at least 29 inches where the top of the rail is 28 inches or less. • Removal of guardrail and replacement with concrete barrier where minimum offsets are not met for bridge column protection.
Concrete Barrier	• Upgrade all concrete barrier not meeting NCHRP Report 350 or MASH to the current standard. • Pre-350 concrete barrier with earth support behind the barrier may remain in service. • All barrier in which the proposed finish grade exceeds the 3" vertical lip (reveal) of the barrier shall be replaced or reset.

312.6 ODOT 3R Rural Arterial, Collector, and Local Route Bridge Width

A decision must be made to retain, widen or replace any bridge within the limits of a 3R project. Widening versus replacement should be evaluated to determine the most cost-effective treatment. Consider the AASHTO Green Book standards for bridges to remain in place, and Table 300-30, whichever is less, for minimum width. Additionally, analysis of the crash history and the cost of widening is required when determining if widening is cost effective. ***If the decision is made to replace an existing structure, new construction standards will apply to the bridge replacement portion of the project only, not to the roadway portion. Replacing structures does not change the remainder of a 3R Project to 4R.***

When a decision is made to retain a bridge, evaluate the bridge rail to determine if it can adequately contain and redirect vehicles without snagging, penetrating or vaulting. **Upgrade structurally inadequate or functionally obsolete bridge rail.** ***Consideration may be given to design standard exceptions for railing upgrades, roadway widths, etc., when the structure is listed in or determined eligible for the National Register of Historic Places. Evaluate the bridge rail design for pedestrian needs and provide a design that accommodates pedestrians as necessary.*** If the clear roadway width on the structure is less than the approach roadway width, install appropriate traffic control devices.

Table 300-30: Minimum Useable Bridge Widths

Design Year Volume (ADT)	Useable Bridge Width
0 – 750	Width of approach lanes
751 – 2000	Width of approach lanes, plus 2 feet
2001 – 4000	Width of approach lanes, plus 4 feet
Over 4000	Width of approach lanes, plus 6 feet

312.7 Low-Cost Safety Mitigation Measures

Table 300-31 is a list of low-cost safety measures that should be considered on all 3R projects. They can also be used as mitigation in justification for design exceptions.

Table 300-31: Low-Cost Safety Measures

Design Element	Low-Cost Safety Measure
Narrow Lanes and/or Shoulders	• Pavement edge lines • Raised pavement markers • Post delineators • Rumble strips • Safety Edge
Steep Sideslopes/Roadside Obstacles	• Roadside hazard markings • Round ditches • Install guardrail • Remove or relocate obstacle • Slope flattening • Breakaway hardware • Rumble Strips
Narrow Bridges/Deficient Rails	• Install supplementary signing • Hazard and pavement markings
Sharp Horizontal Curve	• Install supplementary signing • Shoulder widening • Shoulder paving • Lane Widening • Correct superelevation • Gradual sideslopes • Pavement antiskid treatment • Obstacle removal or shielding • Raised Pavement Markers • Install post delineators • Rumble Strips
Poor Sight Distance at Hill Crest	• Install supplementary signing • Fixed-hazard removal • Shoulder widening • Driveway relocation • Illumination
Intersections	• Install supplementary signing • Illumination • Pavement antiskid treatment • Speed control

312.8 4R Rural Arterial, Collector, and Local Routes Medians

All multi-lane rural highways shall include a median. *The preferred design for these types of highways is a non-traversable type of median.* A non-traversable median may consist of a wide depressed median (similar to expressways), a raised mountable curb, cable barrier, or a concrete barrier. Of these, the concrete barrier should be avoided due to the difficulty of providing at-grade intersections that are common to rural highways. Both depressed and raised curb medians can be easily and safely transitioned to provide turning and crossing opportunities. In some situations, a painted median may be acceptable. If there is a history of crossover crashes, low-cost mitigation such as rumble strips should be applied, and consideration may be given to closing the median with concrete barrier or cable barrier if practical.

1. Non-traversable medians must be constructed for:
   a. All new multi-lane highways constructed on completely new alignment; and
   b. Modernization of all rural multi-lane expressways.
2. Non-traversable medians should be considered for:
   a. All multi-lane highways undergoing 3R or 4R improvements; and
   b. Highways not undergoing modernization where a median would improve safety.

Median openings must conform to the Access Spacing Standards contained OAR 734 Division 51. Where median openings in a non-traversable median are allowed, intersection sight distance should be provided from the intersection. This may require modification of the median design or providing a median opening wide enough to ensure proper sight distance. The minimum median width is dependent upon the design speed of the highway. Figure 300-22 contains the standard median widths.

Where painted medians are acceptable, they should be a minimum of 8 feet wide on rural arterials. Rural collectors and rural local roads may have narrower medians. **Painted medians must be clearly striped so as not to be confused with continuous two way left turn lanes** (CTWLTL). CTWLTLs should be avoided in most rural environments. Short sections may be needed in some rural communities or where closely spaced accesses require it. Figure 300-22 provides standard details for median width, shoulder widths, slopes, and ditch widths.

Missing curb ramps must be installed and curb ramps that do not meet the current accessibility standard, including barriers to accessibility at crosswalks, accessible route islands, and curbless connections to Pedestrian Access Routes (PAR) must be upgraded to the current standard.

312.9 ODOT 4R Rural Arterials, Collectors, and Local Routes Typical Section

Table 300-32 provides the cross-section element guidance for all rural arterials, collectors, and local routes. Where discrepancies exist between the classifications assigned, the higher classification is used. Some rural highways with less than 5000 ADT are classified as rural arterials, yet go through small cities with a posted speed of 25 to 30 mph. In these locations, the use of the urban context standards in Section 312 through Section 317 may be appropriate and careful consideration must be given to the transition from a higher to lower speed environment.

Table 300-32: ODOT 4R/New or Reconstruction - Rural Design Standards
For Non-Freeway RURAL Functional Classifications Including Arterials, Collectors and Local Classifications

Design Feature	Functional Class																	
	Two Lane														Four Lane			
	ADT under 400			ADT 400 - 1500			ADT 1500 - 2000				ADT over 2000				DHV over 700			
Design Speed (mph)	60	50	45	60	55	45	70	60	55	50	70	60	55	50	70	60	55	50
Width of Traveled Way (ft.)																		
Rural Arterials	24	22	22	24	24	22	24	24	24	22	24	24	24	24	2 X 24			
Rural Collectors	22	20	20	22	22	22	24	24	24	22	24	24	24	24	2 X 24			
Rural Local Routes	22	20	18	22	22	22	24	24	24	22	24	24	24	24	2 X 24			
Shoulder Width (ft.)																		
Rural Arterials	4	4	4	6	6	6	6	6	6	6	8	8	8	8	8	8	8	8
Rural Collector	2	2	2	5	5	5	6	6	6	6	8	8	8	8	8	8	8	8
Rural Local Routes	2	2	2	5	5	5	6	6	6	6	8	8	8	8	8	8	8	8
Recommended Max Grades (%)																		
Rural Arterials	3	5 (6)[a]	6 (8)[a]	3	4	6	3	4	4	6	3	4	4	6	3	4	4	6
Rural Collector / Local	5	6 (8)[a]	6 (9)[a]	4	6	6	4	5	5	6	4	5	5	6	4	5	5	6
	[a] Recommended Maximum Grades for ADT under 250																	
Maximum Degree of Curvature	5°	8°15′	10°30′	5°	6°30′	10°30′	3°15′	5°	6°30′	8°15′	3°15′	5°	6°30′	8°15′	3°15′	5°	6°30′	8°15′
Stopping Sight Distance (ft.)	570	425	360	570	495	360	730	570	495	425	730	570	495	425	730	570	495	425
Passing Sight Distance	------------------------ As Available ------------------------------------ 1200 feet for 70 mph or less -------																	

Table 300-32 (Continued): ODOT 4R/New or Reconstruction - Rural Design Standards
For Non-Freeway RURAL Functional Classifications Including Arterials, Collectors and Local Classifications

Design Feature	Functional Class																	
	Two Lane														Four Lane			
	ADT under 400			ADT 400 - 1500			ADT 1500 - 2000				ADT over 2000				DHV over 700			
Design Speed (mph)	60	50	45	60	55	45	70	60	55	50	70	60	55	50	70	60	55	50
Surface Type	---------------------------------- As determined by Pavements Engineer ------------------------------------																	
Type of Shoulder Surface	--- Same as Traveled Way ---																	
Width of Structures	Width of future approach roadway and shoulders, as determined above plus offset to barrier, where applicable																	
Width of Major Long Span Bridges	-------------------------------------- Special study may be required ---																	
Vertical Clearance	-- See Section 317 ---																	
Loading	--------------------- Design Loading – HS 25 Design Truck or HL-93 Vehicular Loading ---------------------																	

Climbing or Passing Lanes shall be considered where combinations of horizontal and vertical alignment prevent passing opportunities. Passing lanes, use 2′ median when 3 or 4 lane sections result. Climbing lanes, use 2′ median in 4 lane section only. Desirable shoulder width is 6′ (minimum 4′). If the roadway has substantial bike use, consult the ODOT Bicycle and Pedestrian Engineer or the project bicycle and pedestrian coordinator for input.

Four lane construction standards should be utilized wherever the traffic is likely to approach or exceed capacity. Refer to median table in Figure 300-22 for four lane median width.

Where roadside barriers are used, increase the shoulder width by 2′ to provide barrier clearance and lateral support. (See Section 320.1 “roadside barriers”

To convert ADT’s and DHV’s, contact Transportation Planning Analysis Unit or Region Traffic Unit.

Figure 300-22 Standard Sections for Highways Other Than Freeways

STANDARD SECTIONS FOR HIGHWAYS OTHER THAN FREEWAYS

TABLE "A"

SHOULDERS (Also See TABLE 7-2)

MINIMUM SHOULDER WIDTHS (ft.)			
Current Traffic	Local	Collector	Arterials
ADT under 400	2	2	4
ADT 400 - 1500	5	5	6
ADT 1500 - 2000	6	6	6
ADT over 2000	8	8	8
DHV over over 200 (4 LANES)	8	8	8

NOTES:
1. Min. 6' Shoulder For Urban Arterial When Barrier Curb Is Used.
2. Where roadside barriers are used, the shoulder width shall be increased by 2 feet to provide barrier clearance and lateral support. (See ODOT Standard Drawings)

TABLE "B"

SURFACING ROCK SLOPES AND DITCH WIDTHS

Shoulder Width (ft.)	Max. Surf. Rock Slope and Ditch Slope (when used)	Ditch Width (when used) (ft.)
10	1:6	3
8	1:6	3
6	1:4	2
4	1:4	2
2	1:3	1½

TABLE "C"

SIDE SLOPES (CUT & FILL) (ft.)

ADT below 1500	0 - 6 6 - 8 8 - 12 over 12	Max 1:4 1:3 1:2 1:½ (See 1)
ADT 1500 AND OVER	0 - 5 5 - 10 10 - 15 over 15	Max 1:6 1:4 1:3 1:2

The above slopes are a guide. Flatter slopes to be used where additional cost is minor. In solid rock, slopes are to be determined by type of material and approved by the State Traffic-Roadway Engineer. Also check clear zone standards.

TABLE "D"

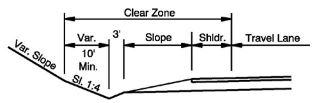
MEDIAN WIDTH TABLE

ROADWAY CLASSIFICATION	MINIMUM (ft.)	DESIRABLE (ft.) (Highway Design Speed) Under 55mph	55mph & Over
Urban Collector Roads & Streets	2	12	14
Arterials - Rural	8	14	16
- Urban	4	14	16

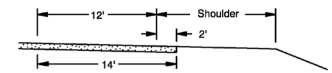
TABLE "E"

PARKING WIDTH TABLE

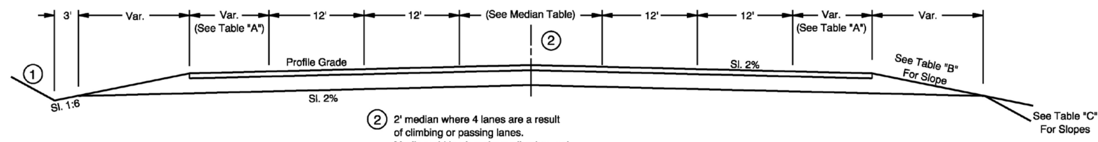
ROADWAY CLASSIFICATION	RESIDENTIAL (ft.)	COMMERCIAL / INDUSTRIAL (ft.)
Urban Arterials	8 - 10	8 - 10
Urban Collector	7 - 10	8 - 10
Urban Local	7	7



1 Use 1:4 Safety Slope At Bottom Of 1:2 Or Steeper Slope.

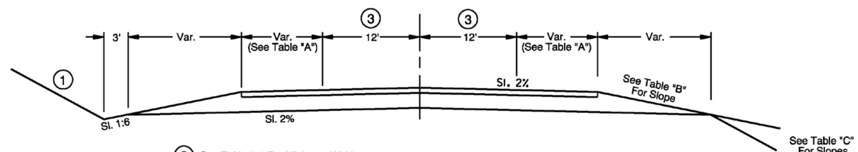


Where Concrete Pavement Is Used For Travel Lanes, Outside Lane Shall Be Constructed 14' In Width. The Shoulder Stripe Is Located 2' In From Edge Of Concrete And Total Shoulder Width Is Measured From Stripe.



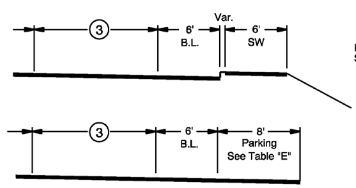
2 2' median where 4 lanes are a result of climbing or passing lanes. Median widths thru channelization and intersections.

4 LANE HIGHWAYS



3 See Table 7-2 For Minimum Widths

2 LANE HIGHWAYS



B.L. = Bike Lane
SW = Sidewalk

NOTES:
1. For minimum bike lane widths See Chapter 13.
2. Sidewalk width is exclusive of curb, utilities, signs, etc., to provide adequate operating clearance. Greater widths should be used in high use areas and against buildings.

BIKE LANE AND SIDEWALK DETAILS FOR URBAN ARTERIAL

NOTE: To Convert ADT's and DHV's Contact Planning Section

STATE OF OREGON
DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING SECTION

STANDARD SECTIONS

HIGHWAY DESIGN MANUAL

312.10 ODOT 4R Rural Arterial, Collector, and Local Route Lane Width

Rural highways carry many different types and volumes of traffic. Some highways may be major freight routes, others may be major recreational routes or commuter routes, while some may only serve an isolated farm to market industry or local traffic. Travel lanes need to be designed in accordance with this wide range of highway uses and functions. The number of lanes required is normally arrived at by consideration of projected volume, level of service, and capacity conditions.

When determining the appropriate lane widths for a particular section of highway, consider the highway classification, presence of trucks, highway function, and traffic volumes. Travel lane widths can significantly impact the capacity or mobility of a particular highway section as well as the safety of the section.

Highways that are identified as freight routes generally have 12-foot lanes, regardless of volume. In urban locations, 11-foot lanes can often be utilized to provide space to accommodate other transportation modes. Twelve-foot lanes are generally used for all rural statewide classified highways on the National Highway System (NHS): the minimum lane width on the NHS system is 11 feet. Research has shown that 11-foot travel lane width is reasonable and adequate in lower speed urban locations and does not pose a safety risk over 12-foot lanes widths, provided truck and freight use and needs are considered. AASHTO design criteria allows lower volume collectors and local routes to have a narrower roadway width. Lane width for regional and district highways is typically based upon functional class and volume. Table 300-32 provides information on standard lane width.

312.11 ODOT 4R Rural Arterial, Collector, and Local Route Shoulders

Shoulders are a very important and often overlooked element of a rural highway. Right side shoulders provide lateral clearance from roadside objects, provide lateral support of the highway section, increase capacity, provide an area for emergency parking, provide an area to pass a stalled vehicle, can aid emergency vehicles reaching a crash site, and provide an area for motorists to recover if they drift outside of the travel lanes. Left side shoulders in separated roadways also provide many of the same benefits, but generally are narrower than the right side.

Paved right side shoulders are required on every rural state highway. The width of the shoulder is dependent upon traffic volumes, terrain, and to some degree by design speed. For most rural highways, shoulders of 4 feet to 8 feet are sufficient to provide the adequate level of safety. Lower classification facilities generally have narrower shoulders. Table 300-32 should be used to determine the appropriate shoulder width.

Another benefit of shoulders on rural highways is a safe area for bicycle use. These shoulders are not exclusively for bicycles, since they also serve the functions described above. Many rural highways provide great recreational opportunities for bicyclists. Some rural highways are along designated tourism routes such as Scenic Bikeways, National Bike Routes and other recognized bikeways. These routes attract bicycle users internationally and from across the country. ***Recognized bikeways need greater attention to bicycle accommodation, beyond the minimum shoulder widths.***

312.12 ODOT 4R Single Function (SF) Rural (Non-Freeway) Arterial, Collector, and Local Route Design Standards

The specific design standards used for a Single Function Standard project will generally be the same design standards used for a 4R/New Construction project. ***The difference is that the scope of work is very limited on SF projects, so the SF Standard does not require addressing non-related substandard features of the roadway.*** For example, if a guardrail upgrade qualifies as a Single Function project, it will not be necessary to address other substandard features on the roadway, such as lane and shoulder width, horizontal and vertical alignment, etc.

312.12.1 Application of 4R Single Function (SF) Project Standards

Single Function projects include projects that are within the right of way but do not permanently impact the travel lanes or shoulders of the highway. Generally, projects that only include work outside the edge of pavement will qualify for the SF standard. The SF standard can also be applied to certain projects within the roadway such as re-striping projects as long as the final configuration of the travel lanes and shoulders is not changed in any way. These projects address a specific need. The scope of work is limited to features that are directly impacted as a result of addressing the specific need. See Section 113.1 for additional information about 4R Single Function project standards. **In no case shall safety, operations, pedestrian and/or bicycle conditions be degraded as a result of a SF project. Each feature constructed in a SF project must be built to the applicable standard for new construction.** The SF Standard does not apply to resurfacing projects.

ADA Program specific projects are technically not classified as Single Function but are classified as 4R projects with a very limited scope. While they are focused on a single overall objective, they have specific requirements that need to be met that often go beyond the intent of the Single Function category. For practical purposes, ADA Program specific projects can be considered similar to Single Function projects in that they do not need to address all elements across the roadway section and substandard roadway features are not addressed. ADA Program specific projects focus on the needed upgrades to meet applicable standards and any element that it affects as a result , such as signal hardware or adjacent driveways.

Section 313 Urban Arterials

This section provides 1R, 3R, 4R, and 4R Single Function (SF) typical section and design guidance for urban arterials, collectors, and local routes. As outlined in Part 200, arterials, make up a large percentage of the state highway mileage and cover a wide range of geographical and topographical conditions. As Part 200 provided the geometric requirements such as vertical and horizontal curvature, vertical clearance, sight distance, and grades, this section focuses on the cross sections elements such as; lane width, shoulder width, cross slope, vertical clearance, roadside design, clear zone, median design, and other cross sectional features for rural arterials, collectors, and local routes.

When the width computed for the lateral support of the surfacing material is a fractional width, round the lateral support width up to the nearest foot.

313.1 ODOT 1R Urban (Non-Freeway) Arterial Design Standards

The primary intent of a 1R project is to preserve the existing paving before it deteriorates to a condition where extensive reconstruction would be necessary to rehabilitate the roadway section. Projects under the urban 1R category consist primarily of paving the existing roadway surface and generally defer other improvements to future 4R projects, 3R projects, specific safety projects, or single function projects. The ODOT 1R Urban Arterial standards apply to all six urban arterial contexts defined in Part 200 and included in Section 305. When project programming and funding are being determined, the ODOT Practical Design Policy and Performance-based, Practical Design decision process can be employed when deciding if a particular preservation project should be in the 1R category or if there is enough value being added to the highway system or corridor for the additional cost to place the project in the 3R category, triggering additional improvements.

The ODOT 1R project standard will apply to Urban Preservation projects that are limited to a single lift non-structural overlay or inlay. Many of the safety items that have traditionally been addressed in 3R projects can be more effectively dealt with in a statewide strategic program. For example, a program for upgrading guardrail to current standards along a highway or in a District not just between specific project limits. A program of this nature has the ability to better utilize funding to target higher need locations for safety item improvements rather than only making safety item improvements based on paving projects. *However, the replacement of safety items such as guardrail, guardrail terminals, concrete barrier, impact attenuators, and signs may be included in the 1R project category when necessary if funding other than Preservation funds are used and the added work will not delay the scheduled bid date.*

Even on a 1R urban project, perform evaluation and include feasible improvements to bicycle and pedestrian facilities within 1R guidelines. Restriping after paving may provide a low-cost opportunity within a 1R project to provide buffered bicycle lanes where appropriate. Preservation paving projects can provide opportunities to make incremental improvements to facilities and should not be overlooked when striving to meet long term planning goals. *The Urban Design Concurrence document is used on 1R projects to document project context and decisions to establish the final design.*

313.2 Resurfacing (1R) Project Standards

These are projects that extend the pavement life of existing highways. **When paving alterations occur adjacent to an ADA ramp, the ADA ramp is required to be accessible. Reconstruct ADA ramps that are both adjacent to pavement alterations and listed as having a poor functional status in the ODOT ADA Ramp inventory.** Refer to Section 309 for more information. Other safety enhancements are not required to be included; however, *safety features may be added to 1R projects where other (non-preservation) funding is available.* ***Any existing safety features that are impacted by the proposed resurfacing must be adjusted or replaced, thus necessitating some work in addition to paving.*** **Since 1R projects will generally not address safety upgrades, pedestrian and/or bicycle enhancements, in no case shall safety, pedestrian and/or bicycle conditions be degraded.** *The safety feature is addressed based on system priorities in standalone projects or other STIP projects.* When scoping 1R projects, the safety feature databases are used to identify opportunities to add safety enhancements with other (non-preservation) funding. Subsequent subsections in 313.2 outline the ODOT Resurfacing 1R project standard. While the criteria primarily relates to the paving treatment and the ability to pave without degrading existing conditions, there may be corridors where analysis of the crash history indicates that a full 3R project is warranted. *Therefore, projects are screened for 1R eligibility from a safety perspective as well.*

313.2.1 Scoping Requirements

In order to ensure the intent of the program is met in addressing pavement and safety needs, adequate advance information is needed to assure adequate statewide decisions are made with consistency.

1. **1R/3R Record of Decision Form**

- This form steps the scoping team through the scoping process. Parts of the form are filled out by different sections including Pavements, Traffic, and Roadway.
- Use of this form provides a statewide uniform approach to determining the project design standard – 1R vs 3R – that will be applied to a pavement preservation project.

2. **Urban Design Concurrence Document (Draft)**

   This document identifies the project context and is used by the scoping team to provide a concept design and provide documentation of decisions leading to that design. The Draft Urban Design Decision document is part of the final scoping package for project initiation.

3. **Urban Design Concurrence (UDC) Exemption Memo**

   There may be a small number of urban projects with scope too limited and outside the roadway that an Urban Design Concurrence document may not be necessary. Projects that could meet the UDC Exemption Memo criteria are ITS projects installing cable, a bridge screening project that does not impact the roadway or similar type projects. The primary focus of the work is outside the roadway and peripheral to it. For these types of projects, an UDC Exemption Memo is required and, if granted, takes the place of the Urban Design Concurrence document.

313.2.2 Project Initiation Requirements

1. **At project initiation, the 1R/3R Record of Decision Form must be reviewed and approve to ensure the project will be developed under the appropriate design standard.**
2. The project development team reviews the Draft Urban Design Concurrence (UDC) document to understand the decisions made by the project scoping team and to verify the conditions, decisions and concept are still appropriate to meet project goals and outcomes. Existing conditions may have changed between scoping and project initiation. If changes are needed, the project development team modifies the Draft UDC to meet project goals and/or planning needs. The Draft UDC is further developed as project development continues and is reviewed again at each project milestone to ensure the final design meets the scoping expectations, goals, aspirations, and outcomes for the project.

3. If the scoping team determined an Urban Design Concurrence document isn't needed and obtains an Urban Design Concurrence Exemption Memo, the project development team reviews the project scope to determine the exemption memo is still appropriate for the project scope. At any time during project development, if the scope of the project changes to include work impacting the roadway, the project development team is required to complete the Urban Design Concurrence document for submittal at the Design Acceptance phase.

313.2.3 1R Project Requirements

1. A paving project is initially designated 1R based on the appropriate paving treatment – a single lift overlay or inlay. *(There is no formal requirement for pavement design life for an individual project; however, since the 1R treatment is location specific, it is expected that an 8-year pavement life will be the goal of the program)*.

   Pavement Services is the final authority regarding the pavement design.
2. **Where less than approximately 5 percent of a project (based on lane miles paved) includes more than a single lift non-structural overlay or inlay, the project may be designated 1R.**
3. **Where up to approximately 25 percent of a project (based on lane miles paved) includes more than a single lift non-structural overlay, the project may be designated 1R; however, this requires the approval of a design exception.**
4. Where more than approximately 25 percent of a project (based on lane miles paved) includes more than a single lift non-structural overlay, the project must be designated 3R.

   As an exception to this is rule, a grind and inlay plus an overlay may also be considered for development under the 1R standard; however, this would be uncommon and requires the approval of a design exception.
5. Where the appropriate course of action is not clear, based on the percentages noted above, include Technical Services Roadway staff in the discussion.
6. Chip seals are 1R projects and subject to the requirements of the 1R standard, with one exception. Chip seals are 1R projects and subject to the requirements of the 1R standard. Chip seal alone is not an alteration paving treatment however when multiple surface treatments are combined it may result in an alteration (see Section 309).

313.2.4 Unprotected and Unconnected Bridge Ends

On 1R paving projects, any bridge rail with unprotected ends or unconnected transitions exposed to traffic must be mitigated. Provide an end treatment meeting the current standard, or a design exception must be obtained. For possible funding options, contact the Senior Roadway / Roadside Design Engineer in the Technical Services Traffic-Roadway Section.

- **Unprotected ends** – Where the end of the bridge rail is exposed with no end treatment such as a transition to guardrail or a crash cushion.
- **Unconnected transition** – Where there is no crashworthy transition between the end of the bridge rail to the guardrail or other barrier.

313.2.5 Responsibilities

1. 1R/3R form filled out by Pavements staff, Region Roadway and Traffic Staff. There are approval signatures by the Pavements Engineer, Region Roadway Manager & Traffic Manger. It will be the Project Leaders role to coordinate. Form is housed in ProjectWise.
2. Final Urban Design Concurrence document is completed by the project development team and approved by the Region Technical Center Manager, with concurrence from the Region Maintenance, Traffic, and Roadway units. The final UDC is part of the Design Acceptance Package submittal. It is the Project Leaders role to ensure the final UDC is submitted.

313.3 ODOT 3R Urban Arterial Typical Section

As the 3R requirements are the same for all of the six urban contexts defined in Part 200, the 3R requirements are listed only once but are applicable to all the urban contexts listed in Section 305. *With Performance-based, Practical Design, even 3R projects are designed with the focus on project goals and outcomes, both short term and long term.* These projects may not be able by themselves to meet all long-range planning goals for a location or roadway section, but they can provide incremental improvements as a stepwise opportunity to work toward the overall goals, outcomes and long-term planning aspirations for a roadway corridor. Preservation projects can provide some level of improvement at relative cost and opportunities should not be overlooked if they can be appropriately incorporated in the final design.

For urban arterial 3R projects, an appropriate urban context is established as defined in Part 200 and the decision process, guidance and design criteria outlined in Section 305 is used in conjunction with the following sections to determine the final project cross-section. ***The Urban Design Concurrence document is used to document project decisions of what can and what cannot be included with the project.***

Because urban preservation is generally more involved than rural, a number of processes are combined to develop the ODOT 3R urban criteria and guidelines. The ODOT 3R urban design criteria incorporate the Safety Priority Indexing System (SPIS) and the Urban Preservation

Pavement Strategy. The Urban Preservation Strategy adds design guidance which provides statewide consistency in the urban preservation program. As with the 3R program in general, urban 3R projects require a roadside inventory to be completed.

When preservation type projects involve the installation of left or right turn channelization, the width of the existing approach lanes or those widths given in Section 305 for the appropriate context are used as minimums. These widths also apply in the situation of a re-striping of an existing section of roadway. The widths of the channelized lanes conform to those specified in Section 305 and in Part 500 as applicable.

313.4 Mandatory 3R Design Features

The following is a list in Table 300-33 of mandatory design features that must be incorporated into Preservation projects:

Table 300-33 Mandatory 3R Design Features

Geometric Deficiency	Mandatory Corrective Measure
ADA Ramps	• If absent, curb ramps, accessible entrances/exits to crosswalks, landings shall be added at intersections • Existing non-standard Ramps shall be upgraded to current standards • Refer to Part 800 for current standards and requirements
Narrow Bridges/Deficient Rails	• See BDM
Guardrail	• Upgrade all guardrail and end terminals and transitions not meeting NCHRP Report 350 or MASH to the current standard. • Provide transitions at unconnected bridge ends. • Install protection at unprotected bridge ends. • Adjust MGS guardrail to 31 inches where the height to the top of the rail is 28 inches or less. Adjust 350 guardrail to at least 29 inches where the top of the rail is 28 inches or less. • Removal of guardrail and replacement with concrete barrier where minimum offsets are not met for bridge column protection.
Concrete Barrier	• Upgrade all concrete barrier not meeting NCHRP Report 350 or MASH to the current standard. • Pre-350 concrete barrier with earth support behind the barrier may remain in service. • All barrier in which the proposed finish grade exceeds the 3" vertical lip (reveal) of the barrier shall be replaced or reset.

313.5 Low-Cost Safety Mitigation Measures

Table 300-34 below is a list of low-cost safety measures that should be considered on all projects utilizing ODOT 3R Urban design standards and can be used as mitigation in justification for design exceptions.

Table 300-34 Low-Cost Safety Measures

Design Element	Low-Cost Safety Measure
Narrow Lanes and/or Shoulders	• Pavement edge lines • Raised pavement markers
Steep Sideslopes/Roadside Obstacles	• Roadside hazard markings • Round ditches • Install guardrail • Remove or relocate obstacle • Slope flattening • Breakaway hardware
Narrow Bridges/Deficient Rails	• Install supplementary signing • Hazard and pavement markings
Sharp Horizontal Curve	• Install supplementary signing • Correct superelevation • Gradual sideslopes • Pavement anti-skid treatment • Obstacle removal or shielding • Install post delineators
Poor Sight Distance at Hill Crest	• Install supplementary signing • Fixed-hazard removal • Driveway relocation • Illumination
Intersections	• Install supplementary signing • Signalization • Illumination • Pavement anti-skid treatment • Speed control (traffic calming, visual cues, etc.)
Bicycle Access - Work with Traffic Section to identify potential ARTS, HSIP or other options that could be included	• Restripe roadway to include a buffered bike lane • Signal timing changes to improve bicycle progression
Pedestrian Access - Work with Traffic Section to identify potential ARTS, HSIP or other options that could be included	• Vehicle speed control (traffic calming measures, visual cues, continental striping crosswalks) • Reduce crossing distance (striping or curb radius reduction options) • Improve visibility of pedestrian (Illumination, curb extensions)

NOTE: Designers need to exercise engineering judgment based upon engineering principles and practices in selecting appropriate mitigation measures from the above list.

313.6 ODOT 3R Urban Preservation Strategy

The 3R Urban Preservation Strategy is a good place to utilize the ODOT Performance-based, Practical Design process and the ODOT Practical Design Policy. Urban areas are complex with many conflicting needs. An urban 4R project would attempt to rebuild and improve a roadway section overall. *Whereas the intent of a 3R project is pavement preservation with improvements to selected design elements for safety and operations.* ***Improvements to some of those design elements may be required by regulation or mandate. Other design elements may or may not be improved at the discretion of the project team.*** It is these elements where Performance-based, Practical Design can be employed to aid in the determination of the amount of value added to the system or corridor by making the improvements on either a wholesale basis or as an incremental improvement.

Due to the complexity and cost of urban preservation type projects, the Urban Preservation Strategy has developed a set of criteria for evaluating other design features for possible modifications or improvements. Table 300-35 contains the list of “Have To” and “Like To” corrective measures. **The corrective measures listed under the “Have To” column must be addressed on all urban 3R preservation projects.** *The corrective measures listed under the “Like To” column should be considered where economically feasible (i.e., minimal extra cost or funds available from sources other than Preservation funding).* **Design exceptions are required for each design feature not meeting the “Have To” corrective measures or dimensions not meeting the guidance in the design tables in Section 305.**

Under some conditions, the “Like To” corrective measures are required as part of an Urban Preservation Project. These conditions include:

1. Pavement condition requiring reconstruction, or
2. Curb exposure less than 6 inches, or
3. Cross slope greater than 8 percent.

If any of these above conditions are met, design exceptions are required for not meeting the corrective measures from the “Like To” column of Table 300-35.

Urban Preservation projects must meet the design standards and features described above or obtain a design exception, depending upon certain conditions. However, it is often desirable to provide additional improvements in urban environments. It is strongly encouraged to consider other design features in the “Like To” column in Table 300-35 when additional funding sources are available other than Preservation and where improvements are cost effective. This optional list is not all-inclusive and is not a requirement for Urban Preservation projects and does not require design exceptions if these items are not included in a project. The Performance-based, Practical Design approach includes providing incremental improvements working toward long-range planning goals and aspirations when possible and preservation projects are a good opportunity to include stepwise improvements.

Table 300-35 Urban Preservation Design Features

Project Element	Corrective Measure		Technical Resource
	"Have To"	"Like To"	
Pavement Life	• 8 to 15 year minimum (unless life cycle benefit/cost justifies an alternative) for overlays, inlays or appropriate treatment.	• 15 year minimum life for reconstruction (may be triggered by cross slope, curb exposure or pavement condition).	Pavement Unit
Signal Loops	• Adjust or replace with non-invasive detection (e.g., radar detection) as necessary.		Traffic-Roadway Section
Striping	• Install pavement markings with materials selected according to Chapter 5 if the ODOT Pavement Marking Design Guide.		Region Traffic
Signing	• Replace and/or add signs according to the ODOT Sign Design Manual		Traffic-Roadway Section
Utilities (manholes, valves, vaults)	• Adjust.		Traffic-Roadway Section
Drainage	• Adjust as necessary to maintain basic system. • Address high priority fish culverts identified in Salmon program.	• Reroute bridge drains which drain directly into waterway. • Address lower priority fish culverts as required.	Fish Prog. Mgr. & Hydraulics Unit
Obstacles behind curbs	• Reconstruct curb to re-establish delineation and drainage function if grades & existing R/W permit. • Relocate to meet standards where practical.	• Meet required clear zone standards for obstacles behind curb. Relocate if necessary.	Traffic-Roadway Section

Table 300-35 (Continued): Urban Preservation Design Features

Project Element	Corrective Measure		Technical Resource
	"Have To"	"Like To"	
Roadside obstacles with demonstrated safety issues	• Remove or mitigate.		Traffic-Roadway Section
ADA Ramps	• Ramps shall be added where absent. • Upgrade or Replace Existing Sub-Standard locations to meet accessibility requirements.	• Meet accessibility standards on sidewalks and driveways.	Traffic-Roadway Section
Vertical Clearances	• Maintain existing or minimum vertical clearances. See Section 317	• Meet required vertical clearance.	Bridge Section
Guardrail	• Upgrade all guardrail and end terminals and transitions not meeting NCHRP Report 350 or MASH to the current standard. • Provide transitions at unconnected bridge ends. • Install protection at unprotected bridge ends. • Adjust MGS guardrail to 31 inches where the height to the top of the rail is 28 inches or less. Adjust 350 guardrail to at least 29 inches where the top of the rail is 28 inches or less. • Removal of guardrail and replacement with concrete barrier where minimum offsets are not met for bridge column protection.	• Meet required standard.	Traffic-Roadway Section

Table 300-35 (Continued): Urban Preservation Design Features

Project Element	Corrective Measure		Technical Resource
	"Have To"	"Like To"	
Concrete Barrier	• Upgrade all concrete barrier not meeting NCHRP Report 350 or MASH to the current standard. • Pre-350 concrete barrier with earth support behind the barrier may remain in service. • All barrier in which the proposed finish grade exceeds the 3" vertical lip (reveal) of the barrier shall be replaced or reset.		Traffic-Roadway Section
Narrow Bridges/ Deficient Rails	• See BDM	• Widen bridge, where practical • Meet current standard for bridge rails and connections	Bridge Section
Curb Exposure	• 4 inch minimum curb exposure for delineation of roadway. Additional exposure may be required for drainage.	• Meet required standard.	Traffic-Roadway Section
Cross Slope	• Maintain existing where applicable. • Minimize cross slope to meet standards where practical. • Maximum cross slope not to exceed 8%.	• Meet required standard for superelevation rates and cross slopes.	Traffic-Roadway Section

The following optional items in Table 300-36 should be considered, when cost effective AND additional funding (other than Preservation funding) is available.

Table 300-36 Additional Urban Design Features

Project Element	Corrective Measure	Technical Resource
Drainage	Upgrade systems.	Traffic-Roadway Section
Access Issues	Driveway relocations/closures.	Region Access Mgr.
Operational Issues	Modify curb radii to facilitate truck movement. Islands (replacing, adding or removing). Install/upgrade traffic control devices.	Traffic-Roadway Section
Safety Issues	SPIS site addressed. Rumble strips, pavement markings, slope flattening, illumination, etc.	Transportation Safety & Traffic-Roadway Section
Sidewalk Infill	If less than 10% missing in length of project.	Traffic-Roadway Section
Bicycle Facility	Upgrade existing facility or add facility if missing	Traffic-Roadway Section
Transit Stop	Upgrade existing facility or add facility if missing	Traffic-Roadway Transit Liaison
Planning Goals	Add improvements to meet long range planning activities	Region Planning/Region Traffic and Roadway

313.7 ODOT 3R Urban Arterial Bridge Width

A decision must be made to retain, widen, or replace any bridge within the limits of a Preservation project. Widening vs. replacement should be evaluated to determine the most cost-effective treatment. Consider the AASHTO Green Book reference to "Standards for Bridges to Remain in Place", and Table 300-37, whichever is less, for minimum width. Additionally, consideration should be given to the accident history and the cost of widening when determining if widening is cost effective. ***If the decision is made to replace an existing structure,***

new construction standards will apply to the bridge replacement portion of the project only, not to the roadway portion.

When a decision is made to retain a bridge, evaluate the existing bridge rail to determine if it can adequately contain and redirect vehicles without snagging, penetrating or vaulting. **Structurally inadequate or functionally obsolete bridge rail needs to be upgraded or replaced. A 1997 FHWA policy in conjunction with an AASHTO agreement stipulates that for 3R and preventative maintenance projects, bridge rails that do not meet NCHRP 230 requirements must be replaced. At a minimum, bridge rail on 3R projects must be NCHRP 350 compliant. Consideration should be given to design exceptions for railing upgrades, roadway widths, etc., when the structure is listed in or determined eligible for the National Register of Historic Places.** Appropriate traffic control devices should be installed where the clear roadway width on the structure is less than the approach roadway width. Refer to the ODOT Bridge Design Manual and the ODOT Bridge Section for additional information when determining bridge decisions on roadway projects.

Table 300-37: Minimum Useable Bridge Widths

Design Year Volume (ADT)	Useable Bridge Width
0 – 750	Width of approach lanes
751 – 2000	Width of approach lanes, plus 2 feet
2001 – 4000	Width of approach lanes, plus 4 feet
OVER 4000	Width of approach lanes, plus 6 feet

313.8 4R Urban Arterial Medians

A median is the area of a roadway or highway that separates opposing directions of travel. Medians can either be traversable or non-traversable. A median can be raised curbed or simply a painted stripe.

All multi-lane state highways, regardless of classification, shall use a median treatment. Non-traversable medians are used in urban areas for operational and safety purposes to control traffic movements to and from access points. Strongly consider installing a non-traversable median during all preservation or modernization work on existing roadways, particularly if a non-traversable median exists on adjacent sections in proximity or where there is a history of cross-over crashes. **The preferred type of non-traversable median for an urban arterial is a raised curb median and shall be designed and constructed for all new, limited access, multi-lane highways constructed on completely new alignments.** In addition, the 1999 Oregon

Highway Plan provides direction where non-traversable medians are recommended and should be considered. These locations include:

1. All multi-lane highways with a forecasted volume of 28,000 vehicles a day or greater within the 20-year planning horizon.
2. Modernization of multi-lane highways which are:
    a. Statewide (NHS) Highways;
    b. Regional Highways where design speeds are greater than 45 mph.
3. Modernization or preservation of multi-lane highways with an annual accident rate greater than the average statewide rate for the same classification.
4. Topography and horizontal or vertical alignment result in inadequate left-turn intersection sight distance and it is impractical to relocate or reconstruct the connecting approach road or impractical to reconstruct the highway in order to provide adequate intersection sight distance.

In urban areas, a Continuous Two Way Left Turn Lane (CTWLTL) can be used on two-lane highways or any multi-lane highway where a traversable median is deemed appropriate. However, CTWLTLs should be avoided on multi-lane highways in urban suburban fringe context due to the induced pressure for local land access and development. *Even where a CTWLTL is the preferred median choice, consideration of sections of raised curb medians may be appropriate to control turn movements at signalized intersections or to provide pedestrian crossing opportunities.* See Section 308 Median Design and the Oregon Highway Plan, "Policy 3B: Medians for more information on median design and location". Table 300-14 provides the required left side shy distances.

Installation of raised medians in urban areas must comply with ORS 366.215.

The use of medians in STAs or urban downtown/CBD contexts may or may not be needed. Medians in these locations are generally only located at spot locations to address left turn needs or specific pedestrian needs, such as a mid-block crossing. A left turn bay should be provided at intersections wherever significant left turning volumes are allowed. However, left turns from a through lane, may be acceptable in some situations. ***Generally, raised curb medians are not appropriate in STAs or urban downtowns, unless they are needed to improve pedestrian crossing opportunities, general mobility, access control or appropriate vegetation treatments.*** The use of highway medians in these areas should consider the classification of the highway, function of the highway, availability of other routes or parallel roadways, economic vitality of the area, impact to pedestrian crossings and pedestrian mobility, and safety for all travel modes. Median widths are addressed in PART 300 for all urban contexts and are dependent on project goals and outcomes. CTWLTLs should be avoided and should only be used where several continuous intersections are in need of left turn channelization. An additional shy distance is required where a raised curb median is used. Section 308 (Median Design) provides more detailed median design information. Table 300-14 provides the required left side shy distances.

Installation of medians in STAs urban downtowns can impact pedestrian crossings. Where medians are required to maintain acceptable traffic flow and safety, the designer needs to evaluate options that reduce the impact to pedestrian crossing and safety. The width of median used should take into consideration the pedestrians needs as well as the roadway needs. When medians are not needed for turning movements, but are needed for pedestrian crossings and bicycle access, the width of the pedestrian crossing median should be 6 feet at a minimum, preferably 8 feet. In tightly constrained areas a 4-foot median could be used. However, a standard adult bicycle is on the order of 6 feet in length from front wheel to rear wheel at a minimum – longer if a trailer for pulling young children or cargo is attached. Providing less than a 6-foot median in locations where bicycle traffic is expected to cross the highway may not provide adequate median width should a cyclist need to use the median as a refuge. In areas where recreational paths cross the roadway, median widths may need to accommodate more than the length of a standard bicycle. In addition to medians, options may include curb extensions, mid-block crossings, pedestrian refuges, or other treatments. Whether or not medians are used, improved pedestrian crossings should be the goal in urban environments. PART 300, Section 305 addresses median widths to consider based on urban context. Information is also provided in PART 800 (Pedestrian Design) and PART 900 (Bicycle Design).

Installing a raised median where one has not previously existed may require investigation and determination of its effect on truck traffic that uses the section of roadway. ORS 366.215, Creation of state highways; reduction of vehicle –carrying capacity, states that ODOT may not permanently reduce the vehicle-carrying capacity of an identified freight route when altering, relocating, changing, or realigning a state highway unless safety or access consideration require the reduction. **If a raised median is proposed to be installed, follow applicable ODOT guidance for determination of reduction of vehicle-carrying capacity and ORS 366.215 compliance.** Additional information about median design can be found in Section 308.

313.9 ODOT 4R Single Function (SF) Urban (Non-Freeway) Design Standard

The specific design standards used for a Single Function Standard project will generally be the same design standards used for a 4R/New Construction project. The difference is that the scope of work is very limited on SF projects, so the SF Standard does not require addressing non-related non-standard features of the roadway. For example, if a guardrail upgrade qualifies as a Single Function project, it will not be necessary to address other non-standard features on the roadway, such as lane and shoulder width, horizontal and vertical alignment, etc.

313.9.1 Application of 4R Single Function (SF) Project Standards

All Urban Contexts and all ODOT Highway Segment Designations can utilize the Single Function category. Single Function projects include projects that are within the right of way but do not permanently impact the travel lanes or shoulders of the highway. Generally, projects that only include work outside the edge of pavement will qualify for the SF standard. The SF standard can also be applied to certain projects within the roadway such as re-striping projects as long as the final configuration of the travel lanes and shoulders is not changed in any way. These projects address a specific need. The scope of work is limited to features that are directly impacted as a result of addressing the specific need. See Section 113.1 for additional information about 4R Single Function project standards. I**n no case shall safety, operations, pedestrian and/or bicycle conditions be degraded as a result of a SF project. Each feature constructed in a SF project must be built to the applicable standard for new construction**. The SF Standard does not apply to resurfacing projects.

ADA Program specific projects are technically not classified as Single Function but are classified a 4R projects with a very limited scope. While they are focused on a single overall objective, they have specific requirements that need to be met that often go beyond the intent of the Single Function category. For practical purposes, ADA Program specific projects can be considered similar to Single Function projects in that they do not need to address all elements across the roadway section and substandard roadway features are not addressed. ADA Program specific projects focus on the needed upgrades to meet applicable standards and any element that it affects as a result , such as signal hardware or adjacent driveways.

Section 314 Oregon Highway Plan Special Overlays

Rural arterial highways cover many miles of varying terrain and roadside development, and they are often located in areas of high scenic or historical significance. *Designers need to consider the need for special consideration of scenic byways, rural communities, historical markers and viewing sites as they develop design plans.* The Oregon Highway Plan includes special overlays for designating roadways needing additional design considerations. These include Scenic Byways, Freight Routes, and Lifeline Routes.

314.1 Scenic Byways

The OHP establishes a Scenic Byway Policy (see Section 314.2).

However, should the Scenic Byway designation apply to an urban roadway section context, ODOT has established a process for portions or segments of highway routes that have been, or are going to be, designated as Scenic Byways. Of the six urban contexts, the Rural Community context is the most likely to overlap with the Scenic Byway designation. However, it is possible that some of the other urban context locations could also fall under parts of a Scenic Byway.

Scenic Byways are those routes or segments that are located in significant scenic or historic corridors. ODOT has adopted many State and Federal Scenic Byway routes. These routes are described in the Oregon Highway Plan, pages 67-69. Scenic Byways are eligible for special federal funding. In addition, federal legislation encourages flexibility in design when designing projects within a Scenic Byway corridor.

When designing projects on a Scenic Byway, the designer should try to minimize the impacts to the natural and historic resources along the corridor. This may require the designer to use non-standard designs to avoid and minimize impacts. However, it is still the responsibility of the project design team to provide a safe and appropriate level of operation of the roadway section for all road users. Some special considerations to minimize impacts within Scenic Byway corridors are:

1. Utilize alternative guardrail types or walls. Consult Roadway and/or Bridge Engineering.
2. Utilize alternative bridge rails.
3. Consider visual impacts and obstructions from guardrail. Reconsider the need for it.
4. Make sure the appropriate design speed is used so as not to change design elements unnecessarily.
5. Consider blending cut and fill slopes with the natural terrain.

Designers need to coordinate early with Region Planners and the Scenic Byway program to identify key resource issues and concerns. The Scenic Byway program can provide valuable services for determining the scope, issues, and parameters to consider. They are also knowledgeable regarding various flexible design solutions to minimize impacts.

314.2 Scenic Byway Policy

The OHP establishes a Scenic Byway Policy. Scenic Byways have exceptional scenic value to the state. The OTC must designate a route as a Scenic Byway. The intent of the designation is to ensure that the scenic qualities of the highway are preserved and may be enhanced by highway designs and projects. The Scenic Byway designation should not impact the design of urban arterials. However, the designer should contact the Scenic Byway Program to make sure the Scenic Byway Corridor Management Plan will not affect the urban highway design. Page 68 of the OHP contains a map of Oregon's Scenic Byways. (The OHP contains a map of Oregon's designated Scenic Byways along with additional information.)

314.3 Freight Route

The Oregon Freight Route system carries a significant tonnage of goods and materials within and through the state. Highways included in the Oregon Freight Route network are shown with the nomenclature of FR in the OHP Highway Classification tables. Many of these routes are also known as Reduction Review Routes as determined by legislative action in ORS 366.215 and OAR 731-012. These routes are to provide a higher level of service and mobility than other statewide highways. However, other state highways serve significant volumes of truck traffic as well and have been pre-approved for use of interstate size trucks. These routes are identified on Route Map 7, which is published by the ODOT Commerce and Compliance Division, Over-Dimension Permit Unit. Although Route Map 7 includes all highways, it identifies those highways where the use of interstate size trucks are allowed and should accommodate those vehicles in the final roadway design.

Route Map 7 is color coded and identifies where the interstate truck is allowed without permit. Projects on routes identified by either the OHP Freight Map or pre-approved for WB-67 size trucks as shown on Route Map 7 should strongly consider freight needs in the design, particularly at intersections. A WB-67 size truck is a single tractor trailer truck with a 67-foot wheelbase; this is currently the largest single tractor trailer approved for travel on Oregon highways without a permit. It is often referred to as the "interstate" design truck. Reducing design standards and through carrying capacity is discouraged on OHP designated Freight Routes. These Freight Routes will generally be the most important facilities to the local jurisdiction as well as surrounding region and possibly the state. As such, they should maintain an appropriate level of functionality. ORS 366.215, Creation of state highways; reduction of vehicle-carrying capacity, states that ODOT may not permanently reduce the vehicle-carrying capacity of an identified freight route when altering, relocating, changing, or realigning a state highway unless safety or access consideration require the reduction. **When a project is proposed on a designated freight route, follow applicable ODOT guidance for determination of reduction of vehicle-carrying capacity and ORS 366.215 compliance.** OAR 731-012 provides a process to follow when working through compliance with ORS 366.215.

In conjunction with the OHP Freight Route system, the Oregon Highway Plan also recognizes the National Network as established in the Surface Transportation Act of 1982 (23 CFR 658). These routes are federally designated truck routes and are denoted in the OHP with the nomenclature TR for Truck Route in order to differentiate them from the FR used for the Oregon Freight Route system. In many instances, the FR routes and the TR routes are coincident. The FR routes are routes specific to Oregon designation for freight movement within and through the state. Whereas the TR routes are specific to federal designation designed to carry freight effectively from state to state at the national level and are part of the national network of truck routes. ***TR routes are part of the National Highway System (NHS) and in most cases, when a TR route is located on a state highway that is not designated as part of the FR system, it may still be subject to the requirements of ORS 366.215. Projects on these routes must follow the guidelines set out for implementation of ORS 366.215 and OAR 731-012.***

A third group of roadways that comprise the freight route system in Oregon are roadways designated as Intermodal Connectors. Intermodal Connectors are part of the National Highway System and connect freight origin and destination points like ports, rail yards or major industrial areas to the arterial highway networks and interstate highways throughout the state. These routes are generally short in length with many of them less than a mile long. However, they are of vital importance for freight to get to and from origin and destination points. These roadway segments are located all across the state. A listing of them is included in Appendix E of the Oregon Highway Plan. All of these roadways must meet federal guidelines as part of the NHS. However, not all of these roadways are on state highways. Some of them are part of local jurisdiction networks. **Intermodal Connectors located on state highways will need to meet ORS 366.215 requirements if designated as a Reduction Review Route and projects on these segments must follow the guidelines set out for implementation of ORS 366.215 and OAR731-012.**

Projects on highways that are designated as part of the Reduction Review Route network must follow the process identified in OAR 731, Division 12 to include input and support from interested parties affected by any permanent changes that reduce the carrying capacity of the roadway. The Mobility Advisory Committee, or MAC, provides review and feedback on agency projects through the lens of freight mobility and work zone safety as it applies to both temporary and permanent reductions or restrictions on the state highway system. In addition to the Reduction Review Route highways subject to ORS 366.215 and OAR 731, Division 12, the MAC also advises the agency on planning and design of projects that propose permanent reductions or restrictions on state highways not subject to ORS 366.215 but have requirements for engagement by interested parties per Department policy. Projects of this type may include safety and/or traffic calming features like roundabouts, pedestrian islands with raised features, new traffic signals, or other items that permanently change the roadway cross-section and may affect mobility of freight movements. ***For state highway projects on Reduction Review Routes or projects per Department policy that have potential to permanently impact freight mobility, include the Mobility Advisory Committee (MAC) early in the design process to solicit feedback that may affect final design parameters.***

314.4 Lifeline Route

Another overlay is the Lifeline Route designation. These routes have been identified as critical connections between areas of the state that may become generally inaccessible during an emergency such as earthquakes, tsunamis or flooding. It is critical to keep these facilities operating during such disasters to aid evacuation and relief efforts. This designation will generally not have much effect on the final design of a particular highway except for structures that are critical to maintaining accessibility. ***If a reduced roadway section is proposed, impacts to effective evacuation along the Lifeline Route must be considered and mitigation provided, if necessary, before a final design is completed and approved.***

Section 315 Cross Slope

The rate of cross slope is an important element in cross section design and is complicated by two contradictory controls. A reasonably steep lateral slope is desirable to quickly remove surface water and thus reduce hydroplaning of the vehicles. On the other hand, steep cross slope is undesirable because of the tendency of vehicles to drift toward the low edge of the traveled way. Cross slopes up to and including 2 percent are barely perceptible in terms of vehicle steering. However, cross slopes steeper than 2 percent are noticeable and require a conscious effort in steering. Steep cross slopes increase the susceptibility to lateral skidding when vehicles brake on icy or wet pavements or when stops are made on dry pavement under emergency conditions.

315.1 ODOT 3R Urban and Rural Freeway Cross Slope

3R urban and rural freeway standards are to use the cross-slope guidance provided in AASHTO's A Policy on Geometric Design of Highways and Streets.

315.2 ODOT 3R Urban and Rural Arterial Cross Slope

Appropriate leveling quantities should be included in the project to correct cross slope to 2 percent. However, for 3R projects, if existing cross-slope is 1.5 percent, it may not be cost effective to correct it to the full standard 2 percent unless the correction would also mitigate other problems or concerns in terms of safety or drainage issues. ***In addition, correction of the superelevation should be applied if the comfort speed of the curve is lower than the project design speed. If the comfort speed exceeds the project design speed the superelevation should be maintained unless there is a justifiable reason to change it.***

315.3 ODOT 4R Urban and Rural Freeway Cross Slope

The cross slope for four lane (two lanes in each direction) urban and rural freeways is 2 percent. When an urban or rural freeway consists of three or more lanes in each direction, the cross slope shall be increased to 2.5 percent for the outside lanes and is applicable to the outside shoulder cross slope. The two inside lanes shall retain a cross slope of 2 percent. At locations where curb is introduced (typically urban areas), the shoulder cross slope shall be increased to 5 percent. *At locations where the curb is intermittent, increasing the shoulder cross slope to 5 percent should be analyzed on a case-by-case basis.* Figure 300-18 and Figure 300-19 indicate the proper cross slope and standards for the different width freeway sections. These figures also provide information and design details on cut and fill slopes, safety slopes, and separated grades.

315.4 ODOT 4R Urban and Rural Arterial Cross Slope

For state highways, the cross-slope standard is 2 percent. This allows a balance between surface drainage and vehicle steering effort. **The central crown line shall not have a total rollover or cross slope change of over 4 percent without approval by the State Traffic-Roadway Engineer.**

On facilities with 3 or more lanes inclined in the same direction, each successive pair of lanes outward from the first two lanes may increase the cross slope by 0.5 percent.

For non-modernization projects correcting poor cross slope can be an inexpensive safety feature to add to the project. Project ends are typical locations for compromised cross slope transitions unless enough length is used for the transition. Sections that transition between a single cross slope and crown cross slope can be problematic if the transition is too abrupt. Vehicles with high centers of gravity can unexpectedly be caused to sway from side to side when traveling at high speed and control of the vehicle may be difficult to maintain. These tangent transitions need to be addressed similarly to the superelevation run out of a horizontal curve.

Section 316 Horizontal Clearances

Figure 300-23: Interstate Clearance Envelopes for Single Lane (Temporary Traffic Control)

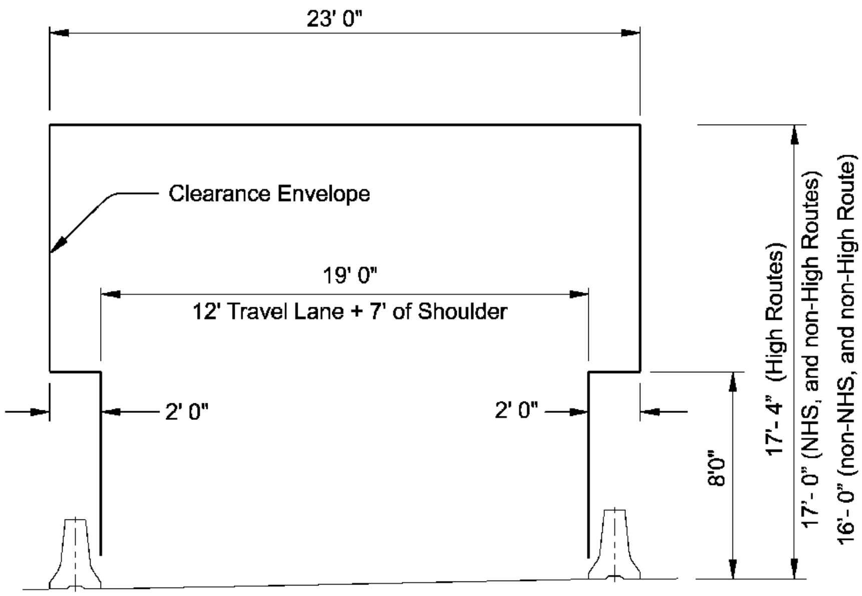
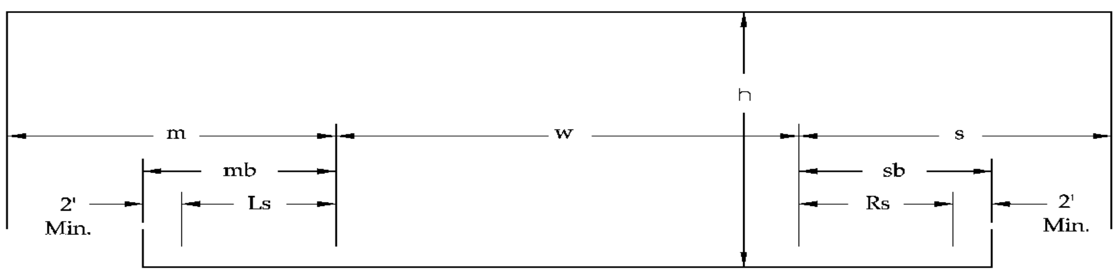


Figure 300-24: Freeway & Highway Clearances

ALL FREEWAY AND HIGHWAY CLEARANCES

(To be adjusted to provide minimum stopping sight distance when necessary)



h Minimum Vertical Clearance includes shoulder area
m Distance from Edge of Traveled Way to Obstacle on Left
mb* Distance from Edge of Traveled Way to Barrier on Left
Ls Left Shoulder

w Width of Traveled Way
s Distance from Edge of Traveled Way to Obstacle on Right
sb Distance from Edge of Traveled Way to Barrier on Right
Rs Right Shoulder

NOTE: On two-lane, two-way highways, s and sb apply to shoulders on both sides of highway.
* When barrier is warranted.

	INTERSTATE FREEWAY	NON-INTERSTATE FREEWAY	ALL FREEWAY RAMPS		ALL OTHER HIGHWAYS
			ONE LANE	TWO LANES	
h	See Figure 4-6				
w	12' Lanes	12' Lanes	16'	24'	12' Lanes
m	See The 2011 AASHTO Roadside Design Guide				
s					
Ls	Full Shoulder	Full Shoulder	4'	6'	Full Shoulder
Rs	Full Shoulder (1)	Full Shoulder	6' (2)	10' (1)	Full Shoulder

(1) Where curb is introduced intermittently for drainage on interstate it shall be set back 2' from edge of shoulder at guardrail locations.

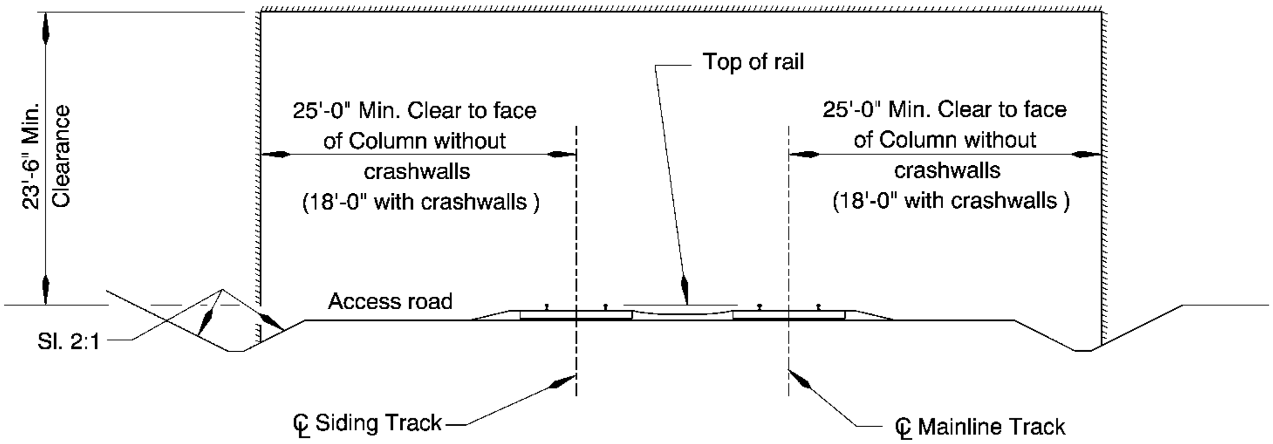
(2) 10' on freeway to freeway ramps.

STATE OF OREGON
DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING UNIT

ROADWAY CLEARANCES

HIGHWAY DESIGN MANUAL

Figure 300-25: Railroad Clearances



Section 317 Vertical Clearance

In 2007, Motor Carrier Transportation Division (MCTD) (now called Commerce and Compliance Division, CCD) completed a study on the frequency of permitted loads that were over dimensional for height. ***From the collected data, it was determined that the actual measured height of bridges needs to be at least 17′ – 4″.*** CCD also identified the routes that are of major significance for the mobility of high loads. These "High Routes" are primarily on the National Highway System (NHS), but there are portions that are on highways other than the NHS. Some of these routes are in rural portions of the state where there are no over passes, so high loads can move freely without physical restrictions. Some high routes require the use of detours, including "up and over" use of interchange ramps, for high vehicles to use the route. **The Vertical Clearance Standards are minimum heights. The Vertical Clearance Standard is required for the full roadway width including shoulders for the through lanes, and to ramps and collector-distributor roadways in Interstate-to-Interstate interchanges.** *Future overlays of the highway are not included in the Vertical Clearance Standard and need to be considered when determining the clearance needed for new construction.*

Minimum Bridge Vertical Clearance Standards are:

- 17′-4″ on High Routes
- 17′-0″ on NHS Non-High Routes
- 16′-0″ on Non-NHS and Non-High Route

For vertical clearance on Local Agency jurisdiction roadways, see Section 317.4.

Proposed new construction that reduces vertical clearance shall require consultation with CCD to ensure understanding of the impact of the proposed decrease to the user. All other projects, which result in final vertical clearances at or above the minimum vertical clearance, require notification of CCD to ensure all vertical clearance inventories are current and updated for the appropriate routing of permit vehicles.

In addition to the vertical clearance requirements above there may be projects that impact freight mobility even though minimum vertical clearance is achieved. **In coordination with the traffic designer, the Region Mobility Liaison is to be contacted when any proposed project (new construction, reconstruction, preservation, or maintenance) adds a new or modifies an existing overhead structure (such as Truss Sign Bridge, Monotube Cantilever, Signal Mast Arm, and Signal Strain Pole) regardless of meeting the existing minimum vertical clearance standards. In addition, contact the Region Mobility Liaison for any project that reduces the existing vertical clearance regardless of meeting the minimum vertical clearance standards.** The Region Mobility Liaison will provide the appropriate coordination with the Region, and CCD. This coordination is intended to address not only project specific mobility requirements, but also any corridor level vertical clearance and mobility needs. **However, because vertical clearance greater than 19’-0” for sign, VMS, and signal support structures are considered non-standard and the additional height may result in other significant issues, a design exception is required.** The Traffic designer is to follow the procedures outlined in Part 1000. The design exception request process for increasing the vertical clearance greater than the above mentioned 19’-0” will need to consider safety, operations, and impact to other design features in order to support the approval of the design exception.

The lateral clearances shown in Section 316 are to the face of rail and assume the barrier is warranted. The 19 feet-0 inch dimension does include off tracking. The design engineer may determine that accommodation for off tracking is not required in tangent sections and may use a minimum dimension of 18 feet-0 inch.

In addition to ODOT vertical clearance standards, the FHWA has agreed that all exceptions to the AASHTO vertical clearance standard of 16 feet for the rural Interstate and the single routing in urban areas will be coordinated with the Military Traffic Management Command Transportation Engineering Agency (MTMCTEA) of the Department of Defense. Regardless of funding, this agreement applies whether it is a new construction project, a project that does not provide for correction of an existing nonstandard condition, or a project which creates a nonstandard condition at an existing structure.

Clearance requirements for transmission and communication lines vary considerably and must comply with the National Electrical Safety Code. Clearance information should be obtained from the State Utility Liaison.

See Appendix C for Oregon Vertical Clearance Standards High Route Highways Table and the High Route map.

317.1 3R Vertical Clearance - Urban and Rural Freeway

The 3R vertical clearance for freeways is to comply with the overall system management goal to maintain current system mobility and not lose any effective usage of the system during preservation activities. **3R freeway projects shall have:**

1. No reduction in existing vertical height clearance below the Minimum Vertical Clearance standards outlined in Section 317. Reduction in current vertical clearance which results in a vertical clearance at or above the minimum vertical clearance requires notification to the ODOT Statewide Mobility Program.
2. No reduction in vertical clearance if the existing vertical height clearance is below the Minimum Vertical Clearance standards outlined in Section 317. Consultation with the ODOT Statewide Mobility Program is required.

3R projects that do not meet the vertical clearance standards will need to apply for a design exception and will require consultation with CCD. As with the 4R vertical clearance requirements, communication and coordination with CCD and interested parties is critical to ensure an understanding of the system requirements. **Vertical clearance for pedestrian overpasses shall follow the standards above.**

The vertical clearance to sign trusses and cantilever sign structures shall be a minimum of 18 feet. The vertical clearance from the deck to the cross bracing on through truss structures shall also be a minimum of 18 feet. For vertical clearance requirements on Local Agency jurisdiction roadways, see Section 317.4.

The vertical clearance for tunnels shall be at least 16 feet. Any reduction in vertical clearance for tunnels shall require a design exception and consultation with the ODOT Statewide Mobility Program. Maintaining the existing vertical clearance for tunnels on all 3R Freeway projects requires notification of the ODOT Statewide Mobility Program.

317.2 3R Vertical Clearance - Urban and Rural Arterial

As a minimum, maintain the existing clear height on all structures. On projects utilizing ODOT 3R standards (Resurfacing, Restoration, and Rehabilitation), the vertical clearance of structures is considered over the entire roadway width, including usable shoulder width. For 3R projects, no reduction of the existing vertical clearance below the minimum vertical clearance is allowed. No reduction in vertical clearance is allowed if the existing vertical height is currently below the minimum vertical clearance.

Projects that do not meet these Vertical Clearance Standards will need to apply for a Design Exception and will require consultation with the ODOT Statewide Mobility Program. The Statewide Mobility Program will then involve interested parties from industry in the consultation process necessary to fully evaluate user impacts, project construction, and design options. For vertical clearance requirements on local agency jurisdiction roadways, see Section 317.4.

317.3 4R Vertical Clearance – Urban and Rural Freeways, Expressways, and Arterials

The vertical clearance guidance provided in the introduction to Section 316 is applicable to all 4R vertical clearance requirements. In addition, the Vertical Clearance standards for all 4R urban and rural projects is as follows:

- 17′-4″ on High Routes
- 17′-0″ on NHS Non-High Routes
- 16′-0″ on Non-NHS and Non-High Route

The vertical bridge clearance on all High Routes shall be 17′ 4″. *Additional height may be needed to provide 17′-4″ clearance if future overlays are anticipated.* **All urban and rural Interstate Freeways are designated High Routes, and therefore, shall have a minimum vertical clearance of 17′ 4″.** The vertical clearance of all urban and rural non-Interstate freeways will depend on the freeway being designated as a High Route, National Highway System (NHS) route (not on High Routes), or non-NHS (not on High Routes). The vertical clearance standards also apply to non-freeway urban and rural highways. **The minimum vertical clearance for NHS (not on High Routes) is 17′ 0″ and 16′0″ for non-NHS (not High Routes).** The designation of the facility (High Route, NHS, non-NHS, etc.) is critical in determining the minimum vertical clearance requirement and should be verified prior to determining the vertical clearance requirement. **The vertical clearance shall be from the top of the pavement to the bottom of the structure and includes the entire roadway width including the usable shoulder width. Any proposed decrease in vertical clearance in new construction, regardless of the vertical clearance standard, requires consultation with the ODOT Statewide Mobility Program.**

The clearance requirements for transmission and communication lines vary considerably and must comply with the National Electrical Safety Code. Clearance information should be obtained from the Utilities Engineer.

The vertical clearance for sign trusses, cantilever sign supports, and through-truss structures shall be a minimum of 18 feet and a maximum of 19′ because of their lesser resistance to impacts. The vertical clearance for pedestrian overpasses shall be 17′-4″ (does not include buffer for future overlays).

317.4 Vertical Clearances for Local Jurisdiction Roads

Local Jurisdiction roads that are part of the NHS are required to meet AASHTO standards for vertical clearance. Also, any projects using federal funds on Local jurisdiction roads are required to meet AASHTO standards for vertical clearance. For new construction or reconstruction, provide 16 feet clearance over the entire roadway width (including travel lanes and paved shoulders). Existing clearances of 14 feet may be retained. In highly urbanized areas, a minimum clearance of 14 feet may be provided if there is an alternate route with 16 feet clearance, or if a local ordinance exists.

317.5 Vertical Clearance – Railroads

The minimum railroad clearance to be provided on crossings shall conform to Oregon Administrative Rule (OAR) 741 and as shown in Figure 300-25. Additional clearance may be required and should be determined individually for each crossing. **Information regarding clearances shall be obtained from the Railroad Liaison.** For vertical clearance requirements on Local Agency jurisdiction roadways, see Section 317.4.

Section 318 Curbs

Curbing should be avoided on higher speed rural highways. **Use mountable curbs on any freeway, expressway, or rural highway with higher speeds. Vertical faced barrier curbs shall not be used on urban or rural freeways.** The Oregon Standard Drawings RD700 series provides information on curb type. **Only the low-profile mountable curb has been approved for freeway application.** The low-profile mountable curb, mountable curb, and mountable curb and gutter are the mountable curb types approved for other locations. **Full shoulder width shall be provided and paved to the same depth as the main roadway.**

Where a standard curb is introduced, it should be curved away from the edge of the travel lane on the end of the curbed section approached by traffic. It need not be curved away where traffic leaves the curbed section. **When curbs are used on highways with narrow shoulders, the beginning of a curb on the right shall be offset a minimum of 6 feet. On the left, the offset shall not be less than 3 feet greater than the normal curb offset** (Figure 500-32 Channelization & Intersection Island Details). Curb and gutter is required at most curb ramp locations to better control the transition from the road surface to the ramp and meet accessibility requirements.

Where roadway grades are 0.5 to 0.3 percent, monolithic curb and gutter design (either curb and gutter, or mountable curb and gutter types) shall be used. The monolithic curb and gutter design is the most hydraulically efficient curb design. **As such, this design type is required**

when the grades are flat to increase the efficiency of removing water from the road surface. On grades greater than 0.5 percent, low profile mountable curb, standard curb, or mountable curb may be used. Refer to ODOT Standard Drawings RD700 and RD701.

Where sidewalk ends, curb endings and transitions to the expected pedestrian access route must be installed. Refer to ODOT Standard Drawings RD950 and RD952.

Consideration of the impact to bicyclists needs to be given when using monolithic curb and gutter. The gutter forms a grade break where typically there is a change of surface materials. Bicyclists tend not to ride on the gutter material. *A reduced bike lane width of 5 feet and the use of a monolithic curb and gutter system needs careful evaluation with regard to the competing needs of all users.*

Although curbs are typically installed in urban areas, there may be instances where curbs are not installed due to water quality reasons. *The Senior Hydraulics Engineer should be contacted for discussion on curbs and water quality issues.*

Section 319 Drainage

319.1 General

Drainage facilities enable the carrying of water across the highway right of way and also provide a mechanism for removing storm water from the roadway itself. There are many types of drainage facilities including channels, bridges, culverts, curbs, gutters, and a variety of drains. It is typical for a roadway designer to design roadside ditches, cut-off ditches, inlet spacing and locations, drainage systems for storm sewer pipes, culverts, and outlet protection when the element is considered low risk. Design of medium-risk and high-risk hydraulic design elements should be performed by a Hydraulic Engineer. See HDM Section 1211 to determine the level of risk for hydraulic design elements. *The designer should work with the regional hydraulics engineer in determining drainage needs for projects with systems larger than described above, or when flood plains, bridge hydraulics, scour or bank protection, fish passage, detention, water quality, or temporary erosion control are involved.* More discussion is provided on hydraulic issues in HDM Section 1211 Hydraulics and Section 1214 Temporary and Permanent Erosion and Sediment Control. Refer to the ODOT Hydraulics Design Manual when performing hydraulic designs.

319.2 Longitudinal Slope

Experience has shown that the recommended minimum values of roadway longitudinal slope will provide safe, acceptable pavement drainage. A minimum longitudinal gradient can be more important for a curbed pavement than for an uncurbed pavement since the water is constrained by the curb. However, flat gradients on uncurbed pavements can lead to drainage problems if vegetation is allowed to build up along the pavement edge. **Desirable gutter grades should not be less than 0.5 percent for curbed pavements with an absolute minimum of 0.3 percent.** *The designer should consult with the regional hydraulic engineer for potential solutions to flat longitudinal grades.* Superelevation and/or widening transitions can create a gutter profile different from centerline profile. *The design should carefully examine the gutter profile to prevent the formation of ponds potentially created by superelevation and widening transitions. Water cross flow in superelevation transitions needs to be considered and inlet locations need to be carefully designed to catch excess flows.* The cross flows can contribute to hydroplaning or be locations of ice. ***Sag vertical curves require analysis to ensure adequate drainage and removal of "flat" areas that impede storm water runoff.***

319.3 Selection of Inlets

The performance of inlets and cross slope has an impact on hydraulic capacity. In a past study, the performance of the CG-3 inlet was compared to the standard grated inlets. The efforts of the study provided the following results. The CG-3 inlet outperformed the CG-1 and G-1 inlets when the gutter grade was less than 1 percent. The CG-3 inlet provided about the same performance as the CG-2 and G-2 inlets when the gutter grade was less than 0.8 percent. When the gutter grade exceeded 1 percent, bypass became a problem with CG-3 inlets and required close inlet spacing to control the bypass flow. *In summary the study concluded that the CG-3 inlets are cost effective when the gutter grade is less than 1 percent*.

319.4 Storm Water Management

Most projects must address water quality and some projects must address flow control issues. ODOT's water quality goal is to design and implement highway projects in a manner that manages project runoff to protect the beneficial uses of the receiving surface and ground waters, and to manage project runoff quantities and flows to protect the receiving water's stream form, function, and stability.

The ODOT Hydraulics Manual provides design guidance for stormwater water quality and flow control (detention). Other manuals may also be referenced such as Metro's "Green Streets" on a project-by-project basis in urban environments.

Coordinate the design of stormwater water quality and flow control facilities with the region hydraulics engineer.

Section 320 Shy Distance

Whenever barriers, such as guardrail, concrete barriers, traffic separators, curbs or other significant vertical elements are introduced into the roadscape it is desirable to provide a buffer space. This buffer helps improve safety of the users, traffic flow, and operational efficiency. This buffer is often referred to as "E" or Shy Distance.

320.1 Roadside Barriers

Where right side roadside barriers are used on Interstate highways, freeways, or higher speed rural arterial roadways, the standard right shoulder width will be increased to provide a 2-foot shy (or "E") distance. This applies to all divided arterial locations, freeway (including ramps), or non-freeway. Studies show that drivers tend to leave extra room on the right side of the vehicle when near a vertical obstruction. The shy distance or "E" allows a horizontal distance for the driver to shy away from the vertical obstruction. **When the right-hand shoulder is 12 feet or greater, the 2-foot "E" is not required**, since a 12-foot right side shoulder is adequate to park a disabled vehicle and drivers do not tend to require extra width when vertical obstructions are 12 feet or more horizontally from the traveled way. The 2-foot shy distance applies to both concrete barrier and guardrail.

The 2 foot "E" is not added to the left side shoulder except under the following conditions:

1. On freeways only, when the standard shoulder is 10 feet. (This occurs on 6 lane minimum facilities). The minimum edge line to edge line distance in this configuration is 26 feet.
2. Four lane mainline section of all roadway types using concrete median barrier when the left side shoulders (6 feet or less) of the opposing lanes is separated by only barrier. Shoulders that are 6 feet in width require an edge line to edge line distance of 18 feet in this configuration.
3. This standard does not require the additional 2-foot "E" for the left shoulder at spot roadside barrier locations such as bridges and interchange areas unless the above criteria is met. Interchange ramps with left side roadside barriers do not require the 2-foot "E" on the left side.

For urban roadway sections that fit into one of the six defined urban contexts, see Section 305 for guidance on shy distances to be applied in the urban contexts.

For more information on roadside barrier design and location refer to Part 400, Roadside Design.

320.2 Shy Distance from Raised Medians

Table 300-38 **establishes the shy distance requirements from raised medians for most rural arterials, except expressways**. Table 300-38 also applies to left side shy distance for other conditions such as curbed sections on one-way roadways.

Table 300-38: Left Side Shy Distance (Rural Arterials)

Design Speed (mph)	Rural Arterial Shy Distance (feet)		
	Curb		Concrete Barrier
	12 ft. Lane	11 ft. Lane	All Lane Width
25	1	1	2
30	1	1	2
35	2	2	2
45	2	2	2
50	2	3	3
55+	3	4	4

When raised curb or concrete barrier medians are not continuous, an additional 1 foot of shy distance should be added to the values above. Table 300-38 is used in place of the direction given in Section 318 relating to curb placement. For higher speed expressways see Table 300-26 and Table 300-27. See Section 308 for more discussion about median design.

Section 321 Safety Edge

Lane departure crashes in which a vehicle departs from its lane and crashes with another vehicle, rolls over, or hits a fixed object represent from 60 to 80 percent of rural Oregon crashes. In 2007, fixed object crashes accounted for 70 percent of the rural crashes with an additional 10 percent involving overturned vehicles. This translates to 80 percent of the crashes being these two types and accounts for 90 percent of the fatal crashes and 90 percent of the injury crashes. These numbers have remained consistent for a number of years not only in Oregon but in states with a large number of miles on rural roads.

Safety Edge is a counter measure developed to address potential problems with tire rubbing along the edge of pavement. When a vehicle's tires drop off the edge of the paved surface the driver tends to over steer in the attempt to return the vehicle onto the paved surface. Safety Edge provides a sloped edge surface to assist the vehicle in returning to the paved surface without over steering.

On paving projects with shoulder widths of 6 feet or less and new pavement thickness of two inches or more, Safety Edge shall be included in the project and shown on the typical sections. Details for Safety Edge are shown on Oregon Standard Drawing RD615.

Roadside features can impede the paving operation and successful construction of the Safety Edge. These most common features are guardrail, mailboxes, approaches, intersections, and deep roadside ditches. Consecutive features may require Safety Edge to be omitted for portions of the project due to constructability issues. **When safety edge is omitted on projects with shoulders less than 6 feet in width, a design exception is required.**

Section 322 Rumble Strips

Safety is a very important component of design and roadway departure. Head-on crashes make up a significant portion of Oregon's fatalities and serious injury crashes. Rumble strips are a relatively low-cost engineering treatment designed to alert drivers of a lane departure through vibration and noise created when a vehicle's tires contact the rumble strip. Rumble strips may be placed on the shoulders, between opposing travel lanes (centerline), or in the travel lanes (transverse). **Rumble strips are considered a traffic control device and require the approval of either the State Traffic-Roadway Engineer or Region Traffic Engineer depending on the application.**

Guidelines have been established on when it may be necessary to install the rumble strips for safety reasons on state highways. Historically, rumble strips have not been used often on urban highways. However, there are sections of urban highways that could benefit from the application of rumble strips. There are newer rumble strip designs that can reduce the noise level of tires running over the strips. ***If rumble strips are proposed, the accommodation of bicyclists and shoulder width should be considered along with maintenance activities.*** The ODOT Traffic Manual provides specific details to determine if a particular project should have rumble strips installed.

Section 323 Earthwork

When the standard sections do not provide for stable slopes and roadbed, a special design is necessary. For preliminary design, cut and fill slopes steeper than 1V:2H should not be considered. Recommendations for final slope configurations are provided by the Geotechnical Engineer in the Geotechnical Report. **The design shall be based on soil tests and other factors and must have the approval of the Geotechnical Engineer.**

When the slope at the edge of the surfacing material is 1:6 and continuous sections of guardrail are required, consider reducing the surfacing material slope to a minimum of 1:3 behind the guard rail to minimize impacts on the total horizontal width. This may apply in the case of railway encroachments, high fill, or very high cost right of way.

When designing individual cuts and fills and varying the rate of slope due to height variations, use care to avoid irregular faces, ponding of water, and poor aesthetics. *Embankment and cut slopes greater than 10 feet in height need to be identified and communicated to the geotechnical staff early in the design process, because subsurface investigation, laboratory testing and analyses is required prior to making final slope configuration recommendations.* Embankment height is measured as the difference in elevation between the subgrade at the shoulder and the toe of the slope. *The toe of existing embankments and cut slopes should not be altered without recommendations from the Geotechnical Engineer.* The recommendations provided by the geotechnical EOR establish the engineered embankment prism. **Non-structural elements shall not infringe on the engineered embankment prism. Non-structural elements placed outside the engineered embankment prism are the sole responsibility of the discipline requesting the elements.**

Table 300-39 provides guidance for additional width for fill sections where there is a concern for the stability of slopes. For additional information about earthwork design, see Section 1202, Geotechnical Design as well as consulting the Geotechnical section for guidance as needed. Earthwork often involves water runoff and drainage issues. See Section 1211, Hydraulics and Section 1214, Temporary and Permanent Erosion Control for additional guidance.

Table 300-39: Additional Embankment Widening on High Fills

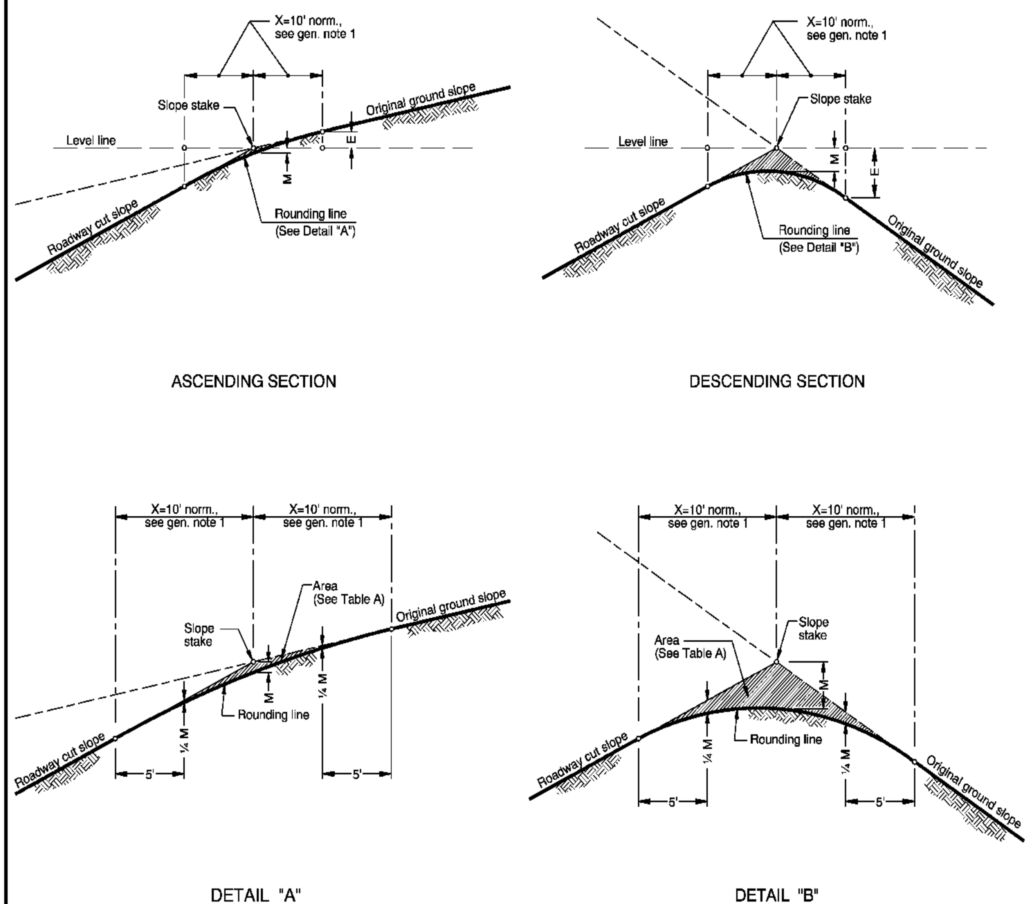
Fill Height (Feet)	Widening of Subgrade as Appropriate, Each Side of Centerline (Feet)
0-20	No Widening
20-30	1
30-40	2
40-50	3
Over 50	4

Fill height is to be considered as the difference in elevation between the subgrade shoulder and the adjacent toe of slope.

323.1 Rounding Cutbanks

Cut slopes shall be designed to blend in with the surrounding terrain. This is accomplished by rounding the top of the cutbanks as shown on Figure 300-26 also as specified in the Oregon Standard Specifications for Highway Construction (Section 00330). The rounding limits also have an impact on right of way requirements.

Figure 300-26: Rounding Cutbanks



* See general note 2

TABLE A *

	E (ft)	CUT SLOPE 1 : 1 M (ft)	1 : 1 AREA (sqft)	1 : 1.5 M (ft)	1 : 1.5 AREA (sqft)	1 : 2 M (ft)	1 : 2 AREA (sqft)	1 : 3 M (ft)	1 : 3 AREA (sqft)	1 : 4 M (ft)	1 : 4 AREA (sqft)
ASCENDING GROUND	4	1.50	10	Rounding not required within these limits.							
	3	1.75	12								
	2	2.00	13								
	1	2.25	15	1.42	9						
LEVEL		2.50	17	1.67	11						
DESCENDING GROUND	1	2.75	18	1.92	13	1.50	10				
	2	3.00	20	2.17	14	1.75	12				
	3	3.25	22	2.42	16	2.00	13	1.58	11		
	4	3.50	23	2.67	18	2.25	15	1.83	12	1.63	11
	5	3.75	25	2.92	19	2.50	17	2.08	14	1.88	13
	6	4.00	27	3.17	21	2.75	18	2.33	16	2.13	14
	7	4.25	28	3.42	23	3.00	20	2.58	17	2.38	16
	8	4.50	30	3.67	24	3.25	22	2.83	19	2.63	18
	9	4.75	32	3.92	26	3.50	23	3.08	21	2.88	19
	10	5.00	33	4.17	28	3.75	25	3.33	22	3.13	21

GENERAL NOTES FOR ALL DETAILS:

1. Extend slope rounding 10' or to right of way line, whichever is less. Use the same X dimension on both sides of slope break point.
2. Table A values are only for slope rounding with an X dimension of 10'.

STATE OF OREGON
DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING UNIT

SLOPE ROUNDING

HIGHWAY DESIGN MANUAL

Section 324 Truck Weigh Stations

On freight routes and other major highways, truck weigh stations may be necessary. The Commerce and Compliance Division shall be consulted when a weigh station is being impacted or considered. **Appropriate acceleration and deceleration lanes must be provided for truck weigh station locations.** The station should also be set back from the highway to provide separation from high-speed traffic and stopped trucks. Truck weigh stations may also be located at non-freeway locations. Due to location and type of facility, the design of non-freeway weigh stations will vary. For freeway and non-freeway weigh station design guidance, contact the ODOT Technical Services Roadway Engineering Unit.

Section 325 Safety Rest Areas

Safety rest areas are a facility removed from the traveled way with parking and facilities for the traveler deemed necessary for rest, relaxation, comfort, and information needs. Rest areas are located on freeways and other highways.

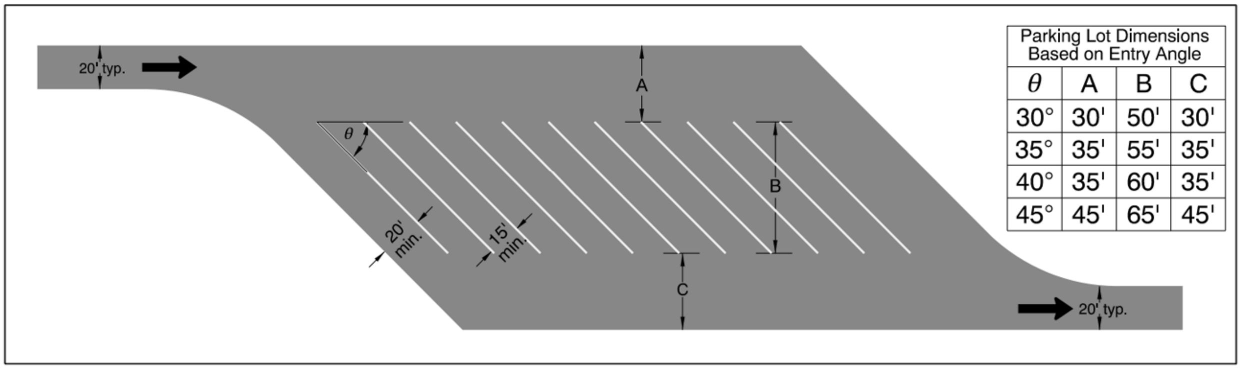
The design of rest areas will vary depending upon location and need. Some rest areas are quite large while other rest areas only serve a few vehicles and are more of a wayside. *Roadway Engineering should be contacted concerning design guidance for rest areas.* **Pedestrian amenities and services at Safety Rest Areas, such as restrooms, picnic tables, information kiosks, etc., must be accessible. In addition, an appropriate number of accessible parking spaces must be provided .**

Rest areas located on the freeway system are to be designed with exit and entrance ramps. The exit and entrance ramps should be designed in the same manner as interchanges. Because rest areas accommodate a large numbers of trucks, the design should consider exit and entrance ramps that better accommodate trucks. As mentioned above, rest areas have different functions. One of those functions is providing travel information. Many times, the rest area will be closed for long periods, and this has an impact on the travel information provider. In cases where the rest area requires remodeling or repair, the designer should see that tourist information facilities are kept in service if possible or look at ways of minimizing the closure time.

325.1 Large Vehicle Parking in Rest Areas

Figure 300-27 shows the minimum dimension layouts for large vehicle parking in new rest area parking areas. This is not always attainable when modifying current rest area parking areas due to limited right of way, current paved surface, and funding. It is also not desirable to remove current parking spaces to get closer to this standard. When repaving current rest areas, evaluate the current layout of the parking area to provide additional parking spaces. At a minimum in the evaluation, make improvements to the design without reducing the number of parking spaces. Only reduce the existing number of parking spaces when absolutely necessary to meet an appropriate design layout based on Figure 300-27. Maintain the maximum number of parking spaces possible.

Figure 300-27: Typical Large Vehicle Parking Space Dimensions for New Rest Area Parking Areas



Section 326 Emergency/Truck Escape Ramps

Rural highways are often located in steep terrain. In some sections, long continuous grades may be the only reasonable design option. *Where long continuous down grades are present or being considered, the designer should investigate the need for emergency/truck escape ramps.* Generally, truck escape ramps are only needed where long descending grades exist. Section 3.4.5 of AASHTO's "A Policy on Geometric Design of Streets and Highway - 2018", has additional design guidance on escape ramps.

Section 327 Chain-up And Brake Check Areas

Chain-up areas are used to allow drivers of trucks or other vehicles to install and remove chains in areas where there is inclement weather. Chain-up areas are typically located at the base of sustained grades and where there is a demonstrated need. Chain-up areas are typically located adjacent to the mainline, where the shoulder can be easily widened. Brake check areas are typically located just prior to long descending grades. ***The width of chain up and brake check areas should be at least 20 feet wide (including the existing shoulder width). Exit and entrance tapers for chain up and brake check areas should be 20:1 and 25:1 respectively.*** The length of chain-up and brake check areas will vary depending on the location and truck volumes.

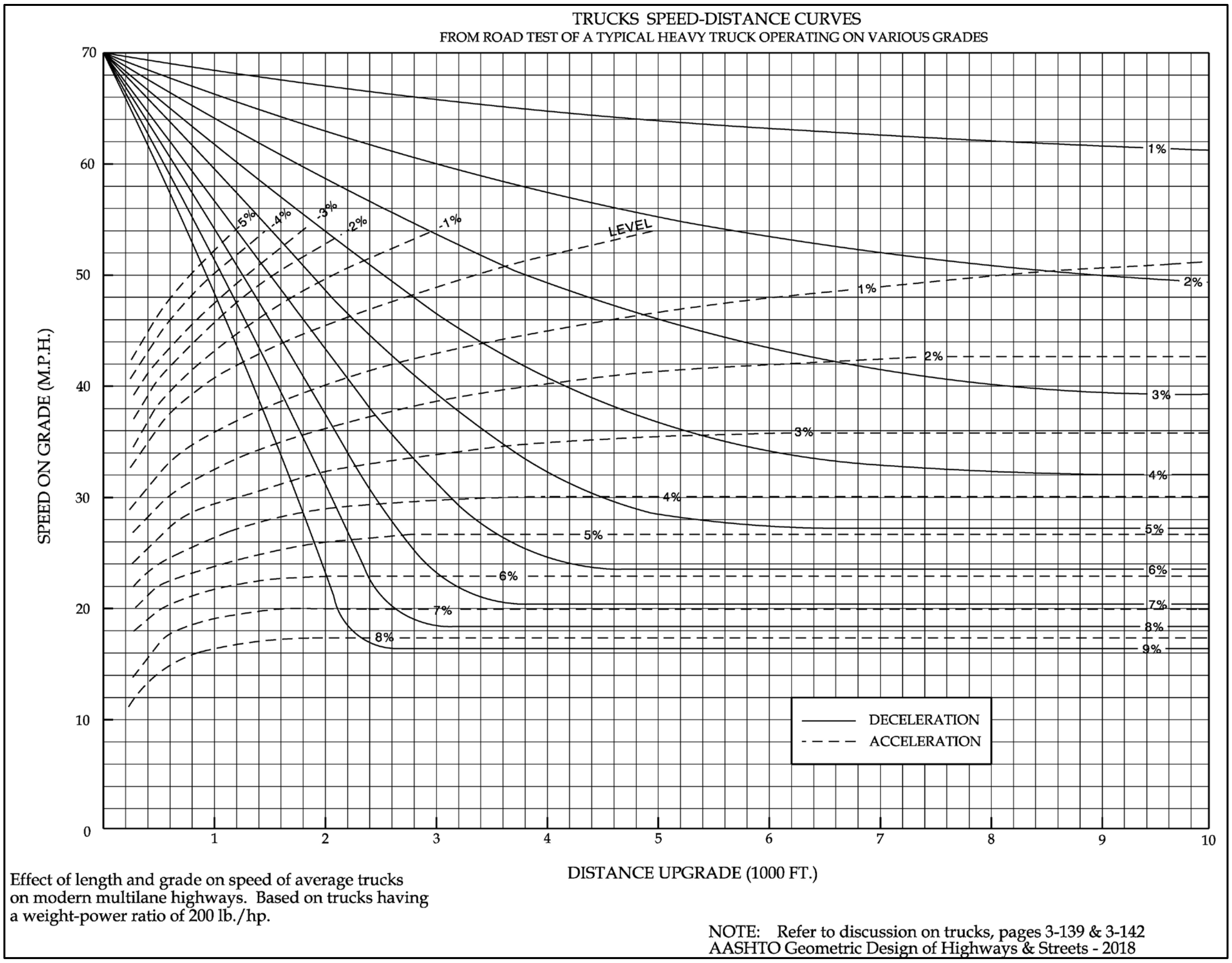
Section 328 Climbing Lanes

Climbing lanes are normally provided to prevent unreasonable reductions in operating speeds. Normally the combination of heavily loaded vehicles operating on long uphill grades results in the need for climbing lanes. *A climbing lane section is not considered a three-lane section but, rather, a two lane section with an additional lane for uphill slow moving vehicles.* (See AASHTO's "A Policy on Geometric Design of Highways and Streets - 2018".)

Where climbing lanes are warranted as specified in Part 300 ODOT 4R/New Standards, the location of the beginning and the end of the lane can be determined by the chart, "Truck Speed / Distance Curves" Figure 300-28. *In using this chart for design purposes, vertical curves are not considered, and the speeds are taken from the chart assuming that the vehicle travels in a straight line from one point of grade intersection to the next. Vertical curves can be broken up into straight line segments if additional accuracy is desired.* ***The taper section added at the beginning of a climbing lane should have a 25:1 ratio desirably, that should be at least 300 feet in length.. The taper section added at the end of a climbing lane should have a 50:1 ratio desirably, that should be at least 600 feet in length.***

Whenever climbing lanes are warranted, the feasibility of supplemental downhill passing lanes should be investigated. **Both climbing lanes and downhill passing lanes shall be the same width as the travel lanes used for normal construction. The desirable adjacent shoulder width is 6 feet with a minimum of 4 feet. If the roadway has substantial bike use, consult the ODOT Bicycle and Pedestrian Design Engineer or the project resource for active transportation for input on shoulder width. When climbing lanes are supplemented with downhill passing lanes, a 2-foot-wide median shall be introduced.** Four-lane construction with appropriate shoulder and median widths should be substituted for climbing lanes wherever traffic is likely to approach or exceed capacity.

Figure 300-28: Truck Speed/Distance Curve



Section 329 Passing Lanes

Passing lanes should be considered on two-lane arterials where it is not practical to achieve adequate passing sight distance or where increased traffic volumes have an adverse impact on the desired volume to capacity ratio. Ideally, passing lanes should be considered only in areas where the roadway can be widened on both sides to provide simultaneous passing opportunities for both directions.

The standard travel lane for a passing lane section is 12 feet. The desirable shoulder width should be 6 feet with a minimum of 4 feet. Consult the ODOT Bicycle and Pedestrian Design Engineer or the project resource for active transportation for input on shoulder width. **The minimum median width in a passing lane section (three or four lanes) shall be 2 feet.**

If at all possible, passing lanes should be located where there are no approaches. If there are existing approaches, the type of approach is critical. **The design team shall evaluate and consider closure of the existing approach(s).** It may be possible to allow a passing lane where there are single residential approaches or possible forest service type roads, but the approach to public/county roads and approaches that serve multiple trip generation opportunities are problematic in a passing lane section. There are expectations in a passing lane such that the drivers will only be focused on the through movement vehicles. Entering and exiting vehicles violate the driver expectations, for example a vehicle stopped in the left lane waiting to make a left turn. In cases where higher volume access points exist in a passing lane section, left turn lanes are strongly encouraged. **The ending point and transition section of a passing lane is critical, and these specific types of locations need to be avoided for ending the passing lane:**

- **The crest of a hill,**
- **On a horizontal curve, and**
- **Locations that have the potential for a left turn.**

Passing lanes should be clearly identified to prevent motorists from thinking they are entering a four-lane section of roadway. The minimum length of a passing lane should be 1,250 feet, plus tapers. The taper section at the end of a passing lane should be computed by the following formula:

$\boxed{L = WS}$ *(L=Length in feet, W=Width in feet, S=Posted Speed in mph).*

The recommended length for the lane addition taper is half to two-thirds of the lane drop length. Optimum passing length is 1.25 miles. It is very important to have passing lanes long enough to allow the passing of vehicles but not too long as to make the added passing lane seem like an additional travel lane. *The Transportation Planning Analysis Unit (TPAU) or the Region Traffic Engineer should be contacted to determine the appropriate length of passing lane.*

Design considerations for providing passing lanes on two-lane highways are as follows:

1. Horizontal and vertical alignment should be designed to provide as much length as feasible with sight distance for safe passing.
2. To maximize safe operations, drivers should be able to clearly recognize both lane additions and lane drops.
3. For volumes approaching design capacity, the effect of lack of passing lanes in reducing capacity should be considered.
4. Where the traffic is slowed or capacity reduced because of trucks climbing long grades, construction of climbing lanes should be considered.
5. Where the passing opportunities provided by application of Items 1 and 4 are still inadequate, the construction of a four-lane highway should be considered. Inability to

economically justify climbing lanes or multi-lanes may require that the roadway be designed for a much higher volume to capacity ratio.

Consider providing extensions to the passing lane section to allow slower vehicles the opportunity to attain free flow speed prior to merging. This reduces the speed differential between vehicles at the merge, improving safety and operations.