Chapter

7

RURAL HIGHWAY DESIGN (NON-FREEWAY)

7.1 INTRODUCTION

THIS CHAPTER PROVIDES INFORMATION ON ODOT 4R/NEW RURAL NON-FREEWAY DESIGN STANDARDS AND ODOT 3R RURAL NON-FREEWAY DESIGN STANDARDS. THE ODOT 4R/NEW RURAL DESIGN STANDARDS ARE COVERED FIRST, FOLLOWED BY THE ODOT 3R RURAL DESIGN STANDARDS. THE DESIGNER MUST BE AWARE OF WHICH STANDARDS APPLY AND CHOOSE THE APPROPRIATE STANDARDS WHEN DEALING WITH RURAL HIGHWAYS. REFER TO CHAPTER 1 FOR A DISCUSSION ON THE DIFFERENT DESIGN STANDARDS.

Rural highways make up a large percentage of the state highway mileage. Rural highways cover the widest range of geographical and topographical conditions. Rural highways connect all parts of the state to each other. Rural highway designs should provide the safest cost effective solutions. This chapter will discuss the various cross sectional design elements and how topography and traffic volumes affect them. Horizontal and vertical alignment information is also described. This chapter also discusses how to design highways that are Scenic Byways and highways that travel through the many rural communities located throughout the state.

The arterial road systems provide a high speed and high volume travel network between major points in urban and rural areas. Rural arterials consist of a wide range of roads, from multi-lane rural expressways to low volume, two lane roads. Most rural state highways in Oregon are functionally classified as arterials as they serve the greatest traffic volumes and provide critical connections to the larger urban areas, ports, multi-modal facilities, and recreational areas. However, some state highways serve very low volumes of traffic and are classified as collectors or local roads. The majority of this chapter will describe the design standards and guidelines for rural expressway design and rural arterial highway design, although there will also be discussion on rural collectors and local roads. The design standards and guidelines contained in this chapter are only to be used for non-freeway rural highway design. Rural freeway design is covered under Chapter 5.

7.2 ODOT 4R/NEW RURAL EXPRESSWAY DESIGN STANDARDS

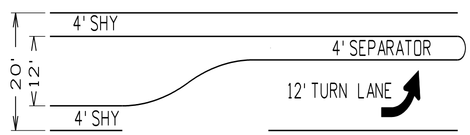
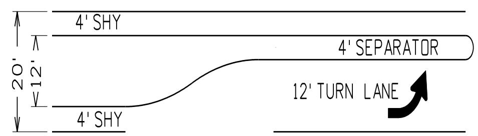
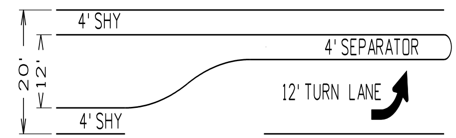
7.2.1 GENERAL

Expressways are designated by the OTC. They are allowed on statewide, regional and district classified highways. Expressways are generally high speed, limited access facilities whose main function is to provide for safe and efficient high speed and high volume traffic movements. Expressway designation is not limited to multi-lane roadways. Rural two-lane highways can also be designated as expressways. The Dalles-California Highway (US 97) in Central Oregon is an example of a designated expressway that includes both multi-lane sections and two-lane sections. The primary function of rural expressways is to provide connections to larger urban areas, ports, and major recreational areas with minimal interruptions. Rural expressways may also serve as major freight corridors or may be located on Freight Routes. Private access is discouraged and public intersections are highly controlled. Rural expressways may utilize at-grade intersections or grade separated interchanges. However, the mixing of at-grade intersections with grade separated interchanges in proximity to each other should be kept to a minimum. Drivers may become confused in their perception of expectations at the different connection styles causing undesirable actions on their part as they interact with other vehicles entering or leaving the roadway. Some expressways may become freeways in the future and therefore should be designed, operated, and managed at the highest level to ensure long-term operations. The transitioning of rural roadways to expressways should take into account the long-term plan for the roadway, which can impact the design of the facility.

High level roadways, although classified as expressways, may operate more as a freeway. These expressways have grade separations in place of at-grade intersections and are fully access controlled. When high level expressways meet the operational definition of freeways, the expressway should be designed with freeway standards (See Chapter 5). This means many of the design elements in Table 7-1, such as left turn lanes, striped medians, and right turn lanes would not apply.

Table 7-1 provides standards for the design of reconstruction and new construction projects on rural expressways. Following Table 7-1 is discussion on the different design elements to provide additional background information.

Table 7-1: ODOT 4R/New Rural Standards - 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)
Median 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 lane 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 3-2	See Table 3-2	See Table 3-2
Maximum Degree of	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 Chapter 4, Section 4.5.1		

[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 Chapter 8. Superelevation rate used from Standard Superelevation, Figure 3-3, which is based on open road conditions.
[5] On-street parking is not allowed on expressways.

7.2.2 DESIGN CONSIDERATIONS

7.2.2.1 DESIGN SPEED

Rural expressways carry high speed and high volume traffic and should be designed accordingly with the function of the facility. Rural expressway design speeds should be designed for a minimum 50 mph design speed in mountainous areas, 60 mph in rolling terrain, and 60 or 70 mph in flat terrain. Expressways may in time evolve into freeways and the chosen design speed should allow for that facility type transition.

7.2.2.2 GRADES

The length and percentage of grade affects on the operation of the expressway. Long, steep grades reduce the efficiency of the facility, especially when there are high truck volumes. The maximum grades for mountainous, rolling, and flat rural expressways are 6%, 4%, and 3% respectively.

7.2.2.3 LANES

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. The standard lane width on all rural expressways is 12 feet. Table 7-1 shows the lane width for left and right turn channelizations.

7.2.2.4 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 rural four lane 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 (See Table 7-1).

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. On rural expressways with more than two lanes in each direction, the left side shoulder requires 2 foot shy to the face of the barrier since it is more likely the shoulder will be used for emergency parking.

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 Section 13.7 and the Oregon Bicycle and Pedestrian Design Guide (attached as Appendix L) for additional information on multi-use paths.

7.2.2.5 MEDIANS

Note: The addition of any median treatment 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 4.3. For depressed median design standards, refer to chapter 5. 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 raised curb median consisting of a 12 foot raised 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 to be 60 feet or less, the median should be closed with concrete barrier or cable barrier to prevent crossover crashes. 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 7-1. 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 ft 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.

7.2.2.6 ACCESS CONTROL

Maintaining access control on rural expressways is critical to retaining the safety and efficiency of the facility. No private approaches should be allowed on rural expressways. If there are existing private approaches, a long term plan should be established to eliminate them or provide alternative access as opportunities occur. Public road connections are controlled and spaced according to the access management spacing standards contained in the Oregon Highway Plan, Appendix C. Traffic signals are not recommended on rural expressways, and modernization of expressways that have traversable medians will typically result in non-traversable medians.

7.2.2.7 INTERSECTIONS AND INTERCHANGES

Connections to rural expressways can be either at-grade intersections or grade separated, grade separation being preferred in most cases. Locating intersections along curves presents some design difficulties such as dealing with superelevation rates and sight distance. Rural interchange spacing (crossroad to crossroad) shall follow Table 9-1. For more information relating to intersections see Chapter 8 and for interchange design, refer to Chapter 9.

7.2.2.8 DECELERATION & ACCELERATION LANES

Deceleration lanes are encouraged at intersections and required at interchanges. Deceleration at an interchange can look similar to a standard right turn lane or a freeway exit ramp. Each situation must be evaluated and analyzed to determine the appropriate treatment. Figure 8-8 should be used for all right turn deceleration lanes. The information contained in Chapter 9 can be used to determine acceptable exit ramp designs.

Acceleration lanes should generally only be used at interchanges on rural expressways. Acceleration lanes at at-grade accesses or intersections may not be appropriate. Acceleration lanes should only be used where they will not be influenced by downstream intersections or accesses. At-grade intersections and access locations may include acceleration lanes only where access management spacing standards are met, the type of turning movements are considered, and where an engineering analysis shows they will operate safely. Design guidance and criteria for at-grade intersections are found in Chapter 8.

For freeway style interchanges, freeway type acceleration lanes are necessary. For jug handle and at-grade acceleration lanes, the parallel type shown in Section 8.3.11 may be most appropriate. Figure 9-11 and AASHTO's *"A Policy on Geometric Design of Highways and Streets - 2011"* provides guidance for determining the appropriate acceleration lane length. The length may need to be increased when a significant volume of truck traffic is using the merge lane or where high volumes are merging into a single lane.

7.3 ODOT 4R/NEW RURAL ARTERIAL DESIGN STANDARDS

7.3.1 GENERAL

Most rural state highways are classified as arterial roadways. Appendix A contains a listing of the functional classification of all state highways. Corridor Plans, and county Transportation System Plans (TSPs) also need to be reviewed to ensure that the highway classification is correct. Where discrepancies exist between the tables in Appendix A and the classifications assigned by a Corridor Plan or TSP, the higher classification is used. The context must also be considered. 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, urban standards are appropriate and careful consideration must be given to the transition from a high to low speed environment – see Chapter 6.

Table 7-2 provides ODOT 4R/New Rural design standards for the design of reconstruction and new construction projects on rural highways. This table provides design standards not only for rural arterials but also for rural collectors and rural local routes. Rural local routes refer to the functional classification of the roadway and not jurisdictional ownership. Following Table 7-2 is additional background information on the different design elements. The design principles for collectors and local roads are similar. Sections 7.3 and 7.4 cover rural collectors and local roads respectively.

Table 7-2: ODOT 4R/New Rural Arterial Design Standards

ODOT Standards For New/Reconstruction Projects

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 ft for 70 mph or less --																	
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 Chapter 4, Section 4.5.1 ---																	
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-Pedestrian Program Manager 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 7-1 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 5.4 "roadside barriers" and Std. Drg. RD420 or RD425).
- **To convert ADT's** and DHV's, contact Transportation Planning Analysis Unit or Region Traffic Unit.

7.3.2 DESIGN CONSIDERATIONS

7.3.2.1 DESIGN SPEED

Rural arterials have a wide range of design speed depending on the terrain, traffic volume, location of facility, and driver expectancy. Design speeds range from 45 mph in mountainous terrain and low volume to 60 or 70 mph on level terrain. A 60 mph design speed works well for most of Oregon's rural two lane highways. Table 7-2 provides standards based on traffic volume and design speed for rural non-freeway highways. In general design speeds on level terrain range from 60-70 mph; rolling terrain design speeds in rural areas range from 50-60 mph; and mountainous terrain design speeds range from 45-50 mph. A 45 mph design speed in mountainous terrain or a 50 mph design speed in rolling terrain would only apply where the traffic volumes are low. The design speed in rural communities will vary according to community characteristics. In addition, some rural communities may receive special designation as a Special Transportation Area (STA) which will factor into the selection of the design speed.

7.3.2.2 GRADES

Rural arterials cover a wide range of topographic areas. Highway grades can have a significant effect on traffic flow and operations and therefore should be as flat as possible. Highways that carry substantial amounts of truck or recreational vehicle traffic will be greatly affected by steep grades. Wherever possible, steep grades should be avoided. Where this is not practical, the length of grade should be minimized. The maximum grade allowed on rural arterial highways can be found in Table 7-2. Where terrain impacts traffic flow, provide frequent passing opportunities where possible.

In some mountainous terrain, long steep grades are unavoidable. In these instances consider the use of truck climbing lanes. On continuous steep down hill grades, the use of truck escape ramps may be necessary. Where truck escape ramps are deemed necessary, they should be designed as an ascending grade type as per AASHTO's *"A Policy on Geometric Design of Highways and Streets - 2011"*. Climbing lanes are covered in more detail in Section 4.8.3

7.3.2.3 TRAVEL LANES AND 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 should have 12 foot lanes, regardless of volume. In addition, a 12 foot lane should generally be used for all statewide classified highways on the National Highway System (NHS). Lower volume collectors and local routes may have a narrower roadway width. Lane width for regional and district highways is typically based upon functional class and volume. Table 7-2 provides information on standard lane width.

7.3.2.4 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 7-2 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, as are bike lanes 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 should have greater attention to bicycle accommodation, beyond the minimum shoulder widths.

7.3.2.5 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 the 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 7-1 contains the standard median widths.

Where painted medians are acceptable, they should be a minimum of 8 feet 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 7-1 provides standard details for median width, shoulder widths, slopes, and ditch widths.

Refer to Section 4.3 for more information about median design

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

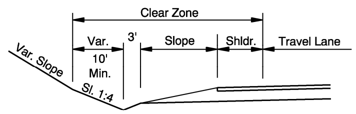
MEDIAN WIDTH TABLE

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

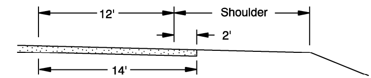
TABLE "E"

PARKING WIDTH TABLE

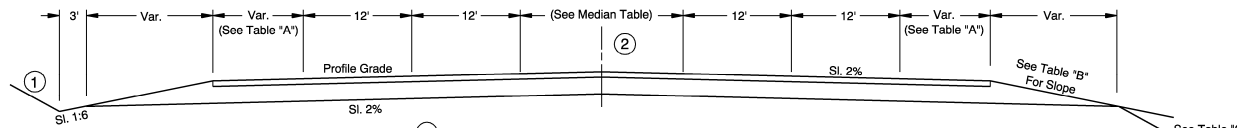
ROADWAY CLASSIFICATION	RESIDENTIAL (ft.)	COMMERCIAL / INDUSTRIAL (ft.)
Urban Arterials	8 - 10	8 - 10
Urban Collector	7 - 10	8 - 10
Urban Local	7	7



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

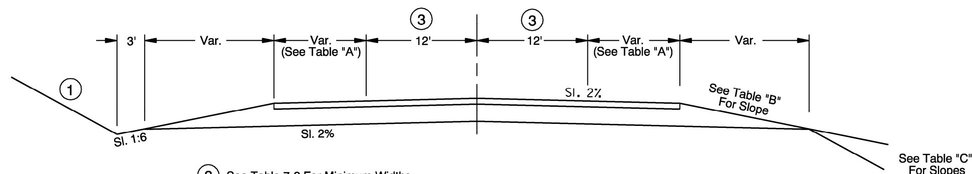


Where Concrete Pavement Is Used For Travel Lanes, Outside Lane Shall Be Constructed 14' In Width. The Shoulder Stripe Is Located 2' In From Edge Of Concrete And Total Shoulder Width Is Measured From Stripe.



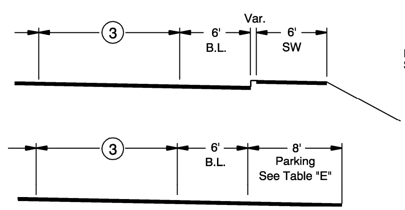
② 2' median where 4 lanes are a result of climbing or passing lanes. Median widths thru channelization and intersections.

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 UNIT

STANDARD SECTIONS

HIGHWAY DESIGN MANUAL

Figure 7-1: Standard Sections For Rural Highways

7.3.2.6 ROADSIDE DESIGN

The design of the roadside environment is a critical part of any rural highway segment. A well designed roadside can significantly improve the safety and operation of a particular segment. Steep slopes or obstacles should be avoided or mitigated where possible and practical. Fixed object and run off the road type accidents often account for a significant number of crashes on a segment of highway. Therefore, providing a safe roadside environment should be a goal of every project. The 2011 AASHTO *"Roadside Design Guide"* should be used to determine the clear zone distance and mitigation measures to use for different highway conditions. Section 4.5.3 has additional information and examples on proper clear zone requirements and roadside design.

As AASHTO's "Roadside Design Guide" directs, the preferred treatment of roadside obstacles is to relocate them outside of the clear zone. Only where this is not possible or cost effective, should shielding be considered. Where a barrier along a roadway is used to shield a roadside obstacle, a 2 foot shy distance from the normal edge of shoulder to the face of barrier should be used. This shy distance maintains the useable shoulder width and provides some additional distance from the traveled way and the barrier.

7.3.2.7 LEFT TURN LANES

On some higher volume and higher speed highways, left turning traffic can become a major safety concern, especially on two-lane highways. On rural highways, left turn lanes should generally only be considered at public road intersections. The Analysis Procedures Manual (Transportation Planning and Analysis Unit) discusses citing criteria for installing left turn lanes. When these criteria are met, a left turn lane should be considered in the design. Generally, left turn lanes are not to be constructed for private accesses in rural areas unless the siting criteria are met and installation of a left turn lane will not create additional safety concerns on the highway. A major concern regarding left turn lanes for private access is that successive accesses may require installation of a section of a continuous two way left turn lane (CTWLTL). Using CTWLTLs in rural environments should be discouraged. CTWLTLs may be considered where needed specifically for safety in short sections or within the boundaries of a rural community.

As stated above, providing left turn lanes at multiple locations that are spaced closely may create a need for a CTWLTL. It is undesirable to provide a typical section that creates an hour glass shape. This is where a highway is widened to provide a left turn lane, then narrowed back to the original typical, only to be immediately widened again. This situation should be avoided. Left turn lanes in rural areas should be selected where adequate spacing exists to avoid this hour glass problem.

7.3.2.8 RIGHT TURN LANES

Similar to left turns, right turning traffic may sometimes create a safety issue at some intersections. However, right turn traffic does not normally need to come to a complete stop and wait for an opposing gap to complete the maneuver, except in the case of a pedestrian crossing. Therefore, the safety implications are not as significant as with left turning vehicles. However, at some intersections, the volumes on the highway and the right turning traffic may be significant enough to create a safety problem. The Analysis Procedures Manual (Transportation Planning and Analysis Unit) discusses siting criteria for installing a right turn lane. A right turn lane should be considered only at public road intersections that meet these criteria. Right turn lanes should not be used for private drives unless the access has significant turning volume, a specific accident problem could be corrected by utilizing a right turn lane, or the access is within a rural community area (as defined in the next section) and meets the criteria from the Analysis Procedures Manual.

7.3.2.9 EMERGENCY/TRUCK ESCAPE RAMPS ESCAPE RAMPS

Rural highways are sometimes 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, investigate the need for emergency/truck escape ramps. Generally, truck escape ramps are only needed where long descending grades exist. Chapter 3 of AASHTO's *"A Policy on Geometric Design of Highways and Streets - 2011"* has a lengthy discussion on escape ramps.

7.3.2.10 TRUCK WEIGH STATIONS

On freight routes and other major highways, truck weigh stations may be necessary. Contact the Motor Carrier Transportation Division when a weigh station is being impacted or considered. The design for weigh scale locations should provide acceptable deceleration and acceleration lanes. The station should also be set back from the highway to provide separation from high speed traffic and stopped trucks.

7.3.2.11 ACCESS MANAGEMENT

Access management is an important tool for maintaining the safety and functionality of a highway segment. In rural environments, access spacing should conform to the standards contained in OAR 734 Division 51. Generally the purchase of access rights is not necessary in rural environments unless the section is near an interchange or an important intersection that cannot be adequately protected through the normal approach road permit process. For more information about access management, refer to Section 2.6.

7.3.3 SPECIAL DESIGN CONSIDERATIONS

Rural arterial highways cover many miles of varying terrain and roadside development. They also are 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.

7.3.3.1 SCENIC BYWAYS

ODOT has established a process for portions or segments of highway routes to be designated as Scenic Byways. 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, at no time should the safety of the section be compromised. 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.

7.3.3.2 RURAL COMMUNITIES

Rural Communities are unincorporated places comprised of primarily residential uses but also include other uses that help to make the community self sufficient. These other uses may include commercial, industrial, or public places (such as schools, churches, and post offices). Rural communities can take many forms. These different forms are defined in OAR 660 Division 22. Designers should be aware of several issues when designing a highway through a rural community. Issues such as speed, access, and pedestrian safety are very important to the local community.

In many rural communities, 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 the design speed. Setting an artificially low design speed does not result in reduced traveling speeds, but tends to result in a design with a lower factor of safety. When reduced traveling speeds are desired, traffic calming techniques and development of roadside culture can be effective. The Technical Services / Roadway Engineering Unit can assist with developing traffic calming designs for these communities.

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. Generally, the designer should adhere to the access spacing standards for rural highways other than expressways and per the highway classification. However, in many rural communities, meeting these standards will be difficult. Where access spacing cannot be met, an access deviation will be required as per the OAR 734 Division 51. Where access spacing is less than standard, the designer should 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.

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. Traffic speed often has a significant physical and psychological impact to pedestrian crossing safety. Techniques to manage traffic speeds should be considered when appropriate. In addition, other tools can assist with pedestrian safety. Providing safe and clear sidewalks should be considered. Generally sidewalks in these areas should 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. Clear, delineated pedestrian crossings should be included where appropriate. Use of markings, signing, and construction materials all may be considered to improve the visibility of pedestrian crossing areas. Other features such as bulb-outs and raised medians may also improve pedestrian crossing safety. The designer should be aware of and take into account impacts to historic areas, which may impact the use of certain roadway designs. For more information on pedestrian design, see Chapter 13 of this design manual and the Oregon Bike and Pedestrian Design Guide (Appendix L).

While these issues are often important considerations for local stakeholders, the designer must still consider the highway classification and other highway designations when developing designs for rural communities. The designer needs to accommodate the through travel as well as local movements when developing project designs in rural communities.

7.4 ODOT 4R / NEW RURAL COLLECTOR DESIGN STANDARDS

Collectors serve two very important functions. First collectors provide mobility to and from the arterial streets. Second, collectors provide land access to abutting properties. Due to their dual purpose, collectors have mobility characteristics that are just below those of an arterial and just above those of a local street.

The design elements of collector roads are similar to the design elements of arterials, although typically the range of values is slightly less demanding. Design speeds are normally lower than those for arterials, steeper grades are allowed, and lane and shoulder widths are generally narrower.

The different design standards for rural collectors can be found in Table 7-2. Additional information on collectors can found in Chapter 6 of AASHTO's *"A Policy of Geometric Design of Highways and Streets - 2011"*.

7.5 ODOT 4R/NEW LOCAL ROUTE DESIGN STANDARDS

A rural local route's primary function is to provide access to rural areas. Local routes account for a very large proportion of the roadway mileage in the State. Local routes normally carry very low volumes; therefore, design standards for local routes are generally lower than those standards for collectors and arterials. Design speeds are lower, steeper grades are allowed, and travel lanes and shoulder widths are narrower.

The different design standards for rural local routes can be found in Table 7-2. Additional information on rural local routes can be found in Chapter 5 of AASHTO's "*A Policy on Geometric Design of Highways and Streets - 2011*".

7.6 ODOT 3R RURAL (NON-FREEWAY HIGHWAYS) DESIGN STANDARDS

7.6.1 GENERAL

This section discusses the appropriate design standards for rural non-freeway highway projects and is applicable to arterials, collectors, and local streets. Non-freeway 3R project should be developed in line with the SCOPE values of Practical Design presented in Chapter 1. The following are minimums for lane and shoulder width, with consideration and improvement to horizontal and vertical curvature, bridge width and side slopes as appropriate. A feature not meeting the standards as specifically noted for roadway width, bridge width, horizontal curvature, vertical curvature and stopping sight distance, pavement cross slope, superelevation, vertical clearance, ADA, or pavement design life must be upgraded or a design exception must be documented and approved. For more information on these criteria and other safety-conscious design considerations, the designer should become acquainted with TRB Special Report #214-"Designing Safer Roads-Practices for Resurfacing, Restoration, and Rehabilitation".

Once the decision is made to upgrade a roadway feature, the designer should use the ODOT Highway Design Manual, AASHTO's *"A Policy on Geometric Design of Highways and Street - 2011"*, AASHTO's *"Roadside Design Guide - 2011"*, or TRB Special Report #214, whichever gives guidance in the particular area of need. When evaluating intersections within a 3R project, turning radius to facilitate truck movements should also be considered as well as intersection sight distance.

7.6.2 ROADWAY WIDTHS

See Table 7-3 for minimum 3R roadway widths.

Table 7-3: Minimum 3R Lane and Shoulder Widths
Rural Non-Freeway (Arterials, Collectors, Local Streets)

Design Yr 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.

7.6.3 HORIZONTAL CURVATURE AND SUPERELEVATION

Alignment improvements to horizontal curvature and superelevation can be as cost effective as lane and shoulder width improvements. Evaluate reconstruction of the horizontal alignment when the design speed of the existing curve is more than 15 mph below the project design speed, and the current year ADT is 2000 or greater. When reconstruction of the horizontal alignment is not justified, apply appropriate mitigation measures such as those listed in Table 7-6. 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, maintain the superelevation unless there is a justifiable reason to change it.

7.6.4 VERTICAL CURVATURE AND STOPPING SIGHT DISTANCE

Evaluate reconstruction of crest vertical curves if:

1. The crest hides from view major hazards such as intersections, sharp horizontal curves or narrow bridges and the current year ADT is greater than 2000.
2. The design speed based on the existing Safe Stopping Distance is more than 20 mph below the project design speed and the current year ADT is greater than 2000.

If vertical curve reconstruction is not justified/cost effective, or the curve is not reconstructed to new construction standards, apply appropriate mitigation measures (see Table 7-6).

7.6.5 VERTICAL CLEARANCE

Maintain the existing clear height of all structures. If the existing vertical clearance of a structure is less than the minimum height as shown in Section 4.5.1, or if the project will result in any reduction in the vertical clearance, contact MCTD. For vertical clearance requirements on Local Agency jurisdiction roadways, see Section 4.5.1.1

7.6.5.1 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 AASHTO's *"A Policy on Geometric Design of Highways and Streets - 2011"* standards for bridges to remain in place, and Table 7-4, 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 on 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 7-4: 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

7.6.5.2 PAVEMENT DESIGN AND CROSS SLOPE

Pavement design for 3R projects requires a minimum of 8 years of service life.

Appropriate leveling quantities should be included in the project to correct cross slope to 2% and correct curve superelevation as close to new construction standards as reasonably possible.

7.6.5.3 SIDESLOPES AND CLEAR ZONE

A roadside inventory shall be provided on all 3R projects. This inventory, along with the accident summary and analysis, gives the designer the information necessary to make good design decisions regarding safety improvements. Evaluation and improvement considerations of roadside features should be consistent with the following:

1. Flatten sideslopes of 1:3 or steeper at locations where run-off-road accidents are likely to occur (e.g., on the outside of horizontal curves).
2. Retain current slope ratios. Do not steepen sideslopes when widening lanes and shoulders, unless warranted by special circumstances.
3. Remove, relocate or shield isolated roadside obstacles.
4. Remove vertical drop-offs at the edge of pavement after paving. See Safety Edge in Section 4.2.3 for shoulders 7 ft or less.

Chapter 1 outlines the 3R design process that should be used in development of all 3R projects.

7.6.5.4 MANDATORY 3R DESIGN FEATURES

Following is a list (Table 7-5) of mandatory design elements that must be incorporated with 3R projects:

Table 7-5: Mandatory Design Features

Geometric Deficiency	Mandatory Corrective Measure
ADA/Sidewalk Ramps	• Ramps shall be added where absent and upgraded where deficient*.
Narrow Bridges/Deficient Rails	• Upgrade or retrofit bridge rails that do not meet the requirements of NCHRP report 230 to current standards unless bridge is scheduled for replacement. • Install Type 3 object markers and post delineators.
Existing Guardrail & Barrier	• All terminals within the clear zone not meeting the requirements of NCHRP report 230 shall be upgraded to current standards. • Runs less than 18.5 inches from top of pavement to guardrail post bolt shall be adjusted or replaced to current standards. • Guardrail bridge connections not meeting the requirements of NCHRP report 230 shall be upgraded to current standards or added if absent. • All Tongue and Groove barrier shall be upgraded to current standards.

*** Ramps are required only where sidewalk is present – see Chapter 13.**

7.6.5.5 LOW-COST SAFETY MITIGATION MEASURES

Table 7-6 is a list of low cost safety measures that should be considered on all 3R projects as a minimum to mitigate existing safety deficiencies. They can also be used as mitigation in justification for design exceptions.

Table 7-6: Low-Cost Safety Measures

Geometric Deficiency	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
Hazardous Intersection	• Install supplementary signing • Illumination • Pavement antiskid treatment • Speed control

7.7 ODOT 1R RURAL (NON-FREEWAY) DESIGN STANDARDS

7.7.1 GENERAL

The ODOT 1R project standard will apply to Rural 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. Any existing 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 prior to the paving project.

7.7.2 RESURFACING (1R) PROJECT STANDARDS

These are projects that extend the pavement life of existing highways. Missing ADA ramps must be installed and ADA ramps that do not meet the 1991 standard must be upgraded to the current standard on all 1R projects except chip seals. 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. Also, since 1R projects will generally not address safety, pedestrian and/or bicycle concerns, in no case shall safety, pedestrian and/or bicycle conditions be degraded. For example, a resurfacing project that is limited to the travel lanes shall not leave a seam, sunken drainage grates or other hazards in the shoulder or bike lane. Also, on facilities where the 1R standard is applied, it is intended that all safety features be inventoried and the applicable safety feature information is added to designated safety feature databases, and that the safety feature is addressed based on system priorities in stand alone 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. Following is an outline for the ODOT Resurfacing 1R project standard. While the criteria primarily relate 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.

7.7.2.1 CRITERIA TO APPLY THE 1R STANDARD

A. 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% 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% 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; however, this requires the approval of a design exception.
4. Where more than approximately 25% of a project (based on lane miles paved) includes more than a single lift non-structural overlay or inlay, 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. The safety assessment may indicate that a paving project is best developed under the 3R standard (see below).
7. Chip seals are 1R projects and subject to the requirements of the 1R standard, including the roadside inventory. Chip seals do not require ADA work.
8. The 1R Pavements and Region Roadway Managers Approval Form must be completed, signed, and submitted to Technical Services Roadway staff prior to the completion of project scoping.

   a. Pavement Services Unit will be the technical resource for screening projects for 1R eligibility from a pavement design perspective (single lift treatment); identifying treatments or providing pavement design recommendations and reports.

   b. The Region Roadway Manager will be responsible for screening projects for 1R eligibility from a safety features perspective.

9. Work does not degrade safety or bicycle/pedestrian facilities
10. Work does not reduce curb exposure below 4 inches.
11. Work does not result in a cross-slope in excess of 8%.
12. Work does not adversely affect drainage.
13. Work does not result in an algebraic difference greater than 11% at ADA ramps.
14. 1R project work typically does not change the existing striping. Modifying existing striping requires a design exception and shall consider ORS 366.215 impact.
15. All projects that include resurfacing (except for chip seals) shall install curb ramps where applicable.
16. All projects that include resurfacing (except for chip seals) shall bring curb ramps up to current standards; except, if a ramp meets the 1991 standard as a minimum, upgrading the ramp may be deferred.
17. Ramps that have been rendered nonfunctional over time from excessive settlement, degradation, or by subsequent overlays must be upgraded to current standards.
18. The following items of work are required in addition to paving where applicable.
    a. Replacement of striping and delineation.
    b. Gravel shoulders will match the paved surface elevation.
    c. Replacement of signal loops if impacted
    d. Replacement of rumble strips if impacted.
    e. Adjust existing features that are affected by resurfacing
        - Safety features (Guardrail, Barrier, etc.)
        - Monuments
        - Catch basins
        - Manholes
19. 1R projects in urban areas also require coordination with local projects with separate funding. For example, it is undesirable to finish paving and then shortly thereafter cut into the pavement for a culvert, sewage, drainage, utility or other type of project.
20. The 1R standard does not require addressing non-related substandard features of the roadway with a design exception request. However, the steps and processes required for the Vertical Clearance and Traffic Mobility Standards still apply and must still be followed (See Section 4.5).

21. All 1R projects will complete a Roadside Inventory to ensure that all substandard safety features are documented and asset management databases appropriately updated.

B. 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.

1. **FACS-STIP tool** - Download existing roadside inventory at time of scoping

    a. Identify pre-230 elements. Funds should be requested from the 1R Safety Features Upgrade Program or other funding sources as early in the process as possible. Replacement of pre-230 elements should be added to the 1R project if additional funds are available.

    b. Identify any corners that must be upgraded for ADA

    c. Drive through project and note any obvious safety issues not included in the existing inventory

2. **Safety Assessment**

    a. The Safety Assessment is a formal review process established in each region to ensure the identification of any safety concerns where a 1R project is planned. It provides a basis for the Region Roadway Manager to sign the Roadway Managers Approval Form indicating it is appropriate to apply the 1R standard from a safety standpoint.

    b. The Safety Assessment serves two key purposes: First, it needs to ensure that the safety issues are not best addressed through a 3R project rather than a 1R project; that analysis will review whether a crash hotspot exists in the project limits (e.g. a SPIS site) and whether the crash frequency and severity is such that a 3R project should be considered. Second, if the decision is made that the safety issues are not significant, it is important that the analysis examine safety treatments that avoid reducing safety and examine low cost safety treatments that are practical considering the roadway and roadside character with these locations and treatments expected to come from the systematic safety plans.

    c. The Safety Assessment includes a review of the Department's Roadway Departure Safety Plan, Intersection Safety Plan, forthcoming Pedestrian/Bicycle Safety Plan, and any other systematic safety plan that is developed. The Safety Assessment includes a list of crash hotspots. The safety assessment identifies recommended countermeasures that could be incorporated into the 1R project.

    d. The Safety Assessment identifies funding sources (e.g. Safety funds, Maintenance funds) for additional work and proposes a schedule for safety work considering

- The extent of the safety work proposed, its staging, and traffic control
- Contractor and State forces availability
- The opportunities for bundling like safety work in larger contracts
- Recommended countermeasures should be added to the 1R project if additional funds are available.

e. If systemic plans are not current a more detailed analysis will be needed and such a crash history review should cover 3 to 5 years and will include at a minimum:

- The number and type of crashes
- The crash severity
- The crash rate and comparison to the average rate for type of facility
- Any SPIS sites and ranking
- The crash analysis should identify crash patterns, contributing factors, and outline potential solutions and remediation

f. If systemic plans are not current a more detailed countermeasure analysis process will need to be conducted and should consider:

- The significance of the existing crash pattern
- The possibility for changes in future traffic and roadway characteristics

g. Where critical safety issues need to be addressed and other funding is not available, it may be most appropriate to designate the paving project 3R. If critical safety needs are identified and the project is still to be progressed as a 1R project, the safety assessment must directly state the Region Traffic and Safety's support for that approach.

h. The Region Traffic Engineer signs the safety assessment and provides a copy to the Region Roadway Manager as supporting documentation for signing the 1R Roadway Manager's Approval Form. Technical Services Roadway Staff is also provided a copy and the Safety Assessment is marked complete on the 1R Tracking Spreadsheet.

C. PROJECT INITIATION REQUIREMENTS

At project initiation, the 1R Roadside Inventory must be completed to verify and update the data in the FAC-STIP tool (see section 11.1.5). The Safety Assessment must be reviewed and updated if necessary to ensure it is appropriate to continue to develop the project under the 1R Standard.

7.8 ODOT SINGLE FUNCTION (SF) RURAL (NON-FREEWAY) DESIGN STANDARDS

7.8.1 GENERAL

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.

7.8.2 APPLICATION OF 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. For example, a signal upgrade at an urban intersection may impact the sidewalk and trigger the need to provide necessary ADA upgrades. 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.