



1.0 Introduction

This section contains design guidance for Perpetuation and Rehabilitation **improvement strategies** on highways (formerly referred to as 3R projects). These include State Trunk Highways (STH), non-STH (local roads), Expressways and non-Interstate Freeways, and Interstate Highways. **County highways must request use, from the region's director, according to [Trans 205.03 \(3\)](#).**

1.1 Overview of Perpetuation and Rehabilitation Improvement Strategies

The intent of Perpetuation and Rehabilitation **improvement strategies** are to preserve and extend the service life of existing highways and to enhance highway safety when needed. The development of Perpetuation and Rehabilitation projects must ensure that the design features of the existing roadway are preserved or enhanced. System functions including serviceability and safety of operations must not be degraded¹.

The design of Perpetuation and Rehabilitation **improvement strategy** projects shall be in accordance with the Facilities Development Process described in [FDM Chapter 3](#). One of the first tasks to do is to determine the appropriate scope of work to best address the purpose and need for a proposed project.

Funding constraints and practical limitations to upgrading existing highways, especially where additional right-of-way is required, are major factors in determining the scope of work for Perpetuation and Rehabilitation **improvement strategy** projects.

Application of design criteria for Perpetuation and Rehabilitation **improvement strategy** projects shall be in accordance with [FDM 11-1-10](#), including the application of ancillary factors.

1.1.1 Final Scope Certification (FSC) Document Preparation

Perpetuation and Rehabilitation **improvement strategy** projects will have FSC document prepared. See [FDM 11-4-3](#) Final Scope Certification for more details regarding preparation of the FSC document.

1.1.2 Definitions

Modernization improvement strategy projects include construction of a new highway, new bridge, or reconstruction of existing highway that includes additional through travel lanes. Perpetuation and Rehabilitation **improvement strategy** projects are those that address pavement needs or deficiencies, and which tend to follow or minimally deviate from existing horizontal and vertical alignments. Perpetuation and Rehabilitation **improvement strategy** projects differ from Modernization **improvement strategy** projects in that they do not substantially deviate from existing horizontal and vertical alignments nor add capacity.

The typical scope of work for Perpetuation and Rehabilitation **improvement strategy** projects exceeds the scope of work for routine maintenance projects but is less than the scope of work for Modernization **improvement strategy** projects.

[FDM 3-5-1.1](#) contains definitions for Perpetuation and Rehabilitation improvement strategies.

1.2 Safety Analysis

While safety may not be the primary reason for initiating a Perpetuation or Rehabilitation project, it is an essential element of these projects. The Safety Certification Process (SCP) was developed to identify safety improvement locations through network screening and then to diagnose the site conditions and quantify the safety benefits. The SCP is described in detail in [FDM 11-38](#). [FDM 11-1-10 Attachment 10.1](#) has more specific guidance on which project types require the SCP.

For local road projects follow guidance described in [FDM 11-38-1.3.1.2](#). Local agencies should consider completing their safety analysis prior to submitting their project application to accurately size their funding request.

1.3 Design Criteria Application

¹ The FHWA 1988 Technical Advisory on 3R projects and TRB Special Report 214² indicate that a "Safety-Conscious Design Process" should be used on 3R projects.

Geometric design criteria have been developed for Perpetuation and Rehabilitation projects (formerly referred to as 3R projects) in accordance with [Part 625 of Title 23, Code of Federal Regulations](#), "Highways" and FHWA Technical Advisory [T 5040.28](#), "Developing Geometric Design Criteria and Processes for Non-freeway RRR Projects."

The principal sources of information used to develop these criteria were the FHWA Technical Advisory and Transportation Research Board's Special Report 214, "Designing Safer Roads."²

Perpetuation and Rehabilitation projects will incorporate the existing nationally recognized 3R Standards as the base design criteria values for geometric and cross-sectional roadway features.

The mechanisms that WisDOT will use to apply these criteria will be through S-1 and S-2 applications. These applications will apply to both Federal-aid and State funded projects.

Reconstruction improvement type will follow the Rehabilitation improvement strategy and apply design criteria to S-1 and S-2 areas as identified in the Final Scope Certification (FSC).

If design criteria are not defined in this section, then utilize lower minimums found in [FDM 11-15](#) for rural roadways and [FDM 11-20](#) for urban roadways, respectively.

See [FDM 11-1-10](#) for additional information regarding S-1 and S-2 applications.

1.3.1 Intersection Control Evaluations

Perpetuation and Rehabilitation projects designed and constructed with federal or state funding must comply with the Intersection Control Evaluation (ICE) process when considering intersection traffic control improvement alternatives.

See [FDM 11-25-3](#) for additional information regarding the ICE process.

1.4 Operations Certification Process

The Operations Certification Process (OCP) is the process to analyze operational concerns at any intersection or mainline facility on the State Trunk Network. It is required for any operational-driven intersection or mainline improvement included in a programmed perpetuation or rehabilitation project. It is not required for perpetuation or rehabilitation projects without any operational-driven improvements, either intersection or mainline.

See [FDM 11-52-15](#) for an overview of the OCP.

1.5 Bridge Improvements

Coordinate development of a Bridge or Structure Certification Document (BOSCD) on Perpetuation and Rehabilitation projects that contain bridge improvements with the Bureau of Structures (BOS). Bridge replacement, whether as part of a Perpetuation or Rehabilitation project or as another project, shall be done to new construction design criteria.

The BOSCD process will evaluate bridges within the limits of Perpetuation and Rehabilitation projects to determine their structural and operational adequacy to determine whether replacement or widening of the bridges would be cost-effective. Table 1.1 shows the location of FDM guidance for bridges.

Table 1.1 FDM Reference Guidance for Bridges

Bridge Element	FDM Chapter
Railing	FDM 11-45-20 and FDM 11-45-30
Vertical Clearance	FDM 11-35 Attachments 1.8 and 1.9
Width	Table 1.2

² TRB Special Report 214: Designing Safer Roads: Practices for Resurfacing, Restoration, and Rehabilitation. Transportation Research Board, National Research Council, Washington, DC, 1987.
http://onlinepubs.trb.org/Onlinepubs/sr/sr214/sr214_001_fm.pdf.

Table 1.2 Lowest Roadway Widths for 2-Lane Bridges, with Lengths < 100 feet, to Remain in Place*

Design AADT	State Trunk Highways and County Trunk Highways ²	Town Roads ²
0 – 100	The greater of either 18 ft. ¹ or Traveled Way width	The greater of either 18 ft. ¹ or Traveled Way width
101 – 400	The greater of either 20 ft. ¹ or Traveled Way width	The greater of either 20 ft. ¹ or Traveled Way width
401 – 750	The greater of either 22 ft. ¹ or Traveled Way width	The greater of either 22 ft. ¹ or Traveled Way width + 1 ft. on each side
751 – 1000	The greater of either 22 ft. ¹ or Traveled Way width + 1 ft. on each side	The greater of either 22 ft. ¹ or Traveled Way width + 2 ft. on each side
1001 – 2000	The greater of either 24 ft. ¹ or Traveled Way width + 1 ft. on each side	The greater of either 24 ft. ¹ or Traveled Way width + 2 ft. on each side
2001 – 4000	The greater of either 28 ft. ¹ or Traveled Way width + 2 ft. on each side	The greater of either 28 ft. ¹ or Traveled Way width + 2 ft. on each side
4001 - 5000	The greater of either 28 ft. ¹ or Traveled Way width + 3 ft. on each side	The greater of either 28 ft. ¹ or Traveled Way width + 2 ft. on each side
>5000	The greater of either 32 ft. ¹ or Traveled Way width + 3 ft. on each side	The greater of either 32 ft. ¹ or Traveled Way width + 2 ft. on each side

* Widths shown may not meet bridge roadway width requirements for bridge reconstruction or bridge rehabilitation.

¹ Lowest Bridge Roadway Width, Curb-To-Curb, To NOT Be Considered Functionally Obsolete Reference³ - Item 68, Table 2A - Rating Code 4

² If lane widening is planned as part of a Rehabilitation project, the lowest usable bridge width is the paved roadway (traveled way plus surfaced shoulders).

1.5.1 Bridges on Expressways, Non-Interstate Freeways and Interstates

Bridges to remain in place must have 12-foot wide traffic lanes, 10-foot wide shoulders on the right, and 3.5-foot wide shoulders on the left. On bridges 200 feet or longer, the lowest shoulder widths will be 3.5 feet for both left and right shoulders.

1.6 Pavement Design

Pavement design (lanes and shoulders) for Perpetuation and Rehabilitation projects shall be in accordance with [FDM 14-10](#).

1.6.1 Shoulder Paving

On Perpetuation and Rehabilitation projects, the following apply:

1. The shoulder next to designated driving lanes shall be paved on STHs functionally classified as arterials, regardless of traffic volume. See Table 1.3.
2. The shoulder next to designated driving lanes shall be paved 3 feet on County Trunk Highways (CTH) functionally classified as arterials, regardless of the traffic volume. See [Trans 205](#).
3. Shoulders on STHs classified as collectors or locals and having a current AADT above 750 vehicles shall be paved in accordance with Table 1.3.
4. CTHs functionally classified as collectors or locals, and other local highways may have paved

³ FHWA. Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges. FHWA-PD-96-001. Office of Engineering, Bridge Division, Bridge Management Branch, Washington, DC, 12-1995.
<http://www.fhwa.dot.gov/bridge/mtguide.pdf>.

shoulders at the discretion of the local officials. See [Trans 204](#) and [Trans 205](#).

5. Continuity of shoulder paving between logical termini is desirable. Do not leave gaps of unpaved shoulders. For purposes of continuity and the closing of short gaps, it may be desirable to pave the shoulders on sections of highway where resurfacing or rehabilitating traffic lanes may not be planned for several years, provided the shoulder paving is done in conjunction with surfacing or resurfacing, or rehabilitating an abutting highway segment.
6. When paving is warranted on highways with existing narrow travel lanes it may be desirable to increase the travel lane width. Shoulder paving width is in addition to the revised travel lane width and in accordance with Table 1.3.

Table 1.3 Rural STH Paved Shoulder Width Requirements ¹

DESIGN CLASS		PAVED SHOULDER WIDTH
RA1		3 ft.
RC3, RL4		3 ft.
RA2		3 ft.
RC4, RL5		3 ft.
RA3	4 - LANE DIVIDED EXPRESSWAY	R ² - 8 ft. L - 3 ft.
RA3	6 - LANE DIVIDED EXPRESSWAY	R - 8 ft. L - 8 ft.
RA3	4 - LANE INTERSTATE OR FREEWAY	R - 10 ft. L - 4 ft.
RA3	6 - LANE INTERSTATE OR FREEWAY	R - 10 ft. L - 10 ft.
RA3	1 - LANE RAMPS	R - 5 ft. L - 3 ft.

¹ See [FDM 11-46-15](#) for shoulder criteria to accommodate bicycles. See [FDM 11-40-1.8](#) for rumble strip criteria.

² These shoulder widths also apply to the initial two-lane roadways of ultimate four-lane highways except when construction of the second roadway is not expected for at least six years. In these cases, initially pave only 3 feet R along concrete roadways and 5 feet R along asphaltic roadways.

1.6.2 Usable Shoulder Width

Usable shoulder width is the design criterion for shoulder width. Usable shoulder width equals the total graded shoulder width if the contiguous foreslope is 4:1 or flatter. Usable shoulder width is less than the total graded shoulder width if the contiguous foreslope is steeper than 4:1. See Figure 1.1.⁴ It is not necessary to make a reduction for foreslopes that are 3.6:1 or flatter, because the reduction is relatively nominal. For foreslopes that are steeper than 3.6:1, use Table 1.4 to determine the reduction in usable shoulder width.

Table 1.4 Useable Shoulder Width Reduction for Foreslopes Within Clear Zone

Foreslope Contiguous with Graded Shoulder (H : V)	Reduction in Usable Shoulder Width (feet)
3.6:1 or flatter	Nominal (0.40 or less) – no reduction required
3.5:1	0.50
3:1	1.00
2.5:1	1.50
2:1	2.00
1.5:1	2.50
1:1	3.00

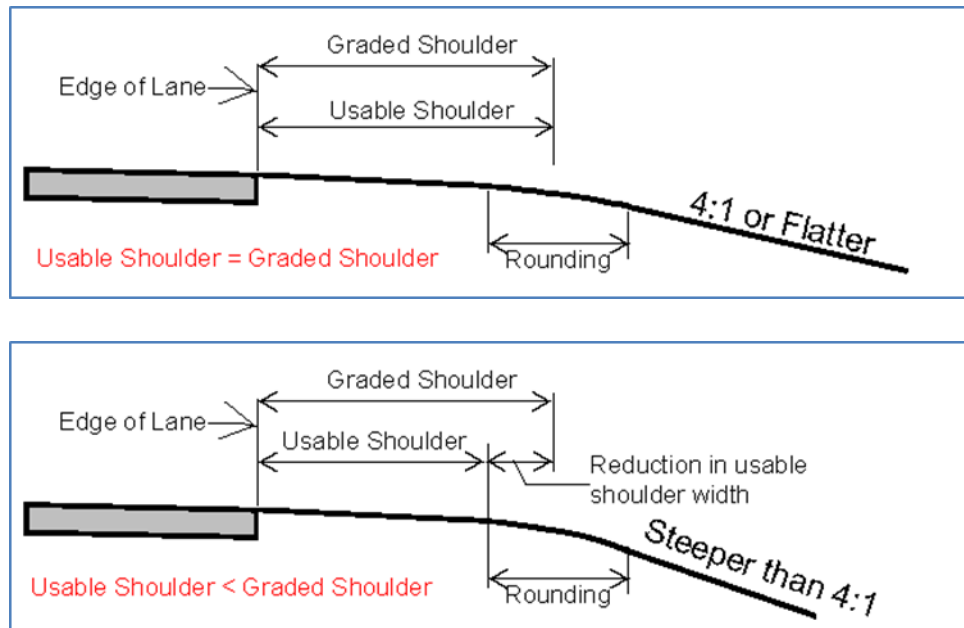


Figure 1.1 Usable Shoulder Width

1.7 Traffic Control Devices and Pavement Marking

Upgrade all traffic control devices and pavement marking to be in conformance with the current MUTCD, Wisconsin MUTCD and Wisconsin Traffic Engineering, Operations and Safety Manual (TEOpS).

⁴ FHWA SA-07-11, "Mitigation Strategies for Design Exceptions", page 36: Clarification: Usable and Paved Shoulders: ". A usable shoulder width is the actual width available for the driver to make an emergency or parking stop. This is measured from the edge of traveled way to the point of intersection of the shoulder slope and mild slope, or to beginning of rounding to slopes steeper than 1V:4H <https://trid.trb.org/view/883633> (see also Section 4.4.1, Pages 4-10 thru 4-12, 2018 GDHS). Usable shoulders do not have to be paved.

Include removal of any epoxy (temporary or permanent), thermoplastic, preformed tape, temporary tape or waterborne pavement markings prior to seal coat placement.

Apply new pavement marking on all Perpetuation and Rehabilitation projects where the existing pavement marking is damaged or obliterated.

Additional information relating to pavement markings can be found in [FDM 11-50-45](#).

1.8 Rumble Strips

See [FDM 11-15-1.8](#) for additional rumble strip design guidance.

1.8.1 Centerline Rumble Strips

Rural centerline rumble strips shall be installed on Perpetuation and Rehabilitation projects subject to the conditions listed in [FDM 11-15-1.8.1.2.1](#) and where the Region Pavement Engineer has reviewed and concurred that the centerline joint will be in good, stable condition to mill-in rumbles after the proposed work is completed.

1.8.2 Shoulder Rumble Strips

Rural shoulder rumble strips shall be installed on Perpetuation and Rehabilitation projects subject to the conditions listed in [FDM 11-15-1.8.1.2.2](#) and concurrence from the Region Pavement Engineer.

1.8.3 Edge Line Rumble Strips

Rural edge line rumble strips should be installed on Perpetuation and Rehabilitation projects where there are known run-off-the-road crash issues subject to the conditions listed in [FDM 11-15-1.8.1.2.3](#).

1.9 Passing Sight Distance for Vertical Curves

This section is provided for configuring project pavement marking and providing a reference for Safety Screening Process evaluation.

There is no existing policy or design criterion specifying the percentage of the length of a roadway to be used for passing opportunities. The decision to improve passing opportunities is made individually for each project. Items to be considered are the terrain, annual average daily traffic (AADT), design class and existing percent passing. The following text about non-striping distances is advisory and is to be used to evaluate when an improvement in passing opportunities is desirable.

The earthwork required to flatten a vertical curve to achieve safe Passing Sight Distance (PSD) is usually beyond the scope of a typical Perpetuation or Rehabilitation project. However, S-2 application highway segments and locations on Rehabilitation projects with grading may provide opportunities to improve sight distance at crest vertical curves.

It is generally safer, more cost effective and improves traffic operations more to re-grade one or two vertical curves to achieve the sight distance values for the S-2 segments and locations on Rehabilitation projects.

Ensure that the spacing between successive passing zones both within and beyond the ends of the project are reasonable.

1.10 Passing and Truck Climbing Lanes

The addition of passing or truck climbing lanes may be applicable for use on Rehabilitation projects in segments or locations with S-2 application, to provide or improve the desired frequency of safe passing zones.

Perpetuation projects will typically not include the construction of passing or truck climbing lanes.

See [FDM 11-15-10](#) for additional passing and truck climbing lane design guidance.

1.10.1 Passing Lane Clear Zones

On Rehabilitation projects, typical passing lane clear zones are the greater of the AS-BUILT clear zone distances from previous construction or the Rehabilitation clear zone requirements in [FDM 11-45-30](#).

See [FDM 11-15-10](#) for additional passing lane design guidance.

1.11 Bicycle and Pedestrian Accommodations

Curb ramps with detectable warning fields shall be installed or upgraded to the max extent feasible on all state or federally funded Perpetuation and Rehabilitation projects with sidewalk that meet the Americans with Disabilities Act (ADA) definition of an "alteration" (see [FDM 11-46 Attachments 1.2](#) and [1.3](#)).

See [FDM 11-46](#) for guidance on bicycle and pedestrian accommodations.

1.12 Roadside Design

Roadside characteristics are important in determining the overall level of safety provided by a highway. The cost-effectiveness of some roadside improvements is highly dependent on the site-specific conditions and interactions between different roadside features.

Perform a roadside hazard analysis (RHA) in accordance with the guidance in [FDM 11-45-10](#).

See [FDM 11-15](#) and [FDM 11-45](#) for guidance on roadside hazards and treatments.

1.12.1 Clear Zone and Lateral Clearance

Clear Zone and Lateral Clearance are not the same and are not controlling design criteria.

1.12.1.1 Clear Zone

Clear zone is defined in [FDM 11-15-1.13.1](#).

WisDOT design criterion for constructing side slopes that contain traversable but non-recoverable slopes within the clear zone is that a recoverable slope (4:1 or flatter) be constructed contiguous with the shoulder before introducing the traversable but non-recoverable slope, (see page 2 of [FDM 11-15 Attachment 1.9](#)). However, if an existing side slope does not meet this requirement, then an existing CLEAR runout area at the foot of this slope would still be considered part of existing clear zone. This existing clear runout area should be at least 10-feet wide, recoverable and free of fixed object hazards. The existing clear zone distance in this case is equal to the existing usable shoulder width (see [FDM 11-40-1.6.2](#)) plus existing clear runout area.

See [FDM 11-45-15.1.3](#) for preferred roadside hazard treatment sequence.

Do not reduce existing clear zone width on Perpetuation and Rehabilitation projects.

If no as-builts exist that previously established a clear zone use the following:

Rural Highways

- Where the design AADT is less than 1,500, the minimum clear zone width shall be the greater of either 10 feet or existing clear zone, but not farther than the right-of-way limits.
- Where the design AADT is greater than or equal to 1,500, the minimum clear zone width shall be the greater of either 18 feet or existing clear zone but not farther than the right-of-way limits.

Urban and Suburban Roadways - With Shoulders

- Where the posted speed is 45 mph or less the minimum clear zone width shall be the greater of either 10 feet or existing clear zone but not farther than the right-of-way limits.
- Where the design AADT is less than 1,500 and the posted speed is greater than 45 mph, the minimum clear zone width shall be the greater of either 10 feet or existing clear zone, but not farther than the right-of-way limits.
- Where the design AADT is greater than or equal to 1,500 and the posted speed is greater than 45
- mph the minimum clear zone width shall be the greater of either 18 feet or existing clear zone, but not farther than the right-of-way limits.

Roadways with Curbs and Posted Speeds of 40 mph or Less

- Provide clear zone to the extent practical.

Roadways with Curbs and Posted Speeds of 45 mph or Greater

- The clear zone width shall be as required for rural highways measured from the edge of the through traffic lane - see above.

The extent of the clear zone depends on the design speed and the probability of a vehicle leaving the roadway. Clear zone establishes the "Zone" in which obstructions or steep slopes warrant evaluation. This "Zone" includes any clear runout areas. Therefore, the proposed clear zone and the basis for its selection should be documented in the DSR. If the clear zone width is less than the bottom of the range for a proposed project, the reason must be documented in the DSR. Approval of the DSR establishes individual project design justifications (DJs) to the WisDOT clear zone policy.

1.12.1.2 Lateral Clearance

Lateral clearance is required for all urban and rural roadways.

Lateral Clearance (also known as “operational offset”) is defined in [FDM 11-15-1.13.2.2](#).

See [FDM 11-15 Table 1.2](#) and [FDM 11-15 Attachment 1.14](#) for guidance on rural lateral clearance.

See [FDM 11-20-1.9.1](#) for guidance on urban lateral clearance.

1.12.2 Roadside Hazards

[FDM 11-45-20](#) and [FDM 11-45-30](#) is the primary source for guidance for roadside hazards and treatments. The following sections will provide some additional discussion about roadside hazards on Perpetuation and Rehabilitation projects.

1.12.2.1 Utilities

Avoid allowing utilities to locate/relocate in locations where Run off the Road crashes are likely to occur. Above ground utility features such as poles, guy wires, pedestals, etc. shall be relocated outside the lower minimum clear zone. In addition, do not allow above ground utility features near ditch bottoms or on ditch foreslopes.

Departmental utility accommodation policy⁵ states that both above-ground and below-ground utility” lines shall be on uniform alignment and located as near as practical to the R/W line without affecting the R/W and geodetic control monuments”.

At some locations, it can be difficult to move a hazardous utility pole because of utility design requirements (e.g. electrical transmission lines need to have safety zone around the electrical lines, or a significant amount of fiber optic may need to be replaced to fix a minor conflict). At other locations, other constraints make it difficult (e.g. a downtown area with limited terrace width and buildings at the right of way line). If it is not possible to move a hazardous pole then provide mitigation such as breakaway or energy absorbing poles. Reducing the number of poles may also help. Methods to minimize the number utility poles include:

- Utilities sharing poles,
- Taller poles with greater post spacing
- Underground utilities

Note: Utility companies have a legal right to occupy highway right of way through a permit process. Coordinate with regional utility staff.

1.12.2.2 Trees

Trees can be a significant hazard – see [FDM 11-45-20.3.5.1](#). Avoid adding new trees on Perpetuation and Rehabilitation projects.

In rural areas, it is more likely that trees can be removed. In urban, suburban or transitions between urban and suburban areas it may be more difficult to remove trees.

Review the Final Scope Certification for other factors such as project type or crash history **that** may influence the decision to remove existing trees. For example, it may not be feasible to remove existing trees in an urban area when an overlay project is on existing alignment. The presence of a bike lane or parking lane also helps to reduce the chances of a vehicle hitting a tree because of the increased distance from the travel lane.

However, removal of hazardous trees should become more of a priority on Perpetuation and Rehabilitation projects with a longer life cycle, or where a section of the project is off the original alignment.

1.12.2.3 Hazardous Mailboxes and Supports

Hazardous mailboxes and supports within the clear zone shall be identified and either modified or replaced in cooperation with the owners in S-2 and S-3 areas. See [FDM 11-45-10](#) for discussion on when to perform an RHA for further detail. See [FDM 11-15-1.13.2.5](#) for additional guidance on hazardous mailbox supports.

1.12.2.4 Sign and Light Supports

See [FDM 11-45-20.3.4](#), [FDM 11-45-20.4.2.4](#) and [FDM 11-55-20](#) for roadside design guidance regarding overhead sign supports, sign bridges, mono tube signs, and message boards. These devices are typically too heavy or large to be breakaway.

Use crashworthy supports when adding new lights or other non-utility poles and for small signs. Provide documentation in the DSR when crashworthy supports are not used.

⁵ Location Requirements. In WisDOT Highway Maintenance Manual Chapter 9, Section 15: Utility Accommodation Policy. Wisconsin DOT, Madison, WI, 2010, subject 25, pp. 1-4. <https://wisconsindot.gov/Pages/doing-bus/local-gov/hwy-mnt/mntc-manual/chapter09.aspx>

1.12.2.5 Bridge Piers and Abutments

Review the location of bridge piers and abutments to determine if shielding for vehicle protection is required (see [FDM 11-45-15.1.3.5](#)).

FDM 11-40-6 Design Criteria for Perpetuation Projects

November 15, 2023

6.0 General

This procedure applies to Perpetuation projects on STH, non-STH, Expressways and non-Interstate Freeways and Interstate Highways. See [FDM 3-5-1](#) for additional information on Perpetuation projects.

Perpetuation projects that have no safety or operational issues as indicated by the SCD will use S-1 application (which retains the existing roadway features as design criteria). Consideration can still be given to the addition of low-cost safety mitigation measures if they are determined to be effective and appropriately fit within the project scope.

See [FDM 11-1-10](#) for additional information regarding S-1 application.

6.1 General Perpetuation Design Criteria with S-1 Application

The existing roadway features listed below shall be retained on all routes (including both NHS and non-NHS).

- Design Speed
- Horizontal Curve Radius
- Superelevation Rate
- Stopping Sight Distance
- Crest Vertical Curves
- Sag Vertical Curves
- Grades

6.2 General Intersection Perpetuation Design with S-1 Application

The existing roadway intersection features listed below shall be retained on all routes (including both NHS and non-NHS):

- configuration and geometry
- sight distance
- vision triangles
- intersection angles

See [FDM 11-25](#) for design guidance on intersections.

6.3 Roadway Cross Section Elements

6.3.1 Rural Highway Design Criteria

The existing two-lane rural highway features listed below shall be retained on all routes (including both NHS and non-NHS):

- Rural Lane Width
- Paved Shoulder Width - Typically minimum paved shoulder on most STH's should be 3'.
- Rural Pavement Cross Slope
- Rural Auxiliary Lanes (See [FDM 11-25-35](#) for additional information about auxiliary lanes)
- Rural Two-Way Left Turn Lanes (See [FDM 11-25-5.4.2](#) for additional information about TWLTLs)
- Side Slope and Ditch Design Criteria

6.3.1.1 Rural Shoulder Unpaved Width and Cross Slope

Unpaved shoulder widths and shoulder cross slopes may be altered due to an increase in the net pavement elevation if existing typical section and safety review allow. These changes may allow for matching at the subgrade shoulder point. Usable shoulder width should be taken into consideration when determining alterations to unpaved shoulder width and cross slope (See [FDM 11-40-1.6.2.](#)) Coordinate with BPD and Regional Safety Engineer.

6.3.2 Urban Highway Design Criteria

The existing urban roadway features listed below shall be retained on all routes (including both NHS and non-

NHS):

- Urban Lane Width and Shoulder Width
- Urban Auxiliary Lanes (See [FDM 11-25-35](#) for additional information about auxiliary lanes) - Urban Two-Way Left Turn Lanes (See [FDM 11-25-5.4.2](#) for additional information about TWLTLs)
- Lateral Clearance Design Criteria (See [FDM 11-40-1.11.2](#) for additional information about lateral clearance)

6.3.2.1 Urban Pavement Cross Slope

The pavements of urban roadways typically have crowns in the middle and slope downward toward both edges. The downward cross slope should be plane rather than curved (parabolic) sections.

Urban pavement cross slopes may need to be altered on RSRF20, RSRF30 and COLD20 projects due to an increase in the net pavement elevation. See Table 6.1 for cross slope rates to use.

Table 6.1 Cross Slopes for Urban Roadways

Lanes	Lower	Higher
Driving	2%	3%
Parking, Turning, etc.	2%	4%

6.3.3 Pavement Edge Drops

Pavement edge drops are undesirable, no matter how they develop, because of safety implications associated with the vehicle recovery maneuver. Pavement edge drops can develop between the pavement surface and the adjacent unpaved shoulder or roadside. Avoid potential edge drops on Perpetuation projects by:

1. Paving the shoulders when warranted by policy.
2. Selectively paving shoulders at points where encroachments are likely to create pavement edge drops, such as on the inside of horizontal curves.
3. Providing a safety-edge as described in [FDM 11-45-30.7](#).
4. Restoring gravel shoulders.

6.3.4 Clear Zone Design Criteria

Do not reduce existing clear zone width on Perpetuation projects. The existing clear zone width shall be retained on all Perpetuation projects (including both NHS and non-NHS routes).

See [FDM 11-45](#) for additional information about clear zones.

FDM 11-40-7 Design Criteria for Rehabilitation Projects

February 16, 2021

7.0 General

This procedure applies to Rehabilitation projects (Reconditioning, Pavement Replacement and Bridge Rehabilitation work types) on STH, non-STH (local roads), Expressways and non-Interstate Freeways, and Interstate Highways. See [FDM 3-5-1](#) for additional information on Rehabilitation projects.

Rehabilitation projects will typically contain both S-1 and S-2 applications. Rehabilitation projects will use S-2 application on segments and at locations with safety or operational issues (as indicated by the SCD) that have been determined to need safety enhancements beyond what can be provided with low-cost safety mitigation measures. See [FDM 11-1-10](#) for additional information regarding S-2 application.

These segments or locations on Rehabilitation projects will evaluate the use of cross-sectional and geometric improvements to existing roadway features beginning with the use of the lower end of the range (when a range exists) for design criteria values. These values shall be considered a starting point. An iterative design approach along with the application of a predictive safety benefit/cost analysis will be used to determine the final design values to apply.

Those segments or locations that have no safety or operational issues (as indicated by the SCD) will use S-1 application which maintains the roadway cross section and geometric features as design criteria. SCD preparers should refer to [FDM 11-40-6](#) for guidance on S-1 application segments.

SCD preparers can reference [Attachment 7.1](#) for S-2 application design criteria that apply to Rehabilitation projects.

The SOCD described in [FDM 11-38](#) is available for non-STH (local program projects) Rehabilitation improvement strategy projects.

LIST OF ATTACHMENTS

Attachment 7.1	S-2 Application Design Criteria for Rehabilitation Projects
Attachment 7.2	Design Criteria for Rehabilitation Projects on Rural State Trunk Highways Functionally Classified as Arterials
Attachment 7.3	Design Criteria for Rehabilitation Projects on Rural State Trunk Highways Functionally Classified as Collectors and Locals
Attachment 7.4	Design Criteria for Rehabilitation Projects on Town Roads
Attachment 7.5	Design Criteria for Rehabilitation Projects on Rural County Trunk Highways Functionally Classified as Arterials
Attachment 7.6	Design Criteria for Rehabilitation Projects on Rural County Trunk Highways Functionally Classified as Collectors and Locals
Attachment 7.7	Design Criteria for Perpetuation and Rehabilitation Projects on Interstate Highways