Chapter 25

Florida's Design Criteria for Resurfacing, Restoration and Rehabilitation (RRR) of Streets and Highways

Tables

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Chapter 25

Florida's Design Criteria for Resurfacing, Restoration and Rehabilitation (RRR) of Streets and Highways

25.1 Introduction

25.1.1 General

Resurfacing, restoration and rehabilitation (RRR) work is defined as work undertaken to extend the service life of an existing highway and/or enhance highway safety. This includes the placement of additional surface materials and/or other work necessary to return an existing roadway to a condition of structural and functional adequacy. Many of the RRR Standards used by the Department are derived from the ***National Academy of Sciences "Special Report 214"***. This publication contains many of the methods necessary to make the safety and cost effective evaluations required by this chapter.

RRR projects must be designed and constructed in a manner that will comply with the accessibility standards and requirements set forth in the ***Americans with Disabilities Act of 1990 (ADA).***

25.1.2 Application

The criteria included in this chapter are for all RRR projects except for Interstate highways, freeways, and Limited Access Florida Intrastate Highway System (FIHS)/Strategic Intermodal System (SIS) Corridors and Connectors, and are not intended to apply to new construction or major modifications of existing facilities.

The RRR design criteria applicable for Interstate Highways and Freeways are new construction criteria, with the following exceptions:

1. The standards used for horizontal alignment, vertical alignment, and widths of median, traveled way and shoulders may be the AASHTO interstate standards that were in effect at the time of original construction or inclusion into the interstate system.

2. Mainline bridges may remain in place if they have minimum cross sections consisting of 12 ft. lanes, 10 ft. shoulder on the right and 3 ft. shoulder on the left. For mainline bridges (over 200 ft.), the offset to the face of parapet or bridge rail on both the left and right is 3 ft. (minimum) measured from the edge of the nearest traveled lane. Bridge railing shall meet or be upgraded in accordance with the requirements of ***Section 25.4.25.3 Bridge Railing*** of this volume.
3. Roadside Safety Hardware shall meet the requirements of ***Section 25.4.26 Roadside Safety Hardware*** of this volume.
4. Pier protection and design shall comply with the requirements provided in ***Structures Design Guidelines, Section 2.6***.
5. The existing roadway and shoulder cross slope may be retained when it meets the criteria in Section 25.4.6.

Existing median crossovers on Interstate highways and freeways shall be evaluated for conformance to the criteria in ***Section 2.14.4, Crossovers on Limited Access Facilities***. Crossovers that do not meet those criteria must be removed as a part of the project unless approved by the State Roadway Design Engineer and FHWA (FHWA approval on Interstate only).

Projects on controlled access FIHS/SIS Corridor and Connector facilities should be designed using new construction criteria. RRR criteria may be applied on a project to the extent permitted by the Action Plan for that corridor, consistent with the schedule for phased improvements to bring the facility up to new construction criteria. For controlled FIHS/SIS Corridors and Connectors with no Action Plan, RRR criteria may be applied if minimum design speed criteria shown in ***Section 25.4.4*** are met or a Design Exception for design speed is approved.

The RRR criteria may be used for establishing the minimum requirements for intersection improvement projects with the understanding that when right of way is adequate, new construction criteria will be used to the maximum extent feasible.

This chapter does not apply to projects programmed as Maintenance Resurfacing projects other than meeting ADA curb ramp requirements. If compliance with ADA curb ramp requirements is determined to be technically infeasible, documentation as a Design Variation is required. Refer to the ***Work Program Instructions (Chapter 28)*** for these projects.

25.2 Planning and Programming RRR Projects

RRR projects must balance a number of competing objectives, the principal ones being the preservation of highways, improved service levels and enhancement of safety. The success in meeting these objectives depends on the quality of individual project designs and project programming decisions.

The majority of RRR projects are identified and programmed as a result of deficient pavement condition. These projects are funded under the Department's Pavement Resurfacing program. Districts are provided specific lane mile targets that must be met annually. Program funds are allocated to each District based on a fixed amount per lane mile to be resurfaced. The amount allocated includes funds necessary to resurface/rehabilitate the pavement plus a limited amount which can be used for other improvements and upgrades. Improvements and upgrades which cost more than the allocated amount result in reduced funds for such improvements on other roadways being resurfaced and/or must come from other Department funding programs. For additional information on the Department's Pavement Resurfacing program requirements and restrictions, see the Department's ***Work Program Instructions***.

25.2.1 Projects Requiring Right of Way

RRR projects do not typically involve Right of Way acquisition. However, in all cases, facilities programmed for RRR projects should be given a review of the existing right of way, roadway, transit stops, access management, drainage design elements and other improvements to identify locations that require additional right of way. For such locations, the design should be expedited to determine actual right of way requirements. The designer must coordinate the requirements with the Right of Way Office so that necessary areas will be cleared before the project is ready for letting.

25.2.2 Projects With Bridges Within Project Limits

Bridges must be reviewed in sufficient detail to clearly establish the cost effective and appropriate changes to be included in the project design effort. Pavement resurfacing funds can only be used for minor bridge improvements such as rail retrofits and ADA improvements. Bridges that require major improvement or replacement must be programmed with the appropriate bridge program funds.

25.2.3 Project Features Requiring Design Exceptions and Design Variations

Projects may have features below criteria values which have not been programmed and/or which are determined not to be appropriate to accomplish under the design project. These usually require design exception or design variation approval, as appropriate. See ***Sections 25.3.6*** and ***25.5***.

25.2.4 Ride Rehabilitation Projects

Projects that are deficient only due to Ride Rating (<5.5) as rated by the Pavement Condition Survey, and have a posted speed limit less than 50 mph, can be programmed as Ride Rehabilitation Projects.

If the pavement is in good structural condition, the scope of the work can be limited to meeting ADA requirements and doing what is necessary and practical to improve the smoothness of the pavement to meet standards. This can often just be adjustments to manholes and valves or the correcting of utility cut patches through short milling and paver-laid friction course.

These projects meeting the specific criteria above do not have to comply with ***Sections 25.3.6*** and ***25.5***. They can be funded with Resurfacing Funds and will receive lane mile target resurfacing credit.

25.2.5 Railroad-Highway Grade Crossing Near or Within Project Limits

Federal-aid projects must be reviewed to determine if a railroad-highway grade crossing is in or near the limits of the project. If such railroad-highway grade crossing exists, the project must be upgraded in accordance with ***Section 6.2.3***.

See ***Section 25.4.21*** for additional railroad-highway grade crossing criteria.

25.3 RRR Project Design Process

Significant improvements in overall safety can be brought about by a systematic safety conscious design process. The design process is a team effort that requires the expertise of persons familiar with design, safety, maintenance, traffic operations and others. To assure that safety issues are fully addressed on RRR projects, in addition to the usual design process, the following are also required:

1. A review of the purpose for which the RRR project was programmed.
2. An assessment of current safety conditions.
3. A final scope of work with recommendations for specific safety improvements.
4. Documentation of the safety design decisions.
5. Reviews of the design for safety issues.
6. Identify and implement needed public involvement activities.

25.3.1 Review of Project Purpose

A RRR project is generated by specific needs or conditions. The designer must become familiar with these needs or conditions at the very beginning of involvement with the project in order to assure that the final scope of work and final design actually accomplish the original purpose of the project. This may involve research of background data or other information that provides the reason, the proposed improvements, estimated project cost and project priority.

25.3.1.1 Principal Reason(s) for the RRR Project

As indicated in ***Section 25.2***, the majority of RRR projects are identified and programmed as a result of deficient pavement condition. The following list indicates some, but not all, of the principal reasons that can generate a RRR project:

1. To preserve or extend the life of the existing pavement.
2. Improve capacity (without adding continuous through lanes).
3. Improve operating characteristics.
4. Site specific crash reduction.
5. Section wide crash reduction.
6. General safety modifications.

25.3.1.2 General Nature of Proposed Improvements (Type of Work)

Department policy requires that the following items be included in each RRR project unless written authorization to deviate from this policy is obtained at a Director level position in the District:

1. Safety improvements needed to address crash problems.
2. Pavement Resurfacing/Rehabilitation.
3. Modifications necessary to Comply with the American's with Disability Act (ADA).
4. Paved Shoulders.
5. Improvements to roadside barriers, guardrail, and bridge rails necessary to meet minimum standards. (Design Exceptions require Central Office approval.)
6. Traffic Signal Mast Arms within the mast arm policy area (see ***Section 7.4.12***) where existing strain poles require replacement/relocation.

In addition to the above, a project may include one or more of the following types of work as a general improvement. The list is not all-inclusive.

1. Widen roadway and bridge lanes.*
2. Widen or add roadway and bridge shoulders.*
3. Provide clear zone.
4. Upgrade pavement markings.
5. Add, update or remove traffic signals.
6. Correct skid hazards.
7. Replace bridges rated "insufficient".*
8. Upgrade to current Access Management requirements.
9. Provide non vehicular transportation needs.
10. Add or extend auxiliary lanes to a roadway.
11. Add turn lanes at an intersection or on a roadway.
12. Realign an intersection or roadway.
13. Replacement of bridges which cannot be widened economically.*
14. Upgrade at-grade railroad crossings.

15. Intersection improvements.
16. Removal of parking lanes.
17. Other safety improvements.
18. Add or upgrade transit stops.

    * Major bridge improvements and replacements must be programmed using the appropriate bridge program funds.

While the general nature and type of improvements that can be made is extensive, due to the limited availability of funds, the cost of improvements other than those needed for safety and to meet minimum criteria must be carefully considered before including these improvements in the project.

25.3.1.3 Review Project Budget and Priority

The design and construction of a RRR project must be accomplished with expediency and at reasonable cost. Nevertheless, the project design must address all issues of safety, plus preservation of investment, and service to the user. Conditions that are discovered but cannot be resolved within the programmed budget and schedule must be addressed and the decisions documented.

25.3.2 Assessment of Conditions

Before beginning actual design of the project, the designer shall assess current conditions on the project. This assessment shall include both physical conditions and operating conditions plus a safety assessment. Office reviews and field reviews shall be performed as part of the assessment.

25.3.2.1 Office Reviews

Office reviews shall be conducted to assimilate and analyze data that may be pertinent to the improvements that can be made on the project.

1. Assess Physical Conditions

   This assessment should include:

   a. Geometrics.

   b. Radius, length, and superelevation of curves.

   c. Typical shoulder treatments.

   d. Cross drain and structure locations.

   e. Location and design of intersections, etc.

   f. Existing cross slope and superelevation data.

   A review of old plans, as built drawings, Straight Line Diagrams, and other historical records will determine many of the existing conditions.

2. Assess Operating Conditions

   This assessment should include:

   a. A summary of legal posted speeds on the project.

   b. Drainage and Maintenance section's verbal or written concerns of past, present and/or anticipated future problems.

   c. Conditions attributable to current control of access.

3. Assess Safety

   A review of historical crash and travel statistics shall be performed by a qualified safety specialist. This assessment, with written recommendations, should include:

   a. Identification of significant crash locations, with:

      1) possible causes.

      2) suggested corrective measures.

   b. Review of correspondence files for letters of public concern.

   The designer shall review the safety assessment, evaluate the cost effectiveness of suggested corrective measures and include these measures in the project when appropriate.

25.3.2.2 Field Reviews

A field review shall be performed by a multi discipline team. This review should assess physical, operational and safety conditions.

1. Assess Geometric and Physical Conditions
    a. Verify office review findings.
    b. Check roadway features such as:
        1) alignment.
        2) cross slope.
        3) Superelevation.
        4) lane width.
        5) existing traffic control markings and signs.
        6) side slopes.
        7) clear zones.
        8) shoulder type and width.
        9) intersection elements.
        10) sight distances.
        11) drainage (including erosion problems).
        12) pavement condition.
        13) highway appurtenances.
        14) transit stops.
        15) other features.
2. Assess Operating Conditions.
    a. Verification of posted regulatory speeds.
    b. Verification of posted advisory speeds.
    c. Verification of reported problems.
    d. Observation of operating conditions.
    e. Evaluation of access features.
3. Assess Safety Conditions.
    a. Observation of known crash locations.
    b. Indications of unsafe operations, such as run-off-the-road indications or previous repairs.

25.3.3 Project Scopes

Utilizing the office and field review findings, prepare a final scope of work by incorporating, where appropriate, other work including engineering and surveying services not identified in the original scope. Improvements other than resurfacing, restoration or rehabilitation to be considered are listed below. The list is not all-inclusive.

1. Remove, relocate or make crashworthy roadside obstacles.
2. Remove unwarranted guardrail.
3. Upgrade or replace non standard guardrail.
4. Upgrade or replace non standard crash cushions.
5. Replace or retrofit obsolete bridge rails.
6. Improve side slopes; slope flattening/stabilizing.
7. Correct shoulder drop-off.
8. Pave shoulders.
9. Improve pavement cross slope and superelevation.
10. Provide side drain safety modifications.
11. Increase sight distance at intersections.
12. Improve pavement markings.
13. Improve pavement drainage.
14. Provide or upgrade sidewalks, transit stops and bikeways.
14. Upgrade railroad crossings (see ***USC Title 23, Chapter 1, Section 109e*** and ***CFR646.214(b)***).
15. Provide or upgrade signalization.
16. Provide or upgrade lighting.
17. Upgrade signing and other traffic control devices.
18. Provide or upgrade curb cuts, ramps and other disability access features.
19. Reconstruct or close driveways to comply with Access Management standards.

25.3.4 Minimum Survey Guidelines for RRR Projects

25.3.4.1 Types of Work for RRR Projects

1. Mill and resurface only, EOP to EOP, no other improvements [Level 1].
2. Resurface with trench widening (Roadway only) [Level 1 if lump sum excavation].
3. Resurface adding turn lanes (spot improvements) [Level 2].
4. Resurface adding shoulder pavement [Level 2].
5. Combination of numbers 2-4 [Level 2].
6. Resurface with access management improvements [Level 2].
7. Resurface with cross slope and/or superelevation correction [Level 2].
8. Add shoulder pavement only [Level 2 or 3].
9. (E) Extend drainage structures [Level 3].
10. (E) Guardrail, end treatments, etc. (safety) [Level 2].
11. (E) Side drain closure; mitered ends [Level 3].
12. Intersection improvements [Minor = Level 2; Major = Level 3].
13. (E) Correct horizontal and/or vertical alignment [Level 3].
14. (E) ADA compliance [Level 2].
15. Approaches to structures [Level 4].
16. RRR with Right of Way acquisition [Level 3].

(E) = Element of an item

(See also ***Section 25.3.1.2***)

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25.3.4.2 Definition of Levels of Survey Effort

1. **LEVEL 1**

   Review by District Surveyor to check for Public Land Corners. Check sections for cross slope at 1000 feet in tangents. For curves, check 50 feet before PC, at PC, 50 and 100 feet after PC and at middle of curve or 300 foot intervals. (Reverse at PT). May use assumed datum if approved by the District Location Surveyor and the Project Manager/Designer. The cross sections will have a common bench mark elevation throughout the curve. In other words, do not assume an elevation at the centerline of the highway for each cross section. A minimum of two (2) bench marks should be set off of the highway near the Right of Way (R/W) Line and may be on assumed elevations or NAVD 88 datum. If the surveyor elects to use temporary assumed bench marks, they must last throughout the life of construction and **cannot** be set in trees, power poles or concrete monuments. Establish begin and end points of project and reference.

2. **LEVEL 2**

   Minor spot improvements such as turn lane at existing crossover, turn lane on 2-lane, etc. No additional Right of Way required. Where Right of Way is adequate, establish horizontal and vertical control in the improvement area. May use assumed vertical datum if approved by the District Location Surveyor and the Project Manager/Designer. The cross sections will have a common bench mark elevation throughout the curve. In other words, do not assume an elevation at the centerline of the highway for each cross section. A minimum of two (2) bench marks should be set off of the highway near the Right of Way Line and may be based on assumed elevations or NAVD 88 datum. If the surveyor elects to use temporary assumed bench marks, they must last throughout the life of construction and **cannot** be set in trees, power poles or concrete monuments. If Right of Way is constrained, re-establish existing R/W line. Level 1 required throughout other portions of project. Cross section level to be determined by Project Manager/Designer with input from the District Location Surveyor and Resident Engineer. TOPO with supplemental cross sections and/or elevations in area(s) of deficient criteria and/or proposed improvement(s). Reference control points outside R/W. Subsurface utility locates if required.

3. **LEVEL 3**

   Continuous improvements through length of project such as widening and/or paved shoulder; or major spot improvements (structure replacement; major intersection improvement). May require Right of Way purchase. Horizontal

Control baseline, centerline or network. Vertical Control on NAVD 88. TOPO with supplemental elevations (limits to be determined). Digital Terrain Model (DTM) at specified locations. Right of Way Control Survey and Maps (if Right of Way purchased). Subsurface utility locates.

4. **LEVEL 4**

   Full Digital Terrain Model (DTM) and TOPO for entire project.

25.3.5 Review Project Plans

RRR design plans are reviewed by other disciplines including a safety specialist. These reviews are detailed in ***Chapter 16*** of this volume.

25.3.6 Document the Design Process

The designer shall include in the design file all documentation that substantiates the design process and decisions made, including the following information:

1. A short paragraph which states the overall project purpose. Factors such as principal reason for the project, anticipated project cost, principal work type, general right of way needs or provisions, and any special project priorities are appropriately addressed here.
2. Documents that detail the existing conditions on the project. Findings of office reviews, field reviews and surveys are assembled here, to document existing geometric and roadside features, operating conditions, traffic volumes, posted speeds, existing pavement markings, signing, safety, etc. A brief overall summary of findings is recommended.
3. Document the selected standards based on project intent and conditions. When RRR criteria cannot be met, a design exception/variation is required.
4. A summary of safety issues that have been identified for the project and the recommended solution of those issues.
5. Reviews of the project design for safety improvements, documenting what was finally accomplished or ruled out of the project subsequent to the scope of work having been completed.
6. Those items in the original scope of work for the project which cannot be reasonably accomplished and must be deleted or delayed.

25.4 RRR Design Criteria

Design values and decisions for roadway features should reflect the anticipated service life of the project. The designer has the responsibility to choose the specific design value to be used, taking into consideration its cost-effectiveness, which can range from the minimum RRR Criteria presented herein, to new construction criteria. Design values in the following sub-sections apply to RRR projects only. When specific values are not provided, the standards used in the original construction or subsequent enhancements may be retained except when an upgrade is identified in the project scope.

Designers are encouraged to make a deliberate selection of design values by explicitly addressing issues of safety cost-effectiveness, overall highway consistency in geometric design, design of adjoining segments and expected trends in traffic growth and truck use before specifying design values. The design values indicated in this chapter usually reflect a cost-effective basis for evaluating existing roadway characteristics to determine which features require upgrading.

The design values presented herein are the minimum to be used for a RRR project on the State Highway System without obtaining an exception or variation. See ***Section 25.5*** of this volume. Existing project features which were constructed to meet minimum metric design criteria, but are mathematically slightly less than equivalent minimum English design criteria, do not require design exceptions or variations to remain.

25.4.1 Design Period

Improvements should be evaluated using a design period which is consistent with the design period selected for the pavement rehabilitation. The design period (service life) for RRR projects should be from 8 - 20 years for projects without milling and 12 - 20 years for projects with milling. See the ***Flexible Pavement Design Manual, Topic No. 625-010-002*** for specific design periods. For skid hazard projects, where other improvements are not made, the design year is the expected year of construction.

25.4.2 Project Traffic Volume

The design year for traffic volume is the same design year as the year established for service life. Traffic data to be used for design:

AADT and DHV for mainline (current, post construction and design year),

1. K, D and T factors,
2. Peak turning movements at signalized and problem intersections and major traffic generators,
3. Movements for future traffic generators that are scheduled during the service life should be considered.

25.4.3 Pavement Design

The pavement design procedures are found in the ***Flexible Pavement Design Manual (Topic No. 625-010-002)***, the ***Rigid Pavement Design Manual (Topic No. 625-010-006)***, and the ***Pavement Type Selection Manual (Topic No. 625-010-005).***

Alternative paving treatments such as patterned pavement may be used to accent the roadway in accordance with the ***Standard Specifications***. Architectural pavers, however, shall not be used on the traveled way of the State Highway System. See ***Section 2.1.6.1*** for additional requirements.

25.4.4 Design Speed

Most highway features are based on design speed. Design speed is a principal design control that regulates the selection of many of the project standards and criteria used to design a roadway project. Selection of the design speed must be logical for the type, location and operational conditions of the highway, and the design speed used should be consistent with comparable adjacent projects. Design speed must not be dictated by an isolated geometric feature.

Design speed should generally not be less than the legal posted speed. The design speed used in the original design of the highway should be used for RRR projects. However, there may be situations where the existing posted speed on the highway is different than that used in the original design of the highway. The decision to modify the posted speed limit after the construction of the original project was completed would have been made under the authority of the District Traffic Operations Engineer (DTOE). In this case, the selected design speed shall be jointly approved by the District Design Engineer and the DTOE. This is to be documented on the Typical Section Package as described in ***Section 16.2.3***. New project features and the correction of features having a significant crash history shall be designed using a design speed equal to or greater than the posted speed and process Design Exceptions or Variations for those new design elements that do not meet the criteria for the higher speed. See ***Table 25.4.4.1*** for further guidance.

Table 25.4.4.1 RRR Design Speed vs. Posted Speed

Condition	Establishing the Proposed Project Design Speed (DS_p)
CASE 1	Use the design speed used in the original design of the highway. **$DS_p = DS_o$**
CASE 2	Use the design speed used in the original design of the highway unless a reduced design speed (not less than posted speed) is approved by the DDE and the DTOE. **$DS_p = DS_o$**
CASE 3	Use the design speed used in the original design of the highway unless there is a significant crash history associated with a specific highway feature. If so, then the design speed used in correcting the feature shall be equal to or greater than the posted speed. The posted speed shall also be used as the design speed for any other new highway features (not replacements). Special attention should be given to curb and gutter sections. **$DS_p = DS_o$** and **$DS_p = PS$** (for design of features that are new or have a significant crash history)

CASE 1: The existing posted speed falls **within** an acceptable range of the original design speed. (i.e., **$PS \leq DS_o \leq (PS + 10\ mph)$** Example: **$DS_o = 65mph$ and $PS = 55mph$**).

CASE 2: The existing posted speed falls **below** an acceptable range of the original design speed. In a case like this, the posted speed was reduced, and the operational conditions have changed. (i.e., **$DS_o > (PS + 10\ mph)$** Example: **$DS_o = 65mph$ and $PS = 35mph$**).

CASE 3: The existing posted speed falls **above** an acceptable range of the original design speed. In a case like this, the posted speed was increased, and the operational conditions have changed. (i.e., **$PS > DS_o$** Example: **$DS_o = 50mph$ and $PS = 60mph$**).

LEGEND
DS_o = Design speed used in the original project
DS_p = Proposed design speed for project
PS = Existing (or proposed if different) posted speed

Regardless of the original design speed or posted speed, the following are the minimum design speeds:

1. Rural Facilities: 55 mph
2. Urban Facilities: 30 mph
3. Urban Facilities on FIHS/SIS: 50 mph*

* For curb and gutter facilities where existing posted speed is 45 mph or less, a design speed of 45 mph may be used.

Note: Values for design speeds less than these minimums have been provided in the tables in this chapter in the event that lower design speeds can be justified. If reconstruction is indicated, the criteria used for design should be selected from ***Chapter 2*** of this volume.

25.4.5 Lane and Shoulder Widths

The minimum lane and shoulder widths allowed are provided in ***Tables 25.4.5.1, 25.4.5.2***, ***25.4.5.3***, and ***25.4.5.4***. The minimum widths shown in these tables are to allow existing lanes and shoulders to remain, not to be reduced to these widths unless the purpose is to provide a bicycle lane or increase the width of the outside lane for cyclists. See ***Section 25.4.19*** for further information.

On resurfacing projects, when the original construction was in metric units, hard convert typical section dimensions where existing conditions permit. Exception: Use direct mathematical (soft) conversion for existing pavement widths in curbed sections, existing right of way widths, and existing median widths.

For interchange ramps, where accommodation of future resurfacing is a factor, consideration should be given to increasing the minimum combined width (traveled way + outside paved shoulder) to 24 ft. where practical.

Table 25.4.5.1 Lane and Shoulder Widths - Rural Multilane

Design Year AADT	Design Speed (mph)	Minimum Lane Width (ft.)	Minimum Shoulder Width (ft.)
ALL	ALL	12	6

Table 25.4.5.2 Lane and Shoulder Widths
Two-Lane Rural and Urban, Without Curb and Gutter

Design Year AADT	Design Speed (mph)	Minimum Lane Width (ft.)	Minimum Shoulder Width (ft.)
1 – 750	ALL	10 [1]	6
751 – 2000	< 50	11 [2]	6
	≥ 50	12 [2]	6
> 2000	ALL	12 [2]	6

1. For rural and urban projects without curb and gutter (regardless of traffic volume), when widening is required, a minimum lane width of 11 ft. is required.
2. May be reduced by 1 ft. if trucks ≤ 10% of design year traffic.

Table 25.4.5.3 Lane Widths
Urban Multilane or Two-Lane With Curb and Gutter

Design Year AADT	Design Speed (mph)	Minimum Thru Lane (ft.)	Minimum Turn Lane (ft.)	Minimum Parking Lane (ft.)
ALL	ALL	10 [1]	9 [2]	7 [3]

1. 11 ft. where either of the following conditions exist:
   a. Trucks are >10% of Design Year Traffic.
   b. Design Speed is 40 mph or greater.
2. 10 ft. for 2 Way Left Turn Lanes.
3. A minimum width of 7 ft. measured from face of curb may be left in place. Otherwise provide 8 ft. minimum, measured from face of curb.

Table 25.4.5.4 Lane and Shoulder Widths
Urban Multilane Without Curb and Gutter

Design Year AADT	Design Speed (mph)	Minimum Thru Lane (ft.)	Minimum Turn Lane (ft.)	Minimum Shoulder Width (ft.)
ALL	ALL	10 [1]	9 [2]	6

1. 11 ft. where either of the following conditions exist:
   a. Trucks are >10% of Design Year Traffic.
   b. Design Speed is 40 mph or greater
2. 10 ft. for 2-Way Left Turn Lanes.

25.4.6 Roadway Cross Slopes

The existing pavement and shoulder cross slopes shall be reviewed for compliance with criteria. Existing pavement and shoulder cross slopes shall be field verified by one of the following:

1. Full Digital Terrain Model for the roadway width – evaluate cross slope on tangent sections at 100' intervals.
2. Vehicle Mounted Scanner – prior to design, using the results of the scan, determine roadway limits where cross slope is potentially out of tolerance and request Digital Terrain Model of the roadway width for these limits. Evaluate cross slope on tangent sections at 100' intervals.

If cross slopes are out of tolerance, additional cross sections may be required by the designer to develop cross slope correction details and estimate material quantities. Whenever practical, pavement and shoulder cross slopes shall be constructed to new construction criteria. When meeting new construction cross slope criteria is not practical, documentation in the design file is required and the normal non-superelevated cross slope used shall be consistent with the values in ***Table 25.4.6***. Superelevation requirements are covered in ***Section 25.4.7*** of this volume.

When cross slope correction is necessary, the designer shall work closely with the Pavement Design Engineer and the District Bituminous Engineer to determine the appropriate method of correction and ensure constructability. Existing cross slopes for the limits where cross slope correction is required shall be tabulated in the plans at 100' intervals. Special milling and layering details showing the method of correction shall be shown in the plans (see examples in ***Volume 2, Chapter 6***). Cross sections depicting cross slope correction shall not be shown in the plans. Cross slope correction material quantities shall be based on the method of correction shown in milling and resurfacing details.

Table 25.4.6 Roadway Cross Slopes

Facility or Feature	Standard	Allowable Range
Two-Lane Roads	0.02	0.015-0.030
Multilane Roads	0.02	0.015-0.040
Shoulders	0.06	Adjacent Lane Cross Slope-0.080
Parking Lanes	0.05	0.015-0.050

The multilane standard cross slope value shown is applicable for up to two lanes in one direction. See Section 2.1.5 for additional guidance.

Existing multilane curb and gutter sections may have outside lanes with a maximum cross slope of 0.05.

Existing curb and gutter sections originally constructed with a parabolic crown section may be resurfaced using a series of tangents with a cross slope range from 0.015 to 0.05.

The maximum algebraic difference between adjacent through lanes shall not exceed 0.06.

When existing shoulders are to remain, the algebraic difference between the shoulder slope and adjoining roadway pavement slope shall be ≤ 0.07.

Parking spaces and access aisles dedicated to serving persons with disabilities shall have cross slopes no steeper than 0.02 (1:50) in any direction.

Table 25.4.7 Freeway Cross Slopes

Facility or Feature	Standard	Allowable Range
Travel Lanes	0.02*	0.015-0.025
Travel Lanes	0.03*	0.025-0.035

* Applies to lanes as designated in Figure 2.1.1.

The algebraic difference in cross slope between adjacent travel lanes shall not exceed 0.04. The maximum algebraic difference in cross slope between a through lane and an auxiliary lane at a turning roadway terminal shall meet Table 2.1.4.

Paved shoulder cross slopes do not need to be corrected if they meet the values in Table 25.4.6 and the algebraic difference in cross slope between the shoulder and adjacent travel lane is 0.07 or less.

25.4.7 Superelevation

Roadway and shoulder superelevation should be provided in accordance with the ***Design Standards, Index 510*** for rural curves and ***Index 511*** for urban curves, consistent with ***Section 25.4.11.1, Number 2, Superelevation***. When the existing superelevation does not meet the Design Standard requirements, a safety study shall be conducted to determine if superelevation may be linked as the primary contributing factor to crashes in the curve. If superelevation can be linked to more than one crash in a five year period superelevation correction is required.

For high speed facilities, including Interstate and toll facilities, correction is generally not required when superelevation cannot be linked as a contributing factor to crashes in the curve and the existing superelevation rate (for the design speed and radius of the curve in question) is greater than or equal to that provided in AASHTO's figure for Minimum Radii for Design Superelevation Rates, Design Speeds, and e_{max} = 6%, or less than or

equal to that provided in AASHTO's figure for Minimum Radii for Design Superelevation Rates, Design Speeds, and e_{max} = 12%. Otherwise, superelevation correction is required.

When superelevation correction is required, details shall address how the transition from normal cross slope to superelevation is to be achieved. Since this type of work will often involve variable depth milling and/or asphalt layers, special care in estimating quantities for milling, overbuild, and structural courses will be necessary. Cross sections depicting superelevation correction shall be shown in the plans for the following locations:

1. At the PC and at the PT.
2. Fifty feet before and after the PC and PT.
3. At 300' intervals within the curve.

25.4.8 Shoulder Treatment

On projects with rural type (without curb) construction, shoulder treatment, erosion control, turf and sod shall be provided consistent with the criteria for new construction. Paved shoulders shall be provided in accordance with new construction criteria with the following exceptions:

1. The widening of existing 4 ft. paved shoulders is optional.
2. When a bicycle lane is provided between the through lane and the right turn lane in accordance with ***Section 25.4.19***, a paved shoulder should be provided for the right turn lane, but is optional. When a paved shoulder is provided for the right turn lane, it should be 5 feet wide (2 feet minimum) to address off-tracking vehicles and to provide drainage benefits.

For RRR projects using ***Index 105*** of the ***Design Standards***, the shoulder treatment option must be identified in the plans. Treatment 1 can only be used if the shoulder is established with good soil and turf, and there is no significant shoulder erosion. If a project meets the overlay thickness requirements for Treatment 1, but there is significant shoulder erosion, Treatment 2 must be used in the plans.

For new construction paved shoulder criteria, refer to ***Chapter 2*** of this volume. Shoulder cross slope is addressed in ***Section 25.4.6***.

25.4.9 Side Slopes

The values selected shall be the flattest that are practical. On RRR projects where existing ditches can be modified for stormwater management purposes, the use of steeper than standard side slopes and additional depth may be cost-effective but would require a variation. Justification must fully address safety, water depth, frequency and duration, as well as cost-effectiveness. The decision to shield steep side slopes shall be made consistent with the guidelines in the ***AASHTO Roadside Design Guide***.

Front Slopes:

1. 1:6 are desirable.
2. 1:4 may be constructed within the clear zone.
3. 1:3 may be constructed outside the clear zone.
4. Existing front slopes 1:3 or flatter may remain within the clear zone. Shielding may be required.
5. Steeper than 1:3 shall be shielded as per ***Design Standards, Index 400, General Notes.***
6. Consideration should be given to flattening slopes of 1:3 or steeper at locations where run-off-the-road type crashes are likely to occur (e.g., on the outsides of horizontal curves).
7. The proposed construction should not result in slopes steeper than the existing slopes in violation of the above values.

Back Slopes:

1. 1:4 are desirable.
2. 1:3 may be constructed in the clear zone.
3. 1:2 may be constructed outside the clear zone without shielding.
4. Existing back slopes 1:2 and flatter may remain.
5. Existing back slopes steeper than 1:3 within the clear zone may require shielding.

25.4.10 Vertical Alignment

Vertical alignment must be reviewed together with the horizontal alignment to assure that the necessary balance of standards is realized and that the combination is both safe and pleasing.

The alignment should be reviewed to see if the following principles are generally satisfied by the existing vertical alignment:

1. The sight distance provided meets or exceeds the values in ***Table 25.4.12***.
2. Grades do not significantly affect truck operations.
3. There are no hidden dips which could obscure traffic or hazards.
4. Steep grades and sharp vertical curves do not exist at or near an intersection.
5. Sufficient grades and, when necessary, special gutter grades exist to adequately drain urban projects.
6. Adequate sight distance exists for traffic signals (e.g., beyond overpasses, etc.).

When any of the above conditions do not exist, the designer should evaluate for hazardous conditions and determine if corrective measures are warranted.

25.4.10.1 Vertical Curvature

The designer shall use the method given in ***Table 25.4.10.1*** to check the sufficiency of vertical curves and provide any indicated corrective measures. When an evaluation is required, it shall consider:

1. The nature of potential hazards hidden by a hill crest.
2. The location of the hazard in relation to the portion of the highway where sight distance falls below new construction criteria.
3. Effectiveness of other options such as relocating or correcting the hazard.
4. Providing warning signs.

Sag vertical curves do not normally pose sight distance problems, therefore only existing sag vertical curves where crash history (related to the curve) indicates a problem must be evaluated against new construction criteria. An evaluated sag vertical curve that does not meet the minimum K value in ***Table 2.8.6*** requires a Design Exception to remain. Sag vertical curves that are to be reconstructed must meet new construction criteria. Sag vertical curves without crash problems that fall below new construction criteria do not require Design Exceptions or Design Variations to remain.

Table 25.4.10.1 K Values for Vertical Curvature

DESIGN SPEED (mph)	K Values	
	Crest Vertical Curves	
	A (1)	B (2)
15	5	3.0
20	10	6.1
25	18	11.1
30	30	18.5
35	47	29.0
40	70	43.1
45	98	60.1
50	136	83.7
55	184	113.5
60	244	150.6
65	313	192.8
70	401	246.9

1. The "A" values are based on an eye height of 3.5 feet and an object height of 0.5 feet.
2. The "B" values are based on an eye height of 3.5 feet and an object height of 2.0 feet.
3. For the design speed, compare the K value to the tabulated values using the following formula:

$$K = \frac{L}{A}$$

Where: K = Rate of vertical curvature
L = Length of vertical curve, (feet)
A = Algebraic difference in grades, (percent)

a. If the K value is equal to or greater than the "A" value, the curve is satisfactory.

b. If the K value is equal to or greater than the "B" value, but less than the "A" value, a study **should** be made to evaluate possible mitigation of hazards requiring driver reaction and/or appropriate treatment (i.e. relocation of the hazard, hazard warning signs, reduced safe speed signs, etc.).

c. If the K value is less than the "B" value, **reconstruction** of the curve is required, or an exception must be obtained.

25.4.10.2 Grades

Grades which satisfied the standards in effect at the time of construction may be used provided the result is consistent with the design principles in ***Section 25.4.10***. Grades which are not consistent with these design principles must be evaluated.

25.4.11 Horizontal Alignment

Vertical and horizontal alignment must be reviewed together to assure that the necessary balance of standards is realized and the combination is both safe and pleasing.

The designer should review the alignment to identify that the existing alignment generally adheres to the following guidelines:

1. Consistent with no sudden changes from easy to sharp curvature.
2. Sufficient tangent length between reverse curves.
3. Superelevation transitions provided.
4. Maximum curvature is not used:
    a. On high fills or elevated structures.
    b. At or near crest in grade.
    c. At or near low points in grade.
    d. At the end of long tangents.
    e. At or near intersections or points of access or egress.
    f. At or near decision points.

At all locations where the existing alignment does not adhere to these conditions, the designer should evaluate for hazardous conditions and determine if corrective measures are warranted.

25.4.11.1 Horizontal Curves

Horizontal curves shall be reviewed for horizontal curvature and superelevation. Review existing curves against the values in ***Table 25.4.11.1***. Every practical attempt shall be made to upgrade curves which are below State Highway System (SHS) minimum values for new construction. The review should also include an on-site review for evidence of near crashes or operational problems.

1. **Horizontal Curvature**

   Condition #1 - Horizontal curves that meet or exceed the SHS minimum radius values are satisfactory unless there is a significant crash history (3 or more crashes within the most recent 5-year) or other evidence of safety or operational problems. If problems are identified corrective measures shall be included in the project.

   Condition #2 - Curves which are below the SHS minimum radius values but meet or exceed the RRR minimum radius values shall be reviewed for specific safety problems at the curve. If the review indicated significant operational or safety problems exist, the curve must be reconstructed. If problems are identified but reconstruction is not warranted, corrective measures shall be included in the project.

   Condition #3 - Those curves which do not meet the RRR minimum radius values must be reconstructed or a design exception must be obtained. Reconstructed curves shall meet the criteria for new construction contained in ***Chapter 2*** of this volume. Sufficient time and budget must be programmed into the RRR project to obtain any right of way necessary for reconstruction of the curve.

2. **Superelevation**

   Rural Curves - Existing rural curves not having the indicated superelevation rate on the ***Design Standards, Index 510*** should be corrected to that rate. Other measures appropriate to correct or improve identified safety or operational problems shall be provided.

   Urban Curves - Existing urban (C&G) curves not having the indicated superelevation rate on the ***Design Standards, Index 511*** should be corrected to that rate by reconstruction of the curve or, if practical, curb adjustment to accommodate overbuild. Other measures appropriate to correct or improve identified safety or operational problems shall be provided.

3. **PIs Without Curves**

   Where alignments have PIs without curves that exceed the new construction values in ***Table 2.8.1***, consideration should be given to reconstructing the roadway with suitable curvature.

Table 25.4.11.1 Safe Criteria for State Highway System With Maximum Superelevation

DESIGN SPEED (mph)	$e_{max.} = 0.10$				$e_{max.} = 0.05$			
	SHS		RRR		SHS		RRR	
	D_{max}	$R_{min.}$ (ft.)	D_{max}	$R_{min.}$ (ft.)	D_{max}	$R_{min.}$ (ft.)	D_{max}	$R_{min.}$ (ft.)
30	24° 45'	231	30° 30'	188	20° 00'	286	25° 45'	223
35	17° 45'	323	20° 45'	276	14° 15'	402	17° 15'	332
40	13° 15'	432	14° 45'	388	10° 45'	533	12° 15'	468
45	10° 15'	559	11° 00'	521	8° 15'	694	9° 00'	637
50	8° 15'	694	8° 30'	674	6° 30'	881	6° 45'	849
55	6° 30'	881	6° 45'	849	N/A		N/A	
60	5° 15'	1091	5° 30'	1042	N/A		N/A	
65	4° 15'	1348	4° 30'	1273	N/A		N/A	
70	3° 30'	1637	3° 45'	1528	N/A		N/A	

25.4.12 Stopping Sight Distance

Stopping sight distance requirements are provided in ***Table 25.4.12***.

Table 25.4.12 Stopping Sight Distance

DESIGN SPEED (mph)	STOPPING SIGHT DISTANCE (ft.)
15	80
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730

25.4.13 Vertical Clearance

The following clearances apply to highway bridges (to remain or be modified only) and other roadway features over the entire roadway. Entire roadway includes lanes and shoulders. Replacement structures shall be to new construction standards.

Underpass Clearance - For roadways passing under existing bridges, vertical clearance shall be at least 14 ft. over the entire roadway. Signing and warning features shall be provided whenever vertical clearance is less than 14 ft. 6 inches. The existing vertical clearance shall not be reduced by the RRR project if the existing clearance is 16 ft. or less.

Low Member Clearance - Existing bridges with sway bracing members over the bridge deck shall have at least 14 ft. clearance over the entire roadway.

Signs and Traffic Control Devices - Clearances shall be provided consistent with new construction standards.

All exceptions to the 16-ft vertical clearance standard on rural Interstate routes or on a single Interstate route through urban areas must be coordinated with Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA) as described in ***Section 23.3***.

25.4.14 Horizontal Clearance

Horizontal clearance is the lateral distance from a specified point on the roadway such as the edge of the travel lane or face of curb, to a roadside feature or object. Horizontal clearance applies to all highways. Horizontal clearance requirements vary depending on the design speed, whether rural or urban with curb, traffic volumes, lane type, the object or feature, and whether the object is or is not within a control zone as described in the following ***Sections 25.4.14.1*** and ***25.4.14.2***.

25.4.14.1 Control Zones

Control zones are areas in which it can be statistically shown that crashes are more likely to involve departure from the roadway with greater frequency of contact with above ground fixed objects. These are described below and shown in ***Exhibit 25-A***. The horizontal clearance requirements and clear zone widths in Control Zones shall be based on new construction criteria provided in ***Chapter 2, Section 2.11*** of this volume.

1. An above ground fixed object having been hit 3 times or more within 3 consecutive years in the last 5 years.
2. Within the return radii of an intersecting street and the new construction horizontal clearance distance.
3. For 'T' intersections (on the non-intersection side) within the area defined by a line through the center of the return radii and return point of tangent extended across the street to the rights of way limits.
4. For a distance of 100 ft. measured downstream from the point of intersection of a right turn deceleration lane and where full lane width is achieved within the new construction horizontal clearance distance (It is assumed the edge of pavement is not constructed on a reverse curve. If it is, the measurement is taken from the point of intersection of the trailing curve).
5. For a distance of 100 ft. measured downstream from the point of intersection of a full lane termination with a skewed merge section within the new construction horizontal clearance distance (It is assumed the edge of pavement is not constructed on a reverse curve. If it is, the measurement is taken from the point of intersection of the leading curve).
6. For a distance of 3 ft. from a driveway flare within the new construction horizontal clearance distance at the intersection of a dedicated intersecting service facility such as an alley way or easement.
7. For a distance of 3 ft. from a driveway flare within the new construction horizontal clearance distance at the entrance turnout for use other than a private residence.
8. The area on the outside of a curve when the operating speed exceeds 35 mph or downstream of a kink in the alignment for a distance of 100 feet. In each case the area falls within the new construction horizontal clearance distance unless protected by a barrier. For curves, if the radius exceeds 3000 feet, no control zone exists and control zone requirements do not apply. For kinks in the alignment, if the kink is less than 5 degrees, no control zone exists specifically for the kink and therefore control zone requirements for kinks do not apply.

25.4.14.2 Areas Outside Control Zones

Outside of Control Zones, horizontal clearance requirements should be based on new construction criteria provided in ***Chapter 2***, ***Section 2.11*** of this volume. When these requirements are deemed impractical, the following horizontal clearance requirements shall be used:

1. Rural highways with flush shoulders and highways with curb or curb and gutter where right of way is not restricted have roadsides of sufficient widths to provide clear zones; therefore, the horizontal clearance requirements for certain features and objects are based on maintaining a clear zone wide enough to provide the recoverable terrain in ***Table 25.4.14.1***. The procedure for determining required clear zone widths is described in ***Chapter 4*** of this volume.
2. In urban areas (Design Speed ≤ 45 mph), horizontal clearance based on clear zone requirements for rural highways should be provided wherever practical. Highways with curb or curb and gutter in urban areas where right of way is restricted, do not have roadsides of sufficient widths to provide clear zones; therefore, while there are specific horizontal clearance requirements for these highways, they are based on clearances for normal operation and not based on maintaining a clear roadside for errant vehicles.
3. Crashworthy objects shall meet or exceed the offsets listed in ***Tables 25.4.14.2*** through ***Table 25.4.14.10*** and objects that are not crashworthy are to be as close to the right of way line as practical and no closer than the offset listed in ***Tables 25.4.14.2*** through ***Table 25.4.14.10***.

Table 25.4.14.1 Recoverable Terrain

DESIGN SPEED (mph)	TRAVEL LANES & MULTI-LANE RAMPS (feet)	AUXILIARY LANES & SINGLE LANE RAMPS (feet)
< 45	6	6
45[(1)]	14	8
> 45	18	8

GENERAL NOTES:

(1) May be reduced to <45 mph widths if conditions more nearly approach those for low speed (40 mph or less).

The above values are to be used in the process for determining the clear zone width as described in ***Chapter 4*** of this volume.

Table 25.4.14.2 Horizontal Clearance for Traffic Control Signs

PLACEMENT	Placement shall be in accordance with the ***Design Standards***. Placement within sidewalks shall be such that an unobstructed sidewalk width of 4 feet or more (not including the width of curb) is provided.
SUPPORTS	Supports, except overhead sign supports, shall be breakaway. When practicable, sign supports should be located behind barriers that are justified for other reasons. Overhead sign supports shall be located outside the clear zone unless shielded.

Table 25.4.14.3 Horizontal Clearance for Light Poles

CONVENTIONAL LIGHTING	Shall not be located in the median except in conjunction with barriers that are justified for other reasons. Supports shall be breakaway, except for median barrier mounted or shielded light poles. Urban Curb or Curb and Gutter (Design Speed ≤ 45 mph): Shall be located no closer than 4 feet from face of curb (may be 1.5 feet from face of curb when all other alternatives are deemed impractical). Placement within sidewalks shall be such that an unobstructed sidewalk width of 4 feet or more (not including the width of curb) is provided. All other facilities: Shall be located no closer than 20 feet from the travel lane or 14 feet from an auxiliary lane (may be clear zone width when clear zone is less than 20 feet).
HIGH MAST LIGHTING	Shall be located outside the clear zone unless shielded.

Table 25.4.14.4 Horizontal Clearance for Aboveground Fixed Utilities

Aboveground fixed utilities are objects owned by a public or private utility agency that are more than four (4) inches above the grade and are not accepted by FDOT as crash worthy (such as strain poles, down guys, telephone load pedestals, temporary supports, etc.). Control Zones are not applicable to AFUs.	
NEW ABOVEGROUND FIXED UTILITIES (AFUs) Other than mid-span poles	For urban roadways with curb or curb and gutter with design speeds less than or equal to 45 mph, new AFUs shall not be placed closer than 4 feet from the face of curb and as close to the R/W as practical. For all other roadways the AFUs are to be outside the Clear Zones established using ***Table 2.11.1 Recoverable Terrain*** and as close to the R/W line as practical.
NEW ABOVEGROUND FIXED UTILITIES (AFUs) Mid-span poles	Mid-span poles are new poles being installed as part of and within the alignment of an existing pole line. When the existing alignment crosses an intersecting roadway, the mid-span pole is to be placed as follows: For intersecting roadways that are urban with curb or curb and gutter with design speeds less than or equal to 45 mph, mid-span poles shall not be placed closer than 4 feet from the face of curb. For all other intersecting roadways, mid-span poles are to be outside the Clear Zones established for new poles appropriate for the intersecting roadway.
EXISTING ABOVEGROUND FIXED UTILITIES (AFUs)	Existing AFUs are not to be relocated unless they are adjacent to added or widened lanes or have been hit 3 times in 5 years. Those identified for relocation shall be relocated as follows: For urban roadways with curb or curb and gutter with design speeds less than or equal to 45 mph, existing AFUs are to be relocated as close to the R/W line as practical and at least 1.5 feet from the face of curb. For all other roadways, existing AFUs are to be relocated as close to the R/W line as practical and outside the Clear Zones established for the project.

Table 25.4.14.5 Horizontal Clearance to Traffic Infraction Detectors, Signal Poles and Controller Cabinets for Signals

SIGNAL POLES AND CONTROLLER CABINETS	Shall not be located in medians. Shall be located outside the clear zone except as follows: Urban Curb or Curb and Gutter (Design Speed ≤ 45 mph): Shall be located no closer than 4 feet from face of outside curbs and outside the sidewalk. However, when necessary the signal poles may be located within sidewalks such that an unobstructed sidewalk width of 4 feet or more (not including the width of curb) is provided. Also, when site conditions make the 4-foot clearance impractical, clearance may be reduced to 1.5 feet.
TRAFFIC INFRACTION DETECTORS	For Traffic Infraction Detector placement and installation specifications, refer to the State Traffic Engineering and Operations Office web page: http://www.dot.state.fl.us/trafficoperations/

Table 25.4.14.6 Horizontal Clearance to Trees

New plantings shall meet new construction criteria.
Existing trees where the diameter is or is expected to be greater than 4 inches (measured 6 inches above the ground) shall be located outside the clear zone except as follows:

Urban Curb or Curb and Gutter (Design Speed ≤ 45 mph):

- 1.5 feet from face of outside curbs,
- 3.5 feet from edge of inside traffic lane.

Table 25.4.14.7 Horizontal Clearance to Bridge Piers and Abutments

Bridge Piers and Abutments shall be located in accordance with ***Table 2.11.6***

Table 25.4.14.8 Horizontal Clearance to Railroad Grade Crossing Traffic Control Devices

Shall be located in accordance with the ***Design Standards***.

Table 25.4.14.9 Horizontal Clearance to Other Roadside Obstacles

Shall be located outside the clear zone except as follows: Urban Curb or Curb and Gutter (Design Speed ≤ 45 mph): Shall be located no closer than 4 feet from face of curb(may be 1.5 feet from face of curb when all other alternatives are deemed impractical).
Note: Horizontal clearance to mailboxes is specified in the construction details contained in the ***Design Standards***, ***Index No. 532***.
Note: Transit and school bus shelters shall be placed in accordance with ***Rule Chapter 14-20.003, Florida Administrative Code***. Transit bus benches shall be located in accordance with ***Rule Chapter 14-20.0032, F.A.C.***.

Table 25.4.14.10 Horizontal Clearance to Canal and Drop-off Hazards

See ***Chapter 4*** of this Volume for horizontal clearance criteria for canal and drop-off hazards.

25.4.14.3 Use of Curb on RRR Projects

Urban areas are typically characterized with lower speed (Design Speed ≤ 45 mph), more dense abutting development, closer spaced intersections and accesses to property, higher traffic volumes, more bicyclists and pedestrians, and restricted right of way. In these areas, curb with closed drainage systems are often used to minimize the amount of right of way needed. It should be noted that curb has no redirectional capabilities except at speeds less than the lowest design speeds used on the State Highway System. Therefore curb should not be considered effective in shielding a hazard. Curb is not to be used to reduce horizontal clearance requirements.

Curbs shall not be used on high speed roadways (Design Speed > 45 mph) except as follows:

1. FDOT Suburban Section
2. FDOT High Speed Urban Section
3. Median Openings
4. Transit Stops

Curbs used on high speed roadways shall be FDOT Type E with the face of the curb placed no closer to the edge of the traveled way than the required full width shoulder for a flush shoulder roadway. For the Suburban and High Speed Urban Section, special offset widths to curb have been established. See ***Section 2.16*** for requirements for High-Speed Urban and Suburban Arterial Highways. For directional median openings, see ***Index 527***. For transit stops, the curb face shall be no closer to the edge of the traveled way than the required full width shoulder for a flush shoulder roadway.

25.4.15 (Reserved)

25.4.16 Border

The minimum border width shall be the greatest of the following:

1. The border width used in the original project.
2. The border width required to satisfy ADA accessibility standards.
3. 8 feet.

When right of way is being acquired for other reasons, the minimum border width shall be that used for new construction projects; however, the minimum length of wider border width shall be a segment of sufficient length to provide reasonable continuity.

25.4.17 Intersections

Intersections shall be evaluated to determine those that need a traffic engineering study. The following items should be considered:

1. Traffic Signal Mast Arms or single point attachment span wires within the mast arm policy area (see ***Section 7.4.12***) where existing strain poles require replacement/relocation.
2. Addition of right and left turning lanes.
3. Realignment of intersection.
4. Adequate turning radii for left and right turning lanes.
5. Use of channelization to reduce excessive areas of conflict at large intersections.
6. Placement of crosswalks as related to sidewalks and stop bars.
7. Locations of pedestrian, bicycle, and transit facilities.
8. Locations of utilities, signal poles, controller cabinets, lighting poles and drainage structures as related to sidewalks and curb ramps.
9. Warrants for traffic control systems.
10. Addition of signal backplates where it would not require structural modifications to mast arms or span wire systems.
11. Addition of auxiliary heads where it would not require structural modifications to mast arms or span wire systems.
12. Installation of buried conduit for future traffic control systems.
13. Lighting for intersection illumination.
14. Adequate sight distance.
15. ADA needs.

Corrective measures shall be included in projects having T-intersections with significant crash histories (3 or more crashes of a specific type within the most recent 5-years) or other evidence of safety or operational problems.

Due to funding limitations, improvements other than those needed for safety and minimum criteria must be carefully considered before inclusion in the project (see ***Section 25.2***). The extra cost associated with improvements requested by local governments that exceed FDOT criteria, e.g. installation of mast arm signal supports in areas beyond the mast arm policy area, should be paid for by the local government making the request.

25.4.18 Drainage

The designer or drainage specialist must evaluate the hydraulic and physical adequacy of the existing drainage system. This requires examination of the existing drainage in the field and by consulting with maintenance personnel and records. If there are apparent problems with the existing drainage system, additional evaluation is required to determine the extent and type of improvements necessary to upgrade the system. The ***FDOT Drainage Manual (Topic No. 625-040-002)*** contains design criteria and methods which provide guidance in formulating suitable drainage features, either through modification or replacement.

Prior to selecting any plan of highway improvement, the designer should consult with drainage and environmental permitting specialists since almost all roadway modifications reduce storage and infiltration and increase discharge rates and volumes. Stormwater retention and detention for quality, rate and volume may be required. Theoretical evaluation of proposed changes to existing and new drainage features necessary to correct operational deficiencies should be referred to a drainage specialist. The drainage specialist will provide the necessary drainage design, flood data information, drainage related information for the Stormwater Pollution Prevention Plan (SWPPP) and any stormwater permit computations.

Due to funding limitations, improvements other than those needed for safety and minimum criteria must be carefully considered before inclusion in the project (see ***Section 25.2***).

25.4.19 Pedestrian, Bicyclist and Transit Needs

Whenever a RRR project is undertaken, pedestrian and bicyclist needs must be addressed, and transit needs should be considered. Recommendations by the District Pedestrian/Bicycle Coordinator and the District Modal Development Office shall be obtained; local government and transit agency contact in developing these recommendations is essential. This should be part of the project scoping and programming effort.

25.4.19.1 Pedestrian Needs

1. Sidewalks and Shared use Paths

On RRR projects, detectable warnings and curb ramps shall be brought into compliance with ADA requirements. This includes installing new detectable warnings for both flush shoulder and curbed roadway connections and signalized driveways where none exist or do not meet current requirements. New curb ramps shall be provided on curbed roadways where none exist; existing substandard curb ramps shall be replaced. Existing ramps not meeting detectable warning requirements which otherwise comply with ADA, shall be retrofitted with detectable warnings. (See ***Design Standards, Index 304 & 310***.)

Pull boxes, manholes, and other types of existing surface features in the location of a proposed curb ramp or detectable warning should be relocated when feasible. When relocation is not feasible, the feature shall be adjusted to the new ramp to meet the ADA requirements for surfaces (including the provision of a non-slip top surface, and adjustment to be flush with and at the same slope as the curb ramp).

When compliance with ADA curb ramp requirements is determined to be technically infeasible documentation as a Design Variation is required. This may occur where existing right of way is inadequate and where conflicts occur with existing features that cannot be feasibly relocated or adjusted, e.g., drainage inlets, signal poles, pull boxes, etc...

Other than meeting detectable warning and curb ramp requirements, existing sidewalks and flared driveway turnouts are not required to be upgraded for the sole purpose of meeting ADA requirements, unless included in the project scope by the District. All new sidewalk and driveway construction or reconstruction included on RRR projects shall be designed in accordance with ADA requirements. However, even if new sidewalk is to be constructed, non-conforming driveways are not required to be upgraded.

2. Medians

Medians shall be evaluated to determine if modifications such as pedestrian refuge sections are necessary. 5-lane and 7-lane sections are restricted or eliminated under current policy, usually by the introduction of a raised or restrictive median, which enhances the opportunity to accommodate pedestrian needs. Traffic separators with a width sufficient to provide refuge should be used at intersections where possible. When adequate pedestrian refuge cannot be provided at the intersection, midblock islands should be provided.

Design details for disability access features including sidewalk, curb ramps and driveway turnouts are found in the ***Design Standards***. Additional standards for ADA are found in the regulations and design guidelines issued by the Secretary of the U.S. Department of Transportation.

25.4.19.2 Bicyclist Needs

1. Bicycle Lanes, Paved Shoulders, Wide Outside Lanes

For existing sections without bicycle facilities where no widening is planned, consideration shall be given to reducing lane widths to provide bicycle lanes, wide outside lanes or paved shoulders. These facilities shall meet the criteria provided in ***Chapter 8***. Existing thru lane widths on urban multilane roadways and two-lane curb and gutter roadways shall not be reduced to less than 11 feet for design speeds ≥ 40 mph, and to no less than 10 feet for design speeds ≤ 35 mph. See ***Section 25.4.5*** for additional information on lane widths. Coordinate with the District Public Transportation (Modal Development) Office and local transit agency when considering the reduction of lane widths on roadways where public transit routes are present. When bicycle facilities are not provided in accordance with ***Section 8.1***, a Design Variation is required.

2. Right Turn Lanes

Bicycle lanes at right turn lanes shall meet the criteria provided in ***Section 8.4.2***.

3. Drainage Inlets, Grates, Utility Covers

Existing drainage inlets, grates and utility covers shall be evaluated as to whether they present an obstruction to bicyclists, and should be relocated out of the cyclist's path of travel. Drainage inlets, grates and utility covers to remain should be adjusted to be flush with the adjacent pavement surface, utilize a grate recommended for bicycle travel, and be marked as an obstruction. See the ***MUTCD*** and ***Design Standards*** for further information. Existing inlets, grates or covers which present gaps sufficient to trap the wheel of a bicycle should be referred to the Maintenance Office for remediation until the project is constructed.

25.4.19.3 Transit Needs

1. Sidewalks and Transit Facilities

A 5-foot wide sidewalk that connects a transit stop or facility with an existing sidewalk or shared use path shall be included to comply with ADA accessibility standards.

25.4.20 At-grade Railroad Crossings

When highway improvements are undertaken that include at-grade railroad crossings, the physical and operational characteristics shall be reviewed and upgraded to meet minimum standards. Recommendations shall be made by the District Railroad Coordinator for incorporation into the project.

See ***Design Standards, Index 560*** for minimum vertical alignment criteria.

See ***Chapter 6*** of this volume and the ***Design Standards*** for additional information.

25.4.21 Aesthetics and Landscaping

Landscaping, including median and intersection treatment, shall be consistent with the criteria in this manual and the ***Design Standards, Index 546.*** Landscape improvements are normally done in response to local government requests and may involve intergovernmental agreements to cover the cost of installation as well as maintenance.

Due to funding limitations, improvements other than those needed for safety and minimum criteria must be carefully considered before inclusion in the project (see ***Section 25.2***).

See ***Chapter 9*** of this volume for additional information and requirements on landscaping.

25.4.22 Highway Lighting

Lighting may be installed at specific locations to improve safety. For example:

1. Reducing the effects of ambient light conditions.
2. Busy or high crash intersections.
3. Transit stops.
4. Channelized intersections.
5. Car pool parking lots.
6. Pedestrian and bicycle crossings.
7. Ramp terminals.

Any lighting, existing or proposed, shall be reviewed by the District Lighting Engineer to determine specific needs. Lighting shall meet new lighting criteria, found in ***Chapter 7*** of this volume.

25.4.23 Highway Traffic Control Devices

Traffic control devices such as signals, signing, and pavement markings shall be updated as required to comply with the ***Manual on Uniform Traffic Control Devices,*** the ***Manual on Uniform Traffic Studies,*** the Department's ***Design Standards*** (excluding the structures of such traffic control devices per ***Section 25.4.27***)***,*** and the ADA design guidelines issued by the Secretary of the U.S. Department of Transportation. The District Traffic Operations Engineer (or staff) shall determine any new or additional devices required.

25.4.24 Bridges

On each project, a determination must be made as to whether an existing bridge should remain as is, be rehabilitated or be replaced. This determination should be made as early as practical due to the potential impact to the work program. Pavement resurfacing funds can only be used for minor bridge improvements such as rail retrofits and ADA improvements. Bridges that require major improvement or replacement must be programmed with the appropriate bridge program funds.

The determination of bridge improvement needs must be supported by an engineering analysis/report and be based on an assessment of the bridge's structural and functional adequacy. The engineering report must include the project description, an operational impact evaluation, safety impacts, and a benefit/cost analysis. The safety impacts must include a detailed review of crash history, severity, contributing factors, etc. If the engineering analysis determines it is not feasible to bring the bridge in full compliance with minimum criteria, a design exception or variation addressing the feature(s) not meeting criteria must be processed in accordance with ***Chapter 23*** of this volume. The engineering analysis/report should be used to support the exception or variation.

If a bridge is found to be functionally obsolete but structurally sound, complete replacement is usually not warranted. For these type structures a full range of possible improvements must be considered, including improvements that enhance safety but do not necessarily bring the bridge into full compliance with minimum criteria. Improvements such as upgrading of connecting guardrail systems, approach roadway or shoulder widening, "Narrow Bridge Ahead" signing, or other appropriate feature modifications should be considered as appropriate. Widening of the structure itself, or rail retrofit, are also options that should be addressed. The designer should always review the Department's work program to see if a structure is scheduled for replacement in the near future, before determining short term improvements.

If the structure is on the Florida Intrastate Highway System (FIHS)/Strategic Intermodal System (SIS), the designer should also consider any improvements based on future alignment and possible lane additions required for an FIHS/SIS corridor. For example: if a bridge is to be replaced, the corridor is on the FIHS/SIS, and the project will be multilaned in the future, the new bridge should be aligned to fit future typical sections.

25.4.24.1 Bridge Loading

See ***PPM Section 26.17*** for load rating requirements.

25.4.24.2 Bridge Width

Bridges shall meet or exceed the following clear width criteria. If lane widening is planned as part of the RRR project, the minimum useable bridge width shall be determined using the width of approach lanes after widening.

Table 25.4.24.2 Clear Width Criteria for Bridges

Design Year ADT		Minimum Usable Bridge Width (ft.)
UNDIVIDED	0 - 750	Total width of approach lanes + 4
	751 +	Total width of approach lanes + 8
DIVIDED	ALL	Total width of approach lanes + 5.5 (median separator) * Total width of approach lanes + 6.5 (median barrier wall)**
ONE WAY BRIDGES	ALL	Total width of approach lanes + 6.5 (2.5 Lt. and 4.0 Rt.)

* 1.5 ft. median and 4 ft. outside shoulder

** 2.5 ft. median and 4 ft. outside shoulder

If widening is required, it shall be in accordance with the ***Structures Design Guidelines*** and meet the geometric requirements for new construction.

25.4.24.3 Bridge Railing

Florida bridge railing must meet or exceed design strength specified in the ***AASHTO "LRFD Bridge Design Specifications"***. In addition, FDOT is moving towards full implementation of ***NCHRP Report 350*** crash test criteria for bridge traffic railing, and FDOT policy is to bring all bridge traffic railing to current standards on bridges that are being widened or rehabilitated. Bridge traffic railings are required to be evaluated for conformance to current standards whenever any improvements are made to any bridge or its approach roadway. An existing obsolete bridge traffic railing within a RRR project must be brought up to current standards, or else a design exception must be obtained for the project, providing that railing replacement or retrofit, or entire bridge replacement, is scheduled within a reasonable time. Structures Design Office staff are available to advise Districts on options.

The Thrie Beam Guardrail Retrofit and Vertical Face Retrofit ***Design Standards***, ***Index 470 and 480 Series*** respectively, are suitable for retrofitting specific types of obsolete bridge traffic railings. These retrofits provide a more economical solution for upgrading obsolete traffic railings when compared with replacing the obsolete traffic railings and portions of the bridge decks that support them. As these retrofits do not provide for any increase in clear width of bridge deck, and in a few cases actually decrease clear width slightly, they should only be considered for use on existing bridges where adequate lane and shoulder widths are present. Detailed guidance and instructions on the use of these retrofits is included in the ***Structures Manual, Volume 3***.

All superseded FDOT Standard Traffic Railings conforming to the designs shown in ***Instructions for Design Standards, Index 402***, "A Historical Compilation of Superseded Florida Department of Transportation "Structures Standard Drawings" for "F" and "New Jersey" Shape Structure Mounted Traffic Railings", are both structurally and functionally adequate.

Existing bridge traffic railing retrofits constructed in accordance with ***1987 through 2000 Roadway and Traffic Design Standards, Index 401, Scheme 16, "Guardrail Continuous Across Bridge"*** may be left in place provided the following four criteria are met:

1. The retrofit railing is in good condition.
2. There is not a history of severe crashes at the site.
3. The bridge is not on an Interstate or a high-speed-limited-access facility.
4. The dimension from the center of the W-beam guardrail to the roadway surface is at least 1'-9" (1" tolerance acceptable).

Existing bridge traffic railing retrofits constructed in accordance with ***1987 through 2000 Roadway and Traffic Design Standards, Index 401, Schemes 1 and 19 "Concrete Safety Barrier"*** may be left in place provided the height of the railing is at least 2'-5" measured from the roadway surface.

All other former FDOT bridge traffic railings not listed above and any other traffic railings that are not based on crash tested designs are inadequate and shall be replaced, retrofitted or excepted, as appropriate, using the criteria included in the ***Structures Design Guidelines***.

For guardrail to bridge rail transition requirements, see ***Section 25.4.26.2.***

25.4.24.4 Vertical Clearance

For vertical clearance requirements for bridges, refer to ***Section 25.4.13***.

25.4.24.5 Considerations

When evaluating bridge replacement or widening, the following should be considered:

1. Cost of replacing the existing bridge with a wider bridge designed to new bridge criteria.
2. Cost of widening the existing bridge (if widening is practical), including life cycle costs of maintaining a widened bridge.
3. The number of crashes that would be eliminated by replacement or widening.
4. The hydraulic sufficiency and the risk of failure due to scour and/or ship impact as well as the consequences of failure.

25.4.24.6 Pier Protection and Design

Pier protection and design shall comply with the requirements provided in ***Structures Design Guidelines, Section 2.6***.

25.4.25 Roadside Safety Hardware

Roadside conditions must be reviewed to determine the need for roadside safety hardware. This review must include a review of existing roadside safety hardware for need and adequacy and whether upgrading or replacement is necessary. See ***Chapter 4*** of this volume for guidance on conducting reviews. All roadside safety hardware on RRR projects must comply with the following requirements.

25.4.25.1 Longitudinal Barriers, Guardrails, Median Barriers

Existing longitudinal guardrail sections must be upgraded or replaced unless they conform to the current ***Design Standards, Index 400***. As an exception, existing guardrail constructed with steel offset blocks, but otherwise conforming to the current ***Design Standards***, are not required to be upgraded or replaced.

Existing concrete barriers conforming to the current ***Design Standards, Index 410***, New Jersey shape barriers, and approved vertical faced concrete barriers may remain in place. Other concrete barrier shapes must be replaced.

All replacements and new installations shall conform to the current ***Design Standards***.

The above applies to barriers used for shielding roadside hazards not involving pier protection. See ***Structures Design Guidelines, Section 2.6***, for barrier requirements for pier protection

See ***Section 25.4.25.3*** for bridge rail requirements.

25.4.25.2 Guardrail to Bridge Rail Transitions

Existing guardrail to bridge traffic railing approach and trailing end transitions must be upgraded or replaced unless they conform to one of the following systems.

1. For approach ends of existing standard New Jersey Shape and F Shape bridge traffic railings:
    a. The nested thrie-beam approach transition shown as ***Detail J*** in the current ***Design Standards, Index 400.***

b. For retrofitted installations, the appropriate nested thrie-beam transition shown in the current ***Design Standards, Index 402.***

c. The nested W-beam approach transition shown as ***Detail J*** in the 1998 edition of the ***Roadway and Traffic Design Standards, Index 400,*** Sheet 7 of 21. This detail is also shown in the 2000 edition of the ***Roadway and Traffic Design Standards, Index 401,*** Sheet 1 of 9.

All guardrail replacements and new installations connecting to standard New Jersey Shape and F Shape bridge traffic railings shall conform to the current ***Design Standards, Index 400***. For guardrail retrofits connecting to existing bridge traffic railings, see ***Design Standards, Index 402*** and the ***Instructions for Design Standards, Index 402***.

2. For approach ends of existing bridge traffic railing retrofits constructed in accordance with the ***1987 through 2000 Roadway and Traffic Design Standards, Index 401, Scheme 16, "Guardrail Continuous Across Bridge"***:

   a. The W-beam approach transition shown as ***Detail J*** in the 1987 edition of the ***Roadway and Traffic Design Standards, Index 400,*** Sheet 9 of 13, upgraded as shown in ***Design Standards, Index 403*** by the installation of a nested section of W-beam guardrail, additional guardrail posts and offset blocks and a transition block if a curb is not present beyond the bridge end.

   b. The nested W-beam approach transition shown as ***Detail J*** in the 1998 edition of the ***Roadway and Traffic Design Standards, Index 400,*** Sheet 7 of 21, upgraded as shown in ***Design Standards, Index 403*** by the installation of a transition block if a curb is not present beyond the bridge end. A transition block is not required if a curb is present.

3. For trailing ends of existing bridge traffic railing retrofits constructed in accordance with the ***1987 through 2000 Roadway and Traffic Design Standards, Index 401, Scheme 16, "Guardrail Continuous Across Bridge"***:

   a. In the absence of continuing guardrail, two panels of W-beam guardrail and a Type II End Anchorage as shown in ***Design Standards, Index 400*** or another approved end anchorage.

   b. A continuous W-beam guardrail system.

4. For approach ends of existing bridge traffic railing retrofits constructed in accordance with the ***1987 through 2000 Roadway and Traffic Design Standards, Index 401, Schemes 1 and 19, "Concrete Safety Barrier"***:
   a. The appropriate nested thrie-beam transition shown in ***Design Standards, Index 402***.
   b. The W-beam approach transition shown as ***Detail J*** in the 1987 edition of the ***Roadway and Traffic Design Standards, Index 400,*** Sheet 9 of 13, upgraded as shown in ***Design Standards, Index 403*** by the installation of a nested section of W-beam guardrail, additional guardrail posts and offset blocks and a transition block if a curb is not present beyond the bridge end.
   c. The nested W-beam approach transition shown as ***Detail J*** in the 1998 edition of the ***Roadway and Traffic Design Standards, Index 400,*** Sheet 7 of 21, upgraded as shown in ***Design Standards, Index 403*** by the installation of a transition block if a curb is not present beyond the bridge end.
5. For trailing ends of existing bridge traffic railing retrofits constructed in accordance with the ***1987 through 2000 Roadway and Traffic Design Standards, Index 401, Schemes 1 and 19, "Concrete Safety Barrier"***:
   a. In the absence of additional downstream hazards, no end treatment is required.
   b. When additional downstream hazards are present, an approved W-beam trailing end treatment similar to those shown in ***Design Standards, Index 400***.

See ***Section 25.4.25.3*** for bridge traffic railing requirements.

25.4.25.3 Guardrail Terminals

Existing guardrail terminals must be upgraded or replaced unless they conform to one of the systems identified in the current ***Design Standards***. As an exception, existing Type MELTs on high speed facilities are not required to be replaced.

All replacements and new installations shall conform to the current ***Design Standards***.

25.4.26 Sign, Signal, and Lighting Structures

25.4.26.1 Existing Structures-Without Planned Additional Loading

Contact the District Structures Maintenance Engineer for replacement recommendations for all sign, signal, and lighting structures within the project. The District Structures Maintenance Engineer will base the recommendations on existing inspection reports, age, importance, structural condition and estimated performance during hurricanes. If necessary, the District Structures Maintenance Engineer may require the structures EOR to complete a structural assessment and /or structural evaluation for some sign, signal, and lighting structures. A structural assessment reports damage, deterioration, or other potential reduction in design capacity. Structural evaluation may range from the review of the structural plans and shop drawings (if available) to detailed structural analysis. If structural evaluation is deemed necessary by the District Structures Maintenance Engineer, evaluate the capacity as described in the following paragraph. When multi column ground signs need to be relocated, they shall be structurally evaluated. Existing signs that meet the new structural requirements may be relocated on the project. Existing signs not meeting the new structural requirements shall not be relocated.

When structural evaluation is required, evaluate the as-built capacity (no allowances for future loads) in accordance with the ***Structures Manual Volume 9*** and ***Appendix C*** of the ***AASHTO design specifications***. Report the D/C ratios and CSRs. If all D/C ratios and CSRs are less than one, the structure meets current AASHTO design specification requirements. If any D/C ratios or CSRs are greater than one, strengthening or replacement is preferred or a Design Variation can be requested. Send a copy of the evaluation to the District Structures Maintenance Engineer for consideration in replacement recommendations. For guidance on evaluating existing structures without plans, shop drawings, foundation depths, or design calculations, contact the District Structures Design Office.

Sign, signal and lighting supports without planned additional loading do not require routine analysis for fatigue or foundation load capacity. Foundations should be checked in situations where there is evidence of distress, instability, or the Engineer has reason to believe their capacity is in doubt.

25.4.26.2 Existing Structures - With Planned Additional Loading

Analyze the proposed structure in accordance with the ***Structures Manual Volume 9***. Report the D/C ratios and CSRs. If any D/C ratios or CSRs are greater than one, strengthening or replacement is preferred.

A Design Variation can be requested if the proposed structure fails to meet the design specification in the ***Structures Manual Volume 9*** but does meet the criteria in ***Structures Manual Volume 9*** and ***Appendix C of the AASHTO design specifications***. If this requirement also fails, a Design Exception can be requested.

25.5 Design Exceptions and Design Variations

Every effort should be made to adhere to the desirable criteria stated herein. However, under unusual conditions, it may be necessary and appropriate to use values that are less than the minimum values shown. If lesser values are proposed for use, these shall be identified and the necessary approval and concurrence obtained at the earliest possible time, but not later than Phase II, so that the denial of any such request will not alter the project letting date. Refer to ***Chapter 23*** of this volume for the necessary procedure.

Exhibit 25-A Control Zones
Sheet 1 of 5

RESTRICTED LOCATIONS FOR ABOVE GROUND FIXED OBJECTS

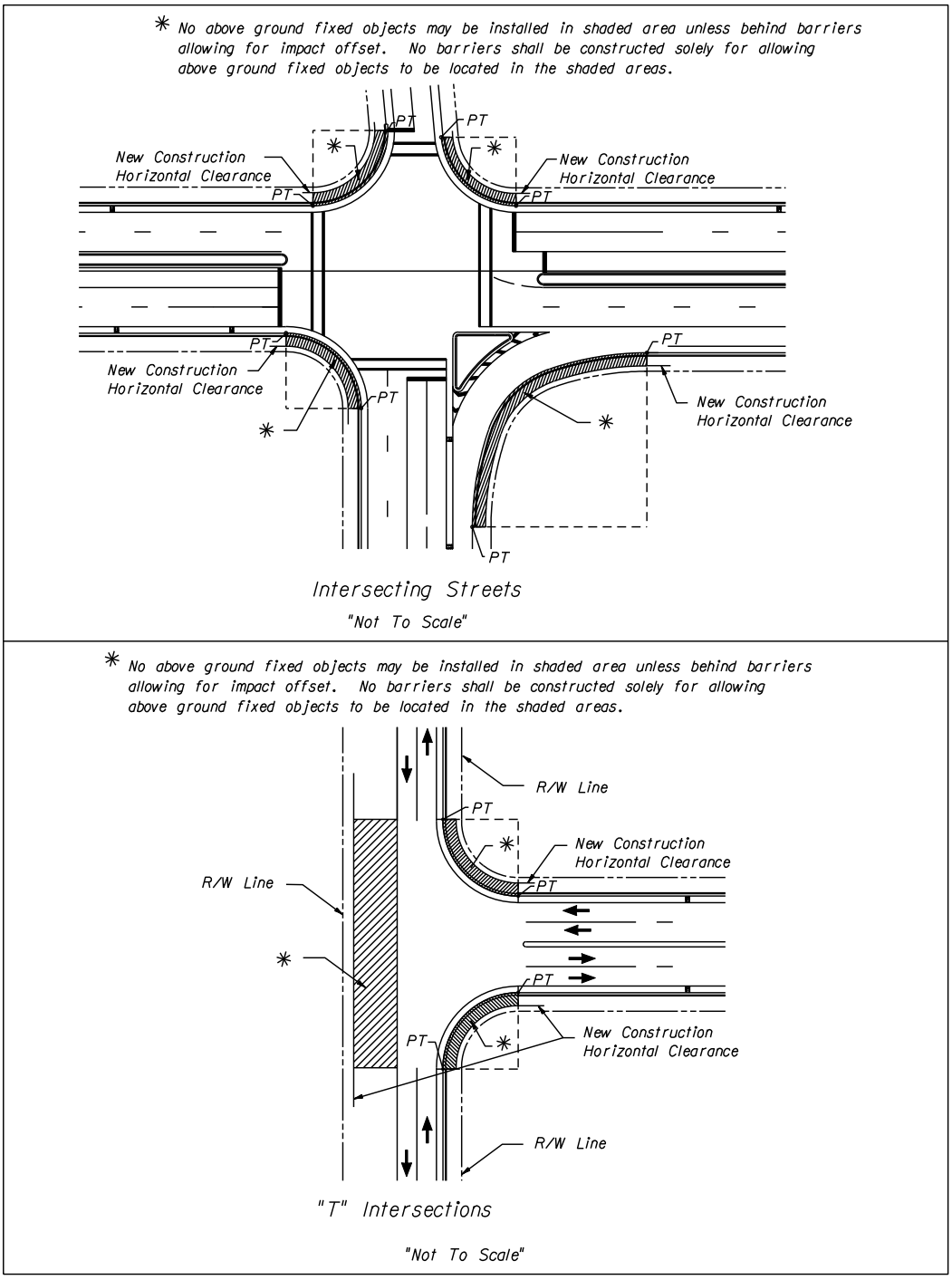

Exhibit 25-A Control Zones
Sheet 2 of 5

RESTRICTED LOCATIONS FOR ABOVE GROUND FIXED OBJECTS

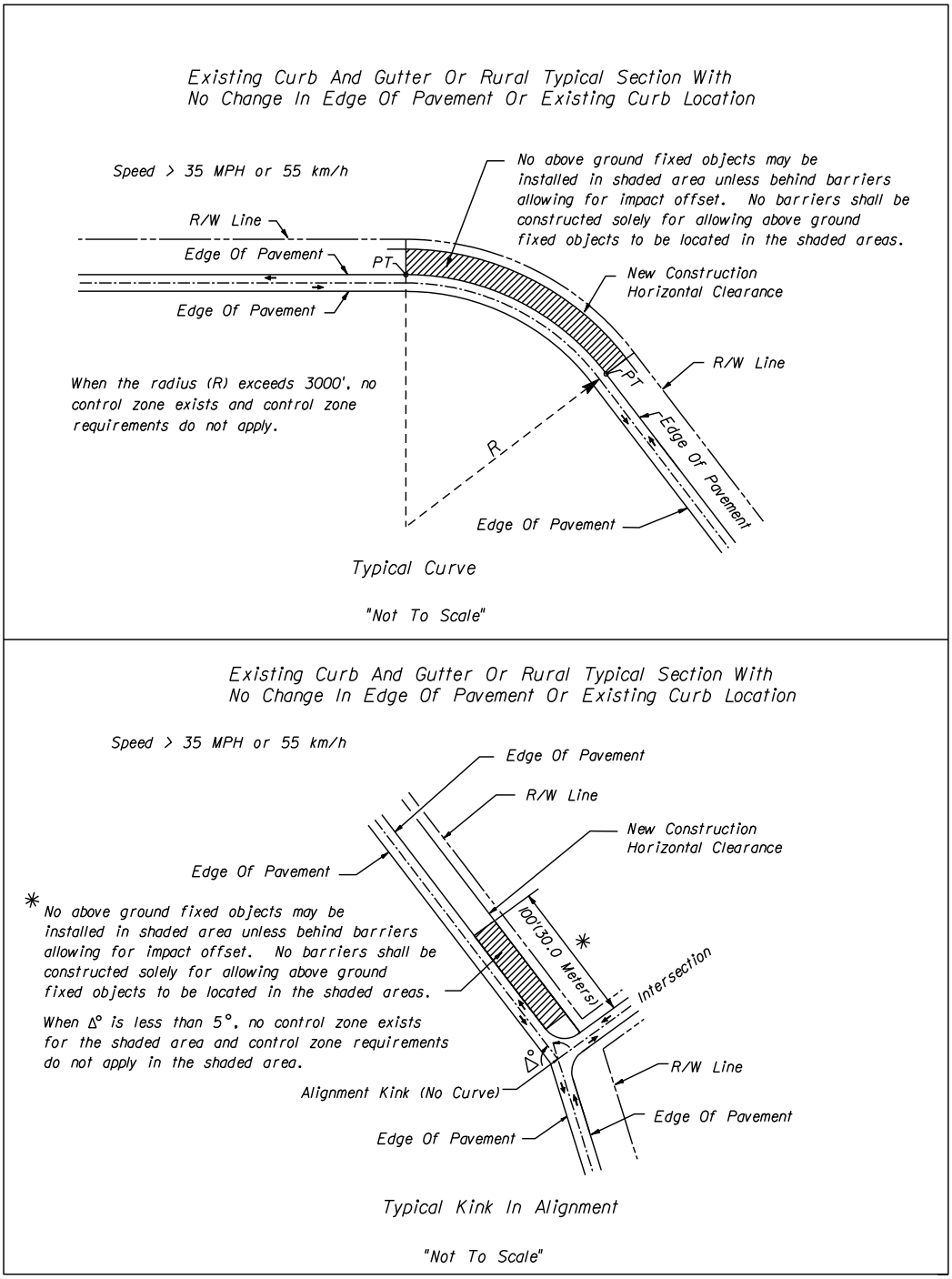

Exhibit 25-A Control Zones
Sheet 3 of 5

RESTRICTED LOCATIONS FOR ABOVE GROUND FIXED OBJECTS

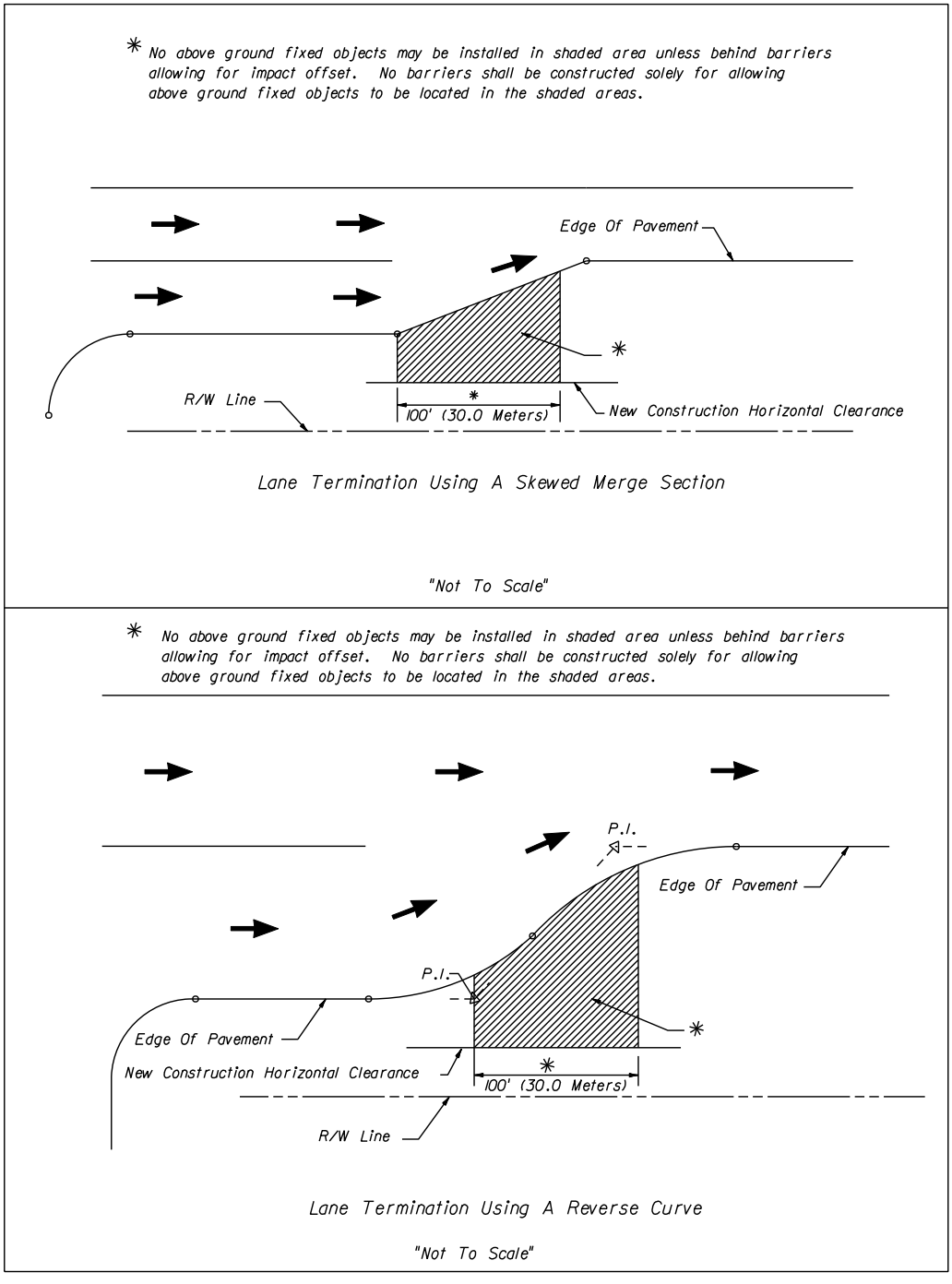

Exhibit 25-A Control Zones
Sheet 4 of 5

RESTRICTED LOCATIONS FOR ABOVE GROUND FIXED OBJECTS

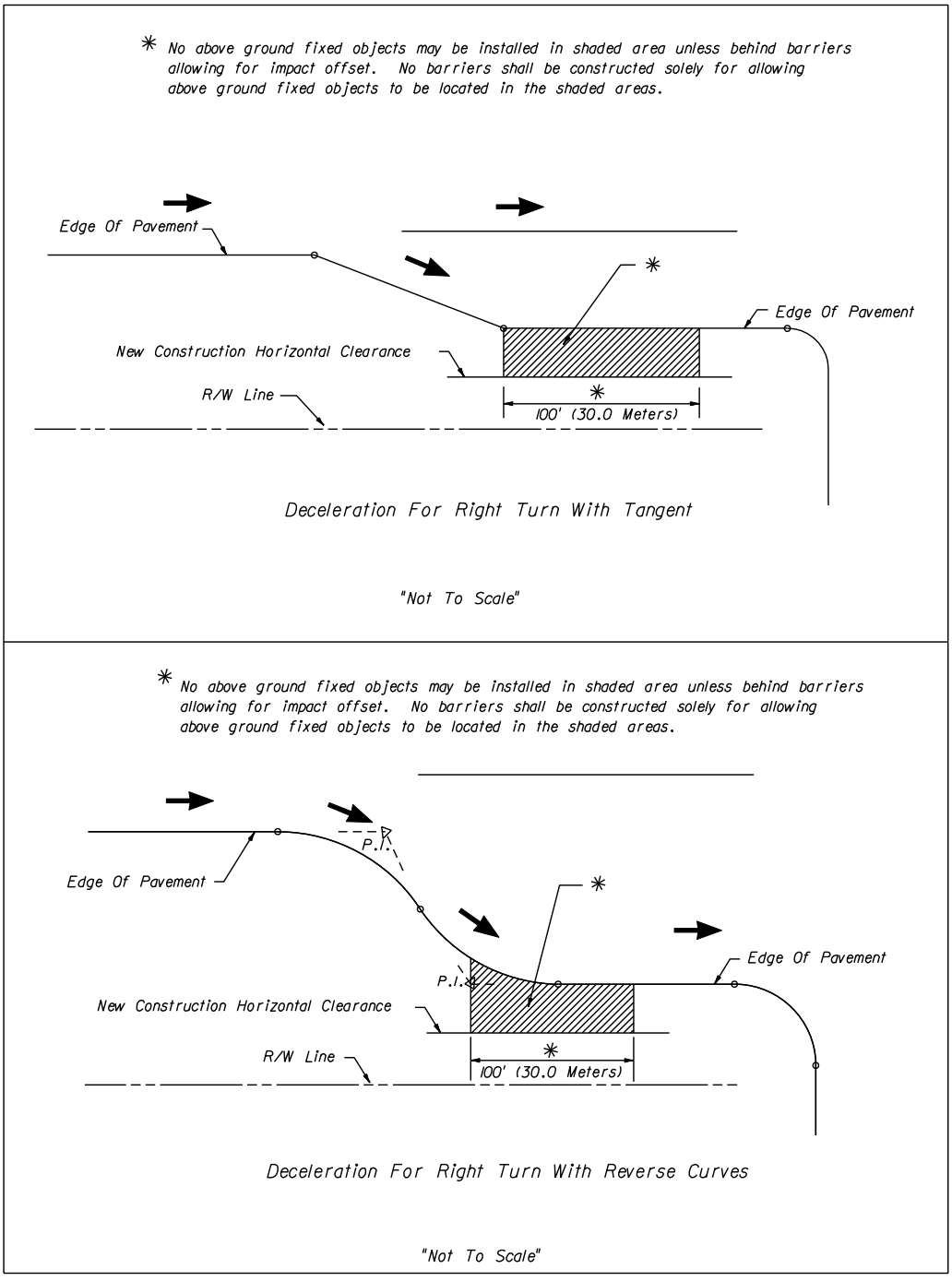

Exhibit 25-A Control Zones
Sheet 5 of 5