

ROAD DESIGN MANUAL REVISIONS January, 2017

CHAPTER 1B

- Page 1B-12 – Added the following language (Definition); *“NORMAL CROWN - Undivided travel ways on tangents shall have a crown or high point in the middle and a cross slope of 2% downward to the outside edge of pavement.”*

CHAPTER 2A

- Page 2A-9 – Added the following language after the third sentence under “PROJECTING VERTICAL ALIGNMENT”; *“Therefore, when the “K” Value for a sag vertical curve does not meet the VDOT Road Design Manual minimum, same as the AASHTO minimum, it shall be submitted as a design waiver and shown as “Other” on the LD-448 Waiver Form.”*

CHAPTER 2B

- Page 2B-7 – Revised the following language in the second paragraph under “REFINING HORIZONTAL ALIGNMENT” from; *“Horizontal alignment must remain within acceptable limits as prescribed in the Geometric Design Standards unless...”* To; Horizontal alignment must remain within acceptable limits as prescribed in the Geometric Design Standards (See Appendix A, Section A-1 *“and Chapter 2A, Section 2A-6”*) unless...
- Page 2B-8 – Revised the following language in the third paragraph under “REFINING VERTICAL ALIGNMENT” from; *“Vertical alignment must remain within acceptable limits as prescribed in the Geometric Design Standards (See Appendix A, Section A-1) unless...”* To; Vertical alignment must remain within acceptable limits as prescribed in the Geometric Design Standards (See Appendix A, Section A-1 *“and Chapter 2A, Section 2A-6”*) unless...

CHAPTER 2D

- Page 2D-10 – Added the following language at the end of the paragraph under “REFINING HORIZONTAL ALIGNMENT”; *“See Chapter 2A, Section 2A-6.”*
- Page 2D-13 – Added the following language at the end of the third paragraph under “DEPICTING VERTICAL ALIGNMENT ON PLANS”; *“Also, see Chapter 2A, Section 2A-6.”*

CHAPTER 2E

- Page 2E-21 thru 23 – Added the following language;
RETAINING STRUCTURES

REINFORCED SOIL SLOPE (RSS) STANDARD

RSS may be used as an alternative to purchasing additional right of way or the construction of a retaining wall. In general, RSS may be less expensive when a wall or additional right of way would otherwise be necessary.

This standard design is applicable when slopes are designed to be steeper than 2.0H:1.0V but no steeper than 0.5H:1.0V, and when the foundation conditions and backfill meets the criteria in the standard. Aesthetics and maintenance should be considered as part of the decision.

The design engineer may use the RSS standard design when the following conditions are met and approved by the District Materials Engineer:

- *New or widening of embankments where sufficient working room may be made available to place the backfill. Review of required reinforcement length as it relates to excavation requirements and potential shoring shall be evaluated.*
- *Limited right of way where a retaining wall would be considered as a way to avoid encroachment.*
- *The foundation conditions satisfy Case 1 or Case 2 as described in the standard.*
- *The fill meets the standard or Type I/II Select Material as specified.*

Aesthetics and long-term slope maintenance have been thoroughly considered.

The engineer shall obtain approval from the District Materials Engineer using Form LD-252.

The engineer shall specify on the roadway drawings the following:

- 1) *In plan view, the top of slope and toe of slope.*
- 2) *Slope:*
 - *1/2H:1V*
 - *1H:1V*
 - *1½H:1V*
- 3) *Backfill Type:*
 - *A (Select Material)*
 - *B (On-site or Imported Soils)*

- 4) *Case:*
- 1 (Soft soil and maximum groundwater level at depths equal to or greater than slope height)
 - 2 (Soft soil at depths equal to or greater than reinforcement length and maximum groundwater level at toe of slope)

EXAMPLE OF TABLE TO BE USED

Station	Slope	Backfill Type	Case	Max Height	Square Footage
XX+XX to YY+YY	1/2H:1V, 1H:1V or 1 1/2H:1V	A or B	1 or 2	Feet	Area ft ²
YY+YY to ZZ+ZZ	1/2H:1V, 1H:1V or 1 1/2H:1V	Must be same as above	Must be same as above	Feet	Area ft ²

Chapter III of the Materials Division Manual of Instructions (MOI) defines the requirements for geotechnical exploration and the determination of strength in designing slopes.

Slopes transitioning from a steeper slope to a flatter slope or a greater height to a lower height will use the reinforcement required in the steeper slope or higher slope.

The engineer will typically adopt the same landscaping requirements for the rest of the project, unless specific needs have been identified and called for on the roadway plans.

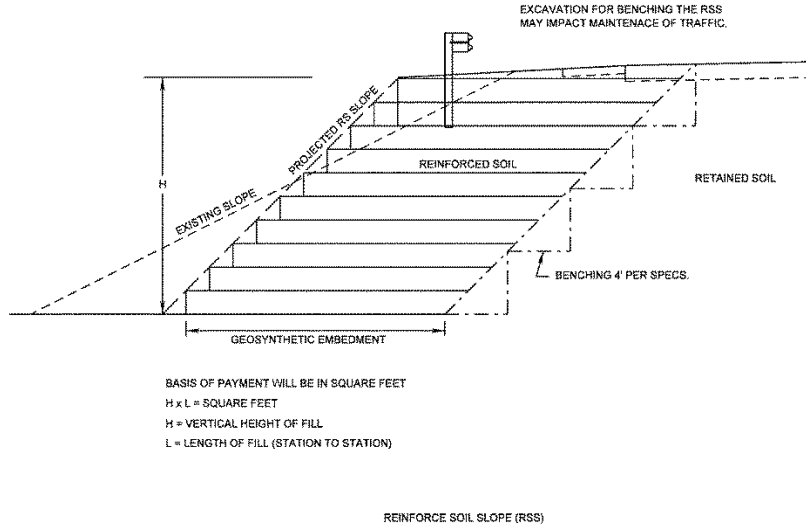
The maximum height for the RSS shall be 35 feet for Type A and 20 feet for Type B.

To reduce the likelihood of an error, the same backfill type and foundation case shall be specified throughout the entire slope, unless there are compelling reasons to differentiate between the two.

If the embankment and RSS are to be simultaneously constructed, consideration may be given to eliminating the internal RSS drainage (geocomposite and outlet drains).

Specially designed RSS may still be used when the standard conditions are not met. These must be evaluated on site specific conditions and approved by the District Materials Engineer.

The engineer shall determine the total square footage of the RSS based on vertical projection of the slope face (top of slope to toe of slope) for the specified slope ratio and payment will be made based on that area.



The standard is based on a 75-year design life.

The following references apply:

- *Reinforced Soil Slope standard design (Drawings available under 2016 insertable sheets in Falcon DMS and the FTP)*
- *Special Provision for Reinforced Soil Slopes (RSS)*
- *VDOT Materials Division Manual of Instructions (MOI)*
- *Federal Highway Administration Publication (FHWA)-NHI-10-024/025*

Pay Items:

00360	NS REINFORCED SOIL SLOPE TY. A	SF	2016	ATTD
00367	NS REINFORCED SOIL SLOPE TY. B	SF	2016	ATTD

- Page 2E-24 – Revised the following language in the last sentence on the page from; “*If Sound Wall is adjacent to the roadway shoulder then a Concrete Traffic Barrier Service Standard MB-7D is to be used, see detail below.*” To; “*If Sound Wall is adjacent to the roadway shoulder then a Concrete Barrier Standard MB-7D is to be used, see detail below.*”
- Page 2E-25 – Revised the following language in the “Sound Barrie Wall” detail from; “*Detail is for Precast Traffic Barrier Service only. If Cast In Place or slip form method is used additional spacing between traffic barrier and sound wall may be required.*” To; “*MB-7D Concrete Barrier Placement in front of Sound Barrier Wall.*”

- Page 2E-27 – Revised the following language in the second sentence under “SIGN ISLANDS” from; “*They will be shown on completed plans only where recommended by the Regional Traffic Engineer and in accordance with the standard.*” To; They will be shown on completed plans only where recommended by the “*responsible District Traffic Engineer*” and in accordance with the standard.
- Page 2E-37 – Revised the following language in the second paragraph under “HISTORICAL MARKER RELOCATION” from; “*Relocation of the marker shall be coordinated with the District Environmental Division (Cultural Resources staff) and District or Regional Traffic staff for review...*” To; Relocation of the marker shall be coordinated with the District Environmental Division (Cultural Resources staff) and “*responsible*” Regional Traffic staff for review...
- Page 2E-42 – Deleted the following language under “TEMPORARY CONSTRUCTION EASEMENTS”; “*Requirements for Temporary Construction Easements (TCE) around Entrances.*”
- 2E-71 – Added the following language at the end of the sixth paragraph under “TYPICAL SECTION SHEETS”; “*(For definition of “Normal Crown”, see Chapter 1B).*”

CHAPTER 2G

- Page 2G-18 – Revised the following language under “ROADSIDE DEVELOPMENT” from; “*The Designer is advised to;*” To; The Designer “*shall determine and provide the following to the District Roadside Manager:*”
- Page 2G-19 – Added the following language; “*Note: Upon completion of the spreadsheet inputs, the District Roadside Manager (DRM) will send the designer the PDF output file generated from excel file, and then the designer will enter the data into the Roadside Development Sheet that will be included in the plan set. The designer will send the DRM a PDF of the final Roadside Development Sheet as it will be shown in the plan set, for final review.*”

CHAPTER 2H

- Page 2H-19 – Replaced these sample sheets with updated files.

APPENDIX “A”

- Page A-7 – Revised the following language in the first sentence in the second paragraph under “POSTED SPEED” from; “*After a project is constructed, the Regional Traffic Engineer will re-establish...*” To; After a project is constructed, the “*responsible District Traffic Engineer*” will re-establish...

- Page A-10 – Revised the following language after the first paragraph under “LANE/SHOULDE5R/PAVEMENT TRANSITION, MERGING TAPERS & SPEED CHANGE” from; “For ≤ 40 mph” and “For > 40 mph” To; “For 40 mph or less” and “For 45mph or greater”

Revised the following language under “LANE/SHOULDE5R/PAVEMENT TRANSITION, MERGING TAPERS & SPEED CHANGE” from; “For Permanent Shoulder and Shifting Tapers see 2009 MUTCD, Section 6, Table 6C-3 and 6C-4.” To; For “Temporary Merging,” Shifting “and Shoulder” Tapers see 2009 MUTCD, Section 6, Table 6C-3 and 6C-4.

- Page A-11 – Added additional rows to separate “Interstates” and “Freeways”.

Revised the language in the “Min. Width of Total Shoulders (Graded & Paved)” column under “Freeways” to reduce the width from 17’ to 16’ with guardrail and 14’ to 12’ without guardrail.

Added new “GENERAL NOTE” at the beginning for “Interstates”.

Revised the following language in the last sentence under the third “GENERAL NOTE” from; “...posted design speed is approved by the Location and Design Engineer and FHWA.” To; ...posted speed limit which “*should be*” enforced during off peak hours.

Revised the following language in “FOOTNOTE” #1 from; “Graded Shoulders (including the paved portion); Shoulder widths shown are for right shoulders and independently graded median shoulders. No additional width is necessary for guardrail situations.” To; “Graded Shoulders include the paved portion. Shoulder widths shown are for right shoulders and independently graded median shoulders. No additional width is necessary for guardrail situations.”

Revised the following language in the last sentence in the second paragraph under “Footnote” No. 1 from; “For Freeways with trucks < 250 DDHV, the graded shoulder width shall be a minimum of 15’ for fills and 12’ for cuts.” To; “On Interstates / Freeways, if truck traffic exceeds 250 DDHV, a wider graded shoulder should be considered (14’ for fills & cuts and 18’ with guardrail).”

Revised the following language in the last two sentences under “Footnote” No. 2 from; “On Freeways, if truck traffic is < 250 DDHV, the right paved shoulder width shall be a minimum of 10’.” To “On Interstates right paved shoulder shall be 10’ minimum. On Interstates / Freeways, if truck traffic exceeds 250 DDHV, a wider right paved shoulder should be considered (12’). ** AASHTO Minimum, See Interstate Guide.”

- Page A-12 – Revised the following language in the “Min. Width of Total Shoulders (Graded & Paved)” column, “ADT Over 2000” to increase the width from 13’ to 14’.

Revised the following language in the “Min. Width of Total Shoulders (Graded & Paved)” column, “ADT 1500 to 2000” to increase the width from 11’ to 12’.

Revised the following language in the “Min. Width of Total Shoulders (Graded & Paved)” column, “ADT 400 to 1500” to increase the width from 11’ to 12’.

Revised the following language in the “Min. Width of Total Shoulders (Graded & Paved)” column, “Current ADT Under 400” to increase the width from 9’ to 10’.

Added the following language between the first and third sentence under “FOOTNOTE” #3; *Provide 5’ wide paved shoulder when design year ADT exceeds 2000 VPD, with 5% or more truck and bus usage or the route is an AASHTO approved U.S. Bicycle Route (1, 76 or 176) or designated as a bicycle route on a locally adopted transportation plan.*

- Page A-13 – Revised the following language in the “Min. Width of Graded Shoulders” column, “ADT Over 2000” to increase the width from 11’ to 12’.

Revised the following language in the “Min. Width of Graded Shoulders” column, “ADT 1500 to 2000” to increase the width from 9’ to 10’.

Revised the following language in the “Min. Width of Graded Shoulders” column, “ADT 400 to 1500” to increase the width from 8’ to 9’.

Revised the following language in the “Min. Width of Graded Shoulders” column, “Current ADT Under 400” to increase the width from 7’ to 8’.

Added the following language to “FOOTNOTE” No. 3; *“Provide 5’ wide paved shoulder when design year ADT exceeds 2000 VPD, with 5% or more truck and bus usage and the route is an AASHTO approved U.S. Bicycle Route (1, 76 or 176) or designated as a bicycle route on a locally adopted transportation plan.”*

- Page A-14 – Revised the following language in the “Min. Width of Graded Shoulders” column, “ADT Over 2000” to increase the width from 11’ to 12’.

Revised the following language in the “Min. Width of Graded Shoulders” column, “ADT 1500 to 2000” to increase the width from 9’ to 10’.

Revised the following language in the “Min. Width of Graded Shoulders” column, “ADT 400 to 1500” to increase the width from 8’ to 9’.

Revised the following language in the “Min. Width of Graded Shoulders” column, “Current ADT Under 400” to increase the width from 7’ to 8’.

Added the following language between the first and third “FOOTNOTE” No. 5; *“Provide 5’ wide paved shoulder when design year ADT exceeds 2000 VPD, with 5% or more truck and bus usage or the route is an AASHTO approved U.S. Bicycle Route (1, 76 or 176) or designated as a bicycle route on a locally adopted transportation plan.”*

Deleted “FOOTNOTE” No. 10; *“See Road and Bridge Standards, Section 500, GR-INS for Guardrail Installation.”*

- Page A-15 – Added additional rows to separate “Interstates” and “Freeways”.

Revised the language in the “Min. Width of Total Shoulders (Graded & Paved)” column under “Freeways” to reduce the width from 17’ to 16’ with guardrail and 14’ to 12’ without guardrail and from 13’ to 14’ with guardrail under “Other Principal Arterial with Shoulder Design.

Revised the following language in the last sentence in the first paragraph under “GENERAL NOTES” from; *“The design speeds for Freeways should never be less than 50 mph.”* To; The design speeds for Freeways “shall not” be less than 50 mph.

Revised the following language in the fourth paragraph under “GENERAL NOTES” from; *“Standard TC-5.11R (Rural) superelevation based on 8% maximum is to be used for **ALL** Freeways (50 – 70 mph) and is to be used for Other Principal Arterials with a design speed of 60 mph. # For minimum radius, See GS-1.”* To; *“Standard TC-5.11R (Rural) superelevation based on 8% maximum is to be used for **ALL** Interstates, Freeways (50 – 70 mph) and for Other Principal Arterials with a design speed of 60 mph. For minimum radius, See GS-1.”*

Revised the following language in the sixth paragraph under “GENERAL NOTES” from; *“Standard TC-5.11ULS (Urban Low Speed) 1 superelevation based on 2% maximum is to be used on Other Principal Arterials with a design speed less than or equal to 45 mph.”* To; Standard TC-5.11ULS (Urban Low Speed) superelevation based on 2% maximum is “may” be used on Other Principal Arterials with a design speed less than or equal to 45 mph.

Deleted the following language after paragraph eight; *“For guidelines on Interchange Ramps, see Standard GS-R.”*

Revised the following language to the last sentence under “FOOTNOTE” #1 from; *“On Freeways, if truck traffic is less than 250 DDHV, the minimum width of graded shoulder shall be 15’ for fills and 12’ for cuts.”* To; *On Interstates / Freeways, if truck traffic exceeds 250 DDHV, a wider graded shoulder should be considered (14’ for fills & cuts and 18’ with guardrail).*

Revised the following language to the last sentence under “FOOTNOTE” #2 from; “*On Freeways, if truck traffic is less than 250 DDHV, the minimum right paved shoulder width shall be 10’.*” To; “*On Interstates / Freeways, if truck traffic exceeds 250 DDHV, a wider right paved shoulder should be considered (12’).*” ** AASHTO Minimum, See Interstate Guide.”

- Page A-16 – Revised the following language in the “Min. Width of Graded Shoulders” column, “Streets With Shoulder Design” to increase the width from 13’ to 14’.
- Page A-17 – Revised the following language in the “Min. Width of Graded Shoulders” column, “Streets With Shoulder Design” to increase the width from 11’ to 12’.

Added the following language to “FOOTNOTE” No. 7; “*Provide 5’ wide paved shoulder when design year ADT exceeds 2000 VPD, with 5% or more truck and bus usage and the route is an AASHTO approved U.S. Bicycle Route (1, 76 or 176) or designated as a bicycle route on a locally adopted transportation plan.*”

Revised the following language in “FOOTNOTE” No 11 from; “*For information on reduced shoulder widths, see AASHTO Green Book, Chapter 6, Section 6.2.2, page 6-6, Table 6-5.*” To; “*Where shoulders are provided, roadway widths in accordance with Table 6-5 should be considered. (See AASHTO Green Book, Chapter 6, Section 6.3.2, page 6-13.)*”

- Page A-18 – Revised the following language in the “Minimum Radius” column for both “Street With Curb & Gutter” and Street With Shoulder Design” for 20 MPH Urban from 92’ to 87’ to agree with the TC-5.11 standards.

Revised the following language in the “Min. Width of Graded Shoulders” column, “Streets With Shoulder Design” to increase the width from 11’ to 12’.

Added the following language to “FOOTNOTE” No. 7; “*Provide 5’ wide paved shoulder when design year ADT exceeds 2000 VPD, with 5% or more truck and bus usage or the route is an AASHTO approved U.S. Bicycle Route (1, 76 or 176) or designated as a bicycle route on a locally adopted transportation plan.*”

- Page A-19 – Revised the following language in the “Min. Width of Shoulders” column to increase the width from 5’ to 6’.

Revised the following language in the “Stopping Sight Distance” column 30 MPH Design Speed from 220’ to 200’.

- Page A-20 – Revised the following language in the “Min. Width of Graded Shoulders” column, “Streets With Shoulder Design” to increase the width from 9’ to 10’.

Revised the following language in the “Relationship of Maximum Grades to Design Speed” table, “Design Speed” row from 45-50 to 45-60.

Revised the following language in the first sentence in the fourth paragraph under “GENERAL NOTES” from; “Where topographic conditions dictate, grades steeper than desirable may be used.” To; Where topographic conditions dictate, grades steeper than “those above” may be used.

Revised the following language in the first sentence of “FOOTNOTE” No. 2 to add “Paved” at the beginning of the sentence.

Revised the following language in “FOOTNOTE” No. 7 to add “Graded” at the beginning of the sentence.

- Page A-26 – Revised the following language in the last sentence in the second paragraph under “ROADWAYS WITH CURBS” from; “See Figure A-2-1A, Case 3 and Case 4.” To; See Figure “A-2-1, Case 2 and” Figure A-2-1A, Case 3 and Case 4.

Revised the following language in the last sentence in the third paragraph under “ROADWAYS WITH CURBS” from; “See Figure A-2-1, Case 2” To; See Figure A-2-1, Case 2 “and Figure A-2-1A, Case 3.”

- Page A-45 – Revised the following language in the first sentence in the fourth Paragraph from; “A completed Roadside Safety Assessment is required to be performed by the Regional Traffic Engineer.” To; A completed Roadside Safety Assessment is required to be performed by the “responsible District Traffic Engineer”.
- Page A-65 – Added the following language after the third paragraph; “In July 2014, AASHTO released the Guide for Geometric Design of Transit Facilities on Highways and Streets. This guide provides a single, comprehensive reference of current practices in the geometric design of transit facilities and streets and highways. The facilities covered include: local buses, express buses, and bus rapid transit operating in mixed traffic, bus lanes, and high-occupancy (HOV) lanes, and bus-only roads within street and freeway environments, and street cars and Light Rail Transit (LRT) running in mixed traffic and transit lanes, and within medians along arterial roadways.”
- Page A-66 – Added the following language at the beginning of the page; “In April 2016, NACTO released the Transit Street Design Guide, which highlights as the centerpiece of transformative street projects such a shared transit streets and transit boulevards. In August 2016, FHWA released Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts which highlights ways that planners and designers can address common roadway challenges and barriers by focusing on reducing multimodal conflicts achieving connected networks so that walking and bicycling are safe, comfortable and attractive options for people of all ages and abilities. All of these guides build upon the flexibilities provided in the AASHTO Guides and are designed to help municipalities consider, evaluate and design a complete street network.”

Revised the following language in the third paragraph from; “*During project design VDOT will coordinate with the Virginia Department of Rail and Public Transportation (VDRPT) to address bicyclist and pedestrian access to existing and planned transit connections.*” To; During project design “*the*” VDOT “*District Planner*” will coordinate with the “*locality*” to address bicyclist and pedestrian access to existing and planned transit connections.

- Page A-68 – Revised the following language in the third sentence under “EXISTING ROADS” from; “*It is necessary for the State Transportation and Mobility Planning Administrator to coordinate with the District Engineer/Administrator, the Regional Traffic Engineer, and appropriate Divisions...*” To; It is necessary for the State Transportation and Mobility Planning Administrator to coordinate with the District Engineer/Administrator, the “*responsible District Traffic Engineer*”, and appropriate Divisions...

Revised the following language in the second sentence in the first “bullet” under “MAJOR DEVELOPMENTS AND SITE PLANS” from; “*... bicycle facility systems must be carried on between the Transportation Land-Use Director, Regional Traffic Engineer, and the State Transportation...*” To; ...bicycle facility systems must be carried on between the Transportation Land-Use Director, “*responsible District Traffic Engineer*”, and the State Transportation...

- Page A-69 – Revised the following language in the second sentence in the fourth paragraph under “SELECTING ROADWAY DESIGN TREATMENT TO ACCOMMODATE BICYCLES” from; “*AASHTO designates bicycle facility types as Shared Roadway (No Bikeway Designation), Signed Shared Roadway, Bike Lane or Bicycle Lane and Shared-Use Path.*” To; AASHTO designates bicycle facility types as Shared Roadway (No Bikeway Designation), Signed Shared Roadway, Bike Lane, Shared-Use Path “*and Separated Bike Lane.*”

Page A-70 – Added the following language after the third bullet; “*Separated Bike Lane* - A facility (also sometimes called “*cycle tracks*” or “*protected bike lane*”) located within or directly adjacent to the roadway and physically separated from the travelway. See *Separated Bike Lane Planning and Design Guide*, which outlines planning considerations for separated bike lanes and provides a menu of design options covering typical one and two-way scenarios. The guide consolidates lessons learned from practitioners designing and implementing separated bike lanes throughout the U.S.”

- Page A-71 – Revised the following language to the third bullet from; “*Separate Bike Path* - A facility physically separated from the roadway and intended for bicycle use.” To; *Separate Bike Lane* - A facility “(also sometimes called “*cycle tracks*” or “*protected bike lane*”) located within or directly adjacent to the roadway and physically separated from the travelway. “

- Page A-78 – Revised the following language in the first paragraph under “Paved Shoulders” from; *“Paved shoulders should be at least 4 feet wide to accommodate bicycle travel. However, where 4 foot minimum widths cannot be provided, any additional shoulder width is better than none at all. A shoulder width of 5 feet is required from the face of guardrail, curb or other roadside barriers. It is desirable to increase the width of shoulders where higher bicycle usage is expected. Additional shoulder width is also desirable if motor vehicle speeds exceed 50 mph, or the percentage of trucks, buses, and recreational vehicles is high, or if lateral obstructions exist at the right side of the roadway. Paved shoulders are not to be marked or signed as “bike lanes”.* To; Paved shoulders should be at least 4 feet wide to accommodate bicycle travel. However, where 4 foot minimum widths cannot be provided, any additional shoulder width is better than none at all. A shoulder width of 5 feet is required from the face of guardrail, curb or other roadside barriers, “or” if motor vehicle speeds exceed 50 mph, or the percentage of trucks, buses, and recreational vehicles is “5% or greater,” or if lateral obstructions exist at the right side of the roadway. “It is desirable to increase the width of shoulders where higher bicycle usage is expected.” Paved shoulders are not to be “designated” (marked or signed) as “bike lanes”.

Revised the following language between “Note a) and b) from; “or” to; “and”.

Revised the following language in “Note b)” under “Paved Shoulders” from; *“The route is an AASHTO Approved U.S. Bicycle Route or designated as a bicycle route on a Locality’s Thoroughfare Plan and the graded shoulder width is 6 feet or greater.”* To; The route is an AASHTO Approved U.S. Bicycle Route “(1, 76 or 176)” or designated as a bicycle route on a Locality’s “Transportation” Plan.

Added the following language at the end of the last sentence in the last paragraph; “See IIM-LD-212.”

- Page A-81 – Added the following language to “FIGURE A-5-2 TYPICAL BIKE LANE CROSS SECTION”; “⊗⊗ 5 feet minimum bike lane is required from the face of guardrail or other roadside barriers.”

Revised the following language in the third sentence in the first paragraph under “Bike Lane Widths” from; *“Greater bike lane widths are desirable where substantial truck traffic is present, or where motor vehicle speeds exceed 50 mph.”* To; Greater bike lane widths “(5 feet Minimum)” are “required” where substantial truck traffic is present, “Transit Buses are present,” or where motor vehicle speeds exceed 50 mph.

Added the following language at the end of the third paragraph; “unless it is a separated bike lane. See FHWA “Separated Bike Lane Planning and Design Guide””

- Page A-82 – Revised the following language under “Bike Lanes and Turning Lanes” from; *“Bike lanes complicate bicycle and motor vehicle turning movements at intersections. It is preferable to continue the same width of bike lane through the intersection. For example, locations where a bike lane approaches an intersection (4 feet from the edge of pavement on a curb and gutter roadway), the bike lane should continue parallel to the left of a right turn lane. See Figure A-5-3 below.”* To; *Bike lanes complicate bicycle and motor vehicle turning movements at intersections. It is preferable to continue the bike lane through the intersection. For example, locations where a bike lane approaches an intersection the bike lane “is to be a minimum of 5 feet wide and” continue parallel to the left of a right turn lane. See Figure A-5-3 below.*

- Page A-83 – Added the following language at the beginning of the page;

SEPARATED BIKE LANES

A separated bike lane is an exclusive facility for bicyclists that is located within or directly adjacent to the roadway and that is physically separated from motor vehicle traffic with a vertical element. Separated bike lanes are differentiated from standard and buffered bike lanes by the vertical element. They are differentiated from shared use paths (and sidepaths) by their more proximate relationship to the adjacent roadway and the fact that they are bike-only facilities. Separated bike lanes are also sometimes called "cycle tracks" or "protected bike lanes."

Within the common elements of separated bike lanes - dedicated space for cyclists that is separated from motor vehicle travel and parking lanes - practitioners have flexibility in choosing specific design elements. Separated bike lanes can operate as one-way or two-way facilities; their designs can integrate with turning automobile traffic at intersections or can be more fully separated; they can be designed at roadway grade, at sidewalk grade or at an intermediate grade; and they can be separated from the adjacent roadway or sidewalk with a variety of treatments including but not limited to on-street parking, raised curbs or medians, bollards, landscaping, or planters. For additional information see FHWA “Separated Bike Lane Planning and Design Guide”

- Page A-85 – Added the following language under “SHARED USE PATHS”; *“Two-Directional Shared Use Path”*.

Added the following language at the bottom of the page; “In addition, a path width of 8 ft. may be used for a short distance due to a physical constraint such as an environmental feature, bridge abutment, utility structure, fence and such warning signs that indicate the path narrows (W5-4a), per the MUTCD shall be posted in each direction at this location(s). When a path is less than 10 ft. wide a Design Waiver is required.”

- Page A-86 – Added the following language; “*One-Directional Shared Use Path*”.

Added the following language after the first Paragraph; “Applies To Both *One-Directional & Two-Directional Shared Use Path*”.

Revised the following language to “Bullet #3” from; “*Slopes 3:1 or steeper, adjacent to a parallel water hazard or other obvious hazard.*” To; Slopes 3:1 or steeper, adjacent to a parallel water hazard “(*greater than 2 feet deep*)” or other obvious hazard.

Deleted the following language after the second paragraph; “*Note: When the separation from the edge of the shared use path to the top of the slope is 5 feet or greater situations may dictate a physical barrier, such as the height of embankment or conditions at the bottom (i.e. – water greater than 2 feet deep).*”

- Page A-88 – Revised the following language to the last sentence under “Vertical Clearance” from; “*In under crossings and tunnels, 10 feet is desirable for adequate vertical shy distance.*” To; “*For underpasses, tunnels and bridges a minimum vertical clearance of 10’ is required.*”
- Page A-89 – Revised the following language to the first paragraph from; “*Based upon various design speeds of 18 to 30 mph and a desirable maximum lean angle...*” To; “*Based upon various design speeds of 18 to 30 mph and a maximum lean angle...*”
- Page A-90 – Added the following language after the first bullet; “*For long downgrades, and/or downgrades not readily apparent to approaching cyclists.*”
- Page A-108 – Revised the following language in the second paragraph under “GUIDELINES FOR CURB RAMP LOCATIONS” from; “*One curb ramp shall be provided for each direction of an intersection crossing, where feasible. Curb ramps shall be in-line with the direction of pedestrian travel to improve wayfinding for visually impaired pedestrians.*” To; “*Curb ramps should be provided for each direction of crossing at intersections that incorporate pedestrian access routes, or on both sides of a mid-block location to establish a pedestrian access route for ramp users.*” Curb ramps shall be in-line with the direction of pedestrian travel to improve wayfinding for visually impaired pedestrians. “*If curb ramps are not placed at all corners of an intersection the ramp user’s accessibility is restricted to the paths that provide curb ramps. Access to all pedestrian paths should be provided.*”
- Page A-109 – Deleted the following language from this page and incorporated it in the second paragraph under “GUIDELINES FOR CURB RAMP LOCATIONS” on the previous; “*Curb ramps should be provided for each direction of crossing at intersections that incorporate pedestrian access routes, or on both sides of a mid-block location to establish a pedestrian access route for ramp users. If curb ramps are not placed at all corners of an intersection the ramp user’s accessibility is restricted to the paths that provide curb ramps. Access to all pedestrian paths should be provided.*”

- Page A-110 thru 125 – Revised, added and reorganized information on the types and locations of standard CG-12.
- Page A-158 – Revised the following language in the second sentence in the fourth paragraph from; “*It may be appropriate to contact the District and Central Office representatives of referenced Divisions, particularly the Regional Traffic Engineer.*” To; It may be appropriate to contact the District and Central Office representatives of referenced Divisions, particularly the “*responsible District*” Traffic Engineer.

Revised the following language in the last paragraph from; “*...possible stage of plan development and reviewed by the Regional Traffic Engineer prior to Field Inspection.*” To; ... possible stage of plan development and reviewed by the “*responsible District*” Traffic Engineer prior to Field Inspection.

- Page A-159 – Revised the following language in four locations from; “*Regional Traffic Engineer*” To; ... “*responsible District*” Traffic Engineer.
- Page A-164 – Revised the following language in the last sentence in the third paragraph from; “*...temporary traffic control plan, particularly the Regional Traffic Engineer.*” To; ...temporary traffic control plan, particularly the “*responsible District*” Traffic Engineer.
- Page A-168 – Revised the following in the last sentence in the first paragraph from; “*...maintenance of traffic patterns. Include traffic items provided by the Regional Traffic Engineer.*” To; ... maintenance of traffic patterns. Include traffic items provided by the “*responsible District*” Traffic Engineer.
- Page A-172 – Revised the following language in the first sentence from; (*These notes should be developed in coordination with the Regional Traffic Engineer.*) To; (These notes should be developed in coordination with the “*responsible District*” Traffic Engineer).

APPENDIX “B(2)”

- Page B(2)-3 – Revised the following language in the “Phase 1 review and approval process” flow chart from; “*Regional Traffic Engineer*” To; “*District*” Traffic Engineer.
- Page B(2)-4 – Revised the following language in the “Phase 2 review and approval process” flow chart from; “*Regional Traffic Engineer*” To; “*District*” Traffic Engineer.

APPENDIX “C”

- Pages C-10 & 11 – Revised language in FIGURES C-1-5 thru C-1-8 to increase the spacing between the beginning/end of curb ramp to the back of sidewalk from 3’Min. to 4’ Min.
- Page C-15 Thru C-26 – Replaced the information pertaining to Transportation Facilities (Bus Stops) with new language and drawings.
- Page C-63 – Revised the following language in the first sentence under item #4 from; “*The District Design Transportation Engineering Program Supervisor will consult with the Regional Traffic Engineer...*” To; The District Design Transportation Engineering Program Supervisor will consult with the “*responsible District*” Traffic Engineer...
- Page C-84 – Revised the following language in the first sentence under item #6 from; “*Forward all traffic impact studies to the Regional Traffic Engineering section.*” To; Forward all traffic impact studies to the “*responsible District*” Traffic Engineering section.
- Page C-104 – Revised the following language in “FIGURE C-8-1 RAMP GORE FOR EXIT RAMP” to add additional labels to address “Gore Area” limits.
- Page C-105 – Revised the following language in “FIGURE C-8-2 RAMP GORE FOR EXIT RAMP – TAPER TYPE” to add additional labels to address “Gore Area” limits.
- Page C-106 – Revised the following language in “FIGURE C-8-3 RAMP GORE FOR MAJOR FORK” to add additional labels to address “Gore Area” limits.
- Page C-107 – Revised the following language in “FIGURE C-8-4 RAMP GORE FOR ENTRANCE RAMP” from; “*Z₁ = See Table C-8-1*” To; *Z₁ = See Table C-8-2*”, also added additional labels to address “Gore Area” limits.
- Page C-108 – Revised the following language in the first column in “TABLE C-8-2 MINMUM LENGTH OF TAPER BEYOND OFFSET NOSE” from; “Design Speed of Approach Highway” To; “*Design Speed of Highway*”.

APPENDIX “F”

- Page F-23 – Revised the following language to the last bullet under “Note E. Roundabouts” from; “*Are measured from the outer edge of the nearest inscribed diameter.*” To; Are measured from the inscribed “*circle*” diameter “(*Yield Line*)”.

- Page F-30 – Revised the following language in the first sentence in the third paragraph under “Median Crossover Location Approval Process” from; “*The District Transportation and Land Use Director should consult with the Regional Traffic Engineer concerning private sector...*” To; The District Transportation and Land Use Director should consult with the “*responsible District*” Traffic Engineer concerning private sector...

Revised the following language in the fifth paragraph under “Median Crossover Location Approval Process” from; “*The approval of the addition or relocation of median crossovers on an existing VDOT highway that do not meet the sight distance requirements or other engineering standards shall be the responsibility of the Regional Traffic Engineer with the concurrence of the State Location and Design Engineer. It shall be the responsibility of the Regional Traffic Engineer...*” To; The approval of the addition or relocation of median crossovers on an existing VDOT highway that do not meet the sight distance requirements or other engineering standards shall be the “*duty*” of the “*responsible District*” Traffic Engineer with the concurrence of the State Location and Design Engineer. It shall be the *duty* of the *responsible District* Traffic Engineer...

- Page F-31 – Revised the following language in the last sentence in the first paragraph under “Highway Construction Project” from; “*...result of field inspection recommendations of the District Engineer/Administrator and the Regional Traffic Engineer.*” To; ...the result of field inspection recommendations of the District Engineer/Administrator and the “*responsible District*” Traffic Engineer.

Revised the following language in the first and last sentence in the second paragraph under “Highway Construction Project” from; “*The approval of median crossovers that do not meet engineering standards shall be the responsibility of the Regional Traffic Engineer and the State Location and Design Engineer, with the final responsibility for the location of median crossover layout on plans resting with the State Location and Design Engineer. Plans at right-of-way stage are to indicate the median crossovers as determined and approved by the above criteria. Any plans that are revised during construction for the addition or deletion of median crossovers where spacing standards or engineering standards are not met shall be approved by the District Location and Design Engineer, the Regional Traffic Engineer, and/or the State Location and Design Engineer in accordance with the approval process outlined above.*” To; The approval of median crossovers that do not meet engineering standards shall be the responsibility of the “*responsible District*” Traffic Engineer and the State Location and Design Engineer, with the final responsibility for the location of median crossover layout on plans resting with the State Location and Design Engineer. Plans at right-of-way stage are to indicate the median crossovers as determined and approved by the above criteria. Any plans that are revised during construction for the addition or deletion of median crossovers where spacing standards or engineering standards are not met shall be approved by the District Location and Design Engineer, the “*responsible District*” Traffic Engineer, and/or the State Location and Design Engineer in accordance with the approval process outlined above.

- Page F-35 – Added the following language at the end of “Note #2” after the sixth paragraph; “*(See Chapter 2D).*”

- Page F-45 – Added the following language under “Multi-Lane Roundabouts”; *“If a Multi-Lane Roundabout design is warranted in the long term, it should be designed as a Multi-Lane Roundabout, but striped and signed as a Single-Lane Roundabout when initially opened to traffic.”*
- Page F-46 – Revised the following language in the second paragraph, under the second bullet under “Geometric Design Criteria for Single-Lane and Multi-Lane Roundabouts” from; *“If the percentage of trucks anticipated to use the road exceeds 5%, that radius should be sufficient to serve those vehicles. The outer edge of the apron shall include a CG-3 Modified Curb (See Detail Below), to vertically separate the apron from circulatory roadway surface. The apron shall also be constructed of a different material than the pavement to differentiate it from the circulatory roadway. Note: If an outside Truck Apron is provided, the CG-3 Modified Curb shall be wiped down in the area of the CG-12 curb ramp.* To; *If the percentage of trucks anticipated to use the road exceeds 5%, that radius should be sufficient to serve those vehicles. The outer edge of the “trunk” apron shall include a CG-3 Modified Curb “(See Figure 2-15 Roundabout Truck Apron Curb Detail),” to vertically separate the “truck” apron from circulatory roadway surface. The “truck” apron shall also be constructed of a different material to differentiate it from the circulatory roadway. “The truck apron shall also be a different color and texture.”*
- Page F-76 – Revised “Table” in “FIGURE 3-4 PASSING/LEFT TURN LANE ON TWO-LANE RURAL HIGHWAY” to add additional information.
- Page F-77 – Deleted the following language after the first sentence under “Taper Lengths (L)- Lane/Pavement Transitions and Merging Tapers”; *“This also applies to where roadways tie-in to bridges.”*

Revised the following language after the first paragraph under “Taper Lengths (L)- Lane/Pavement Transitions and Merging Tapers” from; “ For \leq 40 mph” and “For > 40mph” To; *“For 40 mph or less” and “For 45mph or greater”*

Revised the following language to the “Source” of the equation information under “Taper Lengths (L)- Lane/Pavement Transitions and Merging Tapers” from; *“2009 MUTCD, Section 6, Table 6C-4”* To; *“2011 AASHTO Green Book, Page 3-134, Equations 3-37 & 3-38”.*

Deleted the following language below the equations under “Taper Lengths (L)- Lane/Pavement Transitions and Merging Tapers”; *For Permanent Shoulder Taper (0.33 L Min.) and Shifting Taper (0.5 L Min.) Lengths, see 2009 MUTCD, Section 6, Table 6C-3.*

NOTE:

A pavement transition length of $1/2L$ (calculate L by using the applicable formula above) is to be used when establishing project termini for the majority of small bridge replacement and/or major bridge rehabilitation projects when “NO” horizontal or vertical geometric changes are required to tie into the existing approach alignment. For additional information see Volume 5, Part 2, of the Structure and Bridge Manual.

- Page F-100 – Deleted the detail in “FIGURE 3-29 TYPICAL APPLICATION OF A BUS PULLOUT”. Information on Bus Turnouts (Bus Stops) is now location in Appendix C.
- Page F-105 – Added the following language under “Moderate Volume Commercial Entrances”; *“The reduced design criteria are (i) Minimum entrance throat depth is 25 feet; (ii) Minimum radii is 25 feet with curb/gutter or curbing not required; (iii) Entrance width is 18 feet minimum, 30 feet maximum; and (iv) Minimum angle of entrance is 60 degrees.*

See Figure 4-15 for the moderate volume commercial entrance design illustration.”

- Page F-107 – Deleted the following language at the end of the first paragraph under “Commercial Entrances”; *“(a low volume commercial entrance is not a commercial entrance).”*
- Page F-111 – Deleted the following language, this language can be found on page 105;
Moderate Volume Commercial Entrance

A moderate volume commercial entrance is a commercial entrance located on highways with shoulders that has certain design characteristics reduced. Site requirements for use of this type of commercial entrance are:

- *Maximum highway vehicles per day: 5,000*
- *Maximum entrance vehicles per day: 200*
- *Maximum entrance percent truck trips of vehicles per day: 10%*

*The **reduced** design criteria are (i) Minimum entrance throat depth is 25 feet; (ii) Minimum radii is 25 feet with curb/gutter or curbing not required; (iii) Entrance width is 18 feet minimum, 30 feet maximum; and (iv) Minimum angle of entrance is 60 degrees.*

See Figure 4-15 for the moderate volume commercial entrance design illustration.

- Page F-122 – Revised the following language in the last sentence under item #4 from; When this occurs, the owner's request can be complied with if it is determined that construction of the entrance is economically justified and the District Engineer/Administrator and Regional Traffic Engineer give their approval for the construction thereof. To; When this occurs, the owner's request can be complied with if it is determined that construction of the entrance is economically justified and the District Engineer/Administrator and “responsible District” Traffic Engineer give their approval for the construction thereof.

APPENDIX “T”

- Page I-18 – Revised FIGURE I-3-1 BARRIER LENGTH OF NEED DETERMINATION to add additional language.