

IMPERIAL ROAD DESIGN MANUAL
REVISIONS January, 2014

CHAPTER 1B

- Page 1B-8 – Replaced the following language under “DESIGN SPEED” from; “A *speed determined for design and correlation on the physical features of a highway that influence vehicle operation: the maximum safe speed maintainable over a specified section of highway when conditions permit design features to govern.*” To; “A selected speed used to determine the various geometric design features of the roadway.”

CHAPTER 2D

- Page 2D-10 – Deleted the following language at the end of the first paragraph; “*Equalities are not to be placed on bridges.*”

Added the following language at the end of the first paragraph; “*Horizontal alignment is to be shown on all connections, drainage traverses and new entrance locations.*”

- Page 2D-14 – Added the following language in the second paragraph from; “*Grades on divided highways are to provide for allowable crossover grades (See Appendix F, Section 2-CROSSOVER GRADES). Grades are to be checked for proper mainline sight distances at crossovers, connections, and entrances.*” To; Grades on divided highways are to provide for allowable “*median*” crossover grades (See Appendix F, Section 2-“*MEDIAN*” CROSSOVER GRADES). Grades are to be checked for proper mainline sight distances at “*median*” crossovers, connections, and entrances.

- Page 2D-22 – Replaced the following language at the end of the second sentence under “PLOTTING EDGES OF PAVEMENT” from; “*For ramp terminal treatment, see IIM – LD-20.*” To; For ramp terminal treatment, see “*Appendix C, Section 8.*”

Added the following language to the following heading from; “*PLOTTING ENTRANCES AND CROSSOVERS*” To; PLOTTING ENTRANCES AND “*MEDIAN*” CROSSOVERS.

Added the following language in the first sentence in the third paragraph under PLOTTING ENTRANCES AND CROSSOVERS from; “*All entrances and crossovers impacted...*” To; All entrances and “*median*” crossovers impacted...

CHAPTER 2E

- Page 2E-10 – Added the following language to the last sentence in the first paragraph under “PIPE ENDWALLS WITH LOAD CARRYING GRATE” from; “*The Standard EW-11A is designed for use at crossover locations where there is no other alternative to placing a pipe culvert under the crossover.*” To; The Standard EW-11A is designed for use at “*median*” crossover locations where there is no other alternative to placing a pipe culvert under the “*median*” crossover.

Added the following language to item #4 under “PIPE ENDWALLS WITH LOAD CARRYING GRATE” from; “*Crossover locations should be carefully studied to eliminate the need for a pipe culvert under the crossover. In the event there is no other alternative, the Standard EW-11A is to be specified. The approach slopes of the crossover are to be graded 10:1...*” To; “*Median*” crossover locations should be carefully studied to eliminate the need for a pipe culvert under the “*median*” crossover. In the event there is no other alternative, the Standard EW-11A is to be specified. The approach slopes of the “*median*” crossover are to be graded 10:1...

- Page 2E-16 – Replaced the following language in the first sentence under “STAKING FOR CONCRETE ITEMS” from; “*Formed concrete items, such as curb and gutter, curb, median openings, straight line tapers, turn lanes...*” To; Formed concrete items, such as curb and gutter, curb, median “*crossovers,*” straight line tapers, turn lanes...
- Page 2E-33 – Added the following language at the end of the first paragraph under “CURB AND CURB AND GUTTER” – Mountable Type Curb; See AASHTO Green Book, Chapter 4, Section 4.7.1, Page 4-16.
- Page 2E-36 – Revised the following language in the second sentence in the first paragraph from: “*The plans will not designate prescriptive or statutory right of way as existing right of way.*” To; Prescriptive or statutory right of way “*is to be shown on the plans but is not to be shown or labeled*” as existing “*fee*” right of way.
- Page 2E-43 – Revised the following language in the second sentence in the first paragraph from: “*The Regional Utility Coordinator will furnish an electronic reference file to the designer showing the utility easements which are to be shown on the plans.*” To; **The Regional Utility Coordinator will furnish an electronic reference file to the designer showing the utility easements “and labeling” which are to be shown on the plans.** *The utility easement lines are to be shown on the plans in accordance with the VDOT CADD Manual.*

Deleted the following language in the second paragraph from; “*Electronic reference file furnished, showing the necessary easements, shall contain the appropriate note indicating type and for which utility company the easement is being acquired. There are instances where joint use utility easements are proposed. In those cases, all companies are to be shown.*”

Added the following language in the first sentence of the last paragraph from: “*Electronic reference file of utility easements shall contain adequate information to incorporate the utility easement into the plans.*” To; Electronic reference file of utility easements “*furnished by the Regional Utility Coordinator*” shall contain adequate information to incorporate the utility easements into the plans.

Deleted the following language at the bottom of the page; “*The utility easement lines are to be dot-dashed. Each line is to be labeled as to type and utility company. Parallel utility easements 5 feet (1.5 m) apart or closer should be questioned. Normally these lines should be combined into a joint easement at the wider width; however, the Regional Utility Coordinator should be consulted before making that change.*”

- Page 2E-50 – Added the following language in “FIGURE 2E-9 DEPICTING LIMITED ACCESS RIGHT-OF-WAY”; added stationing to all “Begin and End Limited Access Line & Fence” labels to agree with the language on page 2E-46.
- Pages 2E-52 thru 57 – Deleted the following details; *FIGURE 2E-11 SAMPLE TITLE SHEET (URBAN DESIGN) TIER 1, FIGURE 2E-12.1 SAMPLE TITLE SHEET (SECONDARY DESIGN) TIER 2 and FIGURE 2E-13.1 SAMPLE TITLE SHEET (PRIMARY DESIGN) TIER 2*, reducing the number of details to 3 (pages 2F-52 thru 2F-54).
- Page 2E-64 – Deleted the following language under “INDEX OF SHEETS”; “*Sheet No. J is assigned to the CADD Level Structure Sheet.*”

Revised the following language under “INDEX OF SHEETS” from; “*Sheet No. 1K, 1L etc...*” To; Sheet No. “*1J, 1K*” etc...

- Page 2E-67 – Revised “FIGURE 2E-15 SAMPLE INDIX OF SHEETS” to delete “*Sheet 1J CADD Level Structure Sheet*”.

CHAPTER 2F

- Page 2F-11 – Added the following language to the first sentence of the second paragraph from; “*Utilities are affected by items such as right of way lines, fences, property lines, property owners' names, crossovers, easements...*” To; Utilities are affected by items such as right of way lines, fences, property lines, property owners' names, “*median*” crossovers, easements...

CHAPTER 2G

- Page 2G-13 – Revised the following language at the end of last sentence under “*INTEGRATED PROJECT MANAGER*” from; “*After final submission of the project to the Scheduling and Contract Division, forward a copy of the Activity Report from iPM to the Central File.*” To; After final submission of the project to the Scheduling and Contract Division, forward a copy of the Activity Report from iPM.
- Page 2G-37 – Revised TABLE 2G-1-1 Records Retention to update numerous comments.

APPENDIX “A”

- Page A-6 – Revised language to LANE/TRANSITIONS, MERGING TAPERS & SPEED CHANGE LENGTHS heading to LANE/”*SHOULDER*”/TRANSITIONS, MERGING TAPERS & SPEED CHANGE LENGTHS

Added additional language to after the first sentence under LANE/SHOULDER/TRANSITIONS, MERGING TAPERS & SPEED CHANGE LENGTHS; “*This also applies to where roadways tie-in to bridges.*”

Added additional language to under LANE/TRANSITIONS, MERGING TAPERS & SPEED CHANGE LENGTHS; “*For Permanent Shoulder and Shifting Tapers see 2009 MUTCD, Section 6, Table 6C-3 and 6C-4.*”

Added additional language to the end of the first paragraph under “NOTE” under LANE/TRANSITIONS, MERGING TAPERS & SPEED CHANGE LENGTHS; “*For additional information see Volume 5, Part 2, of the Structure and Bridge Manual.*”

- Page A-7 – Added additional language to the last paragraph under the GENERAL NOTES; For additional information on roadway widths and maximum grades relative to terrain and design speed, see AASHTO Green Book, Chapter 7, “*Section 7.2.2, page 7-4,*” Tables 7-2 and “*Section 7.2.3, page 7-5, Table 7-3*”; for Freeways, see Chapter 8, “*Section 8.2.7, page 8-4, Table*” 8-1.

Added additional language to FOOTNOTE No. 6; For additional information on sight distance requirements on grades of 3 percent or greater, see “*Section 3.2.2, page 3-5,*” Tables 3-2 of AASHTO Green Book.

- Page A-8 – Added additional language to the last 2 paragraph under the GENERAL NOTES; For Passing Sight Distance Criteria, see AASHTO Green Book, “*Section 3.2.4, page 3-8.*”

For maximum grades relative to terrain and design speed, see AASHTO Green Book, Chapter 7, “*Section 7.3.2, page 7-29,*” Table 7-2.

Added additional language to the end of FOOTNOTE No. 4; see AASHTO Green Book, Chapter 7, “*Section 7.2.11, page 7-13.*”

Added additional language to the end of FOOTNOTE No. 8; see AASHTO Green Book, “*Chapter 3, Section 3.2.2, page 3-5,*” Table 3-2.

- Page A-9 – Added additional language to the last 2 paragraph under the GENERAL NOTES; For Passing Sight Distance Criteria see AASHTO Green Book, “*Chapter 3, Section 3.2.4, page 3-8.*”

For maximum grades relative to terrain and design speed, see AASHTO Green Book, “*Chapter 6, Section 6.2.1, page 6.2,*” Table 6-2.

Added additional language to the end of FOOTNOTE No. 3; see AASHTO Green Book, “*Chapter 6, Section 6.2.2, page 6-5.*”

Added additional language to the end of FOOTNOTE No. 8; see AASHTO Green Book, “*Chapter 3, Section 3.2.2, page 3-3.*”

Added additional language to the end of FOOTNOTE No. 9; see AASHTO Green Book, “*Chapter 6, Section 6.2.2, page 6-6.*”

- Page A-10 – Added additional language to the 4th paragraph under the GENERAL NOTES; For minimum design speeds for 250 ADT and under, see AASHTO Green Book, Chapter 5, “*Section 5.2.1, page 5-2,*” Table 5-1.

Added additional language to the last 2 paragraph under the GENERAL NOTES; For Passing Sight Distance Criteria See Current AASHTO Green Book, “*Chapter 3, Section 3.2.4, page 3-8.*”

For maximum grades relative to terrain and design speed, see AASHTO Green Book, Chapter 5, “*Section 5.2.1, page 5-3,*” Table 5-2.

Added additional language to the end of FOOTNOTE No. 5; see AASHTO Green Book, Chapter 5, “*Section 5.2.2, page 5-5.*”

Added additional language to the end of FOOTNOTE No. 9; see AASHTO Green Book, “*Chapter 3, Section 3.2.2, page 3-3*” Table 3-2.

- Page A-11 – Revised the Geometric Design Standards For Urban Principal Arterial System (GS-5) to delete the “Minimum Radius” on design speeds 60 mph and above and added the following language to the end of the fourth paragraph under “General Note”; “# For minimum radius, See GS-1.”

Added additional language to the last paragraph under the GENERAL NOTES; For maximum grades relative to terrain and design speed, see AASHTO Green Book, Chapter 7, “Section 7.3.3, page 7-29,” Table 7-4, for Freeways, see Chapter 8, “Section 8.2.1, page 8-4,” Table 8-1.

Added additional language to the end of FOOTNOTE No. 13; see AASHTO Green Book, “Chapter 3, Section 3.2.2, page 3-3” Table 3-2.

- Page A-12 – Added additional language to the last paragraph under the GENERAL NOTES; For maximum grades relative to terrain and design speed, see AASHTO Green Book, Chapter 7, “Section 7.3.3, page 7-29,” Table 7-4.

Added additional language to the end of FOOTNOTE No. 8; see AASHTO Green Book, Chapter 7, “Section 7.2.11, page 7-13.”

Added additional language to the end of FOOTNOTE No. 12; see AASHTO Green Book, “Chapter 3, Section 3.2.2, page 3-3” Table 3-2.

Added additional language to the end of FOOTNOTE No. 13; see AASHTO Green Book, “Chapter 7, Section 7.2.3, page 7-5” Table 7-3.

- Page A-13 – Added additional language to the last paragraph under the GENERAL NOTES; For maximum grades relative to terrain and design speed, see AASHTO Green Book, Chapter 6, “Section 6.3.1, page 6-12,” Table 6-8.

Added additional language to the end of FOOTNOTE No. 1; see AASHTO Green Book, “Chapter 6, Section 6.2.2, page 6-6,” Table 6-5.

Added additional language to the end of FOOTNOTE No. 10; see AASHTO Green Book, “Chapter 3, Section 3.2.2, page 3-3,” Table 3-2.

Added additional language to the end of FOOTNOTE No. 11; see AASHTO Green Book, “Chapter 6, Section 6.2.2, page 6-6,” Table 6-5.

- Page A-14 – Added additional language to the end of FOOTNOTE No. 1; see AASHTO Green Book, Chapter 5, “*Section 5.2.1, page 5-5,*” Table 5-4.

Added additional language to the end of FOOTNOTE No. 10; see AASHTO Green Book, “*Chapter 3, Section 3.2.2, page 3-3,*” Table 3-2.

Added additional language to the end of FOOTNOTE No. 11; see AASHTO Green Book, “*Chapter 5, Section 5.2.2, page 5-6,*” Table 5-5.

- Page A-15 – Added additional language to the last paragraph under the GENERAL NOTES; see AASHTO Green Book, “*Chapter 3, Section 3.2.4, page 3-8.*”

Added additional language to the end of FOOTNOTE No. 2; see AASHTO Green Book, “*Chapter 5, Section 5.4.2, page 5-29.*”

- Page A-16 – Added additional language to the first paragraph under the GENERAL NOTES; ...in the AASHTO Green Book, “*Chapter 10, Section 10.9.6, page 10-89,*” Table 10-1.

Added additional language to the last paragraph under the GENERAL NOTES; see AASHTO Green Book, Chapter 10,” *Section 10.9.6, page 10-87.*”

Added additional language to the end of FOOTNOTE No. 2; see AASHTO Green Book, “*Chapter 10, Section 10.9.6,*” page 10-102.

Added additional language to the end of FOOTNOTE No. 6; see AASHTO Green Book, “*Chapter 3, Section 3.2.2, page 3-3,*” Table 3-2.

- Page A-22 – Added the following language to the last paragraph on this page; Source: AASHTO Green Book, Chapter 4, “*Section 4.7.1, page 4-16*” / Roadside Design Guide, Chapter 10

- Page A-63 – Revised the following language in the second sentence in the first paragraph under “DESIGN EXCEPTION” from; “*If lesser values are proposed for use, a justification report will be needed...*” To; If lesser values are proposed for use, a “*design exception*” will be needed...

- Page A-76 – SECTION A-5-BICYCLE AND PEDESTRIAN FACILITY GUIDELINE was reorganized to improve the flow of information.

- Page A-77 – Revised the following language in the second sentence in the second paragraph from; “*The selection of the specific accommodations to be used for a project will be based on the application of appropriate planning design, and engineering principles.*” To; The selection of the specific accommodations to be “*included*” a project “*shall*” be based on the application of appropriate planning design, and engineering principles.

Added the following language at the end of the second paragraph; “*Bicycle and Pedestrians accommodations shall be designed and built, or installed, using the VDOT Road Design Manual, VDOT Roads and Bridge Standards and Specifications, the AASHTO Guide for the Development of Bicycle facilities, AASHTO Guide for the Planning Design and Operation of Pedestrian Facilities, the Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Rights-of-Way and the Manual on Uniform Traffic Control Devices (MUTCD). On August 20, 2013 FHWA issued a Memorandum expressing support for taking a flexible approach to bicycle and pedestrian facility design. In doing so, FHWA supports the use of the NACTO Urban Bikeway Design Guide and the ITE Designing Urban Walkable Thoroughfares: A context Sensitive Approach to build upon the flexibilities provided in the AASHTO guides, which can help communities plan and design safe and convenient facilities for pedestrians and bicyclists.*”

- Page A-78 – Added the following language after the first paragraph; ***INDIVIDUALS INVOLVED IN THE PLANNING AND DESIGN OF BICYCLE FACILITIES SHOULD BE FAMILIAR WITH THE RESOURCES MENTIONED IN THE PREVIOUS SECTION TITLED: “VDOT POLICY to improve bicycle and pedestrian access”.***

Revised the following language item number 3 under PLANNING AND DESIGN OF BICYCLE FACILITIES from; “*Design the facility in accordance with the VDOT Guidelines: FHWA and AASHTO*” To; Design the facility in accordance with the “*resources mentioned in the previous section titled “**VDOT POLICY TO IMPROVE BICYCLE AND PEDESTRIAN ACCESS**”.*”

- Page A-79 - Revised the following language in the third bullet under MAJOR DEVELOPMENTS AND SITE PLANS from; “*Bikeways within the VDOT right of way shall be designed to meet AASHTO and VDOT guidelines.*” To; “*Bicycle facilities*” within the VDOT right of way shall be designed “*in accordance with the resources mentioned in the previous section titled: “**VDOT POLICY TO IMPROVE BICYCLE AND PEDESTRIAN ACCESS**”.*”
- Page A-96 – Revised the following language to from; “*FIGURE A-5-5 CROSS SECTION OF TWO-WAY SHARED USE PATH ON SEPARAYED RIGHT OF WAY*” To; “*FIGURE A-5-5 CROSS SECTION OF TWO-WAY SHARED USE PATH*”

- Page A-104 – Replaced the following language in the third paragraph under “Path-Roadway Intersection” from; “When a paved shared use path or trail crosses a gravel road or drive, the road or drive should be paved a minimum of 3 feet, on each side of the path or trail.”
To;
“Where a Shared Use Path cross an unpaved road or driveway, the road or driveway shall be paved a minimum of 20 feet on each side of the crossing to reduce the amount of gravel scattered onto or along the path by motor vehicles. The pavement structure at the crossing shall be adequate to sustain the expected loading at that location. At a minimum, the pavement structure shall be the same as the Shared Use Path pavement structure.”
- Page A-125 – Added new detail “DIAGONAL OR CORNER TYPE CURB RAMPS” under “DIAGONAL CURB RAMP”.
- Page A-126 – Added new detail “LANDING AT THE TOP OF CURB RAMPS” under “LANDING”.

APPENDIX “B”

- Page B-38 – Deleted the following language at the end of the fourth paragraph under “Traffic Calming”; *“Four-way stop conditions should be avoided on low volume streets because there will be a tendency for the stop to be ignored and that has potential to train drivers that 4-way stops don’t really mean “stop.” Any proposal for four-way stops must be reviewed by the Regional Traffic Engineer.”*
- Page B-43 – Replaced FIGURE 13 ROUNDABOUT DETAILS with a new detail.
- Page B-49 – Added the following language;
Note:
 1. *The sight distance triangle shall be free of any obstructions that block a driver's view of potential conflicting vehicles or pedestrians entering the traveled way. Examples of obstructions that limits sight distance include vehicles in adjacent lanes, parked vehicles, bridge piers and abutments, large signs, poorly pruned trees, tall shrubs and hedges, walls fences and buildings.*
 2. *Curb extensions shall only be used where there is on-street parking and where only a small percentage of turning vehicles are larger than the design vehicle.*
 3. *Curb extensions are not applicable to intersections with exclusive right-turn lanes adjacent to the curb, or intersections with a high volume of right-turning trucks or buses turning into narrow cross streets.*

APPENDIX “B(1)”

- Page B(1)-19 – Revised the following language in the first sentence in the second paragraph under “Sight Distance Triangles” from; *Decision points (A, B and C in Figure 2) represent the position...* To; Decision points (A, B and C “shown” in Figure 2 – “Sight Distance Triangles”) represent the position...

Revised the following language in the third paragraph under “Sight Distance Triangles” from; *“Decision point A is located 4 feet from the centerline or left edge of pavement of the minor roadway and 20 feet from the middle of the nearest travel lane of the major roadway. (For reference purposes, AASHTO defines this point as 14.5 to 18.0 feet from the edge of the travel lane of the major roadway.) Note: Decision point A shall be the distance from the edge of the travel lane of the major roadway to the drivers eye, which is determined by the location of the stop bar and/or stop sign.”* To;

Decision point A “(driver’s eye)” is located 4 feet from the centerline or left edge of pavement of the minor roadway 14.5 to 18.0 feet from the edge of the travel lane of the major roadway “(See AASHTO, Chapter 9)”.

Added the following language to the fourth paragraph under “Sight Distance Triangles”; *“Where practical, Decision Point A should be determined by the location of the stop bar and may exceed 18.0 feet from the edge of the travel lane.”*

- Page B(1)-38 – Revised language in the first paragraph under “ROADWAY DRAINAGE – Policy and Procedures” to add updated web sites.

Revised language in the third paragraph under “ROADWAY DRAINAGE – Policy and Procedures” to replace “DCR” with “DEQ” and update web site.

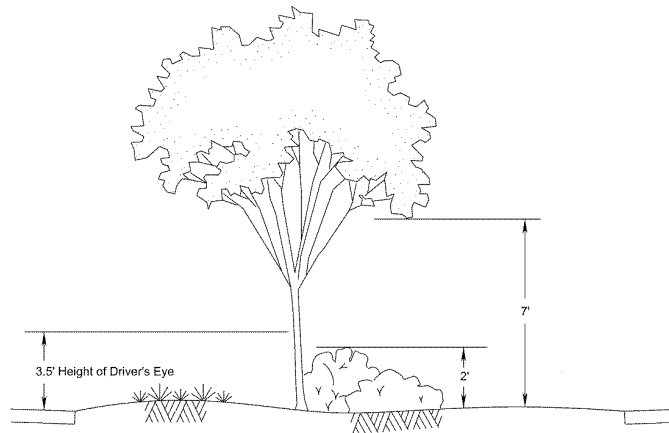
- Page B(1)-43 – Revised the following language to section “D” name from; “*STREETSCAPE*” To; STREETSCAPE “*AND LANDSCAPE*”.

Revised the following language in the second paragraph under “*STREETSCAPE AND LANDSCAPE*” from; “*Planting strips, located between the curb and sidewalk and parallel with the street, shall be 6 feet or more in width. Care should be used to ensure that larger planting strips do not push pedestrian crossing areas back from the intersections by requiring a larger curb radius. To maintain sight lines, trees and other objects should be restricted from corners for distances of 30 feet on all sides measured from the end of the curb return radii. Along all planting strips, the area between 2 and 7 feet above ground should be maintained as a clear zone to preserve sight lines and accommodate pedestrians.*” To; Planting strips, located between the curb and sidewalk and “*within unpaved medians*” parallel with the street, shall be 6 feet or more in width. “*All plantings shall be located a minimum of 3 feet from the back of curb.*” Care should be “*taken*” to ensure that larger planting strips do not push pedestrian crossing areas back from the intersections by requiring a larger curb radius. “*Trees, vegetation and other objects shall be spaced so that the sight distance triangle for intersection sight distance or stopping sight distance is free of any obstructions that may block the driver’s view of potential conflicting vehicles and/or pedestrians. To maintain sight lines,*” trees, “*vegetation*” and other objects “*shall*” be restricted from corners for distances of 30 feet on all sides measured from the end of the curb return radii “*as shown in the diagram below.*”

- Page B(1)-44 – Added the following language under the “sight line detail”; *The diagram above illustrates intersection sight distance for a two lane major road where SDL=SDR.* and “*For more information on Sight Distances see Appendix “F”.*”

Revised the following language in the second paragraph from; “*Along all planting strips, the area between 2 and 7 feet above ground should be maintained as a clear zone to preserve sight lines and accommodate pedestrians.*” To; Along all planting strips, the area between 2 and 7 feet above ground “*shall*” be maintained “*free of any obstructions that may block the driver’s view*” to preserve “*motorists and pedestrian*” sight lines “*to avoid potential conflicts. See diagram below.*”

- Page B(1)-45 – Added the following detail;



Revise the following language under new detail from; *“When trees are planted along streets, especially in association with sidewalks, species selection is critical. When attracted to fruits, nuts and berries produced by some species, congregations of birds may cause potentially undesirable conditions for pedestrians Also, species that leach sap tend to damage the finishes on parked cars and, when wet, the leaves of some species may damage automotive finishes.”*
To; When trees are planted along streets, especially in association with sidewalks, species selection is critical. *“Care should be taken with regard to the species selection so that the roots do not damage the curb or sidewalk. Congregations of birds may be “attracted to fruits, nuts and berries produced by some species, “which” may cause potentially undesirable conditions for pedestrians. Also, species that leach sap “may” damage the finishes on parked cars and, when wet, the leaves of some species may damage automotive finishes.*

- Page B(1)-49 – Deleted the following language at the end of the fourth paragraph under “Traffic Calming”; *“Four-way stop conditions should be avoided on low volume streets because there will be a tendency for the stop to be ignored and that has potential to train drivers that 4-way stops don’t really mean “stop.” Any proposal for four-way stops must be reviewed by the Regional Traffic Engineer.”*
- Page B(1)-53 – Replaced FIGURE 13 ROUNDABOUT DETAILS with a new detail.
- Page B(1)-54 – Added the following language after “For the approval process of roundabouts see Appendix F” information; *“A “Mini-Roundabout” may be the appropriate solution in a low-speed restricted environment. For information on Mini-Roundabouts, see Appendix F of this manual.”*

- Page B(1)-60 – Added the following language;

Note:

1. *The sight distance triangle shall be free of any obstructions that block a driver's view of potential conflicting vehicles or pedestrians entering the traveled way. Examples of obstructions that limits sight distance include vehicles in adjacent lanes, parked vehicles, bridge piers and abutments, large signs, poorly pruned trees, tall shrubs and hedges, walls fences and buildings.*
2. *Curb extensions shall only be used where there is on-street parking and where only a small percentage of turning vehicles are larger than the design vehicle.*
3. *Curb extensions are not applicable to intersections with exclusive right-turn lanes adjacent to the curb, or intersections with a high volume of right-turning trucks or buses turning into narrow cross streets.*

APPENDIX B(2) Multimodal Design Standards for Mixed-Use Urban Centers was added to the Road Design Manual.

APPENDIX “C”

- Page C-47 – Added the following language to item #1 under “B. ROADS”; Existing entrances, entrances of planned developments that are committed, street connections, “*median*” crossovers, etc...

Added the following language to item #5 under “B. ROADS”; “*Median*” crossover spacing and sight distance.

- Page C-51 – Replaced the following language under “AUXILIARY LANES” – A. Left-turn Lanes – item #2 from; “*Note that left-turn lanes are generally provided at median openings.*” To; Note that left-turn lanes are generally provided at median “*crossovers.*”

- Page C-81 – Added the following language to the end of the first bullet under “Exit Ramps”; Ref: AASHTO’s A Policy on Geometric Design of Highways and Streets, “*Chapter 10, Section 10.9.6, page 10-87*”.

Added the following language to the end of the sentence under “Entrance Ramps”; Ref: AASHTO’s A Policy on Geometric Design of Highways and Streets, “*Chapter 10, Section 10.9.6, page 10-87*”.

Added the following language in the first bullet under “Acceleration/Deceleration Lane Lengths and Grade Adjustments; For lengths of Ramp Terminal Acceleration Lanes on flat grades (2 percent or less), see 2011 AASHTO Green Book, “*Chapter 10, Section 10.9.6,*” page 10-110, Table 10-3. Acceleration lane lengths on grades $\geq 3\%$ must be adjusted in accordance with adjustment factors shown in the 2011 AASHTO Green Book, “*Chapter 10, Section 10.9.6,*” page 10-112, Table 10-4.

Added the following language in the second bullet under “Acceleration/Deceleration Lane Lengths and Grade Adjustments; For lengths of Ramp Terminal Deceleration Lanes on flat grades (2 percent or less), see 2011 AASHTO Green Book, “*Chapter 10, Section 10.9.6,*” page 10-115, Table 10-5. Deceleration lane lengths on grades $\geq 3\%$ must be adjusted in accordance with adjustment factors shown in the 2011 AASHTO Green Book, “*Chapter 10, Section 10.9.6,*” page 10-112, Table 10-4.

Added the following language in the third bullet under “Acceleration/Deceleration Lane Lengths and Grade Adjustments; Lengths shown in the 2011 AASHTO Green Book are for single lane traffic. For two-lane ramps, or other conditions, consult the AASHTO Green Book “*Chapter 10, Section 10.9.6, page 10-120*” for additional instructions.

APPENDIX “F”

- PREFACE – Revised the following language in the fourth paragraph from; “*Legislation was enacted during the 2008 General Assembly session to require that the regulations and standards be implemented in phases. The first phase allowed the access management regulations and standards for VDOT highways classified as principal arterials to take effect July 1, 2008.*” To; The “*access management*” regulations and standards “*were*” implemented in phases. The first phase “*applied to*” VDOT highways classified as principal arterials taking effect July 1, “*2008 and second phase applies to minor arterials, collectors and local streets which became effective October 14, 2009.*”

Deleted the following language in paragraph #5; “*During the second phase, the regulations and standards developed during 2007 for minor arterials, collectors, and local streets underwent an extensive public review in accordance with the Administrative Process Act. These regulations and standards became effective on October 14, 2009.*” And replaced it with; “*For regulatory efficiency and streamlining on December 5, 2013 the two sets of access management regulations were consolidated into one: the Access Management Regulations 24VAC30-73, applying to all highways.*”

Revised the following language in the first sentence in the sixth paragraph from; “*This Appendix, therefore, contains the standards for the design of intersections, turning lanes, and entrances and for the spacing of entrances, intersections, traffic signals, median openings and crossovers that apply to all state highways:*” To; This Appendix, therefore, contains the standards for the design of intersections, turning lanes, and entrances and for the spacing of entrances, intersections, traffic signals, median crossovers that apply to all state highways:

- Page F-1 – Revised the language in the definition to deleted the following from; “***Access Management:*** *The systematic control of the location, spacing, design, and operation of entrances, median openings/crossovers, traffic signals, and...*”
To: **Access Management:** The systematic control of the location, spacing, design, and operation of entrances, median crossovers, traffic signals, and...

Deleted the definition for “**Crossover**” and renamed it “**Median Crossover**” and relocated to page F-3.

Deleted the following definition; “*Curb Cut: An opening along the curb line where vehicles may enter or leave the highway.*”

- Page F-2 – Revised definition to deleted the following from;
“***Functional Classification:*** *The federal system of classifying groups of highways according to the character of service they are intended to provide and classifications made by the Commissioner based on the operational characteristics of a highway.*”
To; **Functional Classification:** The federal system of classifying groups of highways according to the character of service they are intended to provide.

- Page F-3 – Revised definition to add the following from; **Intersection**: *An at-grade crossing of two or more highways, a crossover, or any at-grade connection with a highway such as a commercial entrance.* To; **Intersection**: *An at-grade crossing of two or more highways, a “median” crossover, or “full access entrances directly across from each other on an undivided highway.”*

Revised definition to add the following from; **Intersection Sight Distance**: *The sight distance required at an intersection to allow the driver...* To; **Intersection Sight Distance**: *The sight distance required at “entrances and” intersections to allow the driver...*

Added the following definition; **Median Crossover**: *An opening in a nontraversable median that can be designed to provides for crossing, left turns and U-turns. See “Median Crossover (Directional)” and “Median Crossover (Full)”.*

Revised definition heading from; **Median Opening (Directional):...** To; **Median Crossover (Directional):...**

- Page F-4 – Revised definition to add the following from; **Median Opening (Full)**: *See “Crossover”* To; **Median “Crossover” (Full)**: *“An opening in a restrictive median that provides for crossing, left turns and U-turns.”*
- Page F-10 – Added the following language to the source for the detail shown on this page; Source: 2011, AASHTO, A Policy on Geometric Design of Highways and Streets, “Chapter 1, Section 1.2.3, page 1-7”
- Page F-12 – Revised the following language in the eighth bullet under “Intersection Design Principles” from; *“Consider the Design Vehicle”* To; *“Determine” Design Vehicle.*

Added the following language in the ninth bullet under “Intersection Design Principles”; *“Utilize Auto Turn to Verify Vehicle Turning Movement”.*

- Page F-14 – Revised the following language in the last sentence in the first bullet from; *“The design vehicle must be identified and turning templates properly applied.”* To; *The design vehicle must be identified and “utilize Auto Turn to verify the design.”*

Revised the following language in the second paragraph from; *A Highway Capacity Manual (HCM) capacity or other appropriate analysis (Corsim/Synchro) should be performed...* To; *A Highway Capacity Manual (HCM) capacity or other appropriate analysis (Corsim/Synchro) “shall” be performed...*

- Page F-22 - Added the following language to the last sentence on the page; *Other criteria that may need to be considered for new “median” crossover spacing is presented later in this section.*

- Page F-23 – Added the following language to the heading and the Table 2-2; Minimum Spacing Standards for Commercial Entrances, Intersections, and “*Median*” Crossovers.

Added the following language to the second column under “Minimum Centerline to Centerline Spacing (Distance) in Feet” in “TABLE 2-2 MINIMUM SPACING STANDARDS FOR COMMERCIAL ENTRANCES, INTERSECTIONS, AND MEDIAN CROSSOVERS; Spacing from Unsignalized Intersections “& *Full/Directional Median*” Crossovers to Signalized or Unsignalized Intersections “& *Full/Directional Median* Crossovers”

Added the following language to the third column under “Minimum Centerline to Centerline Spacing (Distance) in Feet” in “TABLE 2-2 MINIMUM SPACING STANDARDS FOR COMMERCIAL ENTRANCES, INTERSECTIONS, AND MEDIAN CROSSOVERS from; “*Spacing from Full Access Entrances to Other Full Access Entrances and Any Intersection on Highways Without Restrictive Medians*” To; Spacing from Full Access Entrances to Other Full Access Entrances and Any Intersection “*or Median Crossover*”

Added the following language to the fourth column under “Minimum Centerline to Centerline Spacing (Distance) in Feet” in “TABLE 2-2 MINIMUM SPACING STANDARDS FOR COMMERCIAL ENTRANCES, INTERSECTIONS, AND MEDIAN CROSSOVERS; Spacing from Partial Access One or Two Way Entrances to Any Type of Entrance, Intersection or “*Median*” Crossover

Deleted the following language under Notes; “**A. Entrances and restrictive medians** – Entrances opposite such medians have no left turn ingress/egress movements: the Partial Access Entrance spacing applies. Entrances on highways without such medians are full access entrances. Entrances directly opposite each other on a highway create an intersection.”

Added the following language under Notes;

A. Intersection – The intersection spacing applies when two full access entrances are directly across from each other on an undivided highway.

B. Entrances – The entrance spacing applies to entrances on the same side of the highway.

C. Entrance offset – See Figure 4-6 for Offsetting entrances on opposite sides of a roadway.

Added the following language to the end of the first bullet under “E. Roundabout”; Are separated from signalized intersections and unsignalized intersections/*median* crossovers by the Unsignalized Intersection spacing standard “*and from full access and partial access entrances by the Partial Access Entrance spacing standard.*”

- Page F-24 – Revised the following language in Footnote #3 from; “**Unsignalized Intersection/Crossover** – Intersections and crossovers need ample spacing to accommodate the complex situations faced by motorists from vehicular deceleration, acceleration, and numerous conflict points associated with vehicular crossing and left and right turning movements. At a four way intersections, these traffic movements’ create 32 conflict (collision) points (see Figure 2-1). Intersections and crossovers also may become signalized over time. Spacing is allocated in fractions of a mile (see footnote 2). **Note:** Roundabouts are separated from signalized and unsignalized intersections/crossovers by this spacing standard.”
To; **Unsignalized Intersection/”Median” Crossover** – Intersections and “full/directional median” crossovers need ample spacing to accommodate the complex situations faced by motorists from vehicular deceleration, acceleration, and numerous conflict points associated with vehicular “movements such” as crossing and left and right turns. At a four way intersections, these traffic movements’ create 32 conflict (collision) points (see Figure 2-1). Intersections and “full median” crossovers also may become signalized over time. Spacing is allocated in fractions of a mile (see footnote 2). **Note:** Roundabouts are separated from signalized and unsignalized intersections/”median” crossovers by this spacing standard.

Revised the following language in the first sentence in Footnote #4 from; “**Full Access Entrance Spacing** – Spacing can be less than unsignalized intersection and crossover spacing as there are fewer turning movements and potential conflict points and generally no crossing movements.”
To; **Full Access Entrance Spacing** – Spacing can be less than unsignalized intersection and “median” crossover spacing as “a full entrance has” fewer turning movements “and generally no crossing movements, resulting in only 11 potential conflict (collision)” points.

Revised the following language in Footnote #5 from; “**Partial Access One or Two Way Entrance Spacing** – Left turn movements are limited (right in/right out with or without left in movement). The focus is on making sure motorists have sufficient time to be able to see/react to a vehicle slowing down to turn into the entrance or to a vehicle exiting the entrance, and stop in time to avoid a collision. Stopping sight distance can be used for this purpose. See Figure 4-5 for illustrations of commercial entrance channelization island options for creating a partial access entrance on highways without a restrictive non-traversable median. Also see “Restricting Left Turn Movements at Commercial Entrances” for additional information. **Note:** Roundabouts are separated from other roundabouts by the partial access entrance spacing standard.”

To; **Partial Access One or Two Way Entrance Spacing** – Left turn movements are limited (right in/right out with or without left in “only” movement. “If a directional median crossover is involved the unsignalized intersection/median crossover spacing applies)”. The focus is on making sure motorists have sufficient time to be able to see/react to a vehicle slowing down to turn into the entrance or to a vehicle exiting the entrance, and stop in time to avoid a collision. Stopping sight distance can be used for this purpose. See Figure “4-4” for illustrations of “right in/right out with or without left in” commercial entrance channelization island options. Also see “Restricting Left Turn Movements at Commercial Entrances” for additional information. **Note:** Roundabouts are separated from other roundabouts by the partial access entrance spacing standard.

- Page F-26 – Revised “FIGURE 2-8.1 ILLUSTRATION OF THE RELATIONSHIP BETWEEN SPACING STANDARDS” to additional partial access entrance detail.
- Page F-27 – Revised the following language in the first paragraph under “Spacing Standards for Commercial Entrances/Intersections Near Interchange Ramps” from; *“The spacing standards near interchange ramps focus on safe ramp exit and entry movements. Greater separation between ramp terminals and entrances and intersections is necessary for multilane versus two-lane highways because the motorist’s maneuvers at multilane roads are more complex, such as crossing through lanes to reach a left turn lane at an intersection. Functional classification is not applied because arterials may be two lane or multilane. If the off and/or on ramp has a full auxiliary lane, the spacing would be determined as if there were a ramp taper. Note: For Limited Access Line and/or Fence Requirements, See Figures 2-9 and 2-10 in Chapter 2E of the Road Design Manual.”* To;
 The spacing standards near interchange ramps focus on safe ramp exit and entry movements. Greater separation between ramp terminals “(see definition of Ramp Terminal)” and entrances and intersections is necessary for multilane versus two-lane highways because the motorist’s maneuvers at multilane roads are more complex, such as crossing through lanes to reach a left turn lane at an intersection. Functional classification is not applied because arterials may be two lane or multilane. If the off and/or on ramp “connects to” a “continuous” auxiliary lane, the spacing “distance is measured from where the AASHTO calculated acceleration or deceleration lane and taper would end if there were no continuous auxiliary lane.” Note: For Limited Access Line, Fence Requirements “and 100’ Urban/300’ Rural FHWA minimum access control,” See Figures 2E-9 and 2E-10 in Chapter 2E of the Road Design Manual.

Revised “FIGURE 2-9 ACCESS CONTROL ON MULTI LANE HIGHWAYS AT INTERCHANGES” to add additional information.

- Page F-28 – Revised “FIGURE 2-10 ACCESS CONTROL ON TWO LANE HIGHWAYS AT INTERCHANGES” to add additional information.

- Page F-29 – Added the following language to the first heading from; “*Exceptions/Waivers to the Spacing Standards*” To; “*Exceptions/Waivers to the Spacing Standards*”/Access Management Requirements”.

Revised the following language in the first paragraph under “Exceptions/Waivers to the Spacing Standards/Access Management Requirements” from; “*The Access Management Regulations for Principal Arterials (24VAC30-72-120) and for Minor Arterials, Collectors, and Local Streets (24VAC30-73-120) identify potential exceptions to the spacing standards for commercial entrances, intersections, and crossovers found in Tables 2-2 through 2-4 in this Appendix. Exceptions to the spacing standards are referenced in sections 24VAC30-72-120 and 73-120 of the Access Management Regulations. See the VDOT Access Management web page for the regulations at www.virginiadot.org/projects/accessmgt.*”

To; The Access Management Regulations (24VAC30-73-120) identify potential exceptions to the spacing standards for commercial entrances, intersections, and “*median*” crossovers found in Tables 2-2 through 2-4 and “*Figure 4-4 corner clearance*” in this Appendix. “*The Regulations also establish access management requirements for shared use entrances, cross parcel access, and functional area of intersections and identify potential exceptions to these requirements.*” Exceptions to the spacing standards “*and access management requirements*” are referenced in section 24VAC30- 73-120 of the Access Management Regulations. See the VDOT Access Management web page for the regulations at www.virginiadot.org/projects/accessmgt.

Revised the following language in the first sentence in the second paragraph under “Exceptions/Waivers to the Spacing Standards” from; “*For commercial entrances, intersections, and crossovers (new or to be relocated) proposed for private sector land development projects, the Access Management Regulations specify the documentation to be submitted to justify an exception to the spacing standards. A request for an exception to the spacing standards shall be submitted to the District Administrator or designee using Exception Form AM-1 or AM-2. These forms are available on the VDOT web site at <http://vdotforms.vdot.virginia.gov/>.*”

To; For commercial entrances, intersections, and “*median*” crossovers (new or to be relocated) proposed for private sector land development projects, the Access Management Regulations specify the documentation to be submitted to justify an exception to the spacing standards “*and access management requirements.*” A request for an exception shall be submitted to the District Administrator or designee using Exception Form AM-1. “*This*” form “*is*” available on the VDOT web site at <http://vdotforms.vdot.virginia.gov/>.

Revised the following language in the first sentence in the first paragraph under “Exceptions/Waivers to the Design Standards” from; “*For both land development and highway construction projects on VDOT owned and maintained roadways only, the appropriate intersection sight distance from Table 2-7 must be met for all commercial entrances, intersections, and crossovers.*”

To; For both land development and highway construction projects on VDOT owned and maintained roadways only, the appropriate intersection sight distance from Table 2-7 must be met for all commercial entrances, intersections, and “*median*” crossovers.

Added the following language in the first sentence in the last paragraph under “Exceptions/Waivers to the Design Standards”; For both private developments and highway construction projects, if any design standard in Appendix F (everything except the spacing standards, “*shared use entrances, cross parcel access, and functional area of intersections*”) cannot be met...

- Page F-30 – Revised language throughout this page (13 places) to add “*median*” in front of crossover/s.
- Page F-31 – Revised language in the first 2 paragraphs on this page (8 places) to add “*median*” in front of crossover/s.

Added the following language to the heading “Signalized and Unsignalized Intersection Design” to read; “*Corner Island Designs (Signalized and Unsignalized Intersection Design)*”.

Added the following language to the second and third paragraph under “Corner Island Designs (Signalized and Unsignalized Intersection Design)”;

For shoulder “(*Rural*)” applications, Figures 2-11 and 2-12 provides the Engineer with the basic types of intersection designs and minimum dimensions, radii, skews, angles, and the types of island separations, etc. “*Also see AASHTO Green Book, Chapter 9, Section 9.6.3, page 9-102, Figure 9-39.*”

For curb and gutter “(*Urban*)” applications see AASHTO's A Policy on Geometric Design of Highways and Streets, Chapter 9, “*Section 9.6.3, page 9-101, Figure 9-38*” (Intersections).

Deleted the following language at the bottom of the page; “*Figures 2-11 and 2-12 are also applicable for intersection designs without sign islands.*”

- Page F-34 – Added the following language to both TABLE 2-5 STOPPING SIGHT DISTANCE and 2-6 STOPPING SIGHT DISTANCE ON GRADES source; 2011 AASHTO Green Book, “*Chapter 3, Section 3.2.2,*” page 3-5.

Revised the language following that is in between TABLE 2-5 STOPPING SIGHT DISTANCE and 2-6 STOPPING SIGHT DISTANCE ON GRADES from; “*When a highway is on a grade, the sight distances in the table below should be used.*” To;
When a highway is on a grade, the sight distances in the table below “*shall*” be used.

- Page F-35 – Added the following language to TABLE 2-7 INTERSECTION SIGHT DISTANCE source; 2011 AASHTO Green Book, “Chapter 9, Section 9.5.3, page 9-37 thru 9-52” Table 9-5 thru 9-14.

Taper rates: Rural - 8:1 for design speeds up to 30 mph and less, 15:1 for design speeds 35 mph and greater. Urban - 8:1 for design speeds up to 45 mph and less, 15:1 for design speeds 50 mph and greater. For urban dual lane taper (150’ min.), See 2011 AASHTO Green Book, Chapter 9.

- Page F-36 – Revised the following language in the first sentence of the first paragraph from; “*Note: Both SDR and SDL must be met at the intersection...*” To; Note: Both SDR and SDL must be met at the “*entrance or*” intersection...

Revised the following language in the first sentence of the fifth paragraph from; “*The Engineer must check each intersection to insure...*” To; The Engineer must check each “*entrance and*” intersection to insure...

Added the following language in the fourth paragraph from; “*For major roadways of more than four lanes, large truck volumes on a minor road or crossover, or median widths...*” To; For major roadways of more than four lanes, large truck volumes on a minor road or “*median*” crossover, or median widths...

Added the following language in the seventh paragraph from; “*The Intersection Sight Distance values in the table above permit a vehicle stopped on a minor road or crossover...*” To; The Intersection Sight Distance values in the table above permit a vehicle stopped on a minor road or “*median*” crossover...

- Page F-37 – Revised the following language to the page heading from; “*Median Opening Crossovers*” To; “*Median Crossovers*”

Added the following language in the first sentence in the second paragraph from; “*The length of the crossover and the shape...*” To; The length of the median crossover and the shape...

Added the following language in the third paragraph from; “*New crossovers must demonstrate...*” To; New “*median*” crossovers must demonstrate...

Added the following language to the sub-heading from; “*Crossover Grades*” To; “*Median Crossover Grades.*”

- Page F-38 – Revised the following language *from*; “**FIGURE 2-13 CROSSOVERS WITH AND WITHOUT CONNECTIONS**” label to add FIGURE 2-13 “**MEDIAN**” CROSSOVERS WITH AND WITHOUT CONNECTIONS.
- Page F-39 – Revised language throughout this page (8 places) to add “*median*” in front of crossover/s.
- Page F-40 – Added the following language after the third sentence in the second paragraph under “Roundabouts” *Roundabouts treat all vehicle movements equally, each approach is required to yield to circulating traffic.*

Deleted the following language at the end of the page; “*Because roundabouts treat all vehicle movements equally (each approach is required to yield to circulating traffic), a roundabout that will serve the intersection of a higher volume major roadway and a lower volume minor street (e.g. principal arterial vs. collector) can cause traffic delays and stopped queues on the major roadway. Consequently, functional classification (hierarchy) of the intersecting roads needs to be assessed when considering the construction of a roundabout.*”

- Page F-41 Added the following language at the end of roundabouts VDOT Policy; “*When a Roundabout(s) is being considered a simulation video is to be shown at the Public Hearing.*”
- Page F-43 –Revised the following language in the second sentence in the second paragraph under “The Approval Process for Roundabouts”; “*Roundabout designs in which the counts are beyond this volume should be submitted to...*” To; Roundabout designs in which the counts are beyond this volume “*shall*” be submitted to...
- Page F-45 – Replaced FIGURE 2-14 ROUNDABOUT DETAILS with a new detail.

- Page F-46 – Added the following language;

Mini-Roundabouts

Mini-Roundabouts are applicable to low-speed environments ≤ 35 miles per hour. Because they adapt to existing boundaries by providing a fully traversable central island, a mini-roundabout can be a low-cost solution for improving intersection capacity and safety without the need for acquiring additional right of way. The suitability of a mini-roundabout depends on:

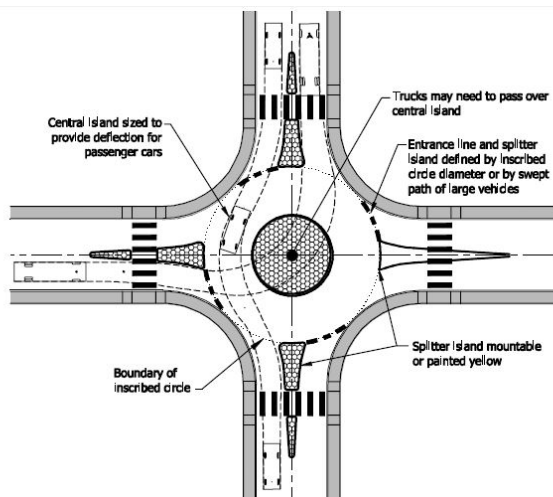
- 1) *Traffic Volumes (comparable ADT from each approach roadway)*
- 2) *Truck Volumes $\leq 5\%$*
- 3) *Frequency of School Bus*

Mini-Roundabouts should meet the following geometric design criteria:

- 1) *Central island of 25 to 50 feet*
- 2) *Circular roadway width of 12 feet
(may be wider for intersections with acute angles)*
- 3) *Central island curb height < 2 inches*
- 4) *Central island cross slope of 12:1 maximum*
- 5) *Approach lanes 10 to 11 feet (to reduce speeds)*

Mini-Roundabouts are designed with a painted “splitter islands” in each quadrant to guide traffic. The majority of traffic (usually estimated at 97%) should be able to pass through the mini-roundabout while staying within the circular roadway. The traversable central island and splitter islands allow larger vehicles to pass through. Mini-Roundabouts can conservatively handle 1,600 VPD (all approaches) while providing an adequate level of service.

*Sources: ITE Journal, November 2013, Article by Lochrane, Zhang and Bared;
Public Roads Magazine, Nov./Dec. 2012, “They’re Small But Powerful” at:
NCHRP Report 672, Roundabouts: An Informational Guide, Second Edition,
Chapter 6, Section 6.6*



- Page F-47 – Revised the following language in the fifth paragraph from; “*Bicycle Facility Guidelines (web link) are presented in Section A-5, Appendix A of The Road Design Manual. Section 2E-3 of this Manual also provides Sidewalk Design Standards (web link) on sheet 7 in the Location & Design Division Instructional and Informational Memorandum IIM-LD-55.11.*” To; “*Bicycle and Pedestrian Facility Guidelines are presented in Section A-5, Appendix A of the Road Design Manual. For information on curb ramps and sidewalks, see IIM-LD-55, Also see MUTCD, Chapter 9, Traffic Control for Bicycle Facilities.*”
- Page F-50 – Revised the following language in the first sentence under “Turn Lane Criteria for Single and Dual lanes” from; “*As a general policy, left-turn lanes are to be provided for traffic in both directions in the design of median crossovers and in for directional median openings...*” To; “*As a general policy, left-turn lanes are to be provided for traffic in both directions in the design of median crossovers and in “one direction” for directional median openings...*”

Revised the following language was added to the “Length of Storage” for Urban; Urban - Length determined by capacity analysis for Left and Right Turn Storage “(100’ Minimum)”

Added the following language to the end of the third paragraph; See 2011 AASHTO Green Book, Chapter 9, “*Section 9.7.1, page 9-127.*”

- Page F-52 – Deleted the following language at the bottom of the page; “*The No. 211 study was undertaken to provide consistent volume warrants for left-turn storage lanes at unsignalized intersections.*”
- Page F-53 – Added the following language to the first sentence in the second paragraph The warrants in table below are taken from the 2011 AASHTO Green Book, “*Chapter 9, Section 9.7.3,*” Page 9-132, Table 9-23.

Deleted the following language under “Warrants for Left Turn Storage Lanes on Two-Lane Highways”; “*The No. 211 study was undertaken to provide consistent volume warrants for left-turn storage lanes at unsignalized intersections.*”

Added the following language to TABLE 3-1 WARRANTS FOR LEFT TURN LANES ON TWO-LANE HIGHWAYS source; 2011 AASHTO Green Book, “*Chapter 9, Section 9.7.3,*” page 9-132 Table 9-23.

- Page F-54 – Added the following language to “FIGURE 3-4 PASSING/LEFT TURN LANE ON TWO-LANE HIGHWAY; Source: 2011 Virginia Work Area Protection Manual, Chapter 6C, Page 6C-7 AASHTO Green Book, Chapter 9,” Section 9.7.2, *page 9-127*” (For turning lane tapers)

- Page F-55 – Added the following language in the first sentence in the third paragraph from; “*For example, intersections with poor visibility...*”
To; For example, intersections “*and entrances*” with poor visibility...

Revised language to LANE/TRANSITIONS, MERGING TAPERS & SPEED CHANGE LENGTHS heading to LANE/”*SHOULDER*”/TRANSITIONS, MERGING TAPERS & SPEED CHANGE LENGTHS

Added additional language to after the first sentence under LANE/SHOULDER/TRANSITIONS, MERGING TAPERS & SPEED CHANGE LENGTHS; “*This also applies to where roadways tie-in to bridges.*”

Added additional language at the end of the page; “*For Permanent Shoulder and Shifting Tapers see 2009 MUTCD, Section 6, Table 6C-3 and 6C-4.*”

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.

Pavement transition is separate from the length of need for guardrail. Length of need and shoulder prep for guardrail shall be in accordance with the VDOT RDM Appendix A and the Road & Bridge Standards.

- Page F-65 – Replaced the following language from; “*For additional information see Highway Research Report Number 211, Volume Warrants for the Left Turn Storage Lanes at Unsignalized Grade Intersections.*” To; “*Source: Highway Research Report Number 211*”.
- Page F-66 – Revised the following language in the second paragraph from; “*When DLTl’s are required, a capacity analysis of the intersection should be performed...*” To; When DLTl’s are required, a capacity analysis of the intersection “*shall*” be performed...

Added the following language after the second paragraph; “*For addition information on Duel Left Turn Lanes see AASHTO “Green Book” Chapter 9, Section 9.7.3.*”

Revised the following language in the second sentence in the first paragraph under “Continuous Left-Turn Lanes” from; “C2WMLTL’s also may be used where an arterial or major route must pass through a developed area having numerous street and driveway intersections, and where it is impractical to limit left turns.” To;
C2WMLTL’s also may be used where an arterial or major route must pass through a developed area having numerous street intersections “*and entrances*”, and where it is impractical to limit left turns.

- Page F-67 – Revised “FIGURE 3-23 DOUBLE LEFT-TURN LANES” to add additional information.
- Page F-69 – Revised language throughout this page (8 places) to replace “median openings” with “median crossover/s”.
- Page F-70 – Revised language throughout this page (4 places) to replace “median openings” with “median crossover/s”.
- Page F-71 – Revised language throughout this page (7 places) to replace “*median openings and directional openings*” with “median crossover/s and directional openings”.
- Page F-76 – Added the following language to the first paragraph under “Acceleration Lanes”; Acceleration lanes shall be considered on high speed *roadways (Design Speed 50 mph and greater)* where WB 62 vehicles will be entering the roadway. *See Figure 3-32.*

Added the following language to the first bullet in the second paragraph under “Acceleration Lanes”; Acceleration Lane: See AASHTO Green Book, “*Chapter 10, Section 10.9.6, page 10-110,*” Table 10-3...

Added the following language at the end of the sentence under “Deceleration Lanes”; Storage and Transition Taper: See Section 3 – Turning Lanes, Figure 3-1 Left and Right Turn Lanes Criteria in this chapter. “*See Figure 3-28, and 3-30.*”

Added the following language at the end of the page;

Bus Pullout

- *See Figure 3-29*

Left Turn Deceleration Lane

- *See Figure 3-31*

- Page F-87 – Revised the following language in the seventh bullet from; “*Entrance location in relation to other traffic features such as intersections, neighboring entrances, and median openings.*” To; Entrance location in relation to other traffic features such as intersections, neighboring entrances, and median “*crossovers.*”

- Page F-90 - Added the following language to “FIGURE 4-3 ELEMENT OF THE FUNCTIONAL AREA OF INTERSECTION; Source: 2011 AASHTO Green Book, “*Chapter 9, Section 9.7.2.*”

- Page F-92 – Revised the following language to the last sentence at the top of the page from; Figure 4-5 presents illustrations of commercial... To; Figure “4-4” presents illustrations of commercial...

Revised the following language from; Figure 4-5 Commercial Entrance Channelization Island Options To; “*Figure 4-4*” Commercial Entrance Channelization Island Options.

- Page F-94 – Revised the following language in the last sentence in the first paragraph from; Figure 4-4 illustrates the concept of corner clearance. To; “*Figure 4-5*” illustrates the concept of corner clearance.

Revised the following language from; Figure 4-4 Corner Clearance To; *Figure 4-5*” Corner Clearance.

- Page F-95 – Revised the following language in the third sentence under “Entrance Connections on Entrances on opposite sides of a roadway from; “Entrances on opposite sides of a roadway shall be offset a sufficient distance to assure that entrance left turning movements do not conflict.” To; “*Unless*” entrances “*are directly across from each other creating a 4 way intersection that meets Table 2-2 intersection spacing, entrances on opposite sides of a roadway*” shall be offset to ensure that entrance left turning movements do not conflict, “*see Figure 3-1 for turn lane and taper criteria.*”