

ROAD DESIGN MANUAL REVISIONS
January, 2016

CHAPTER 1D

- Page 1D-1 – Revised the following language in the first paragraph from; “*PROJECT DEVELOPMENT PROCESS FLOW CHARTS are available that explain the steps listed above. These charts are on the VirginiaDOT.org web site. A link is provided for your information* <http://www.virginiadot.org/business/resources/LocDes/PDCE.pdf>.” To; PROJECT DEVELOPMENT PROCESS FLOW CHARTS are available “*at the following link; <http://www.virginiadot.org/business/resources/LocDes/PDCE.pdf>.*”

Revised the following language in the last paragraph from; “*For Additional Information on Project Development See Project Management Online Guide.*” To; *For additional Information see Project Management Guide Policy at the following link; http://www.virginiadot.org/business/resources/Project_Management_Online_Guide.pdf*

CHAPTER 2D

- Page 2D-11 & 12 – Relocated the following language from Appendix F;
Stopping Sight Distance

Stopping sight distances exceeding those shown in the table below should be used as basis for design wherever practical.

In computing and measuring stopping sight distances, the height of the driver’s eye is estimated to be 3.5 feet and the height of the object to be seen by the driver is 2 feet, equivalent to the taillight height of a passenger car. The “K Values” shown are a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of the vertical curve that will provide minimum sight distance. Crest vertical curves shall meet or exceed AASHTO design criteria for Stopping Sight Distance, not the “k” Values. The “K” values for sag vertical curves take into account the headlight sight distance.

<i>Height of Eye 3.5’</i>	<i>Height of Object 2’</i>										
<i>Design Speed (mph) **</i>	<i>25</i>	<i>30</i>	<i>35</i>	<i>40</i>	<i>45</i>	<i>50</i>	<i>55</i>	<i>60</i>	<i>65</i>	<i>70</i>	<i>75</i>
<i>MIN. SIGHT DISTANCE (FT.)</i>	<i>155</i>	<i>200</i>	<i>250</i>	<i>305</i>	<i>360</i>	<i>425</i>	<i>495</i>	<i>570</i>	<i>645</i>	<i>730</i>	<i>820</i>
<i>MINIMUM K VALUE FOR:</i>											
<i>CREST VERTICAL CURVES</i>	<i>12</i>	<i>19</i>	<i>29</i>	<i>44</i>	<i>61</i>	<i>84</i>	<i>114</i>	<i>151</i>	<i>193</i>	<i>247</i>	<i>312</i>
<i>SAG VERTICAL CURVES</i>	<i>26</i>	<i>37</i>	<i>49</i>	<i>64</i>	<i>79</i>	<i>96</i>	<i>115</i>	<i>136</i>	<i>157</i>	<i>181</i>	<i>206</i>

Source: 2011 AASHTO Green Book, Chapter 3, Section 3.2.2, page 3-4

TABLE 8-1 STOPPING SIGHT DISTANCE

When a highway is on a grade, the sight distances in the table below shall be used.

***For all tables, use design speed if available, if not use legal speed.*

Design Speed (mph) **	Stopping Sight Distance on Grades					
	Downgrades			Upgrades		
	3%	6%	9%	3%	6%	9%
15	80	82	85	75	74	73
20	116	120	126	109	107	104
25	158	165	173	147	143	140
30	205	215	227	200	184	179
35	257	271	287	237	229	222
40	315	333	354	289	278	269
45	378	400	427	344	331	320
50	446	474	507	405	388	375
55	520	553	593	469	450	433
60	598	638	686	538	515	495
65	682	728	785	612	584	561
70	771	825	891	690	658	631
75	866	927	1003	772	736	704

TABLE 8-2 STOPPING SIGHT DISTANCE ON GRADES

(See 2011 AASHTO Green Book, Chapter 3, Section 3.2.2, page 3-5)

***For all tables, use design speed if available, if not use legal speed.*

CHAPTER 2E

- Page 2E-51 – Added the following language in item #2 under “Items needed for Commonwealth Transportation Board (CTB) Approval”; “*Plan sheet(s) with existing Limited Access Line shown, (Provided by the District)*”.

Revised the following language in item #8 under “Items needed for Commonwealth Transportation Board (CTB) Approval” from; “*Copy of the Public Hearing Transcript, (Provided by the District).*” To; Copy of the Public Hearing Transcript, “*Public Hearing Brochure*” (Provided by the District).

- Page 2E-59 – Revised the following language in the first paragraph under “IDENTIFICATION” from; “*This identifier will be (FO) for projects with Federal Oversight and (NFO) for projects with No Federal Oversight.*” To; This identifier will be (FO) for projects with Federal Oversight “*that are Projects of Corporate Interest (PoCI) or Projects of Division Interest (PoDI) as described in the latest FHWA-VDOT Stewardship and Oversight Agreement. The identifier will be (NFO) for projects with no federal oversight.*”

- Page 2E-61 – Revised the following language to the last paragraph under “PROJECT LENGTH TABULATION BLOCK” from; *"Type Code No."- Listing of applicable Type Code Nos. such as "F000", "I000", "K000", etc. are to be shown in the Construction "C", Bridge "B" and Drainage Structures "D" section.* To; *"Type Code No."- Listing of applicable Type Code Nos. such as "F000", "I000", "K000", etc. are to be shown in the Construction "C", Bridge "B" and Drainage Structures "D" section "Only. See Figure 2E-13 for Type Code numbers."*

CHAPTER 2G

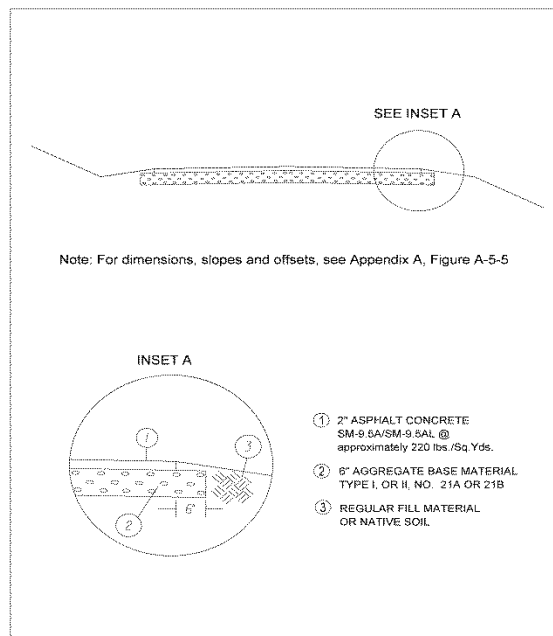
- Page 2G-19 – Revised the following language in the first paragraph under “ROADSIDE DEVELOPMENT” from; *“Quantities relative to Roadside Development and Temporary Erosion and Sediment Control are summarized on the Roadside Development Sheet provided as a CADD file. This is a multi-purpose sheet providing types of seed mixtures, rates of application, and quantities. Quantities relative to temporary Erosion and Siltation Control shall be summarized on the Roadside Development Sheet, with the exception of any necessary outfall pipe, which will be summarized in the drainage summary.”* To; *Quantities relative to Roadside Development and Temporary Erosion and Sediment Control are summarized on the “appropriate” sheet provided as a CADD file.*

APPENDIX “A”

- Page A-27 – Revised clear zone distances in “Table A-2-1 Clear Zone Distances” under “Design Speed” 40 mph or less under “Backslopes” to comply with the July 2015 Errata to the “AASHTO Roadside Design Guide”.
- Page A-69 – Revised the following language under “Bike Lane” from; *Bike Lane - A portion of the roadway designated by striping, signing, and/or pavement markings for preferential or exclusive use of bicycles. On urban projects the bike lane width is the distance from the face of the curb to the bike lane stripe. For VDOT projects, the bike lane stripe will lie 4 feet minimum from the edge of a gutter pan and 5 feet minimum from the face of curb without gutter pan.* To; *Bike Lane - A portion of the roadway designated by striping, signing, and/or pavement markings for preferential or exclusive use of bicycles. On urban projects the bike lane width is the distance from the face of the curb “or front edge of gutter pan” to the bike lane stripe. “Therefore”, the bike lane stripe will lie 4 feet minimum from the “front” edge of “the” gutter pan and 5 feet minimum from the face of curb without gutter pan. “See Figure A-5-2.”*

“Note: Delineating bike lanes within the limits of a required shoulder area is not permitted.”

- Page A-87 – Revised the following language in the first sentence under “Vertical Clearance” from; “*The vertical clearance to obstructions shall be a minimum of 8 feet.*” To; The vertical clearance “*from the shared use path to the bottom of any sign or overhanging vegetation (Trees)*” shall be a minimum of 8 feet “*in accordance with the MUTCD, Part 9 and AASHTO’s Guide for the Development of Bicycle Facilities, 2012, respectively.*”
- Page A-94 – Added the following language under “Pavement Structure”; “*The pavement structure below, Figure A-5-6.1, shall be used and shown on the pavement typical section sheet of the plans unless otherwise directed by the District Materials Engineer. Any additional information, such as changes in pavement depths, treatment of unsuitable materials, etc. shall be provided by the District Materials Engineer. Compaction of the asphalt concrete shall be completed by a minimum of 5 passes of a 8 ton smooth drum roller (no vibration). Asphalt density shall not be measured in accordance with the Roads and Bridge Specifications. This pavement structure typical section can be found in the CADD cell library under the name: Shared-Use Path Pavement Structure.*”
- Page A-95 – Added the following;
FIGURE A-5-6.1 SHARED USE PATH PAVEMENT STRUCTURE



- Page A-124 – Revised the following language in the first sentence under “Height Restrictions” from; “*The vertical clearance from the top of the sidewalk to the bottom of any sign shall be 7 feet minimum in accordance with the MUTCD, Part 2.*” To; The vertical clearance from the sidewalk to the bottom of any sign “*or overhanging vegetation (Trees)*” shall be 7 feet minimum in accordance with the MUTCD, Part 2 “*and AASHTO’s Guide for the Planting, Design, and Operation of Pedestrian Facilities, respectively.*”

APPENDIX “B”

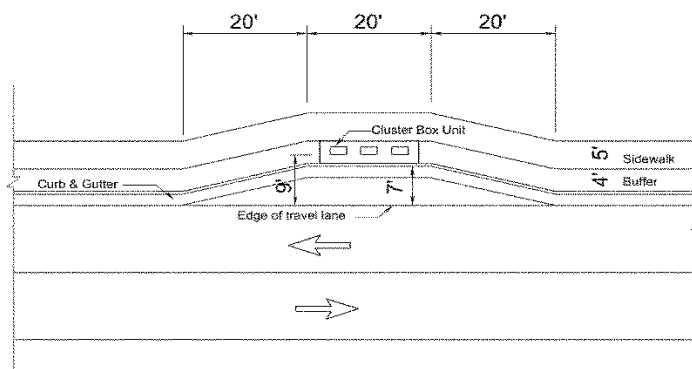
- Page B-45 – Revised the following language in the first sentence under item #7 Curb Extension to add “(Bulb-Outs)”

Added the following language to “FIGURE 15 – CURB EXTENSION DETAIL” to “FIGURE 15 – CURB EXTENSION “(BULB OUTS)” DETAIL”.

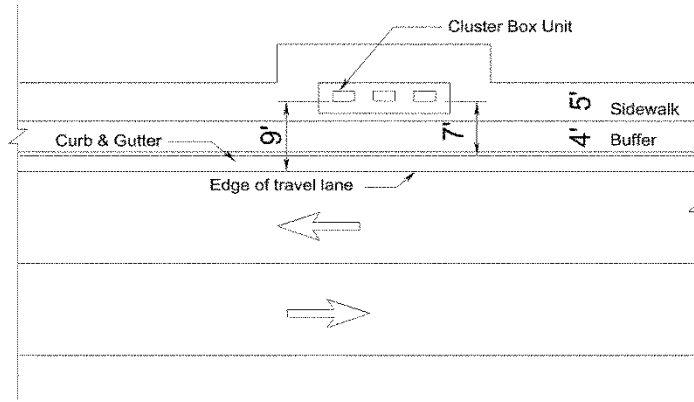
APPENDIX “B(1)”

- Page B(1)-41 & 42 – Added the following language;
“Units (CBUs) may be required by the U.S. Postal Service in subdivisions. If so, the placement of CBUs will be restricted to subdivision streets with design speeds of 30 mph or less and shall be located outside the clear zone (7 feet minimum measured from the face of curb or 9 feet minimum from the edge of travel lane on a shoulder and ditch typical section).

Contact your local USPS representative for USPS Approved Specifications for the Concrete Pad for Single or Multiple Units as well as the CBU orientation (access for USPS delivery and customer) relative to the roadway. CBUs shall be ADA accessible in accordance with IIM-LD-55 (Curb Ramps and Sidewalks). See Details for CBU Turnout and CBU Without Turnout below.”



Detail for Cluster Box Unit Turnout



Detail for Cluster Box Unit Without Turnout

- Page B(1)-43 – Revised “Figure 10 – Setback Details With Curb and Gutter” to add “Lateral Offset and Clear Zone” detail.
- Page B(1)-49 thru 51 – Added the following language “LANDSCAPE CONSIDERATIONS”;
 - d. *Planting Design in the vicinity of Bridge Structures:*

Planting in the roadway environment is a challenge given the competition for space among utilities, drainage systems, bridge structures and other design features of the roadway environment. While these guidelines are intended to provide the designer a palette of plant types that are suitable for planting in proximity to bridge structures in particular, good engineering judgment should always be used when siting trees that takes into account plant form, root structure and ultimate size.

For example, trees with an ascending vase shape crown at maturity would be more suitable than a descending branch pattern where the tree is planted downslope from the roadway (bridge) elevation as not to conflict with the pedestrian space or vehicles crossing the bridge as the tree matures. A tree with a descending branch pattern at maturity should generally be spaced further away. Also of note is the fact that a number of species change from a descending branch pattern to an ascending branch pattern as they mature.

The following table lists trees and evergreens as classified by the American National Standards for Nursery Stock (the Specification reference for VDOT approved plant materials) relative to the recommended set back from the headwall, abutment or bridge parapet of a bridge structure. Tree and plant types not listed below are not subject to a particular setback. Planting designs that deviate from this guideline shall require the use of a continuous 24 inch depth “Root Barrier” parallel to the edge of the bridge structure with at least a two foot offset from the structure.

<i>ANSI Plant Type*</i>	<i>Examples</i>	<i>Minimum</i> Distance from Bridge/Structure
<i>Type 1 Shade Trees</i> (Spreading, pendulous or irregular form)	<i>Quercus phellos; Quercus palustris; Quercus virginiana; Platanus occidentalis; Salix babilonica</i>	20' to center of the Tree ** <ul style="list-style-type: none"> assumes a 40' Diameter spread in 30 – 50 years
<i>Type 1 Shade Trees</i> (vase shape, columnar, oval or rounded form)	<i>Acer rubrum; Betula nigra; Ginko biloba; Liriodendron tulipifera; Zelkova serrata; Ulmus parvifolia</i>	15' to center of the Tree <ul style="list-style-type: none"> assumes a 30' Diameter spread in 30 - 50 years
<i>Type 2 Shade Trees</i> (Spreading or irregular form)	<i>Magnolia grandiflora; Quercus alba; liquidamber styraciflua; Fagus sylvatica</i>	25' to center of the Tree <ul style="list-style-type: none"> assumes a 50' Diameter spread in 30 - 50 years
<i>Type 2 Shade Trees</i> (vase shape, columnar, oval or rounded form)	<i>Aesculus pavia; Koelreuteria paniculata; Magnolia grandiflora upright cultivars (Brackens Brown, Little Gem, etc.); Syringa reticulata; Tilia cordata</i>	15' to center of the Tree <ul style="list-style-type: none"> assumes a 30' Diameter spread in 30 - 50 years
<i>Type 3 Small Upright Trees</i> (small upright or multi-stem)	<i>Acer campestre; Cercis Canadensis; Chionanthus virginicus; Malus and Prunus species</i>	<ul style="list-style-type: none"> Place trees with respect to potential crown growth. ***
<i>Type 4 Small Spreading Trees</i>	<i>Acer palmatum; Cornus florida; Lagerstroemia indica; magnolia stellate, Vitex agnuscastus</i>	<ul style="list-style-type: none"> Place trees with respect to potential crown growth. ***
<i>Type 4 Conifers</i>	<i>Abies concolor; Cedrus deodora; Picea abies; Pinus palustris; Taxus cuspidata</i>	15' to center of the Tree <ul style="list-style-type: none"> assumes a 30' Diameter spread in 30 - 50 years.
<i>Type 5 Broad Upright Conifers</i>	<i>Chamaeyparis pisifera; Juniperus scopuorum 'Wichata Blue'; Taxus media 'Hicksii'; Thuja occidentalis 'Wareana'</i>	6' to center of the Tree <ul style="list-style-type: none"> assumes a 12' Diameter spread in 30 - 50 years.
<i>Type 6 Columnar Conifers</i>	<i>Cupressocyparis leylandii; Juniperus communis 'Suecica'; J. virginiana (columnar var.); Taxus baccata 'Fastigiata'; Thuja occidentalis 'Smaragd'</i>	6' to center of the Tree <ul style="list-style-type: none"> assumes a 12' Diameter spread in 30 - 50 years.
<i>Type 5 or 6 Broadleaf Evergreens</i> (Tree-like varieties only)	<i>Ilex opaca; Ilex attanuata 'foster No. 2'; Ilex x 'Nellie R' Stephens'; Prunus caroliniana</i>	6'-10' to center of the Tree <ul style="list-style-type: none"> depending on the species - assumes a 12' to 20' Diameter spread in 30 - 50 years.

*American National Standards for Nursery Stock (ANSI-Z60.1, most current issue).

http://americanhort.org/documents/ANSI_Nursery_Stock_Standards_AmericanHort_2014.pdf

***Trees whose ultimate crown diameter may exceed 40' in 30 years shall be planted 30' or more based upon projected growth patterns.*

**** The root structure on type 3 and type 4 trees is not a concern with respect to the structural integrity of a bridge foundation.*

APPENDIX “B(2)”

- Page B(2) – 11 Revised the following language in the first paragraph under “STOPPING SIGHT DISTANCE” from; “*Stopping Sight Distance may be used for intersection design for P5 and P6 with Urban Connected Network for streets with design speeds of 35 mph or less as shown in APPENDIX F, TABLE 2-5 STOPPING SIGHT DISTANCE and TABLE 2-6 STOPPING SIGHT DI STANCE ON GRADES. However, Intersection Sight Distance shall be used for all Multimodal Through Corridors.*” To; Stopping Sight Distance may be used for intersection design for P5 and P6 with Urban Connected Network for streets with design speeds of 35 mph or less as shown in “CHAPTER 2D, TABLE 2D-1” STOPPING SIGHT DISTANCE AND “TABLE 2D-2” STOPPING SIGHT DI STANCE ON GRADES. However, Intersection Sight Distance shall be used for all Multimodal Through Corridors.

APPENDIX “F”

- Page F-27 – Revised the following language in “TABLE 2-3 MINIMUM SPACING STANDARDS FOR COMMERCIAL ENTRANCES AND INTERSECTIONS NEAR INTERCHANGE AREAS ON MULTILANE CROSSROADS” from; “*Spacing Dimension*” To; “*Minimum Spacing Standards for Intersections and Commercial Entrances Near Interchange Areas on Multilane Crossroads (These Spacing Standards Apply to Both Signalized Intersections and Commercial Entrances Regardless of the Interchange Configuration)*”.
- Page F-28 – Revised “TABLE 2-4 MINIMUM SPACING STANDARDS FOR INTERSECTIONS AND COMMERCIAL ENTRANCES NEAR INTERCHANGE AREAS ON TWO-LANE CROSSROADS to add the following language; “*(These Spacing Standards Apply to Both Signalized and Unsignalized Intersections and Commercial Entrances Regardless of the Interchange Configuration)*”.
- Page F-29 – Revised the following language in the first sentence in the first paragraph under “Exceptions/Waivers to the Design Standards” from; “*...the appropriate intersection sight distance from Table 2-7 must be met...*” To; “*...the appropriate intersection sight distance from “Table 2D-2 in Chapter 2D” must be met...*”

Revised the following language in the last sentence in the first paragraph under “Exceptions/Waivers to the Design Standards” from; “*...then the minimum stopping sight distance from Table 2-6 must be met.*” To; “*...then the minimum stopping sight distance from “Table 2D-1 in Chapter 2D” must be met.*”

- Page F-34(old) – Relocated the “Stopping Sight Distance” language and tables to Chapter 2D.
- Page F-51 – Relocated the following language from page 69;

Alternative Intersection Design Guides

- *Displaced Left-Turn Intersection – (Also known as Continuous Flow Intersection (CFI), Crossover Displaced Left-Turn Intersection)*
- *Median U-Turn Intersection – (Also Known as Median U-Turn Crossover, Boulevard Turnaround, Michigan Loon and ThrU-Turn Intersection)*
- *Restricted Crossing U-Turn Intersection (Also known as Superstreet Intersection, J-Turn Intersection and Synchronized Street Intersection)*
- *Diverging Diamond Interchange (Also known as Double Crossover Diamond (DCD))*

http://www.virginiadot.org/info/alternative_intersection_informational_design_guides.asp

- Page F-100 – Revised “FIGURE 3-29 TYPICAL APPLICATION OF A BUS PULLOUT” to add additional dimensions to the detail.
- Page F-124 – Revised “FIGURE 4-9 COMMERCIAL ENTRANCE DESIGNS ALONG HIGHWAYS WITH SHOULDERS” to replace language under letter symbol “A” and “B” to read “*See Section 3, Figure 3-1 in this Appendix for lengths of storage and tapers.*”
- Page F-125 – Revised “FIGURE 4-10 COMMERCIAL ENTRANCE DESIGNS ALONG HIGHWAYS WITH CURB AND GUTTER” to replace language under letter symbol “A” and “B” to read “*See Section 3, Figure 3-1 in this Appendix for lengths of storage and tapers.*”
- Page F-127 – Revised “FIGURE 4-12 COMMERCIAL ENTRANCE DESIGNS ALONG HIGHWAYS WITH SHOULDERS AT INTERSECTION” to replace language under letter symbol “A” and “B” to read “*See Section 3, Figure 3-1 in this Appendix for lengths of storage and tapers.*”
- Page F-128 – Revised “FIGURE 4-13 COMMERCIAL ENTRANCE DESIGNS ALONG HIGHWAYS WITH CURB AND GUTTER AT INTERSECTION” to replace language under letter symbol “A” and “B” to read “*See Section 3, Figure 3-1 in this Appendix for lengths of storage and tapers.*”
- Page F-129 – Revised “FIGURE 4-14 COMMERCIAL ENTRANCE DESIGNS TO SERVE DRIVE-IN TYPE BUSINESSES” to replace language under letter symbol “A” and “B” to read “*See Section 3, Figure 3-1 in this Appendix for lengths of storage and tapers.*”