

IMPERIAL ROAD DESIGN MANUAL
REVISIONS July, 2014

CHAPTER 1B

- Page 1B-8 – Added the following definitions;
DETOUR - A detour is a temporary rerouting of road users onto an existing highway.
DIVERSION – A diversion is a temporary rerouting of road users onto a temporary highway.

CHAPTER 2A

- Page 2A-9 – Revised the following language in the forth sentence under “PROJECTING VERTICAL ALIGNMENT” from; “*Sag vertical curves shall meet or exceed the AASHTO design criteria for headlight sight distance and "k" Values.*” To; *Sag vertical curves shall meet or exceed the AASHTO “minimum” "K" Values. “The “K” values for sag vertical curves take into account the headlight sight distance.”*

CHAPTER 2B

- Page 2B-12 – Revised the following language in paragraph three under “VALUE ENGINEER” from; “*Upon receipt of the Initial Field Review and Scoping Report, the Value Engineering Section of the Scheduling and Contract Division will review...*” To; *Upon receipt of the Initial Field Review and Scoping Report, the Value Engineering Section of the “Construction” Division will review...*

CHAPTER 2D

- Page 2D-14 – Revised the following language in the last sentence in the last paragraph under “REFINING VERTICAL ALIGNMENT” from; “*...the Permit Office is to be advised when the project is turned in to the Scheduling and Contract Division. The following information is to be furnished so that permit holders can be notified.*” To; *...the Permit Office is to be advised when the project is turned in to the “Construction” Division. The following information is to be furnished so that permit holders can be notified:*
- Page 2D-15 – Deleted the following language at the end of the sentence under “CREST VERTICAL CURVES”; *(Also see IIM LD- 117).*
- Page 2D-17 – Revised the following language in the third sentence in the second paragraph from; “*Approximate design speeds are to be shown in accordance with IIM LD-117.*” To; *Approximate design speeds are to be shown in accordance with “the information in Appendix A, Section A-1.”*

CHAPTER 2E

- Page 2E-24 – Revised the following language in the second bullet under “Summary” from; *Retaining Wall Excavation should denote the symbol (⊗) for payment on basis of plan quantity as per IIM-LD-135.* To; *Retaining Wall Excavation should denote the symbol (⊗) for payment on basis of plan quantity. “For additional information on plan quantity see Chapter 2G.”*
- Page 2E-26 – Revised the following language in the third paragraph under “SOUND BARRIER WALL DESIGN PROCEDURES” from; *“Special Provisions for the sound barrier wall designed by VDOT engineers are prepared by the Scheduling and Contract Division.* To; *Special Provisions for the sound barrier wall designed by VDOT engineers are prepared by the “Construction” Division.*

Revised the following language in the second sentence in the fourth paragraph under “SOUND BARRIER WALL DESIGN PROCEDURES” from; *“When Standards/Special Design Section is made aware of a need for special provisions, it will coordinate with the Scheduling and Contract Division and...”* To; *When Standards/Special Design Section is made aware of a need for special provisions, it will coordinate with the “Construction” Division and...*

- Page 2E-32 thru 35 – Revised the following language under “DEMOLITION OF EXISTING PAVEMENT AND OBSCURING ROADWAY” from; *“Demolition of pavement and obscuring old road are to be computed and depicted on plans as outlined in IIM LD-47. These items are to be shown on the plans after right of way has been plotted.”* To;

“Demolition of Pavement” is defined as removal of existing pavement structures.

The designer will gather the existing pavement data needed for demolition of pavement. This information will be shown on the summaries or typical sections and denoted on each existing roadway using the symbol for demolition of pavement (hatching). The existing pavement data will consist of the following information:

- *Type of existing pavement structures for all areas to be demolished (i.e cement stabilized, hydraulic cement concrete, asphalt concrete pavement and shoulder structure courses or combinations thereof).*
- *Limits, width, including 1 ft. (0.3 m) extension of pavement structures, if applicable, and depth (depth of pavement structures to include cement stabilized subgrade if present).*

If existing pavement data is unknown and cannot be determined from the “as built” plans, the designer should contact the materials Division and request that the data be included as part of the normal soils report.

The following note is to be placed on plan sheets containing demolition of pavement:

Hatched areas denote areas of demolition of pavement.

Grading Summary

Earthwork quantities are to be adjusted in the grading summary to reflect the removal of the volume of cement stabilized, hydraulic cement concrete or asphalt concrete pavement and shoulder structure courses (based on the width of the widest course) where applicable. If the depth of existing pavement is unknown and cannot be obtained, use 1 foot (0.3 m) to figure this quantity. If the width of the cement stabilized subbase is unknown, add an additional 1 foot (0.3 m) to each side of the existing pavement.

“Obscuring Roadway” is defined as restoring areas, which are no longer needed for highway use.

In order to allow for obscuring shoulders, ditches and slopes, the quantity for Obscuring Roadway is to be estimated at twice the area of pavement located outside the limits of construction. The areas covered under “Obscuring Roadway” are not to be designated by hatching.

The following definitions should be used when establishing pay items for Demolition of Pavement (a special Provision Copied Note is available from the Construction division).

- *Demolition of hydraulic cement concrete pavement will be measured and paid for as Demolition of Pavement (Rigid) S.Y. (m2).*
- *Demolition of asphalt concrete pavement will be measured and paid for as Demolition of Pavement (Flexible) S.Y. (m2).*
- *Demolition of a combination of hydraulic cement concrete pavement and asphalt concrete pavement will be measured and paid for as Demolition of Pavement S.Y. (m2).*
- *Obscuring Roadway will be measured and paid for as Obscuring Roadway in Unit **

** One unit is equal to 1000 ft² (100 m²).*

The following criteria are to be used in establishing the pay items for Demolition of Pavement and Obscuring Roadway.

| INSIDE OF NEW CONSTRUCTION LIMITS | | |
|---|---|----------------------------------|
| TYPE OF PAVEMENT STRUCTURE | DEMOLITION OF PAVEMENT (S.Y. or m²) | OBSCURING ROADWAY (UNITS) |
| CEMENT STABILIZED HYDRAULIC CEMENT AND ASPHALT CONCRETE PAVEMENT AND SHOULDER STRUCTURE COURSES OR COMBINATIONS THEREOF | PAY ITEM | NO PAY ITEM |
| CEMENT STABILIZED, HYDRAULIC CEMENT AND ASPHALT CONCRETE PAVEMENT AND SHOULDER STRUCTURE COURSES LOCATED BEYOND EXISTING PAVEMENT STRUCTURE | PAY ITEM | NO PAY ITEM |
| SURFACE TREATED AND UNTREATED PAVEMENT AND SHOULDERS | NO PAY ITEM * | NO PAY ITEM |

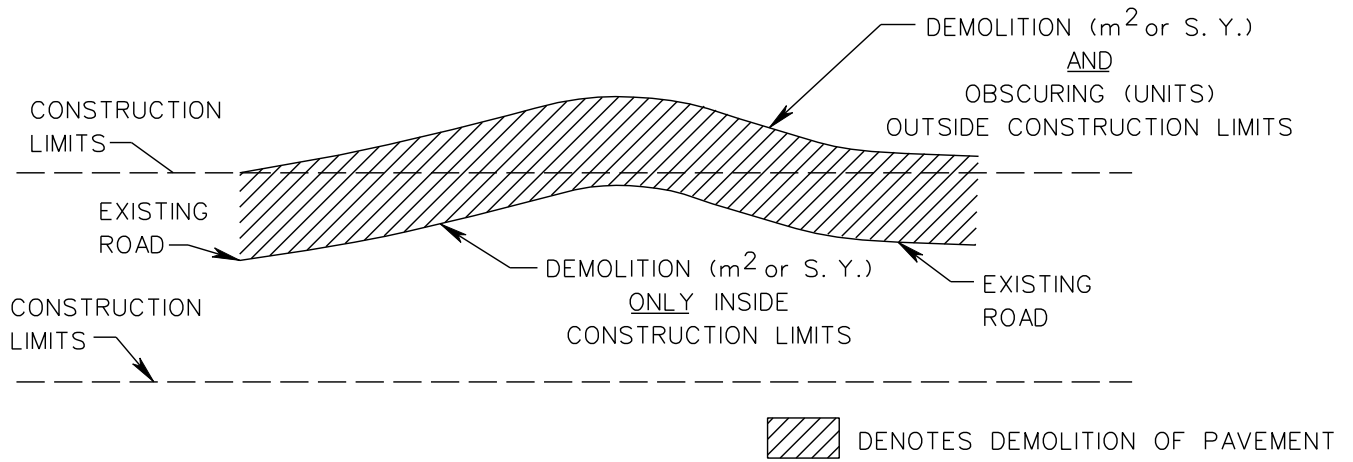
| OUTSIDE OF NEW CONSTRUCTION LIMITS | | |
|--|---|----------------------------------|
| TYPE OF PAVEMENT STRUCTURE | DEMOLITION OF PAVEMENT (S.Y. or m²) | OBSCURING ROADWAY (UNITS) |
| CEMENT STABILIZED, HYDRAULIC CEMENT AND ASPHALT CONCRETE PAVEMENT AND SHOULDER STRUCTURE COURSES OR COMBINATIONS THEREOF | PAY ITEM | PAY ITEM |
| SURFACE TREATED AND UNTREATED PAVEMENT AND SHOULDERS | NO PAY ITEM * | PAY ITEM |

The demolition of cement stabilized, hydraulic cement and asphalt concrete pavement and shoulder structure courses located beyond the existing pavement structure will also be measured for payment.

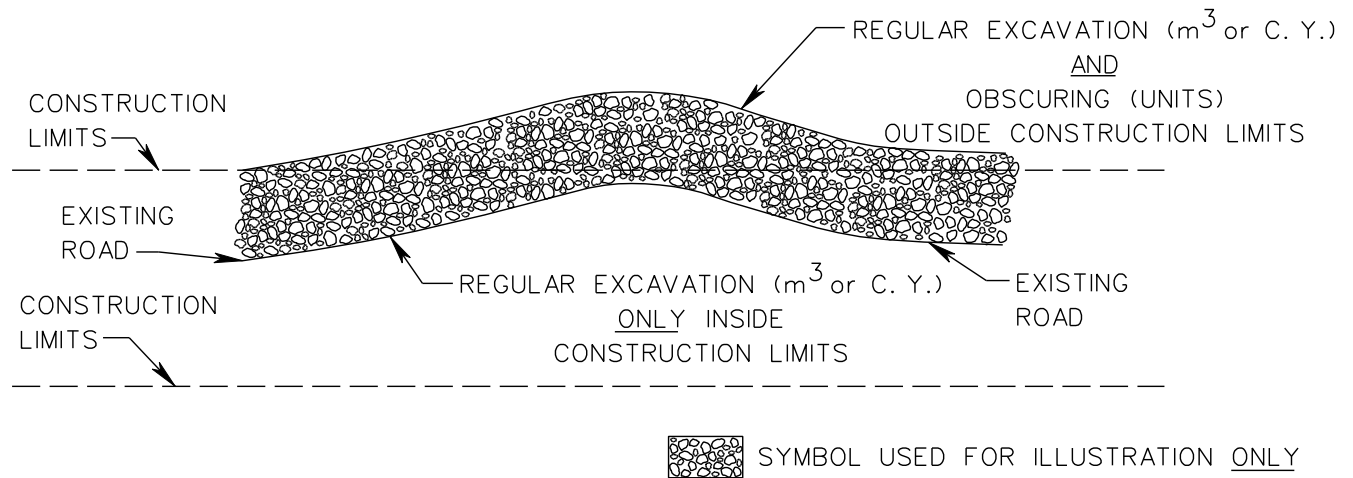
Removal of all pavement and shoulder structures other than cement stabilized, hydraulic cement concrete and asphalt concrete pavement structure courses will be measured as regular excavation in accordance with Section 303 of the Specifications or as lump sum grading on Minimum Plan and No Plan projects.

EXAMPLES

Cement Stabilized/Hydraulic Cement and Asphalt Concrete Pavement



Surface Treated/Untreated Pavement



- Page 2E-38 – Added the following language;

HISTORICAL MARKER RELOCATION

When a project requires the relocation of a historical marker, and the normal typical section does not provide for stopping at the marker (curb and gutter, no shoulder, etc.), a pullover area is to be provided.

Relocation of the marker is to be coordinated with the Environmental Division.

The pullover area is to be 12' X 40' (3.6 m X 12 m) with 50' (15.2 m) tapers.

The pavement design should be the same as the adjacent roadway.

Relocation of the historical marker will be covered by Section 105.15 and 510.01 of the Road and Bridge Specifications.

- Page 2E-50 – Added the following language to the end of “LIMITED ACCESS FENCING”; *“If a limited access highway is subsequently incorporated into the street system of a municipality, the municipality may discontinue any limited access feature including the limited access fencing only with the approval of the CTB. For additional information see AASHTO “An Informational Guide on Fencing Controlled Access Highways”.*”
- Page 2E-68 – Revised the following language in the second sentence under “INDEX OF SHEETS” Sheet No. 1A from; *“(Note: Numbering in the "1" series for Secondary projects must be adjusted to allow for exclusion of the Project Location Map).”*
To; (Note: Numbering in the "1" series “*may need to*” be adjusted to allow for “*the*” exclusion of “*sheet(s), such as*” the Project Location Map).
- Page 2E-78 – Added the following language to the second sentence in the sixth paragraph under “TYPICAL SECTION SHEET(S)” to; Pavement cross slopes for concrete and high type flexible pavement are to be “*normal crown*” (2%) from the inside edge...

CHAPTER 2F

- Page 2F-3 – Added the following;

HAZARDOUS MATERIAL/WASTE SITES

Addressing contamination issues can be both costly and time-consuming and therefore early identification and consideration of location and design alternatives is critical. If contaminated sites cannot be avoided, thoughtful consideration of certain design features such as cut/fill areas and storm water management features can minimize impacts. Such avoidance measures will also help limit the Department's exposure to liability. Such liabilities can be viewed as:

- *Cleanup/site closure requirements that would be mandated by a regulatory agency for contaminated properties that we acquire;*
- *Individual legal claims for personal and/or property damages arising from contamination associated with acquired properties; or*
- *Contribution claims made by other party(s) for the department's involvement in multi-party contamination sites.*

Prior to Field Inspection the Project Manager will request that the District Environmental Manager provide any known areas of significant contamination.

Areas of contamination, as provided by the District Environmental Manager, are to be shown on the plan sheet (hatching, crosshatching, etc.).

The Project Manager, with the assistance of the Survey Manager, shall communicate any findings of the route survey where potential contamination sites were identified, to the District Environmental Manager for further review.

When a potential contamination site is present, the Project Manager will communicate to the District Environmental Manager any substantial changes in grades, alignment, stormwater management features and subsurface utilities, especially those changes made late in project development.

For additional information on Hazardous Material/Waste Sites, see the VDOT Survey Manual, Chapter 4.

- Page 2F-11 – Revised the following language in the third paragraph under “FORMAL REVISIONS-MAJOR CHANGES” from; “... *the Right of Way Division should be advised accordingly as soon as possible in order that they can arrange to clear the desired segment and subsequently certify to the Scheduling and Contract Division that a project is clear for advertisement.*” To; ... *the Right of Way Division should be advised accordingly as soon as possible in order that they can arrange to clear the desired segment and subsequently certify to the “Construction” Division that a project is clear for advertisement.*

CHAPTER 2G

- Page 2G-1 – Revised the following language in the second sentence in the second paragraph under “REVIEWING REPORTS” from; “*The Right of Way Division should be advised accordingly, as soon as possible, in order that they can arrange to clear the desired segment and subsequently can certify to the Scheduling and Contract Division that a project is clear for advertisement.*” To; The Right of Way Division should be advised accordingly, as soon as possible, in order that they can arrange to clear the desired segment and subsequently can certify to the “*Construction*” Division that a project is clear for advertisement.

Revised the following language in the second sentence in the first paragraph under “RESOLUTION OF PENDING CONSTRUCTION DETAILS” from; “*When special design or modified items are called for in the plans, it would be prudent to review these with the Scheduling and Contract Division for inclusion of proper notes or special provisions.*” To; When special design or modified items are called for in the plans, it would be prudent to review these with the “*Construction*” Division for inclusion of proper notes or special provisions.

- Page 2G-3 – Revised the following language in the first and second sentence of the fourth paragraph from; “*Special Provisions for sound barrier walls (designed by VDOT) are prepared by the Scheduling and Contract Division. The Lead Design Engineer will request Standards/Special Design Section to provide the Scheduling and Contract Division with a suggested draft of the provisions.*” To; Special Provisions for sound barrier walls (designed by VDOT) are prepared by the “*Construction*” Division. The Lead Design Engineer will request Standards/Special Design Section to provide the “*Construction*” Division with a suggested draft of the provisions.

Revised the following language in the last sentence of the fifth paragraph from; “*When Standards/Special Design Section is made aware of the need for a Special Provision, it will coordinate with the Scheduling and Contract Division and provide Engineering Development...*” To; When Standards/Special Design Section is made aware of the need for a Special Provision, it will coordinate with the “*Construction*” Division and provide Engineering Development...

- Page 2G-4 – Added the following language;
RAILROAD FORCE ACCOUNT WORK - RAILWAY FLAGGING AND WATCHMAN SERVICE

The Department of Rail and Public Transportation will furnish estimated cost for:

“Railroad Force Account Work”

“Railway Flagging and Watchperson Service”

Designate work appropriately

| <i>Type Project</i> | <i>Railroad Force Account Work</i> | <i>Railway Flagging & Watchperson Service</i> |
|-------------------------|---|---|
| <i>Federally Funded</i> | <i>Participating Item</i> | <i>Participating Item</i> |
| <i>State Funded</i> | <i>Participating or Non-Participating</i> | <i>Participating or Non-Participating</i> |

Show on Incidental Summary Sheet

Railroad Names and Computer Estimate Numbers

Railroad Force Account – Total Estimated Cost (TEC)

| <i>ITEM CODE</i> | <i>PAY ITEM</i> | <i>PAY UNIT</i> |
|-------------------------------|---|-----------------|
| <i>Non-standard Item Code</i> | <i>R/R Force Account</i> | <i>TEC</i> |
| <i>Standard Item Code</i> | <i>Railway Flagging and Watchperson Service</i> | <i>LS</i> |

Fill in the name of the R/R on the second line of the description.

Items on railroad force account should always be coded under group code 6, column 12.

- Page 2G-6 – Revised the following language in the last sentence under item #2 at the bottom of the page from; *“The Scheduling and Contract Division will then incorporate a provision in the proposal...”* To; The *“Construction”* Division will then incorporate a provision in the proposal

- PAGE 2G-7 – Replaced Scheduling and Contract Division with *Construction* Division in two locations under item #3 at the beginning of the page.

Deleted the following language under GRADING DIAGRAM AND SUMMARY; “*The notes shown in the legend should be used to clarify the method of arriving at the individual earthwork totals. Pay items should be designated and plan quantity items specified in accordance with Instructional and Informational Memorandum IIM LD-135. Show the plan quantity symbol for "Roadway Cut" as well as other applicable measured cut quantities in the Grading Summary. Because the "Total Regular Excavation" quantity is subject to change during construction as well as inclusion of some non-plan quantity items, do not show the plan quantity symbol with the "Total Regular Excavation" in the Grading Summary. The plan quantity symbol should not be shown on the "Regular Excavation" quantity in the engineer's estimate if any part of the total includes non-plan quantity items.*

For instructions on computing and summarizing earthwork quantities see IIM LD-138.”

- Page 2G-8 thru 13 – Added the following language;

COMPUTATION AND SUMMARIZATION OF EARTHWORK QUANTITIES

Projects containing Regular Excavation and Borrow as pay items shall have compaction (shrinkage or swell) factors, as furnished by the Materials Division, applied to Regular Excavation and Borrow quantities.

When Regular Excavation is to be paid for on a plan quantity basis, and Embankment is a pay item, the contractor shall be responsible for determining the effect of the shrinkage or swell of the material. Reference VDOT's Road and Bridge Specifications, Section 303.

The Materials Division will generally estimate the shrinkage or swell in each cut and recommend an average shrinkage or swell factor to be used throughout the project. On a project having differing soil types, the Materials Division may recommend more than one factor to be applied to the applicable areas of the project. The Materials Division will recommend a compaction factor for borrow based on average shrinkage or swell for the general vicinity.

In the event that the shrinkage or swell factor is not received from the Materials Division by Preliminary Field Inspection Stage, an estimated factor (as provided by Materials Division) shall be used in the interim.

This procedure has been developed to apply shrinkage or swell to excavation quantities in lieu of fill quantities and should prevent large overruns of Borrow quantities during construction.

PLAN SUMMARY NOTES

The notes shown in the legend should be used to clarify the method of arriving at the individual earthwork totals.

For projects with a pay item for Borrow, the following note is to be shown on the Grading Summary sheet:

“The borrow quantity shown was computed on the basis of the estimated average shrinkage or swell factor for the general vicinity of the project. The contractor will be responsible for determining the actual factor for the site(s) from which he proposes to secure borrow material and shall determine the actual quantity of borrow material needed to complete this project.”

For projects with a pay item for Embankment, the following note is to be shown on the Grading Summary sheet:

“The embankment quantity shown has not been adjusted for shrinkage or swell factors. The contractor will be responsible for determining the effect of the shrinkage or swell factor of the embankment material, and no adjustment will be made in pay quantities for this factor. The contractor shall determine the actual quantity of embankment material needed for complete this project.”

GRADING DIAGRAM AND SUMMARY

In development of the Grading Diagram and Summary it is essential that the project sequence of construction be taken into consideration to avoid specifying use of material which may not be available until a later phase of construction. On complex projects, it may be necessary for the designer to develop rough grading diagrams and summaries for each phase of work to accurately determine the grading effort required. This may include making provision for stockpiling material for phased construction, protecting stockpiled material from moisture, provisions for second hauls, timing of excavation for stormwater management/erosion and sediment control, etc.

The Grading Diagram is to be on a scale that enables the entire limits of the project to be shown on a single sheet, if practicable. Straight line alignment is to be used to graphically depict all baselines on this sheet. List all earthwork quantities (computer, manual, or estimated quantities) on the GRADING DIAGRAM AND SUMMARY Sheet. Cut and fill quantities should be adjusted (for compaction factor, root mat and unsuitable material to be removed) on a print or rough draft. Adjusted cut and fill quantities are not to be shown on the final Grading Diagram.

Symbols shall be used to identify quantities shown in the grading diagram. Notes and formulas (with corresponding letters applied to grading items) shall be shown with the grading summary to demonstrate how earthwork quantity totals were derived. If any of the notes or symbols on the GRADING DIAGRAM AND SUMMARY insertable sheet are not applicable for a particular project they should be deleted or lined through. The same applies for any column in the Grading Summary. If any of the columns are deleted the formulas on the bottom of the sheet should be revised.

In several locations on the insertable sheet (specify material) appears. The designer must fill in the appropriate material in these locations.

The Designer should modify notes as necessary to reflect different conditions applying to his/her particular project.

Pay items shall be designated in accordance with the Engineer's Estimate Item Code Listings.

The plan quantity symbol is to be shown for "Roadway Cut" and other appropriate cut quantities. The "Total Regular Excavation" quantity is subject to change during construction and may include some non-plan quantity items. Therefore, do not show the plan quantity symbol for "Total Regular Excavation" in the Grading Summary. The plan quantity symbol should not be shown on the "Regular Excavation" quantity in the engineer's estimate if any part of the total includes non-plan quantity items.

Fill Quantities

Material removed from locations in fill (root mat, unsuitable material, demolition of pavement) is to be backfilled with Regular Excavation, Borrow material, Embankment, etc.

Include the quantity for backfill with the quantity for roadway fill (if same type material) to obtain the fill quantity needed for applicable locations.

CLEARING AND GRUBBING

Clearing and grubbing as covered in the current Road and Bridge Specifications can be measured and paid for on either of the following:

- lump sum basis
- unit basis

Lump Sum

Unlike previous Specifications for this method of payment, this method now necessitates a work order for any change in the limits of clearing and grubbing.

Unit

Payment by this method is applicable to removal of isolated tress, stumps or structures on very small projects or urban projects. The number of units paid for will be determined by the actual count of trees, stumps, structures, etc. to be removed.

Summarize units of Clearing and Grubbing with description as shown below.

| UNITS OF CLEARING AND GRUBBING | | |
|---------------------------------------|-----------------------|--------------------|
| <i>PLAN SHEET</i> | <i>LOCATION</i> | <i>DESCRIPTION</i> |
| 3 | Sta. 30 + 00, 20' Rt. | 36" Oak Tree |
| 4 | Sta. 39 + 25, 10' Lt. | 12" Pine Tree |
| 5 | Sta. 41 + 50, 15' Rt. | 24" Pipe |

Usable Cut Quantities

To obtain usable cut to make fills, subtract root mat and/or unsuitable material above subgrade from individual cut quantities. Then, for borrow projects, apply shrinkage or swell factor received from Materials Division. The resulting quantity will be usable cut.

Earthwork Hauls

In diagramming earthwork hauls, care must be taken to specify only usable materials, which are available for use in the same stage of construction, and not materials, which will be needed in a different phase of work.

Usable excavation should be hauled the shortest distance possible to make fills. Balance points should be established and locations that require additional material (Borrow or Embankment) should be held to a minimum.

Haul material shown in grading diagram is C.Y. of non-compacted material.

EARTHWORK COMPUTATIONS (PAY ITEM FOR BORROW)

Example Roadway #1: Compaction Factor of 20% Shrinkage

Fill (Measured) = 5,000 C.Y.

Cut (Measured) = 5,000 C.Y.

Cut (Adjusted) = (5,000 C.Y. x 80%) = -4,000 C.Y.

**Borrow (Measured) = 1,000 C.Y.*

**To comply with the plan note for borrow material this quantity must be converted to measured cut to meet borrow requirements. The compaction factor as furnished by the Material Division must be applied to determine the computed borrow as follows:*

Sample Borrow Site: Compaction Factor of 20% Shrinkage

Borrow (Measured) = 1,000 C.Y.

*Borrow (Computed) = (1,000 C.Y. ÷ 80%) = 1,250 C.Y. ***

-or-

Sample Borrow Site: Compaction Factor of 20% Swell

Borrow (Measured) = 1,000 C.Y.

*Borrow (Computed) = (1,000 C.Y. ÷ 120%) = 833 C.Y. ***

*** This is the measured cut required to meet borrow requirements.*

Example Roadway #2: Compaction Factor of 20% Swell

| | |
|---|---------------------------|
| <i>Fill (Measured) =</i> | <i>5,000 C.Y.</i> |
| <i>Cut (Measured) =</i> | <i>5,000 C.Y.</i> |
| <i>Cut (Adjusted) = (5,000 C.Y. x 120%)</i> | <i><u>-6,000 C.Y.</u></i> |
| <i>Surplus (Adjusted) =</i> | <i>1,000 C.Y.</i> |

EARTHWORK COMPUTATIONS (PAY ITEM OF EMBANKMENT)

| | |
|---------------------|---------------------------|
| <i>Fill</i> | <i>10,000 C.Y.</i> |
| <i>Cut (usable)</i> | <i><u>-4,000 C.Y.</u></i> |
| <i>Embankment</i> | <i>6,000 C.Y.</i> |

Fill quantity includes mainline, connections, entrances, etc., plus any area such as material removed from below fill that needs to be replaced.

Cut (usable) includes plan and non-plan quantity minus any unsuitable material.

COMPUTATIONS FOR GRADING DIAGRAM:

Example: Compaction Factor of 18% Shrinkage

Right Side of Roadway

| | |
|--------------------------|---|
| <i>3679 C.Y.</i> | <i>cut (measured)</i> |
| <i><u>- 561 C.Y.</u></i> | <i>rootmat in cut (unusable material)</i> |
| <i>3118 C.Y.</i> | <i>usable excavation (measured)</i> |
| <i><u>x 0.82</u></i> | <i>(18% Shrinkage factor)</i> |
| <i>2557 C.Y.</i> | <i>usable excavation (adjusted)</i> |

| | |
|-------------------------|---|
| <i>395 C.Y.</i> | <i>fill (measured)</i> |
| <i><u>+141 C.Y.</u></i> | <i>rootmat in fill (to be backfilled)</i> |
| <i>536 C.Y.</i> | <i>fill (measured)</i> |

| | |
|-------------------------|---|
| <i>2557 C.Y.</i> | <i>usable excavation (adjusted)</i> |
| <i><u>-536 C.Y.</u></i> | <i>fill (measured)</i> |
| <i>2021 C.Y.</i> | <i>extra usable excavation (adjusted)</i> |

| | |
|-------------------------|---|
| <i><u>2021 C.Y.</u></i> | <i>usable excavation (adjusted) = 2465 C.Y. haul (measured)</i> |
| <i>0.82</i> | |

Left Side of Roadway

177 C.Y. cut (measured)
-177 C.Y. rootmat in cut (unusable material)
0 C.Y. usable excavation

4093 C.Y. fill (measured)
+198 C.Y. rootmat in fill (to be backfilled)
4291 C.Y. fill (measured)

2465 C.Y. haul (measured)
x 0.82
2021 C.Y. haul (adjusted)

4291 C.Y. fill (measured)
-2021 C.Y. haul (adjusted)
2270 C.Y. Borrow (measured)

Computation Factor for Borrow Site = 18%

$$\frac{2270 \text{ C.Y.}}{0.82} = 2768 \text{ C.Y. Borrow Material (computed)}$$

INSERTABLE SHEET

See Insertable sheet number A-71 GRADING DIAGRAM AND SUMMARY. This sheet contains standardized notes, formulas and symbols applicable to a typical Grading Summary. Designers should use only notes, which are applicable to their project.

The insertable sheets are available on Falcon/DMS, eng-ser, file name "minsert" (Metric) or "insert" (Imperial) for insertion into applicable plan assemblies.

- Page 2G-14 & 15 – Added the following language;
PLAN QUANTITIES- DETERMINATION OF PLAN QUANTITIES

Plan quantities are items that are not likely to vary as a result of field conditions.

In accordance with Section 109.02 of the Road and Bridge Specifications, items designated in the Contract as plan quantity will not be field measured, but will be paid as the quantity shown on the plans. Therefore, quantities shown as plan quantities should be carefully selected.

Attached is a list of items that, under normal design and project conditions are commonly considered for designation as plan quantity items. Any item, whether on the example list or not, may be designated as a plan quantity item only after consultation with the District Construction Engineer or his designee.

Plan quantity items are paid for based on the exact quantities shown on the plan summaries as plan quantities, whereas other items shown in the summary are estimated quantities and are paid for as measured in the field.

If the Contractor believes there is an error in a plan quantity figure, he may request that the Department check the computations by furnishing evidence and computations supporting his belief along with a written request for review (See Section 109.02 of the Road and Bridge Specifications.)

Should the Department determine at any time that an actual measurement is warranted, the Department will make the necessary measurements in the field. Payment will then be based on the measured quantity instead of the plan quantity originally shown on the summary.

If during the design of a project, and after consultation with the District Construction Engineer or his designee, it is determined that conditions vary too much to pay for an item by plan quantity, then the plan quantity symbol should not be used indicating the plan summary reflects estimated quantities and payment would be based on actual quantities measured in the field.

Plan Summaries

All plan summaries are to show a symbol (⊗) by the appropriate plan quantity totals with the following note:

"Denotes item(s) to be paid for on the basis of plan quantities in accordance with the applicable provisions of the current Road and Bridge Specifications."

Note to designers: It will no longer be necessary to designate and code plan quantity items when preparing the Engineer's estimate. The plan quantity symbol will not appear as a margin code in the Schedule of Items in the bid proposal.

- Page 2G-18 – Revised the following language in the last paragraph under “AGGREGATE BASE MATERIAL” from; “If there is any question about the usage of nomenclature of a material, the designer is to contact the Materials and Scheduling and Contract Divisions for clarification.” To; If there is any question about the usage of nomenclature of a material, the designer is to contact the Materials and “Construction” Divisions for clarification.

Revised the following language in the last sentence under “COAL TAR PITCH EMULSION” from; “A special provision will be included in the project assembly by the Scheduling and Contract Division.” To; A special provision will be included in the project assembly by the “Construction” Division.

- Page 2G-19 thru 23 – Added the following language;
The Roadside Development Sheet and the Erosion Control Summary Sheet are to be included in project plan assemblies.

The Roadside Development Summary will indicate the Maintenance Division’s recommended seed mixtures, and estimated quantities for Topsoil, Seeding (Regular and Legume), Fertilizer and Lime.

Seed additives (e.g. foxtail millet) are paid for as Regular Seeding except Crown Vetch, Sericea Lespedeza and Birdsfoot Trefoil

Seed mixture recommendations may at times deviate from the seed mixture guidelines on the Roadside Development Sheet. The District Roadside Manager will provide recommendations for the application of seed mixtures (core mix and additives), fertilizer, lime, etc.

SPECIAL INSTRUCTIONS

The approximate area (acres or hectares) to be disturbed will be shown under “Notes” on the Roadside Development Sheet. This area is not to be expanded for estimating purposes.

Notes on the Roadside Development Sheet marked by a star are for the use of field forces only. The Designer is not to use any percentages shown under “Notes” on the Roadside Development sheet when computing quantities.

MULCH

Roadside Development involves two categories of mulch as follows:

- *Seeding Mulch, Type I or II is applied in the field with the seed mixture. This mulch is included in the price for the regular seeding and is not summarized in the plans.*
- *Erosion Control Mulch is summarized on the Erosion Control Summary Sheet when recommended by the Maintenance Division. This material is estimated at the rate of 1,210 S.Y. (0.25 acres) per 100 feet of alignment or 0.332 hectares (3,319 m²) per 100 meters of roadway alignment).*

LEGUME SEEDING

The seed mixes available for roadside development include three “Legume” seeds, Crown Vetch, Sericea Lespedeza and Birdsfoot Trefoil specified as additives “E, F, and G” on the Roadside Development Sheet.

These Legume seeds are used only on slopes 3:1 or greater and are not used on shoulders or other locations to be mowed.

Legume Seed, and Legume Overseeding are to be summarized for separate payment.

Whenever the Maintenance Division specifies any of these Legume seeds, the mowable areas on the project (slopes flatter than 3:1) and non-mowable areas (slopes 3:1 and greater) must be measured separately in order to accurately summarize the seeding requirements.

ESTIMATING QUANTITIES

If the lime application rate is not provided by the Maintenance Division, the Designer should estimate the Normal Lime Quantity based on 2 tons per acre (5 metric tons per hectare).

If the fertilizer application rate is not provided by the Maintenance Division, the Designer should estimate the Normal Fertilizer Quantity based on 300 pounds per acre (336 kilograms per hectare).

The seed mixtures (core mix plus additives) shown on the Roadside Development Sheet are weights per acre (or hectare) of disturbed area. These quantities may vary for each construction season.

The Designer is advised to:

1. Determine the disturbed area to be seeded.
2. Determine the application rate for the sloped and mowed areas shown for each construction season.

Example for Seed Mix 2E:
100 lbs. Core Mix + 20 lbs. Additive = 120 lbs.

3. The greatest seeding rate is assumed to be the “Normal” Seeding rate.

Example for 10 acre area:

MIX REQUIREMENTS ON THIS PROJECT

| PROJECT NUMBERS | SLOPES | MOWED | SLOPES | MOWED | SLOPES | MOWED |
|-----------------|---------------|----------|---------|----------|--------------------|----------|
| | SPRING & FALL | | SUMMER | | LATE FALL & WINTER | |
| 0123-123-103 | 2E | 2B | 3A | 3A | 4B | 4B |
| | 120 LBS. | 120 LBS. | 110 LBS | 110 LBS. | 120 LBS. | 120 LBS. |

The Normal Seeding rate = 120 lbs. per acre.
120 lbs. x 10 acres of disturbed area = 1200 lbs. “Normal” Seeding Quantity

When a legume seed additive is specified (Crown Vetch, Sericea Lespedeza or Birdsfoot Trefoil) the sloped areas and mowed areas must be measured separately when summarizing seeding quantities.

1. Determine the flat (less than 3:1) areas and sloped (3:1 and greater) areas to be seeded.

Example: 10 acres of mowed areas; 5 acres of sloped areas.

2. Determine the application rate for the mowed areas.

Example for "Seed Mix 2B": 100 lbs. Core Mix + 20 lbs. Additive = 120 lbs.

3. Determine the application rate for the sloped areas:

Example for Seed Mix 2E: Core Mix "2" = 100 lbs.; Additive E" = 20 lbs.

4. Determine the quantities of Regular Seed and Legume Seed.

Example for mowed area (Seed Mix 2B):

Core Mix 100 lbs. + 20 lbs. = 120 lbs. x 10 acres = 1200 lbs. Regular Seed

Example for sloped areas (Seed Mix 2E):

100 lbs. x 5 acres = 500 lbs. Regular Seed

20 lbs. x 5 acres = 100 lbs. Legume Seed

The "Normal" quantities for lime, fertilizer, and seeding are based on the actual area to be disturbed. The "Normal" quantities are to be increased by the following percentage factors to obtain the quantity to show in the summary:

- Lime = Normal Quantity increased by 90%
- Fertilizer (15-30-15) = Normal Quantity increased by 90%
- Regular Seed = Normal Seeding Quantity increased by 60%
- Overseeding = 100% of Normal Seeding Quantity (no mulch or fertilizer)
- Legume Seed = Normal Seeding Quantity increased by 60%
- Legume Overseeding = 100% of Normal Seeding Quantity (no mulch or fertilizer)

Examples for determining quantities to summarize:

20 tons "normal" Lime x 1.90 (or 190%) = 38 tons Lime

3 tons "normal" Fertilizer x 1.90 (or 190%) = 5.7 or 6 tons Fertilizer

1700 lbs. "normal" Seeding x 1.60 (or 160%) = 2720 lbs. Regular Seeding

1700 lbs. "normal" Seeding (@ 100%) = 1700 lbs. Overseeding

100 lbs. "normal" Legume Seeding x 1.60 (or 160%) = 160 lbs. Legume Seed

100 lbs. "normal" Legume Seeding (@ 100%) = 100 lbs. Legume Overseeding

REVIEW BY MAINTENANCE DIVISION

The Roadside Development Sheet is to be reviewed by the Maintenance Division prior to submission of the plan assembly for construction.

Anytime the current Roadside Development Sheet is replaced by a revised Roadside Development Sheet, the District Roadside Manager should be requested to determine the need for any changes in seed mixes, quantities, etc.

INSERTABLE SHEETS

The Imperial Roadside Development Sheet may be accessed from the [sheet2000.cel](#) library in Microstation.

- *A-4 Roadside Development Sheet (RDSDEV)*

The Metric Roadside Development Sheet may be obtained through the insertable sheet directory on Falcon DMS.

- *Special Design Section Drawing No. MA-4 (Metric)*

The Imperial Erosion Control Summary Sheet may be accessed from the [sheet2000.cel](#) library in Microstation.

- *A-5 Erosion Control Summary Sheet (ECSUM)*

The Metric Erosion Control Summary Sheet may be obtained through the insertable sheet directory on Falcon DMS

- *Special Design Section Drawing No. MA-5 (Metric)*

- Page 2G-24 – Replaced the following language from “Detours” with “Diversions” in 6 locations.
- Page 2G-25 – Replaced the following language from “Detours” with “Diversions” in 4 locations.
- Page 2G-26 – Revised the following language in the last sentence under ”INTEGRATED PROJECT MANAGER” from; “After final submission of the project to the Scheduling and Contract Division...” To; After final submission of the project to the “Construction” Division...
- Page 2G-27 – Replaced Scheduling and Contract Division with *Construction* Division in four different locations under “PREPARATION OF CONSTRUCTION COST ESTIMATE”.

- Page 2G-31 – Revised the following language in the first sentence in the second paragraph under “GOVERNMENT STREAM GAGING STATIONS” from: “*When plans have been submitted to the Scheduling and Contract Division for advertisement...*” To;

Replaced Scheduling and Contract Division with *Construction* Division in three different locations under “POST-CERTIFICATION PLAN CHANGES”.
- Page 2G-32 – Replaced Scheduling and Contract Division with *Construction* Division in three different locations under “BID PROPOSAL”.
- Page 2G-36 – Replaced Scheduling and Contract Division with *Construction* Division in six different locations under “FORMAL CONSTRUCTION REVISIONS”.
- Page 2G-37 – Revised the following language in fifth paragraph from; “*During the life of a construction project, all construction revisions that will affect the final contract cost must be approved by the Scheduling and Contract Division before revising the plans.*” To;
During the life of a construction project, all construction revisions that will affect the final contract cost must be approved by the “*Construction*” Division before revising the plans.
- Page 2G-47 – Added “FIGURE 2G-3 SAMPLE GRADING DIAGRAM AND SUMMARY SHEET.”

APPENDIX “A”

- Page A-3 – Added the following language after the first paragraph under “DESIGN SPEED”; “*Except for local streets where speed controls are frequently included intentionally, every effort should be made to use as high a Design Speed as practical to attain a desired degree of safety, mobility, and efficiency within the constraints of environmental quality, economics, aesthetics, and social or political impacts.* (See 2011 AASHTO Green Book, Chapter 2).”
- Page A-4 thru A-7 – Added the following language under “DESIGN SPEED”;
The minimum Design Speed shall be based on the following criteria:
 - 1) *For roadways with a Posted Speed:*
 - a) *For high-speed designs (50 mph and greater) Design Speed shall be a minimum of 5 mph greater than the Posted Speed.*
 - *Example - Design Speed 60 mph – Posted Speed 55 mph*
 - b) *For low-speed designs (45 mph and less) Design Speed shall be equal to or greater than Posted Speed.*
 - *Example - Design Speed 40 mph – Posted Speed 40 mph*

2) For unposted roadways: Design Speed shall be equal to Statutory Speed or 85% percentile speed (based on speed analysis, rounded up to nearest 5 mph increment).

3) Roadways with ADT < 400, see the VDOT Road Design Manual, Appendix B(1), Tables 1 through 3 and AASHTO's "Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400)".

Whenever VDOT criteria (provided above in cases 1-3) are not met, a design waiver is required to document the design speed.

A Design Exception is required if AASHTO minimum design speeds for individual geometric elements are not met.

Additional information is available in NCHRP Report 504 "Design Speed, Operating Speed and Posted Speed Practices", at:

http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_504.pdf.

For the determination of the roadway posted speed limits, the plans are to indicate the Design Speed (V) of each horizontal and vertical (crest and sag) curve along with the horizontal and vertical curve data.

The Design Speeds (V) are to be determined as follows:

- Crest Vertical Curves

- See "Sight Distance on Crest Vertical Curves" (VDOT's Road & Bridge Standards, Section 600) to determine sight distance parameters.

- See 2011 AASHTO Green Book "Crest Vertical Curve" criteria, pages 3-151 through 3-157 to determine the Design Controls.

- Sag Vertical Curves

- See 2011 AASHTO Green Book "Sag Vertical Curve" criteria, pages 3-157 through 3-161 to determine the Design Controls.

Horizontal Curves

- The appropriate Transition Curve Standard (TC-5.01R, TC-5.01U, or TC-5.04ULS, TC-5.11R, TC-5.11U, or TC-5.11ULS) from VDOT'S Road and Bridge Standards, Section 800, provides the Design Speed (V) for horizontal curves (based on the radius of curvature (R) and the superelevation rate (E) provided by GeoPak.

SHOWING DESIGN SPEED (V) FOR HORIZONTAL CURVES ON PLANS

The Design Speed shown on the plans for each horizontal curve is not necessarily the Minimum Design Speed shown on the Title Sheet.

GEOPAK supplies the superelevation dependent upon the input (urban/rural, radius, etc.) for each curve but does not provide the design velocity.

Designers shall determine the Design Speed (V) for each curve. This data is to be shown on the plans in the horizontal curve data for each curve.

Example:

Title Sheet:

*Urban Principal Arterial (TC-5.11U - 2011 AASHTO Green Book)
45 mph Minimum Design Speed*

Horizontal Curve on plans:

*Radius = 1533'
Superelevation = 3.3% (provided by GEOPAK)
V = ?*

- 1. To verify the velocity of the horizontal curve compare project radius and superelevation with Design Factors Charts in Section 800 of the Road and Bridge Standards.*
- 2. Start with Section 802.30 TC-5.11U for given Design Speed shown above (45 mph).

⇒ Chart shows that a curve with 3.3% superelevation and radius of 1446' will support a velocity of 45 mph. The radius on the plans is greater than 1477' (1533').*
- 3. Go to Section 802.31 (50 mph Design Speed).

⇒ Chart shows that a curve with 3.3% superelevation and radius of 1857' will support a velocity of 50 mph, but the radius on the plans is less than 1857' (1533').*
- 4. Therefore, the project radius and superelevation will not support a 50 mph design velocity. The more conservative V = 45 mph shall be shown on the plans as the velocity of the curve.*

A Design Exception is required whenever the curve radius and superelevation do not support the minimum design speed. (See IIM-LD-227 for information on Design Exceptions.

ADDITIONAL RESOURCES

*Transportation Research Board, NCHRP Report 504, Design Speed, Operating Speed, and Posted Speed Practices, available at:
http://trb.org/publications/nchrp/nchrp_rpt_504.pdf.*

2004 AASHTO Green Book, "Speed", Chapter 2.

NS 23 CFR 625 available at:
<http://www.fhwa.dot.gov/legregs/directives/fapg/0625sup.htm>

The Federal Aide Policy Guide (FAPG)

“Compatibility of Design Speed, Operating Speed and Posted Speed” (1995 - By FHWA and TXDOT)

ITE’s “Speed: Understanding Design, Operating and Posted Speed” (1997 - By Ray Krammes (FHWA) and Kay Fitzpatrick (TTI))

Manual on Uniform Traffic Control Devices (MUTCD, 2009 Edition)

- *Note that the statutory speed limit is 55 mph for cars and 45 mph for trucks with the following exceptions: 25 mph in residence and business districts; 35 mph in cities and towns; 35 mph on Rural Rustic Roadways; 35 mph on nonsurface-treated highways. See the Code of Virginia (Speed Limits). As of July 1, 2014 nonsurface-treated highways speed limit shall be 35mph in accordance with the Code of Virginia §46.2-873.1.*

SHOWING DESIGN SPEED ON TITLE SHEET

See the current version of Instructional and Informational Memorandum IIM-LD-204 for the method of showing design speed data on the plans.

*An asterisk is to be shown adjacent to the Design Speed (Example - * 60 MPH) on the title sheet and the following note shown:*

** See Plan and Profile Sheets for the horizontal and vertical curve design speeds.*

OPERATING SPEED

Operating Speed is the speed at which drivers are observed operating their vehicles during free-flow conditions. The 85th percentile of the distribution of observed speeds is the most frequently used measure of the operating speed associated with a particular location or geometric feature of a highway, or highway segment.

POSTED SPEED

The Posted Speed for existing, new or reconstructed roadways should be determined by factors outlined in the MUTCD, Section 2B.13. The MUTCD requires that an engineering study be conducted in accordance with established engineering practice. VDOT has a standard study template for developing speed limit recommendations which incorporates the MUTCD, Section 2B.13 as well as other considerations pertaining to VDOT’s decision-making process for speed limit approvals, including enforcement consensus.

After a project is constructed, the Regional Traffic Engineer will re-establish the speed limit based on established traffic engineering policies. An engineering study will be performed as needed in accordance with documented traffic engineering practices.

It is important to note that the Design Speed shown on the project title sheet may not be the same as the Design Speed of the individual geometric elements. Each curve on the project (horizontal and vertical) should show a Design Speed for that particular feature. Although these curves may present isolated instances where the physical roadway dictates the speed of vehicles, they shall not be the sole basis for determining the posted speed limit. It is more appropriate to address these locations by warning signs. It is only where the physical roadway features dictate the speed of the vehicles on extended sections, for a major portion of the roadway that they should be considered as a limiting factor in setting the speed limit. Such limitations in speed due to physical features will become apparent in the speed analysis conducted as part of the engineering study.

For design criteria and instructions on signing roadways with a design speed < 25 mph, see the VDOT Road Design Manual, Appendix B(1), Tables 1 through 3 and AASHTO's "Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT ≤ 400).

- Page A-21 – Revised the following title to “Figure A-1-11” from; “Geometric Design Standards for Temporary Detours (GS-10)” to; “Geometric Design Standards for Temporary Diversion (GS-10)” and the language in the detail from; “Minimum Design Criteria Temporary Detours” to; “Minimum Design Criteria Temporary Diversion”.

Revised “Figure A-1-11 Geometric Design Standards for Temporary Diversion (GS-10)” to revise the minimum radii for 20, 30 & 40 mph in the Geometric Table and updated the TC standard from TC-5.01R to TC-5.11R.

- Page A-22 – Revised “Figure A-1-12 Geometric Design Standards for Shoulder Design (GS-11)” to add “Max.” to “7% Alg. Diff.” and to add “(Over 2%)” to “High Side Superelevation”.
- Page A-37 – Removed all information in Section A-3 Traffic Barrier Installation Criteria and created a new Appendix I in the RDM and replace with the following; “This information is now located in Appendix I in the Road Design Manual”.
- Page A-66 – Deleted the following language in the first paragraph under “PLANNING AND DESIGN BICYCLE FACILITIES”; “The Transportation and Mobility Planning Division will recommend to the road designer the inclusion of a bikeway on a particular project.”

Added the following language to the second sentence under “PLANNING AND DESIGN BICYCLE FACILITIES” from; “The District, Transportation and Mobility Planning Division, Locality and other interested parties will provide input.” To; The District, Transportation and Mobility Planning Division, Locality and other interested parties will provide input “on the inclusion of a bikeway on a particular project.”

- Page A-95 – Added the following language under “SOURCES”; 2012 NATCO “*Urban Bikeway Design Guide*”, Second Edition
- Page A-101 – Added the following language (Web sites) to “Rails with Trails”;
For additional information on Rails-With-Trails;
https://www.fhwa.dot.gov/environment/recreational_trails/publications/rwt/index.cfm and
<http://www.railstotrails.org/ourWork/reports/railwithtrail/report.html>
- Page A-102 thru A-122 – Restructured and rewrote portions of the “Curb Ramp and Pedestrian Access Route” portion under Section 5 – Bicycle and Pedestrian Facility Guidelines.
- Page A-135 – Revised the following language in the last sentence in the second paragraph from; “*Form C-99 should indicate an estimate of grading quantities, including anticipated waste quantities, to guide the Scheduling and Contract Division in preparing the construction cost estimate.*” To; Form C-99 should indicate an estimate of grading quantities, including anticipated waste quantities, to guide the “*Construction*” Division in preparing the construction cost estimate.

Revised the following language in the seventh paragraph from; “*The Central Office Location and Design, Utilities Section will obtain any necessary FHWA authorization for utility work and will furnish utility clearances and estimates to the Scheduling and Contract Division for contract projects with federal funding.*” To; The Central Office Location and Design, Utilities Section will obtain any necessary FHWA authorization for utility work and will furnish utility clearances and estimates to the “*Construction*” Division for contract projects with federal funding.

- Page A-136 – Revised the following language in the first paragraph from; “*The Project Manager or Responsible Change will submit stand alone “Accelerated Bridge Plan” assembly directly to the Scheduling and Contract Division for processing...*” To; The Project Manager or Responsible Change will submit stand alone “Accelerated Bridge Plan” assembly directly to the “*Construction*” Division for processing...

Revised the following language in the third paragraph from; *If the proposal and final estimate are to be developed by the Scheduling and Contract Division...* To; If the proposal and final estimate are to be developed by the “*Construction*” Division...

Revised the following language in the second sentence in the fourth paragraph from; “*Plan coordination will forward the plan assembly to the Scheduling & Contract Division...*” To; Plan coordination will forward the plan assembly to the “*Construction*” Division...

- Page A-139 – Revised the following language in the third paragraph from; “*When “Minimum Plan” roadway projects are combined with “Accelerated Bridge Plan” projects, the proposal and final estimate will be developed by the Scheduling and Contract Division.*” To; When “Minimum Plan” roadway projects are combined with “Accelerated Bridge Plan” projects, the proposal and final estimate will be developed by the “*Construction*” Division.

Revised the following language in the first sentence in the third paragraph under “SPECIFICATION” from; *The Special Provisions for “No Plan” and “Minimum Plan” Projects (available from VDOT’s Scheduling and Contract Division) are approved...* To; The Special Provisions for “No Plan” and “Minimum Plan” Projects (available from VDOT’s “Construction” Division) are approved...

Revised the following language in the last sentence in the third paragraph under “SPECIFICATION” from; *“Any additional Special Provisions are to be reviewed by the Scheduling and Contract Division in ample time for inclusion in the project bid proposal.”* To; Any additional Special Provisions are to be reviewed by the “Construction” Division in ample time for inclusion in the project bid proposal.

- Page A-179 – Revised the following language in the last sentence in the sixth paragraph under “ITEMS TO BE ADDRESSED UNDER CONSTRUCTABILITY INCLUDE” from; *The Scheduling and Contracts Division is a source for advice.* To; The “Construction” Division is a source for advice.

Revised the following language in the last sentence in the seventh paragraph under “ITEMS TO BE ADDRESSED UNDER CONSTRUCTABILITY INCLUDE” from; *“The Scheduling and Contract Division is a source for advice.”* To; The “Construction” Division is a source for advice.

- Page A-181 – Deleted the following language under IIM Reference; *“LD-138 Earthwork Quantities, Sheet 3 (first paragraph)”*

Deleted the following language after IIM Reference; *“Road and Bridge Standards: Standard GS-10, Minimum Design Criteria for Temporary Detours”.*

APPENDIX “B”

- Page B-40 – Deleted ALL the language under “ROUNDABOUTS” and replaced it with the following; *“See Appendix “F” for Roundabout Information.”*

APPENDIX “B(1)”

- Page B(1)-7 – Revised the following language in Note #6 from; *“Horizontal clearance (measured from face of curb)...”* To; *“Lateral offset” (measured from face of curb) is 1.5’ (Min) 2011 AASHTO Green Book Chapter 5 (Page 5-20). “Gutter pan is not a portion of the travelway, but is a portion of the parking lane.”*
- Page B(1)-10 – Revised “Figure 1.1 – 24’ Curb to Curb No Parking/Parking on One Side” to add dimension of the gutter pan and to add the following; *“Gutter pan is not a portion of the travelway, but is a portion of the parking lane.”*

- Page B(1)-21 – Revised the following language in note #2 under “PAVEMENT DESIGN” from; “*Standard crown*” means the cross slope... to; “*Normal crown*” means the cross slope ...

Added the following language under “PAVEMENT WIDTH”; “4. *Pavement width (Travelway) does not include the gutter pan when used.*”

- Page B(1)-23 – Revised the language in the first paragraph to add following; At street intersections, there are two distinct radii that need to be considered, the effective turning radius of the turning vehicle and the radius of the curb return “(*actual curb radius*).”

Added the following language in the third paragraph; “*The radius of the curb return (actual curb radius) should be no greater than that needed to accommodate the design turning radius. The actual curb radius shall be such that the design vehicle does not encroach into the adjacent or opposite lanes when making a turn. **The minimum radius of the curb return (actual curb radius) shall not be less than 15 feet. In industrial areas with no on-street parking, the radius of the curb return shall not be less than 30 feet.***”

- Page B(1)-44 – Deleted the following language at the end of the first paragraph; “*On-street parking is considered a temporary condition and is an exempt factor.*”
- Page B(1)-50 – Deleted ALL the language under “ROUNDABOUTS” and replaced it with the following; “*See Appendix “F” for Roundabout Information.*”

APPENDIX “B(2)”

- Page B(2)-15 – Added the following language after the first sentence in the first paragraph; “*This radius is determined by the selection of a design vehicle appropriate for the streets being designed and the lane on the receiving street into which that design vehicle will turn.*”

Revised the following language after the first sentence in the second paragraph from; “*The Actual Curb Radius is determined by the design vehicle.*” To; The Actual Curb Radius “*should be no greater than that needed to accommodate the design turning radius.*”

Revised the following language after the first sentence in the third paragraph from; *If Intercity Buses or City Transit Buses are the design vehicle a larger actual curb radius is required.* To; *If Intercity Buses or City Transit Buses are the design vehicle “the minimum radius should be increased to accommodate the turning radius of such vehicles. Minimal encroachment into the opposing lane of traffic of the receiving street is expected.”*

Added the following language in the fourth paragraph; “*Auto-TURN® diagrams shall be used to demonstrate the impact on the opposing lane of the receiving street and the sufficiency of the street widths to accommodate the vehicles without scrubbing curbs.*”

- Page B(2)-17 – Added the following language “ACTIVITY CENTER AMENITIES SUMMARY” See *ACTIVITY CENTER AMENITIES SUMMAR* at: http://www.virginia.gov/VDOT/Info/asset_upload_file482_62127.pdf.

APPENDIX “C”

- Page C-82 – Revised “FIGURE C-8.1 RAMP GORE FOR EXIT RAMP” to add 14’ dimension to exit ramp pavement width.
- Page C-85 – Revised “FIGURE C-8.4 RAMP GORE FOR ENTRANCE RAMP” to add note about ramp left paved shoulder width.
- Page C-87 – Added the following language;

EXPANSION JOINTS (RIGID PAVEMENT)

Each entrance and exit ramp must be examined on an individual basis to determine joint arrangements. The joint arrangement details are to be made a part of the plans.

Transverse expansion joints are to be provided in plain and reinforced concrete pavement as shown in Standard PR-2. Additionally, transverse expansion joints are to be provided at all ramp gores constructed of Portland Cement Concrete Pavement, either plain or reinforced.

The following sample drawings depict typical joint arrangements at entrance and exit ramps, and are not intended to be all encompassing.

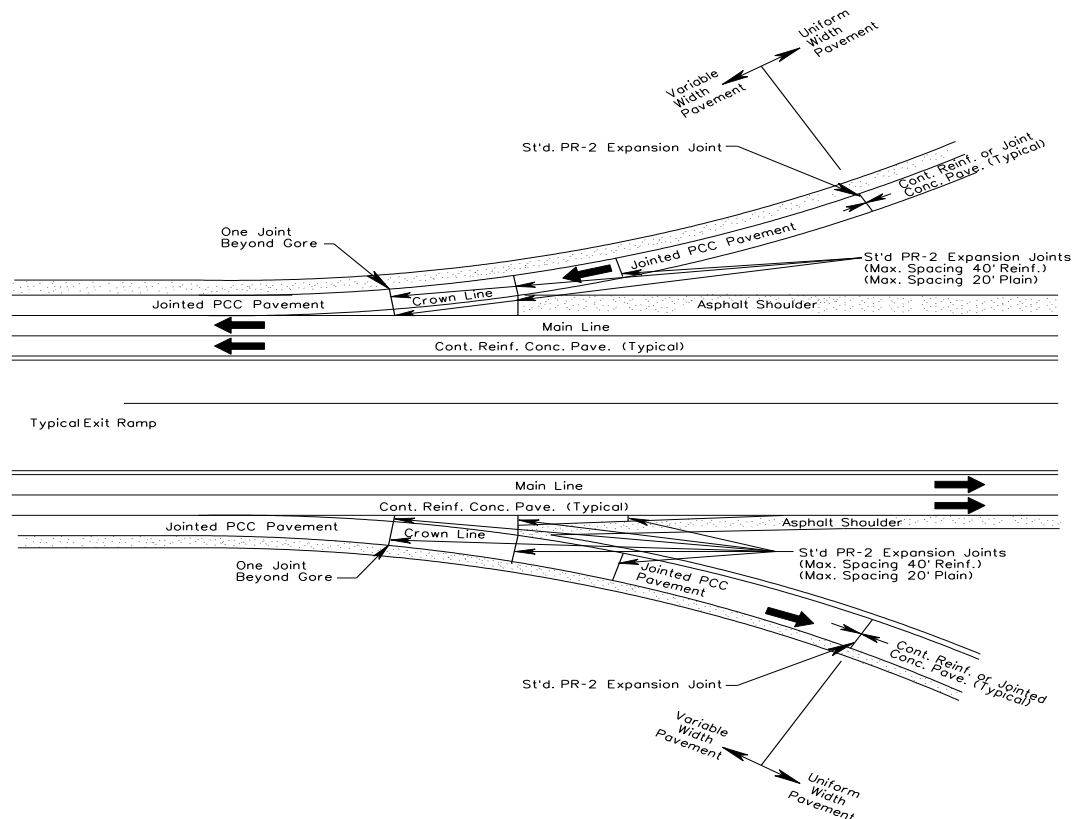


FIGURE C-8-5 TYPICAL ENTRANCE RAMP

APPENDIX “F”

- Page F-3 – Added the following language to the “Intersection” definition: An at-grade crossing of two or more highways *in a “T” three leg design or four leg design*, a median crossover...
- Page F-23 – Revised the language in the second column under “Minimum Centerline to Centerline Spacing (Distance) in Feet” to delete the word “*Directional*” from “Spacing from Unsignalized Intersections & Full/Directional Median Crossovers...”

Revised the language in the third column under “Minimum Centerline to Centerline Spacing (Distance) in Feet” to add “& *Directional Median*” to “Spacing from Full Access Entrances & *Directional Median* to Other...”

- Page F-24 – Revised the language in “Footnote #3” to add “*Full*” to the definition as follows; Unsignalized Intersection/*Full* Median Crossover.

Revised the following language in the first two sentences in “Footnote #4” from; “*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. However, studies have demonstrated that the majority of access related vehicular crashes involve left turns.*” To; **Full Access Entrance “& *Directional Median Crossover*” Spacing** – Spacing can be less than unsignalized intersection and “*full*” median crossover spacing. Full “*access*” entrances have only 11 potential conflict (collision) points “*and directional crossover only 6*”. However, studies have demonstrated that the majority of access related vehicular crashes involve “*multiple*” left turn “*movements*”.

Revised the following language in the second sentence in “Footnote #5” from; “*If a directional median crossover is involved the unsignalized intersection/median crossover spacing applies.*” To; If a directional median crossover is involved the “*directional*” median crossover spacing “*applies to the entrance*”.

- Page F-26 – Revised “Figure 2-8-1 Illustration of the Relationship Between Spacing Standards” to correct spacing between a partial entrance with a directional median crossover and a signalized intersection.
- Page F-40 thru F-51 – Revised language under the “Roundabouts” portion of “Section 2 – Intersection Design; Spacing Standards” to add new details and additional language.
- Page F-51 thru F-68 – added Diverging Diamond Interchange (DDI) information.
- Page F-75 – Replaced the following language at the end of the last paragraph from; “*Design Speed may be obtained from IIM LD-117.*” To; Design Speed may be obtained from “*Appendix A, Section A-1*”.

- Page F-76 – Revised “FIGURE 3-4 PASS/LEFT TURN LANE ON TWO-LANE HIGHWAY” to reduce T₁ lengths to agree with the shifting tapers in the MUTCD.
- Page F-104 thru F-122 – Restructured and rewrote portions of “Section 4-Entrance Design” to help clarify entrance definitions and information.

APPENDIX “I”

- Appendix “I” was added to combine the information that was located in Appendix A, Section 3 Traffic Barrier Installation Criteria and IIM- 184.5 Median Barrier Design.